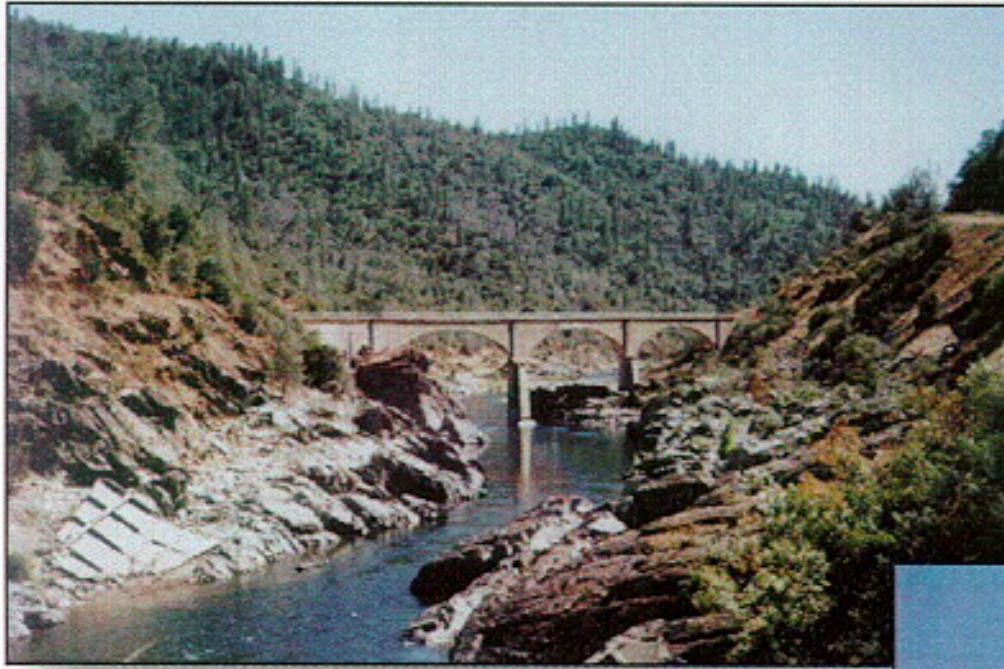
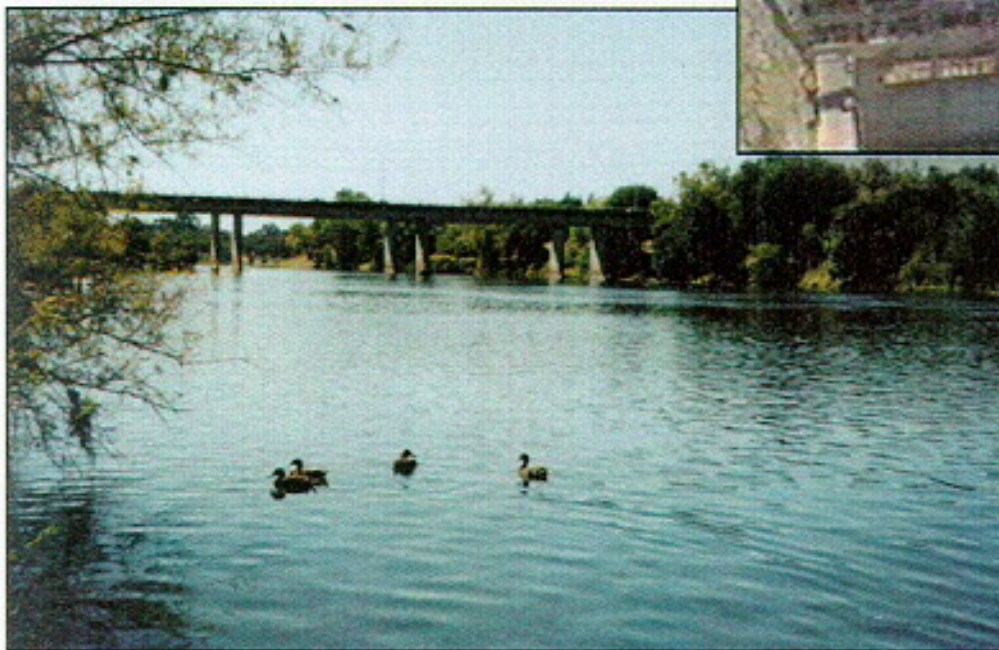


American River Watershed Sanitary Survey



1998 Update



December 1998

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in association with



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List of Abbreviations

ACWA	Association of California Water Agencies
ACWS	Arden Cordova Water Service
AF/yr	acre-feet per year
AMP	Sacramento Ambient Monitoring Program
ARWSS	American River Watershed Sanitary Survey
AWD	Arcade Water District
AWWA	American Water Works Association
BAT	best available technology
BMP	best management practice
CalEPA	California Environmental Protection Agency
CALFED	consortium of California and federal agencies addressing restoration of the Delta's ecosystem health
Caltrans	California Department of Transportation
CAO	clean up and abatement order
CDF	California Department of Fire and Forestry
CDMG	California Division of Mines and Geology
CHMIRS	California Hazardous Materials Incident Reporting System
CHP	California Highway Patrol
CMP	Sacramento Coordinated Monitoring Program
COC	constituent of concern
CRMP	Coordinated Resources Management Plan
CSUS	California State University at Sacramento
CT	contact time
CUPA	Certified Unified Program Agency
CUWA	California Urban Water Agencies
CWA	Clean Water Act
CWD	Carmichael Water District
DBP	disinfection by-product
D/DBP	disinfectants/disinfection by-product
DFG	California Department of Fish and Game
DHS	California Department of Health Services
DOC	dissolved organic carbon
DPR	Department of Pesticide Regulation
DTSC	Department of Toxic Substances Control
DWCCL	Drinking Water Candidate Contaminant List
DWSAP	Drinking Water Source Assessment and Protection
EBMUD	East Bay Municipal Utility District

List of Abbreviations

EID	El Dorado Irrigation District
EPTC	s-ethyl-dipropylthiocarbamate
ESWTR	Enhanced Surface Water Treatment Rule
Folsom	City of Folsom
FSP	Folsom State Prison
GAC	granular activated carbon
GET	groundwater extraction and treatment
GIS	geographic information system
HAA	haloacetic acid
ICR	Information Collection Rule
IMS	immunomagnetic separation
IOC	inorganic contaminant
Kinder Morgan	Kinder Morgan Pipeline L.P.
LAA	Local Administering Agency
LCR	Lead and Copper Rule
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MFL	million fibers per liter
MGD	million gallons per day
MID	Modesto Irrigation District
MPN	most probable number
MRDL	Maximum Residual Disinfectant Level
MTBE	methyl tert-butyl ether
MWD	Metropolitan Water District of Southern California
NDMA	n-Nitrosodimethylamine
NIPDWR	National Interim Primary Drinking Water Regulations
NODA	Notice of Data Availability
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
OES	Office of Emergency Services
PAC	polyaluminum chloride
PCE	perchloroethylene
PCWA	Placer County Water Agency
PG&E	Pacific Gas and Electric Company
PUC	Public Utilities Commission
PWS	public water system
RAPID	Railroad Accident Prevention and Incident Deployment
Roseville	City of Roseville
RPHL	Recommended Public Health Limit
RWQCB	Regional Water Quality Control Board

List of Abbreviations

SAC	Strategic Air Command
SAFCA	Sacramento Area Flood Control Agency
SAWWA	Sacramento Association of Water Works Agencies
SDWA	Safe Drinking Water Act
SEMS	Standardized Emergency Management System
SJWD	San Juan Water District
SMUD	Sacramento Metropolitan Utility District
SOC	synthetic organic chemical
SRLF	State Revolving Loan Fund
SUVA	specific ultraviolet absorbance
SWAP	Source Water Assessment Program
SWRCB	State Water Resources Control Board
SWTR	Surface Water Treatment Rule
TAF	thousand acre-feet
TC	Technical Committee
TCE	trichloroethylene
TCR	Total Coliform Rule
THM	trihalomethane
TOC	total organic carbon
TOX	total organic halide
TPH	total petroleum hydrocarbons
TT	treatment technique
TTHM	total trihalomethanes
UCD	University of California at Davis
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
UV	ultraviolet
VOC	volatile organic chemical
WDR	Waste Discharge Requirement
WTP	water treatment plant

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WDR permits for all the landfills in the American River Watershed (see Table 5-12).

PERSONAL COMMUNICATIONS

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References

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Executive Summary

The California Surface Water Treatment Rule (SWTR) requires public water supply systems using surface water sources to conduct a sanitary survey of the watershed and then to update the survey every 5 years. The first American River Watershed Sanitary Survey (ARWSS) was completed in 1993; this 1998 Update is the first update.

A sanitary survey involves an evaluation of watershed contaminant sources, source water quality, treatment plant capabilities, and treated water quality to assess the ability of a water agency to provide safe drinking water that meets all drinking water standards. A sanitary survey should recommend activities to protect and improve the source water quality. An update should take into account changes within the previous 5 years that affect this assessment and the recommended activities.

Eleven agencies jointly funded this study: 10 agencies that divert surface water from the American River, including Placer County Water Agency (PCWA), El Dorado Irrigation District (EID), the Folsom State Prison (FSP), the City of Folsom (Folsom), the City of Roseville (Roseville), San Juan Water District (SJWD), Arden Cordova Water Service (ACWS), Carmichael Water District (CWD), Arcade Water District (AWD), and the City of Sacramento, and the East Bay Municipal Utility District (EBMUD), which is currently developing a water supply project on the American River.

The study area and location of each of the participating agency's intake facilities are shown on **Figure ES-1**. The upper watershed (the North, Middle, and South forks) is characterized by high erosion potential, timber harvesting, some livestock grazing, past and current mining, limited agriculture, relatively small urban centers, and considerable recreational use. The lower watershed (Folsom Lake, Lake Natoma, and the Lower American River) is characterized by a large urban population, limited industry, and a high degree of recreational use. Folsom Lake, which is a multi-purpose reservoir, is the hub of the river system. Its operation affects the source water quality of agencies that divert directly from the lake and agencies that divert downstream along the Lower American River.

During the initial scoping phase for the update, agency staff met with DHS staff to jointly develop the topics that would be addressed in the 1998 Update and to concur on the level of detail of the update. Several topics that were covered in considerable detail in the 1993 ARWSS Report and have not changed significantly in the last 5 years, are covered only briefly in this 1998 Update. These topics include a detailed identification of tributaries and reservoirs with typical hydrologic patterns; physical features such as geography, topography, geology, soils, vegetation, climate, and rainfall; major land-ownership patterns; and abandoned mines.

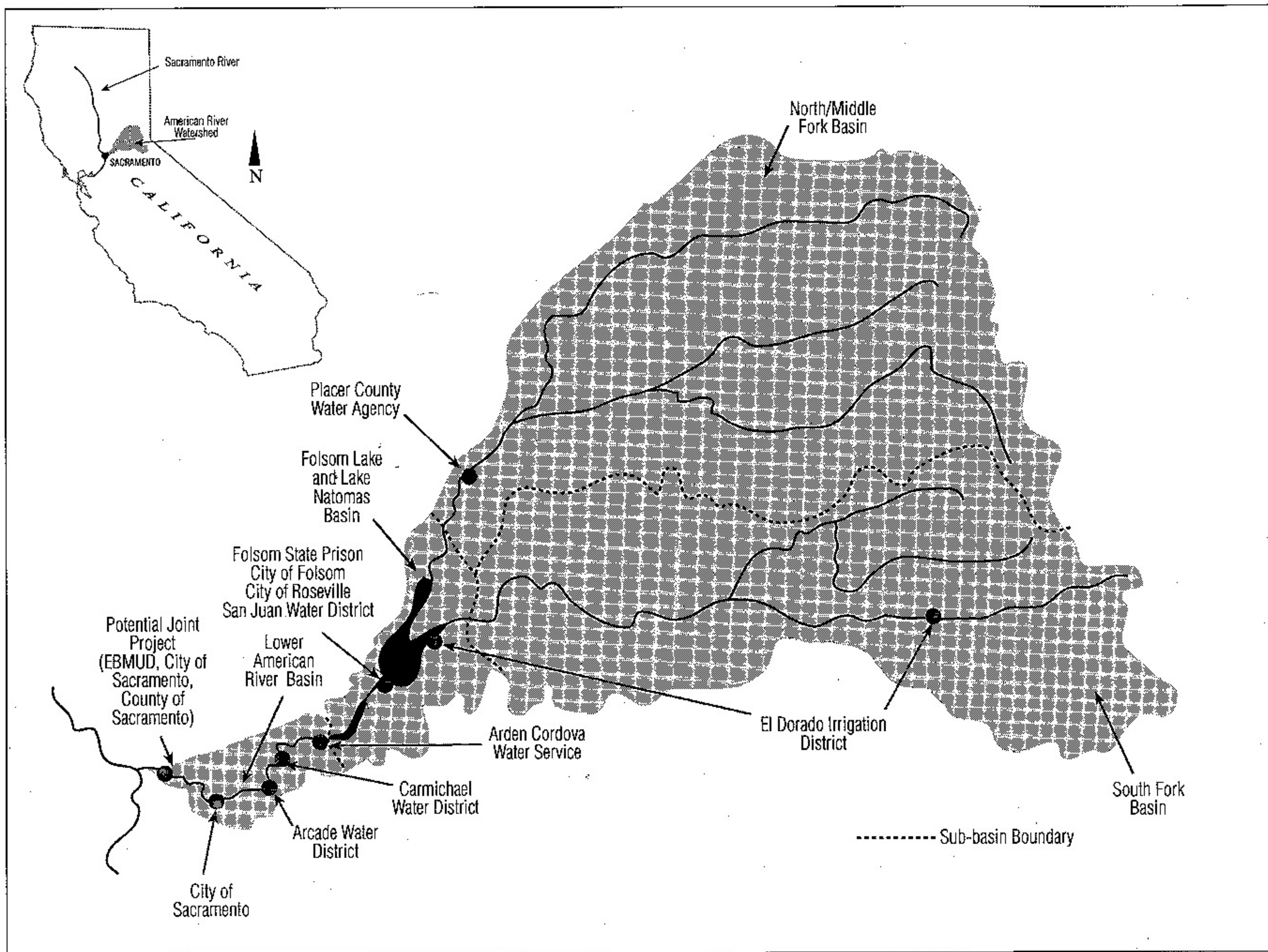


Figure ES-1. Water Agency Intake Locations Along the American River

EXECUTIVE SUMMARY

This study was conducted by surveying each participating agency's water treatment plant (WTP) processes; by collecting agency raw and treated water data, as well as data from other monitoring programs; by obtaining information from numerous documents; by contacting various state, federal, and local agencies knowledgeable about watershed contaminant sources; and by preparation of detailed maps of contaminant sources in the river reaches near each water treatment plant intake (termed "near-intake zone").

SUMMARY OF WATER QUALITY FINDINGS

The study included a compilation of raw and treated water data for each agency from 1993 through 1997. A more detailed evaluation was conducted for several parameters pertinent to the existing SWTR, the future Enhanced Surface Water Treatment Rule (ESWTR), the future Disinfectants/Disinfection By-Products (D/DBP) Rule, and the existing Trihalomethane (THM) Regulation. These parameters include several microbiological organisms (coliform bacteria, *Giardia*, *Cryptosporidium*, and viruses), turbidity, and several parameters related to disinfection by-products (DBPs), namely, total organic carbon (TOC), specific UV absorbance (SUVA), and THMs. Methyl tert-butyl ether (MTBE) and perchlorate were also examined. MTBE is a gasoline additive being found throughout the state in groundwater contaminated by leaking underground storage tanks and in surface waters used heavily for recreation. Perchlorate is a rocket fuel component found in contaminated groundwater underlying the Aerojet facility, which is located just south of Lake Natoma.

- The source water quality along the entire American River is generally excellent. All regulated drinking water parameters in treated water fall below maximum contaminant levels (MCLs) standards. Also, concentrations of constituents that have trigger levels for additional treatment (i.e., *Giardia*, viruses, TOC) are, or appear to be, below the trigger levels.
- The evaluation of the coliform data showed that high coliform levels are frequently associated with storms, although high levels are also observed during dry weather. There is a clear trend of increasing concentrations from upstream to downstream, with the largest increase along the Lower American River. The most likely sources of the increased coliform levels along the Lower American River are urban runoff discharges and recreational use along the river. As a result of numerous research projects, it is becoming increasingly clear in the water industry that coliform bacteria are not good indicators of *Giardia*, viruses, or *Cryptosporidium*. Monitoring directly for the pathogenic organisms, with increasingly reliable methods, is important in evaluating their presence. Nevertheless, in the absence of more reliable pathogen data, the coliform bacteria data should continue to be seriously regarded and evaluated as one of several inexact tools used in our attempt to understand the overall quality of the source water.
- A substantial amount of *Giardia* and *Cryptosporidium* data and a limited amount of virus data have been collected over the last 5 years. Detections have been uncommon; however, since the accuracy

EXECUTIVE SUMMARY

and reliability of the analytical methodology is limited, this may indicate only that these pathogens are present at low levels.

- As follow up to the Information Collection Rule (ICR), the U.S. Environmental Protection Agency (USEPA) will be conducting a voluntary sampling program for pathogens in surface water. The USEPA will be collecting 12 monthly water samples from 47 utilities around the United States for analysis of *Cryptosporidium*, and potentially *Giardia*, by the new USEPA Method 1622. This method is used to analyze for pathogens using a combination of filtration, immunomagnetic separation, and immunofluorescence assay, and is expected to provide higher recovery rates than the immunofluorescence assay method alone. The City of Sacramento has volunteered to participate as part of the study. Raw samples from E.A. Fairbairn WTP will be submitted beginning November 1998 and continue through October 1999.
- Increased turbidity in the river reaches of the American River system correlates positively with increased flow. In general, turbidity levels in the source water exceed 10 NTU less than 10% of the time and exceed 100 NTU less than 1% of the time.
- TOC levels average 1.5 mg/L. A limited amount of SUVA data, collected along the Lower American River, show an average of 3.3 m-L/mg, indicating that the organic material present is humic in nature and will contribute to DBP formation. Each agency has observed varying levels of THMs in the treated water due to different physical removal and chemical treatment processes and distribution system configurations.
- MTBE has been monitored regularly in Folsom Lake and irregularly along the Lower American River. It has been detected once, in Folsom Lake, by El Dorado Irrigation District at a concentration of 0.92 Fg/L.
- Perchlorate has been monitored a few times on the Lower American River (i.e., below Folsom Dam) by the California Department of Health Services (DHS). It was not found above the detection limit of 4 Fg/L.

In addition to the information described above, a comprehensive compilation of data and other pertinent information was made in order to provide, in one document, information needed by the DHS to evaluate watershed-wide monitoring waivers. This included information on arsenic, asbestos, cyanide, and pesticides. The average arsenic concentration in the Lower American River is about 0.35 Fg/L. A considerable amount of pesticide monitoring has been conducted on the Lower American River with few detections, even at ultra-low detection limits (i.e., nanograms per liter). There are three exceptions: diazinon, diuron, and simazine have been occasionally detected, but at concentrations well below drinking water levels of concern.

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SUMMARY OF WATERSHED CONTAMINANT SOURCES

The study included an evaluation of various contaminant sources in the watershed including (1) storm-related turbidity and pathogen sources, (2) recreation, (3) wastewater, (4) industrial facilities, (5) urban runoff, and (6) transportation and pipeline corridors.

- Many drinking water contaminants, including pathogens, are transported into the river system during storm events. The upper watershed has a high erosion potential due to its topography and soils composition while the lower watershed is highly urbanized with a high percentage of impervious area. Both of these conditions provide a mechanism for contaminant transport.
- Exposed soil can contribute to elevated turbidity levels in the river system and can be caused by timber harvesting, fires, landslides, and over-grazing. Forest health, including timber harvesting and fires, in part of the upper watershed (Placer County) is beginning to be addressed through the American River Coordinated Resources Management Plan (CRMP).
- Fecal waste from wild animals, livestock, and pets, whether in undeveloped or urban areas, can be transported during storms. There is less concern with these sources during the dry season since there is virtually no runoff from undeveloped areas during the dry season. In addition, heat and dry conditions (i.e., desiccation) play an important role as inactivation factors for protozoa. Pathogen occurrence in wild animal species, livestock, and companion animals is an active area of research.
- In urban areas, wild and domestic animal populations contribute fecal matter to the land surface. The impervious nature of an urban area results in more rapid and complete transport of contaminants than in undeveloped areas. Monitoring data show that urban runoff probably contains some level of fecal/pathogen contamination. In urban areas, although heat and dry conditions prevail during the dry season, a continual dry weather flow from outdoor water use may carry some animal fecal waste. Pathogens in Sacramento area urban runoff are being addressed through the Sacramento Stormwater Management Program in a process of problem identification and an exploration of potential source identification methods and control measures.
- Recreation is the other major potential source of pathogens in this watershed during dry weather. Recreational use of the American River system involves an estimated 8 million visitor-days per year. Improper sanitary practices during body-contact recreation and handling of waste on boats may contribute pathogens directly to the river system. Water agencies that own or have a high degree of control of their reservoirs typically limit recreational use. The entire American River system is, however, a multi-use system with recreation being one of the key benefits to the surrounding population.

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- Boating and urban runoff are both sources of MTBE. MTBE is being addressed at a policy level through state legislation, the adoption of an MTBE policy statement by the Association of California Water Agencies (ACWA), and various other activities. If MTBE is banned or its use is severely curtailed as a result of these efforts, it will rapidly become a low-priority issue in surface waters. If not, it will remain a potential problem. More monitoring data are needed to evaluate the extent of the problem on the American River system (see Recommendation No. 10).
- The potential for untreated human wastewater inputs in this watershed is very limited, but is more likely to occur during storms. The Colfax and Placerville wastewater treatment plants both have capacity problems due to high flows during storms. Also, some of the small non-discharging community wastewater systems have had spills during major storms.
- Septic systems are of concern because of (1) their large number in the upper watershed—somewhere in the order of 27,000 to 35,000 (many are close to the South Fork) and (2) due to a lack of resources for monitoring there is little assurance that they are properly maintained once installed.
- In general, industries pose little risk to the drinking water quality of the river system. This is in large part due to the relatively low level of industrialization in the watershed.
- The only industry currently of potential concern to source water quality is the Aerojet facility which is located just south of Lake Natoma and has discharges to the Lower American River system. Although effluent discharge limits for Aerojet's discharges to the river system have been developed to protect all the beneficial uses of the river based on current knowledge and analytical capabilities, there is a history of finding previously unknown constituents of concern (COC) to drinking water (i.e., perchlorate and n-Nitrosodimethylamine [NDMA]) in Aerojet's treated groundwater once analytical method detection limits are lowered sufficiently. In addition, there is a concern with future disposal options for the potentially very large volume of water that may eventually be generated by groundwater extraction and treatment at the facility, i.e., the potential for additional discharges to the American River and/or the Folsom South Canal.
- Finally, there is the potential for spills of hazardous materials due to traffic accidents, railroad, or pipeline spills. The agencies need timely notification in order to respond properly at the WTP. There is currently no assurance that the agencies will be notified promptly, except for PCWA and Sacramento, which have direct notification procedures in place, providing coverage for most of the area tributary to their WTP intakes. Neither the City of Sacramento nor PCWA have notification procedures in place for El Dorado County.

SUMMARY OF WATER TREATMENT PLANT EVALUATIONS

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The study included an evaluation of compliance at the existing water treatment plants from the perspective of source water quality, present and anticipated future regulations, and changes in the operation of Folsom Dam.

- The 1993 ARWSS Report concluded that 3- to 4-log removal for *Giardia* and viruses was sufficient, pending the collection of data on *Giardia* and viruses. The *Giardia* and virus data collected over the past 5 years show few detections of *Giardia* and viruses, suggesting that the incidence of these pathogens in the source water is low. Although these data are inexact, based on the limitations of the analytical methods, they support the conclusion from the 1993 ARWSS Report that 3- to 4-log removal is the appropriate level of treatment for American River water agencies at this time.
- The coliform data show that agencies diverting water from the upper watershed and Folsom Lake rarely see total coliform levels greater than 1,000 most probable number (MPN)/100 mL, while agencies on the Lower American River may see coliform levels greater than 1,000 MPN/100 mL from 15 to 25% of the time primarily during the rain season. As a result of numerous research projects, it is becoming increasingly clear in the water industry that coliform bacteria are not good indicators of the presence of *Giardia*, viruses, or *Cryptosporidium*. Nevertheless, until more reliable methods are developed for accurately determining the presence of these pathogens, the coliform bacteria data should continue to be evaluated as an indicator of the general water quality. The Lower American River water agencies, in particular, should optimize treatment during storms and periods of high recreation as well as support a public education campaign targeted at recreational users of the river.
- Currently, all the agencies are in compliance with all existing regulations, except for AWD and CWD, which are under compliance orders for the SWTR. Both AWD and CWD are responding to the compliance orders.
- All of the agencies experienced some level of difficulty during the January 1997 Pineapple Express storm. Similar difficulties can be expected when similar climatic conditions recur and cause short-term turbidity spikes. Recent flood conditions have changed perceptions about the degree of flood protection provided by Folsom Dam to downstream residents. To protect the Sacramento area, Folsom Dam is now operated for increased flood control, which results in additional exposure of shoreline and also passes a large amount of water through the reservoir during the wet years. During the rain season, these conditions are likely to accentuate turbidity spikes during major storms and cause short-term treatment difficulties. Long-term flood control solutions are mired in political controversy over Auburn Dam.
- Installation and operation of a temperature control device to provide the four Folsom Dam water diverters with water from the reservoir at elevations above the cold water pool could result in increased temperature, turbidity, coliform levels, TOC, and MTBE in the raw water. The specific impacts depend on the details of the design and operational rules of the device, which are still being developed.

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- Future treatment plant issues may include the potential need to install backwash water treatment facilities and filter-to-waste capabilities, the potential change in disinfection requirement procedures due to the Stage 2 DBP Rule, the potential need to monitor for constituents in accordance with the Drinking Water Contaminant Candidate List, and the potential need to prove physical removal of *Cryptosporidium* to obtain 2-log removal credit.

LIST OF RECOMMENDATIONS

The list of recommendations, developed to protect source water quality and to maintain treated water quality, is shown in **Table ES-1**, along with the agency(ies) to which the recommendation applies.

Table ES-1. List of Recommendations

RECOMMENDATION	P C W A	E I D	F S P	City of Fol- som	City of Rose- ville	S J W D	A C W S	C W D	A W D	City of Sac	EB M U D
HIGH PRIORITY											
1. Optimize treatment during storms and other critical periods such as high recreational use times.	T	T	T	T	T	T	T	T	T	T	T
2. When pathogen analytical methods become substantially more exact, the water agencies may consider collecting additional pathogen data.	T	T	T	T	T	T	T	T	T	T	T
3. The four water agencies that divert water at Folsom Dam should remain involved throughout the design, construction, and operational phases of the temperature control device project.			T	T	T	T					
4. Ensure that spill notification procedures are in place so that each agency can be assured it will receive timely notification in the event of a hazardous material spill into the river system.	T	T	T	T	T	T	T	T	T	T	T
5. Develop and implement a public education campaign targeted to responsible recreational use of the river system.	T	T	T	T	T	T	T	T	T	T	T
MEDIUM PRIORITY											
6. Provide planning and space at new or expanded WTPs to allow for potential installation of alternative facilities to meet future regulatory requirements.	T	T	T	T	T	T	T	T	T	T	T
7. Continue to monitor distribution system DBPs and disinfection practices to ensure that future anticipated DBP standards are not exceeded.											
8. Conduct coliform monitoring upstream and downstream of Strawberry to better identify the potential effects of septic systems.		T									
9. Coordinate the Folsom Lake agencies to monitor raw water in Folsom Lake for MTBE at a higher frequency.		T	T	T	T	T					

Table ES-1. Continued[illegible]

Chapter 1. Introduction

This report presents the findings of the 1998 Update to the American River Watershed Sanitary Survey (ARWSS). The initial sanitary survey was completed in 1993; and in accordance with the Surface Water Treatment Rule (SWTR), updates must be developed every 5 years thereafter. The American River watershed drains the west slope of the Sierra Nevada from just west of Lake Tahoe to the confluence of the American River with the Sacramento River in the City of Sacramento. For assistance with acronyms, the reader is referred to the list of abbreviations at the front of the report.

PURPOSE OF THE STUDY

This watershed sanitary survey assesses the ability of the water agencies using American River water to provide their customers with safe drinking water that meets all drinking water standards. Making this assessment involves an evaluation of watershed contaminant sources, source water quality, treatment plant capabilities, and treated water quality. The assessment is intended to accomplish the following purposes:

- Identification of appropriate watershed management activities to protect and improve source water quality. Recommended watershed management activities should be economically feasible and within the authority of the water agency to implement.
- Identification of water quality and treatment issues at each of the participating agency's water treatment plants (WTPs). Recommended treatment plant activities should address an identified water quality or treatment issue.
- Fulfillment of the California SWTR requirement that surface water agencies conduct a sanitary survey of the source watershed once every 5 years.

An additional purpose was added by the water agencies participating in this study, in order to take full advantage of the sanitary survey work. That purpose is:

- Compilation of information on potentially waivable monitored constituents, sufficient to allow the California Department of Health Services (DHS) to evaluate monitoring waivers for the American River water agencies on a watershed-wide basis.

One other additional purpose may also be served by this 1998 Update:

- For surface water sources, watershed sanitary surveys provide much of the same type of information that will be required under the new Drinking Water Source Assessment and Protection (DWSAP) Program being developed by the DHS, including a delineation of the watershed, an inventory of contaminant sources, and an analysis of the significance of those sources to drinking water quality at

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the intake. This sanitary survey is generally consistent with the current draft DWSAP Program requirements, including identification of watershed zones close to the intake (DHS, 1998).

It is currently envisioned that if a water agency has completed an evaluation that is the functional equivalent of a portion or all of the DWSAP requirements, that information may be submitted to fulfill the DWSAP. DHS intends that the watershed assessments be completed by April 2003. It is hoped that this sanitary survey will be adequate to fulfill all or a portion of the DWSAP requirements for the American River.

PARTICIPATING AGENCIES

Eleven agencies joined together under a Memorandum of Understanding to conduct this study. Ten of the agencies currently divert and treat American River water. The East Bay Municipal Utility District (EBMUD), which is currently developing a water supply project on the American River, also participated in the study. The 11 participating agencies are listed in upstream to downstream order, starting with the North Fork. EBMUD (which is not currently diverting water) is listed last. The 11 agencies include:

- Placer County Water Agency (PCWA)
- El Dorado Irrigation District (EID)
- City of Folsom (Folsom)
- City of Roseville (Roseville)
- Folsom State Prison (FSP)
- San Juan Water District (SJWD)
- Arden Cordova Water Service (ACWS)
- Carmichael Water District (CWD)
- Arcade Water District (AWD)
- City of Sacramento
- East Bay Municipal Utility District (EBMUD)

CONDUCT OF THE STUDY

The project team consisted of a Technical Committee (TC), comprised of representatives from the 11 water agencies, and a consultant team, consisting of Archibald & Wallberg Consultants, Montgomery Watson, and McGuire Environmental Consultants.

The TC developed the initial scope of work, reviewed and commented on work products, helped identify and develop watershed management recommendations, and provided guidance to the consultant team. During the initial scoping phase for the update, agency staff met with DHS staff to jointly develop the topics that would be addressed in the 1998 Update and to concur on the level of detail of the update. Several topics that were covered in considerable detail in the 1993 ARWSS Report and have not changed

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significantly in the last 5 years, are covered only briefly in this 1998 Update. These topics include a detailed identification of tributaries and reservoirs with typical hydrologic patterns; physical features such as geography, topography, geology, soils, vegetation, climate, and rainfall; major land-ownership patterns; and abandoned mines.

The consultant team obtained information from each participating agency by conducting individual agency surveys. The surveys addressed each treatment plant's processes, including a discussion of treatment challenges with operating staff, solicited raw and treated water data from each agency, addressed public education and watershed activities, and included a tour of each treatment plant.

The consultant team obtained additional water quality data on the American River from the U.S. Geological Survey's (USGS's) Nationwide Water Quality Assessment Monitoring Program, the Sacramento Coordinated Monitoring Program, and the Central Valley Regional Water Quality Control Board (RWQCB).

Each participating agency identified potential contaminant sources of interest within its own near-intake zone. The consultant team compiled the near-intake zone information into map displays for the upper watershed, Folsom Lake, and the Folsom South Canal. The City of Sacramento compiled the near-intake information for the Lower American River and displayed it on geographic information system (GIS) maps.

The consultant team collected information on contaminant sources in the watershed through literature reviews, file reviews, and discussions with various agencies' staff. Agencies contacted for information included the RWQCB; the State Water Resources Control Board (SWRCB); the DHS; the California Department of Parks and Recreation; the California Department of Pesticide Regulation (DPR); the California Division of Mines and Geology (CDMG); the California Department of Boating and Waterways; the California Department of Fire and Forestry; the California Department of Transportation (Caltrans); the University of California at Davis (UCD); the State Office of Emergency Services (OES); the California Department of Toxic Substances Control (DTSC); the U.S. Forest Service (USFS); Amador, Alpine, El Dorado, Placer, and Sacramento counties' Departments of Environmental Management; the Sacramento Stormwater Management Program; the Kinder Morgan Pipeline L.P. (Kinder Morgan); and Union Pacific Railroad. Internet sites accessed for information are listed in **Appendix A**. No watershed field survey was conducted.

REPORT ORGANIZATION

Chapter 1 - Introduction. This chapter describes the purpose of the study, lists the participating agencies that funded the study, describes how the study was conducted, and includes a description of the basic report organization. **Appendix A** lists Internet sites accessed for information.

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Chapter 2 - Watershed and Water Supply Systems. This chapter is largely descriptive and provides (1) an overview of the physical, hydrologic, and land use characteristics of the watershed and (2) a description of each of the participating agency's water supply system. A brief summary of each agency's ability to treat American River water is also included under the discussion of each agency's water supply system. **Appendix B** contains watershed figures from the 1993 ARWSS Report and also the table of contents. **Appendix C** contains the agency surveys.

Chapter 3 - Drinking Water Regulations. This chapter describes key parameters and the drinking water regulations pertinent to key parameters in the American River watershed. Both existing and potential future regulations are discussed. **Appendix D** contains a comprehensive outline of existing and anticipated drinking water regulations.

Chapter 4 - Water Quality Data Review. This chapter contains a tabular summary of the raw and treated American River water data and an evaluation of the data for selected parameters. Some of the tables and graphs developed for this review are in **Appendix E**.

Chapter 5 - Watershed Contaminant Sources. This chapter describes pertinent characteristics of each of the contaminant sources that were included in this update. Contaminant sources within each near-intake zone are identified. The most significant contaminant sources for each participating agency are also identified. **Appendix F** contains the near-intake zone maps. **Appendix G** consists of a list of emergency notification contacts at each participating agency. **Appendix H** contains a TC work product used in evaluating the significance of the contaminant sources to each of the participating agencies.

Chapter 6 - Potentially Waivable Title 22 Constituents. This chapter pulls together information relevant to waiver eligibility and provides a brief description of monitoring waiver regulations; a tabular summary of data for constituents which are eligible for waivers along with information on general uses and environmental persistence; and watershed sources for arsenic, asbestos, cyanide, and pesticides.

Chapter 7 - Evaluation of Ability to Meet the Surface Water Treatment Rule. This chapter contains the evaluation of each treatment plant's capability to meet the SWTR and includes findings and recommendations for each individual treatment plant.

Chapter 8 - Watershed Management. A review of the 1993 ARWSS Report's watershed management recommendations is included along with a discussion of current relevant activities being conducted by the participating agencies and under the auspices of other watershed management efforts. Finally, the watershed management recommendations developed through discussions among the TC are presented.

Chapter 9 - Findings and Recommendations. This chapter consists of a summary of principal findings and a comprehensive list of recommendations.

Chapter 2. The Watershed and Water Supply Systems

This chapter provides an overview description of the watershed which summarizes physical, hydrologic, and land use characteristics and also provides a description of each agency's water supply system. A brief summary of each agency's ability to treat American River water is included under the section on the water supply system. For assistance with acronyms, the reader is referred to the list of abbreviations at the front of the report.

DESCRIPTION OF THE WATERSHED

The American River Watershed consists of approximately 1,900 square miles on the western slope of the Sierra Nevada mountains, extending from the spine of the Sierra Nevada westward to the City of Sacramento. Elevations in the watershed range from above 10,000 feet in the high Sierra to 23 feet above mean sea level at the confluence of the American and Sacramento rivers. The location of the watershed is shown on **Figure 2-1**.

Folsom Dam, owned and operated by the U.S. Bureau of Reclamation as part of the Central Valley Project, is the principal regulating reservoir on the American River. Folsom Lake is a multi-purpose reservoir; its primary uses are providing flood control, water supply, and recreation. Folsom Lake and its afterbay, Lake Natoma, release water to the lower American River and to the Folsom South Canal. The operation of Folsom Dam directly affects most of the water diverters on the American River system. When the dam is operated for flood control purposes, there are often low lake levels that expose the shoreline and also high flow-through volume during storms. Both of these conditions can impact water quality at the WTPs that divert water directly from the lake and those on the Lower American River. These impacts are discussed in more detail in Chapter 7. Numerous dams, canals, pipelines, and penstocks are located in the upper watershed above Folsom Dam. The principal uses of these facilities include power generation, water supply, and recreation. The river system, major reservoirs, and sub-watershed basins are shown on Figure 2-1. Typical hydrologic conditions in the watershed were described in detail in the 1993 ARWSS Report (HDR, 1993).

The American River watershed climate is temperate and is characterized by wet winters and dry summers. Ninety-five percent of the annual precipitation occurs between November and April, and ranges from an average 17 inches per year at the City of Sacramento to more than 70 inches per year at elevations above 5,000 feet. Winter storms drop their moisture as rain and snow, with much of the precipitation falling as snow at the higher elevations. The resulting annual snowpack at the higher elevations acts as a natural reservoir, releasing water as temperatures rise over the spring and summer months. Both droughts and floods occur from year to year with unpredictable periodicity. Over the past 5 years, floods and reservoir reoperations have caused water quality and treatment issues. As mentioned previously, operation of the dam for flood control often means the direct release of storm flows through the dam. In January 1997, a

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major storm occurred in conjunction with a landslide in the South Fork basin, resulting in the highest turbidity levels ever seen at the WTPs on Folsom Lake and the Lower American River.

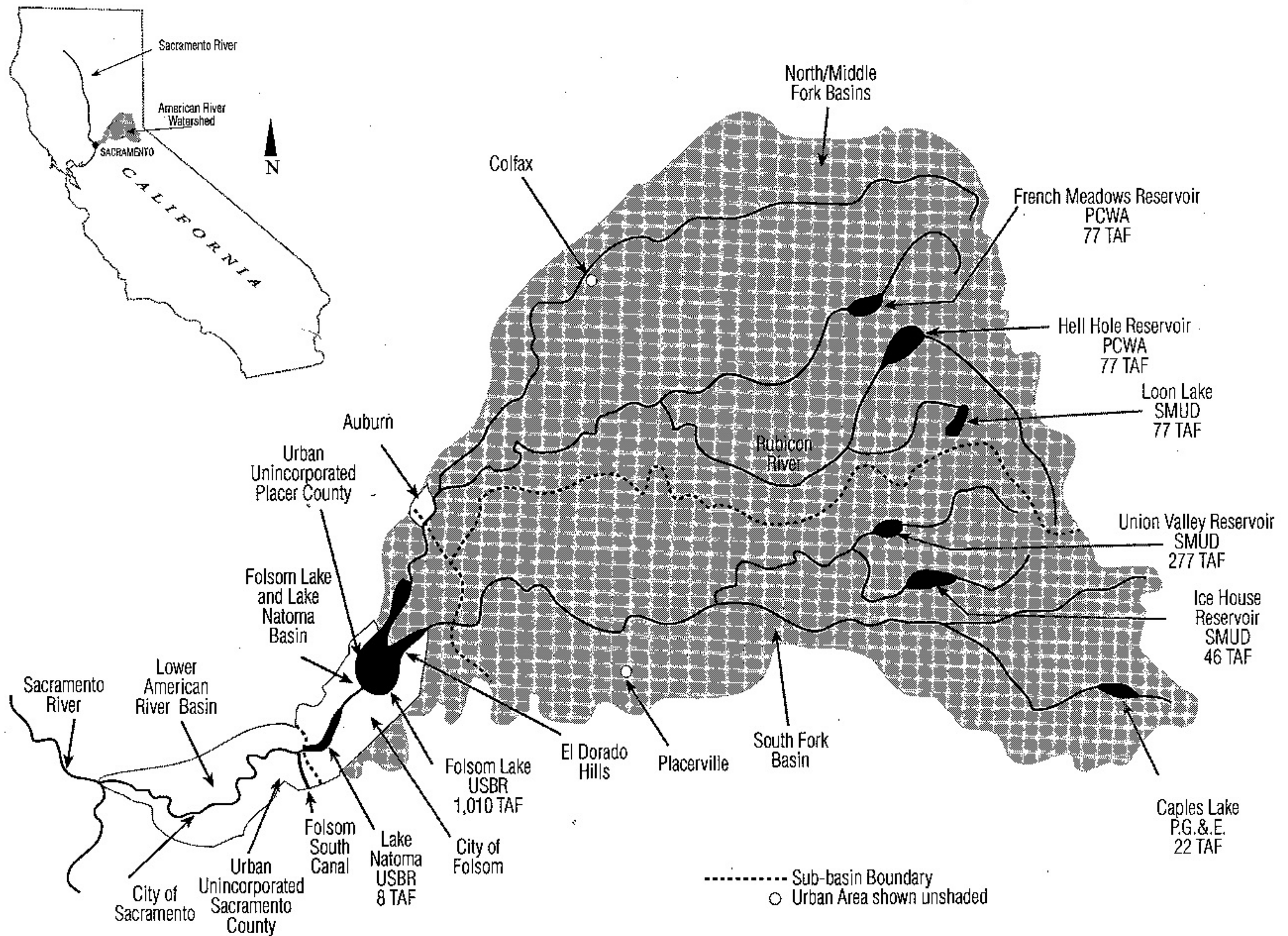


Figure 2-1. The American River Watershed

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The upper watershed is principally formed by a granite core (the Sierra Nevada batholith), capped by volcanic rock on the higher peaks. Glacial lakes abound in the higher elevations of the watershed. The foothills are an older suite of rocks, west of the batholith, folded and metamorphosed by the intruding batholith along a northwest-trending zone. The foothill fault system, a sub-parallel northwest-trending zone of faults is essentially a remnant of the batholith's intrusion. The foothills fault zone has been relatively inactive in historical times, with episodic earthquakes of magnitude 3.8 to 5.6 on the Richter Scale. The river system in the foothills and western portion of the batholith is characterized by deeply-incised canyons. In the lower watershed, the lowest elevations of the foothills grade into the nearly flat Sacramento Valley floor. The valley floor consists primarily of flood-outwash deposits.

The highest elevations of the watershed are above the tree line. From east to west, as the watershed elevation decreases, vegetation is principally characterized by coniferous forests, oak-studded grasslands, and finally grasslands. Little native grasslands actually remain below Folsom Lake, having been replaced by urban landscaping. Wild animals in the upper watershed and along the riparian corridor in the lower watershed include many mammalian species such as deer, beaver, coyote, mountain lion, bear, opossum, river otter, mink, muskrat, and gray fox, and a variety of other types of animals including birds and reptiles. In addition to wild animals, there are also livestock in the watershed. The principal type of livestock is beef cattle; sheep are also grazed, but to a much lesser degree. Other types of livestock include some horses, goats, pigs, etc.

The major urban and population centers are in the lower watershed, where approximately 80% of the population resides. This includes the City of Sacramento, the greater Sacramento metropolitan area, and communities around Folsom Lake. Major transportation corridors in the watershed include Interstate 80, U.S. Highway 50, and State Highway 49.

Some specific characteristics of the upper and lower watersheds are described below. Figures showing detailed information on erosion potential, land use, land ownership, deer herd migrations, and locations of major fires and mudslides are in **Appendix B**. These figures are copied from the 1993 ARWSS Report, with the permission of the agencies that funded that report. For more detailed information on geology, soils, vegetation, precipitation, and runoff, the reader is referred directly to the 1993 ARWSS report. The table of contents for the 1993 ARWSS report is also included in Appendix B.

Upper Watershed

The North Fork, Middle Fork, and South Fork sub-watersheds share the following characteristics:

- high erosion potential;
- seasonal deer herd migrations;

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- wildfires caused by lightning and human activity;
- considerable public land ownership by the USFS and the U.S. Bureau of Land Management in the upper reaches and by the State of California along the lower reaches of the North and Middle forks.
- timber harvesting and livestock grazing on public and private lands;
- past and current mining in the Mother Lode;
- relatively small urban centers, low-density residential areas, an expanding urban population, little industry, and no active landfills;
- wastewater discharged mostly to land or handled by private septic systems;
- limited agriculture in the foothills (orchards and vineyards); and
- considerable recreational use.

The North/Middle Fork

The North Fork basin lies mostly in Placer County. Auburn and Colfax are its principal urban centers (see Figure 2-1). All urban areas are shown in Chapter 5 in the section discussing urban runoff. Interstate 80 and State Highway 49 are its major transportation routes. The Tahoe National Forest occupies much of the upper basin; much of the lower reach of the North Fork is owned by the State of California and forms the Auburn State Recreation Area.

The Middle Fork basin lies in Placer and El Dorado counties. Foresthill is its principal urban center; other towns include Georgetown and Cool. State Highway 49 is its major transportation route. The Tahoe National Forest occupies much of the upper basin; much of the lower reach of the Middle Fork is owned by the State of California. The Rubicon River is a major tributary.

The South Fork

The South Fork basin lies mostly in El Dorado County. Placerville, Coloma, and Pollock Pines are its principal urban centers; U.S. Highway 50 and State Highway 49 are its major transportation routes. U.S. Highway 50 runs mostly in the canyon of the South Fork and is particularly subject to land instability (avalanches, mudslides, and rockslides). The El Dorado National Forest occupies approximately half the area in the upper basin.

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Lower Watershed

The Folsom/Natoma lakes and Lower American River sub-watersheds share the following characteristics:

- slight to moderate erosion potential;
- mostly private land ownership, except for state ownership of land surrounding the lakes and County of Sacramento ownership of the lower American River Parkway;
- relatively large urban centers and an expanding urban population, including some industry;
- wastewater discharged outside the sub-watershed; and
- considerable recreational use.

Folsom Lake and Lake Natoma

The Folsom Lake and Lake Natoma basin lies in Placer, El Dorado, and Sacramento counties. U.S. Highway 50 is its major transportation route. The City of Folsom and surrounding communities in unincorporated Placer, El Dorado (El Dorado Hills), and Sacramento counties are its principal urban centers. The urban population uses the lakes heavily for recreation. The Folsom South Canal is an out-of-basin diversion originating at Nimbus Dam that carries American River water south for both municipal and agricultural use.

The Lower American River

The Lower American River basin lies in Sacramento County. The City of Sacramento and neighboring suburbs in unincorporated Sacramento County form a contiguous greater Sacramento metropolitan area. The Lower American River is bounded by levees for flood control; urban runoff is mostly pumped over the levees (with some gravity flow) into the river. U.S. Highway 50 is its major transportation route. The American River Parkway lies in the riparian corridor along the Lower American River and is used heavily for recreation.

DESCRIPTION OF AGENCY WATER SUPPLY SYSTEMS

Eleven agencies participated in this study that currently divert or will divert water from the American River system. A total of 17 WTPs and 9 intake facilities are or will be used by these 11 agencies to treat American River water (intake locations are shown on **Figure 2-2**). Each agency's water supply system is described below, in upstream to downstream order and starting with the North Fork. Also, a brief statement is provided to highlight the major regulatory concerns based on the evaluation in Chapter 7. Chapter 7 contains a description of treatment processes at each treatment plant. **Appendix C** contains the

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agency surveys that are the basis for the descriptions in this section. **Table 2-1** summarizes each agency's intake location, capacity, and type of treatment.

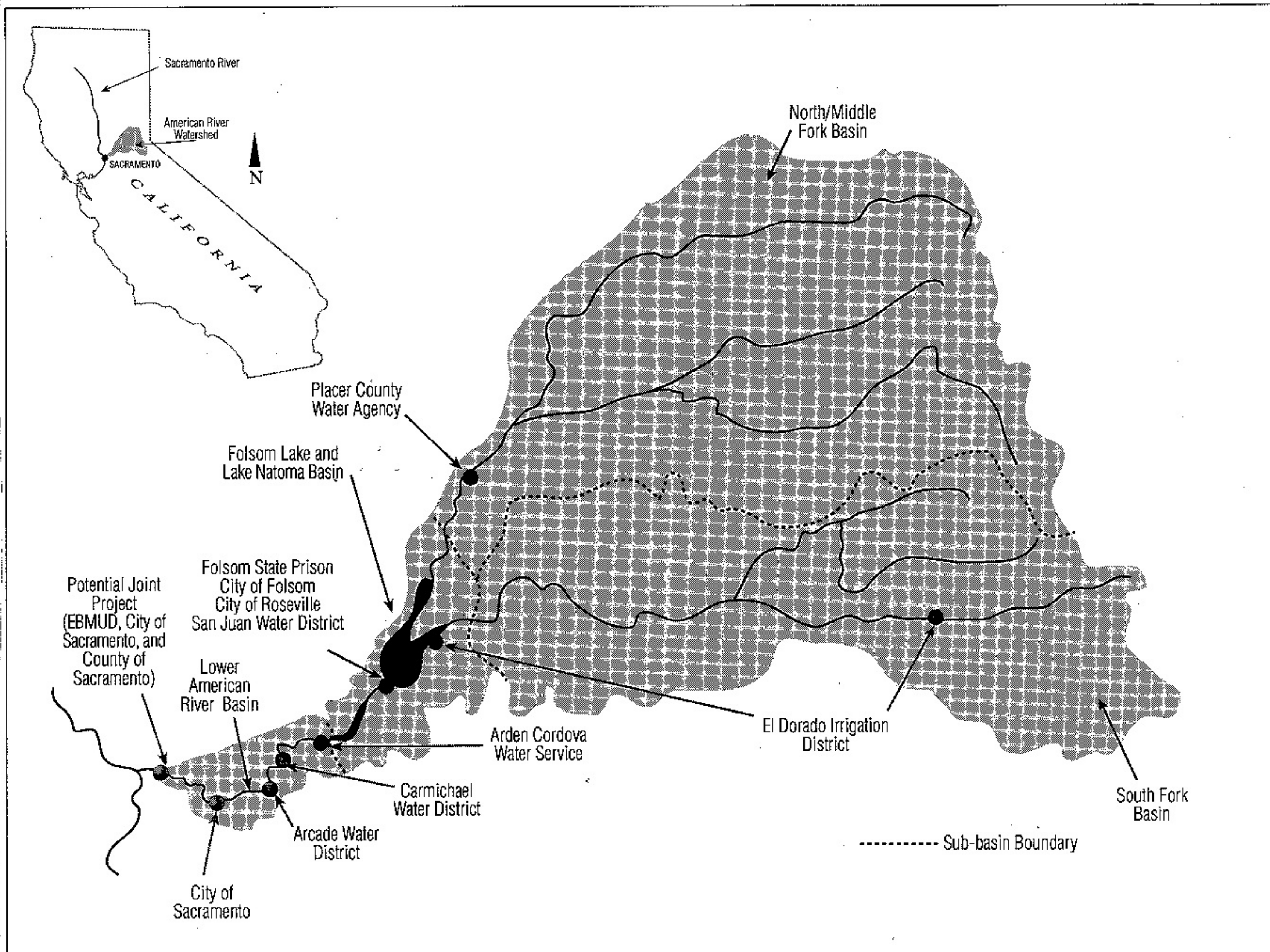


Figure 2-2. Water Agency Intake Locations

Table 2-1. Summary of Agency Treatment Facilities

Agency	Intake Location	Water Treatment Plant Facility
PCWA	North Fork of the American River approximately 3 miles downstream of the confluence with the Middle Fork of the American River, at the proposed Auburn Dam Site.	Foothill WTP 27 MGD (12 MGD Old Train, 15 MGD New Train) Old Train - Conventional WTP with Tube Settlers (Classified as Direct Filtration by DHS) New Train - Conventional WTP Sunset WTP 5 MGD Conventional WTP
EID	South Fork of the American River at the town of Strawberry.	Strawberry WTP 100 gpm Membrane Filtration Plant
	South Fork of the American River at the confluence with Folsom Lake.	El Dorado Hills WTP 12 MGD Conventional WTP with Upflow Clarifiers
City of Folsom	Folsom Lake at the combined Intake Facility at Folsom Dam.	Folsom WTP 25 MGD Conventional WTP with Traveling Bridge Type Filters
City of Roseville	Folsom Lake at the combined Intake Facility at Folsom Dam.	Roseville WTP 48 MGD Conventional WTP with Circular Upflow Clarifiers
Folsom State Prison	Folsom Lake at the combined Intake Facility at Folsom Dam.	FSP WTP 4 MGD Two-Stage Filtration (Microfloc)
SJWD	Folsom Lake at the combined Intake Facility at Folsom Dam.	Sidney N. Peterson WTP 120 MGD Conventional WTP with Tube Settlers
ACWS	Lower American River water is diverted at Nimbus Dam (River Mile 23) into the Folsom South Canal. The water is diverted from the Canal approximately 3 miles downstream of the Dam.	Coloma WTP 7 MGD Conventional WTP with Pressure Filters (Classified as Direct Filtration by DHS)
CWD	Lower American River water diverted using three Ranney Collectors located near River Mile 17.5, at Rossmoor Bar.	Ranney Collectors 22 MGD Chlorination and Corrosion Control
AWD	Lower American River water diverted using infiltration wells located near River Mile 12.0, near Harrington Park.	American River Well System 10 MGD Chlorination
City of Sacramento	Lower American River at River Mile 7.5, near Howe Avenue bridge crossing.	E. A. Fairbairn WTP 100 MGD Conventional WTP
EBMUD	Potential: Lower American River at River Mile 0.4, near Discovery Park.	Lafayette WTP 35 MGD In-Line Filtration WTP Orinda WTP 175 MGD In-Line Filtration WTP Walnut Creek WTP 80 MGD In-Line Filtration WTP Upper San Leandro WTP 65 MGD Conventional WTP Sobrante WTP 60 MGD Conventional WTP

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Placer County Water Agency

PCWA operates two WTPs (Foothill WTP and Sunset WTP) that may treat water diverted from the North/Middle Fork of the American River. Both of these treatment plants were designed as conventional WTPs. The Foothill WTP has a capacity of 27 MGD and services the Newcastle, Loomis, Rocklin, and City of Lincoln areas. The Sunset WTP has a capacity of 5 MGD and services the communities of Rocklin and the City of Lincoln in western Placer County. Currently, PCWA diverts water from the American River on the North Fork, downstream of the confluence with the Middle Fork, at the Auburn Dam site. In the 1960s, the U.S. Bureau of Reclamation agreed to install a temporary pump station for PCWA until a permanent pump station could be built, pending construction of the Auburn Dam. The U.S. Bureau of Reclamation continues to install this temporary pump station in the early spring, for operation during late spring, summer, and early fall. The pump station is dismantled in fall. PCWA uses this source to meet peak summer demands and to serve as a main supply during the PG&E source down-times during planned maintenance. PCWA has 120,000 acre-feet per year (AF/yr) of water rights and 117,000 AF/yr in Central Valley Project entitlements to be diverted from the North/Middle Fork of the American River.

The water diverted from the American River is pumped through the Ophir Tunnel then pumped again to PG&E's South Canal. There it is blended with water from the Yuba and Bear rivers. This blended water can then be provided directly to the Foothill WTP or transported, via open canals, to the Sunset WTP.

Both of PCWA's WTPs are in compliance with all existing drinking water regulations. Filter-to-waste capability will probably need to be installed at both WTPs, if not already installed, to comply with future drinking water regulations. The current treatment of recycled backwash water may need to be expanded or upgraded. Treatment concerns also may be associated with removal of methyl tert-butyl ether (MTBE) if it is regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

El Dorado Irrigation District

EID operates two WTPs with a direct intake in the American River. EID operates the Strawberry WTP in the community of Strawberry in the upper South Fork basin and the El Dorado Hills WTP in the community of El Dorado Hills on Folsom Lake. The Strawberry WTP is a small membrane filtration plant that services approximately 100 residents of the Strawberry community; and the El Dorado Hills WTP is a conventional WTP. The Strawberry WTP has a 15,080 AF/yr entitlement of American River water. The El Dorado Hills WTP has 24,500 AF/yr in water entitlement and contracts.

Both of EID's WTPs are in compliance with all existing drinking water regulations. EID may need to prove 2-log removal of *Cryptosporidium* at the Strawberry WTP since it will not be automatically granted credit (since it is not a pre-approved treatment technology), but there are no other major future regulatory concerns for this WTP. The El Dorado Hills WTP may need to install filter-to-waste capacity and improve

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treatment of recycled backwash water to meet future regulatory requirements. Treatment concerns also may be associated with removal of MTBE at El Dorado Hills WTP if it is regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

City of Folsom

The City of Folsom operates the Folsom WTP, which is provided water from Folsom Lake. The Folsom WTP is a conventional WTP with a design capacity of 25 MGD and an operating range of 0–25 MGD. The average flow in the winter is 10 MGD, and the average flow in the summer is 24 MGD. The WTP is currently being expanded to 40 MGD. Folsom has 27,000 AF/yr of water rights and a co-tenancy agreement with ACWS. Folsom may also receive an additional 7,000 AF/yr, pending the environmental review process for Public Law 101-514 (i.e., Fazio Water). The influent water is diverted from Folsom Lake at a deep-water intake facility at Folsom Dam shared with SJWD, Roseville, and FSP.

Folsom is currently in compliance with all existing drinking water regulations. Folsom may need to install treatment for recycled backwash water to comply with future regulations. Treatment concerns may be associated with removal of MTBE if it is regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

City of Roseville

The City of Roseville operates the Roseville WTP, which treats water diverted from Folsom Lake. The influent water is diverted from Folsom Lake at a deep-water intake facility at Folsom Dam that is shared with SJWD, Folsom, and FSP. The Roseville WTP has a design capacity of 48 MGD. The plant typically operates between 9 and 36 MGD. The average flow during winter is 10 MGD, and the average flow during summer is 30 MGD. Roseville services approximately 22,000 retail customers. Roseville has 62,000 AF/yr in contracts with the U.S. Bureau of Reclamation and PCWA.

Roseville is currently in compliance with all existing drinking water regulations. The current treatment of recycled backwash water may need to be expanded or upgraded to meet future drinking water regulations. Treatment concerns may be associated with removal of MTBE if it is regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

Folsom State Prison

FSP diverts water from Folsom Lake at a deep-water intake facility at Folsom Dam that is shared with SJWD, Roseville, and Folsom. The plant is operated throughout the year from 5:00 to 12:00 a.m. The plant services approximately 7,500 inmates. FSP has 4,000 AF/yr in water rights of American River water.

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FSP is currently in compliance with all existing drinking water regulations. The existing WTP should be able to meet all major future drinking water regulations during most operating conditions. Treatment concerns may be associated with removal of MTBE if it is regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

San Juan Water District

SJWD operates the Sidney N. Peterson WTP which treats American River water diverted from Folsom Lake. The influent water is diverted from Folsom Lake at a deep-water intake facility at Folsom Dam that is shared with Roseville, Folsom, and FSP at Folsom Dam. The Sidney N. Peterson WTP has a design capacity of 120 MGD. The WTP is typically operated between 20 and 120 MGD. The average winter flow is 30 MGD, and the average summer flow is 80 MGD. SJWD services approximately 21,000 retail customers and 125,426 wholesale customers. SJWD has 69,200 AF/yr in water rights and contracts with the U.S. Bureau of Reclamation and PCWA.

SJWD is currently in compliance with all existing drinking water regulations. SJWD may need to install filter-to-waste facilities and expand or upgrade recycled backwash water treatment facilities to comply with future drinking water regulations. Treatment concerns also may be associated with removal of MTBE if it is regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

Arden Cordova Water Service

ACWS operates the Coloma WTP, which uses American River water diverted to the Folsom South Canal. The Coloma WTP is a direct filtration plant with a capacity of 7 MGD (the plant has been classified as direct filtration plant by the DHS due to the size of the sedimentation basins) that uses pressure filters. Groundwater is the primary water supply for the ACWS system, with surface water as a supplemental source during the high-demand period of summer months. Due to contamination of some of the local groundwater resources with perchlorate, ACWS will begin operating the Coloma WTP throughout the year. ACWS has 32,000 AF/yr of water from water rights and a co-tenancy agreement with Folsom.

ACWS is currently in compliance with all existing drinking water regulations. As ACWS begins treating American River water during winter months, there may be difficulty in adjusting to the variable influent water quality. Treatment concerns also may be associated with removal of MTBE if it is regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

Carmichael Water District

CWD currently provides potable water to a population of approximately 39,000 people. The CWD has both groundwater sources (11 wells) and surface water sources (four Ranney Collectors) for water supply.

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Historically, the surface water supply has been the primary supply and has provided about 70–75% of CWD's needs.

The surface water supply for CWD is from the Lower American River using four Ranney Collectors. The collectors are located within the American River floodplain and adjacent to the streambed. They serve as intake and pump structures to provide naturally-filtered water to the distribution system.

CWD is not in compliance with the SWTR and is under a Compliance Order from DHS to install facilities for filtration and disinfection. CWD has selected microfiltration for treatment; the project is currently in the design phase, with facilities expected by November 2000. There have been some associated turbidity and coliform problems in the distribution system. When designing these treatment facilities, CWD has included the facilities necessary to comply with more stringent future drinking water regulations as described in Chapter 7. Treatment concerns may also be associated with removal of MTBE and perchlorate if they are regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

Arcade Water District

AWD owns and operates the American River Well Field, which consists of 11 shallow infiltration wells located adjacent to the Lower American River near Harrington Park at river mile 12.0. These wells act as the intake facility for AWD. AWD services approximately 100,000 retail customers in two service areas: North Highlands and Town and Country. Groundwater is AWD's primary water supply, with surface water as a supplemental source during the high-demand period of the summer months. The surface water from the American River, when in operation, is supplied only to the Town and Country service area. AWD has 26,064 AF/yr of water through entitlements and contracts with the City of Sacramento.

AWD is not currently in compliance with the SWTR and is under a Compliance Order from the DHS to install treatment facilities for filtration and disinfection. AWD performed a process evaluation and has selected two-stage filtration to be installed to comply with DHS requirements. These facilities should be installed by July 1, 2001, if AWD continues to use the American River supply. When designing these treatment facilities, it is important that AWD include the facilities necessary to comply with more stringent future drinking water regulations as described in Chapter 7. Treatment concerns may also be associated with removal of MTBE and perchlorate if they are regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

City of Sacramento

The City of Sacramento operates the E.A. Fairbairn WTP, which treats American River water diverted from the Lower American River at river mile 7.75. The E.A. Fairbairn WTP has a design capacity of 100 MGD. The WTP is typically operated between 30 and 100 MGD. The average winter flow is 37 MGD, and the average summer flow is 48 MGD. This WTP services approximately 164,873 retail

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customers. The City of Sacramento has 225,000 AF/yr in water rights and contracts on the American River.

The City of Sacramento is currently in compliance with all existing drinking water regulations. The City of Sacramento may need to install filter-to-waste facilities and recycled backwash water treatment facilities to comply with future drinking water regulations. Treatment concerns may also be associated with removal of MTBE and perchlorate if they are regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

East Bay Municipal Utility District

EBMUD does not currently divert or treat any American River water. EBMUD has a contract with the U.S. Bureau of Reclamation for 150,000 AF/yr of water from the American River. When EBMUD begins to divert water from the American River to supplement its Mokelumne River supply, the water will be transported to the San Francisco Bay Area via the Folsom South Canal and the Mokelumne Aqueducts. The water will be blended with water from Pardee Reservoir that has been chlorinated and pH-adjusted. The water may then be delivered directly to three East Bay WTPs including Lafayette WTP, Orinda WTP, and Walnut Creek WTP. Each of these WTPs is an in-line filtration WTP. The water may also be delivered to terminal storage facilities in the East Bay and then treated at either the Upper San Leandro WTP or the Sobrante WTP.

The in-line filtration WTPs are currently treating Mokelumne River water and are in compliance with all existing drinking water regulations. The Upper San Leandro WTP is currently treating Upper San Leandro Reservoir water, and the Sobrante WTP treats water from San Pablo Reservoir. Both are in compliance with all drinking water requirements. It is expected that the in-line filtration WTPs will require slight modifications to reliably treat American River water. In the event the in-line filtration plants are unable to adequately treat American River water, EBMUD may exercise one of several options:

- (1) not take American River water,
- (2) blend American and Mokelumne river water, or
- (3) store American River water in its terminal reservoirs which receive full conventional treatment.

The procedure used to pre-treat the American River water during transport to the Bay Area will be important in determining whether the water will exceed the proposed MCLs from the Disinfectant/Disinfection By-Product (D/DBP) Rule. EBMUD will probably need to prove 2-log *Cryptosporidium* removal for the in-line filtration WTPs, since they will not be automatically granted credit. Treatment

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concerns may also be associated with removal of MTBE and perchlorate if they are regulated as part of the Drinking Water Candidate Contaminant List as expected. This is discussed further in Chapter 7.

Chapter 3. Drinking Water Parameters and Regulations

This chapter provides an overview of the major drinking water parameters of concern and the regulatory framework governing drinking water. The drinking water parameters of concern are divided into microbiological, physical, inorganic, and organic categories. A description of each constituent, potential sources, and the relevant regulations is provided. The regulatory framework discussion provides an overview of the current and anticipated drinking water regulations. A detailed discussion of each regulation is provided in **Appendix D**. For assistance with acronyms, the reader is referred to the list of abbreviations at the front of the report.

DRINKING WATER PARAMETERS

This section contains a general discussion of constituents within each of the four major categories: microbiological, physical, inorganic, and organic.

Microbiological Parameters

The major microbiological parameters of concern include total and fecal coliform bacteria, *Giardia lamblia*, *Cryptosporidium parvum*, and viruses. Generally speaking, pathogenic organisms carried by mammalian species may be infectious to humans. Pathogens infecting other types of animals such as birds and reptiles are typically not infectious to humans (Fayer and Ungar, 1986).

Coliform bacteria, a class of organisms found in the intestines of warm-blooded animals (but also found in plants and soils), have long been used to indicate the effectiveness of disinfection processes. Coliform bacteria have also been used to indicate the potential presence of pathogenic organisms in source waters, in the absence of affordable and reliable direct analytical methods for pathogens. Unfortunately, coliform bacteria are imperfect for this use; virtually no studies have shown a strong relationship between coliform levels and pathogens in ambient waters. Nevertheless, in the absence of better data and to be protective of public health, high coliform levels in source water must be seriously attended to as a general indicator of degraded microbiological quality. Potential sources of coliform bacteria include storm runoff, urban runoff, recreation, and wastewater. Coliforms levels are currently regulated in treated water directly through the Total Coliform Rule and indirectly through the THM regulation by potentially limiting the allowed chlorine residual in the distribution system. The future D/DBP Rule may indirectly impact coliforms by limiting the maximum levels of disinfectant residuals allowed in the distribution system.

Giardia lamblia is a protozoa that infects humans and can cause the gastrointestinal disease giardiasis. *Giardia* is found in the environment as a cyst from the feces of wild animals, although both wild and domestic animals may be hosts. Cysts may be destroyed naturally in the environment by desiccation and/or

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heat. Thus, animal sources close to streams during the rain season have the most potential to contribute cysts that remain viable. The analytical methods for *Giardia* are not sufficiently precise to establish true concentrations, do not determine viability, and do not speciate. Speciation is important as not all species may be infectious to humans. *Giardia* may be carried in storm runoff, urban runoff, and wastewater sources or may be contributed directly as a result of body-contact recreation or animal defecation into streams. *Giardia* is currently regulated by the SWTR. *Giardia* may be regulated further in the future Enhanced Surface Water Treatment Rule (ESWTR) as discussed in Appendix D.

Cryptosporidium parvum is a protozoa that also infects humans and can cause the gastrointestinal disease cryptosporidiosis. *Cryptosporidium* is found in the environment as an oocyst from the feces of domestic animals, although both wild and domestic animals are known to be hosts. *Cryptosporidium* in cattle has been the subject of considerable research. Like *Giardia*, *Cryptosporidium* can produce an epidemic among young cattle, especially in crowded conditions. Rangeland cattle bear young during the spring. Dairy cattle bear young year-round. Continuing research is now suggesting that infected field mice and perhaps other wild animals initiate the herd infections. Also like *Giardia*, oocysts may be destroyed naturally in the environment by desiccation and/or heat. Once in the source water, however, viable oocysts are very resistant to chemical inactivation, and only a few oocysts are required to infect humans. The analytical methods for *Cryptosporidium* are not well developed and are not sufficiently precise to establish true concentrations, determine viability, or speciate. Speciation is important because not all species are infectious to humans. *Cryptosporidium* may be carried in storm runoff, urban runoff, and wastewater sources or may be contributed directly as a result of body-contact recreation or animal defecation into streams. *Cryptosporidium* is not currently regulated by the U.S. Environmental Protection Agency (USEPA) or the DHS. It is expected that the ESWTR will regulate *Cryptosporidium* as discussed in Appendix D. The DHS has developed the *Cryptosporidium* Action Plan which identifies recommended turbidity requirements. The plan was developed to help utilities optimize treatment processes to ensure maximum removal of *Cryptosporidium* oocysts and reduce the risk of waterborne illness. This plan is intended for large utilities with over 1,000 service connections.

Viruses, primarily enteric viruses, include a group of organisms that can be pathogenic to humans. Generally, enteric viruses are shed by infected humans and passed on by fecal-oral contact. Potential sources of viruses include body-contact recreation and wastewater sources. Viruses are currently regulated by the SWTR. The ESWTR may make the treatment requirements for viruses more stringent.

Physical Parameters

This group includes alkalinity, pH, and turbidity. Alkalinity is an indicator of the capacity of a water to neutralize acids. Bicarbonates are the major component of alkalinity in surface waters. Alkalinity levels will impact the chemical treatment processes at the WTP. Low alkalinity makes the coagulation and flocculation processes more difficult to achieve during high-turbidity events. Often, lime is required to be

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added at the influent during high-turbidity events to increase the alkalinity to allow for adequate coagulation, flocculation, and sedimentation.

pH is the measurement of the acidity of a water and indicates the corrosivity of the water. pH adjustment is important to ensure that the water is not corrosive to the WTP or the distribution system piping. pH may impact the effectiveness of coagulation and sedimentation in the treatment plant and will influence the type of DBPs formed in the distribution system.

Turbidity is the measurement of the light scatter caused by suspended matter such as clay, organic particulates, and microorganisms such as *Giardia* and *Cryptosporidium*. Turbidity is a major parameter used to evaluate the efficiency of the treatment process and comply with regulatory requirements. High turbidity levels are typically the result of erosion during precipitation and high flow events, and are undesirable because they may mask the presence of harmful particulates. It has also been found that the presence of suspended matter can interfere with disinfection of microorganisms.

In order to reduce the potential for pathogens, such as *Giardia* and *Cryptosporidium* in treated drinking water, utilities optimize pretreatment processes to maximize turbidity removal. Therefore, turbidity is monitored throughout the treatment plant to ensure that particles are removed. Turbidity has been assumed to be an indicator constituent for the presence of *Giardia* and *Cryptosporidium*. However, a recent study of the 1993 Milwaukee *Cryptosporidium* outbreak showed a low correlation coefficient indicating that turbidity alone may be a poor predictor of microbiological quality (Juranek and MacKenzie, 1998).

Inorganic Parameters

The major inorganic parameters of concern fall into five categories, including radiological parameters, minerals, metals, nutrients, and other inorganic parameters.

The radiological parameters of concern include both natural and man-made constituents. All of these elements are carcinogens. These elements include alpha emitters, beta emitters, radium, uranium, strontium, and tritium. Generally, these constituents are of concern only to groundwater systems or areas near man-made radioactivity. The natural radiological constituents are created from the decay of specific elements in existing geologic formations. Several of these constituents are currently regulated by the Radioactivity Regulation and some by the DHS. The USEPA is expected to re-promulgate the regulation for radium and add a regulation for uranium.

General minerals include calcium, sodium, magnesium, chlorides, sulfates, and carbonates. These constituents are derived from contact with rock and soil. These constituents are typically found at low levels in surface water. Most of these constituents are currently regulated as secondary constituents for aesthetic reasons.

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Metals are of concern because they act as carcinogens at high concentrations and may also cause damage to various organs. Some metals, such as arsenic, are contributed by soils and rock formations. Human activity is also a source of metals, including mining, urban runoff, and runoff from highway corridors. Most metals have been regulated by the USEPA or will be regulated soon, such as nickel. It is expected that the arsenic regulation will be revised based on new health effects data for low-level exposure to arsenic. Arsenic is discussed further in Chapter 6.

Nutrients include various nitrogen and phosphorus compounds. Both of these types of nutrients are essential for plant growth. These constituents can also cause algal blooms in lakes and rivers, which may lead to increased total organic carbon (TOC) levels and taste and odor problems. Potential sources of nutrients include wastewater sources, storm runoff, and urban runoff. Most nutrients have been regulated by the USEPA. High levels of nitrate or nitrite can cause methemoglobinemia, a blood disorder.

Several other inorganic parameters may be of concern at the WTP including asbestos and cyanide. Asbestos is a potential carcinogen, and cyanide may cause damage to the nervous system. Asbestos originates from natural rock formations and mining. Cyanide is a product of multiple industrial processes. Both of these constituents have current primary drinking water regulations. Asbestos and cyanide are discussed further in Chapter 6.

Organic Parameters

The three main groups of organics include disinfection by-product (DBP) precursors, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs). Many of these compounds are known or probable human carcinogens or may impact various organs.

DBPs are formed when disinfectants added to water react with naturally occurring organic matter or other constituents, namely bromide. TOC is a surrogate measure of organic matter, including humic and fulvic acids. The most common DBPs are THMs, which are suspected carcinogens. Other DBPs, including haloacetic acids (HAAs) are suspected mutagens and teratogens. Potential sources of these organics include plant matter, animal matter, soil, storm runoff, urban runoff, and wastewater sources. While DBP precursors are not currently regulated, Stage 1 of the proposed D/DBP Rule will require varying levels of removal of TOC if the source water TOC concentrations exceed 2 mg/L.

Most VOCs and SOCs are formulated for, or are by-products from, industrial processes. Pesticides are a main group of the SOCs used for agricultural, urban, and other uses. Many of these constituents have been regulated by the Phase I, II, and V regulations. Two compounds that have recently been found in drinking water sources are MTBE and perchlorate. MTBE is a gasoline additive that is persistent in surface waters and groundwaters and may also be a carcinogen. It is discussed in greater detail in Chapter 5. Ammonium perchlorate is a rocket fuel propellant that is persistent in water and resistant to treatment. Perchlorate may interfere with the thyroid gland and the hematopoietic system. It is discussed in more

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detail in Appendix D. It is expected that MTBE, perchlorate, and various other organics may be regulated within the next 5 years as part of the Drinking Water Candidate Contaminant List.

REGULATORY OVERVIEW

The Safe Drinking Water Act (SDWA) gave the USEPA the authority to set standards for contaminants in drinking water supplies in the United States. The USEPA was required to establish primary regulations for the control of contaminants that affect public health and secondary regulations for compounds that affect the taste or aesthetics of drinking water.

The 1986 Amendments to the SDWA identified a list of 83 contaminants to be regulated by the USEPA. For each contaminant, the USEPA was required to establish an MCL or a treatment technique (TT) to limit the level of these compounds in drinking waters. The 1986 Amendments required the USEPA to regulate the 83 contaminants within 3 years of promulgation and 25 additional contaminants every 3 years thereafter. For more detailed information on the development of MCLs, maximum contaminant level goals (MCLGs), and TTs, see Appendix D.

The SDWA was again reauthorized in August 1996. The 1996 Amendments were developed to provide more flexibility, more state responsibility, and more cooperative approaches. The law changes the standard setting procedure and establishes a State Revolving Loan Fund to help public water systems improve their facilities and to ensure compliance with drinking water regulations.

The 1996 Amendments eliminated the requirement for USEPA to establish 25 standards every 3 years. Instead, the USEPA developed a list of chemical and microbial contaminants for possible future regulation called the Drinking Water Candidate Contaminant List (see **Table 3-1**). These contaminants are known to occur in public water systems and may require regulation. Within 5 years of enactment of the 1996 Amendments (and every 5 years thereafter), the USEPA will select five contaminants from the list and determine whether to regulate them. The regulations will be determined based on risk assessment and cost-benefit considerations and on minimizing overall risk. A summary of data collected by the 11 participating agencies for these constituents is provided in Appendix E.

Once a contaminant is determined to need regulation, the standard shall be promulgated within 18 months. The standard will take effect 3 years later. For each new regulation, the USEPA is required to identify affordable technologies that will achieve compliance for small systems.

Under the provisions of the SDWA, the DHS has the primary enforcement responsibility (referred to as "primacy"). The Health and Safety Code of the California Administrative Code establishes DHS authority and stipulates drinking water quality and monitoring standards. To maintain primacy, a state's drinking water regulations can be no less stringent than the federal standards (a state's regulations can be more stringent).

Table 3-1. Drinking Water Candidate Contaminant List

Chemical Contaminants	
1,1,2,2-tetrachloroethane	Disulfoton ^a
1,2,4-trimethylbenzene	Diuron ^a
1,1-dichloroethane	EPTC (s-ethyl-dipropylthiocarbamate) ^a
1,1-dichloropropene ^b	Fonofos ^{a,b}
1,2-diphenylhydrazine ^{a,b}	Hexachlorobutadiene
1,3-dichloropropane ^b	p-isopropyltoluene
1,3-dichloropropene (telone or 1,3-D)	Linuron ^a
2,4,6-trichlorophenol ^{a,b}	Manganese
2,2-dichloro-propane	Methyl bromide ^b
2,4-dichlorophenol ^{a,b}	Methyl-tert-butyl-ether (MTBE) ^{a,b}
2,4-dinitrophenol ^{a,b}	Metolachlor
2,4-dinitrotoluene ^a	Metribuzin
2,6-dinitrotoluene ^a	Molinate ^a
2-methyl-phenol (o-cresol) ^{a,b}	Naphthalene
Acetochlor ^{a,b}	Nitrobenzene ^a
Alachlor ESA (a degradation product of alachlor) ^{a,b}	Organotins
Aldrin	Perchlorate ^{a,b}
Aluminum ^b	Prometon ^a
Boron	RDX ^{a,b}
Bromobenzene	Sodium ^b
DCPA mono-acid degradate ^{a,b}	Sulfate
DCPA di-acid degradate ^{a,b}	Terbacil ^a
DDE ^a	Terbufos ^a
Diazinon ^a	Triazines and degradation products
Dieldrin	Vanadium
Microbiological Contaminants	
Acanthamoeba	
Adenoviruses ^{a,b}	
Aeromonas hydrophila ^{a,b}	
Caliciviruses ^{a,b}	
Coxsackieviruses ^{a,b}	
Cyanobacteria ^{a,b}	
Echoviruses ^{a,b}	
Helicobacter pylori ^{a,b}	
Microsporidia (Enterocytozoon & Septata) ^{a,b}	
Mycobacterium avium intracellulare complex (MAC) ^b	
^a Additional Occurrence Data Required Prior to Regulatory Determination, May Be Monitored in Unregulated Contaminant Monitoring Regulation	
^b Additional Health, Treatment or Analytical Method Research Required Prior to Regulatory Determination	

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Current Regulations

The most significant current drinking water regulations are shown in **Table 3-2**.

A general discussion of the requirements of each of the regulations is provided in Appendix D.

Table 3-2. Current Federal Regulations

Regulation	Targeted Contaminants
NIPDWR ^a	Health contaminants
Phase I Standards	VOCs
Phase II Standards	VOCs, SOCs, and IOCs
Phase V Standards	VOCs, SOCs, and IOCs
NIPDWR-Radioactivity	Radionuclides
NIPDWR-THM regulation	Trihalomethanes
Surface Water Treatment Rule	Microbiological and turbidity
Total Coliform Rule	Microbiological
Lead and Copper Rule	Corrosion by-products
Information Collection Rule	Microbiological and D/DBP
^a No longer referred to as Interim Standards.	
NIPDWR = National Interim Primary Drinking Water Regulations.	

Table 3-3 contains a summary of each of the contaminants currently regulated in drinking water by both the USEPA and the DHS. The table identifies the federal regulation and the MCL or the TT associated with each of the contaminants listed. The State of California is required to adopt state regulations that meet or exceed the federal regulations. To date, DHS has established regulations for several drinking water contaminants that are not currently regulated by the USEPA. The state has also established MCLs for several contaminants at levels more stringent than the federal MCLs.

Table 3-3. Summary of Contaminants Currently Regulated by EPA and DHS^a

Classification	Contaminant	Regulation	MCL (mg/L)
Inorganics (Section 64432)			
	Aluminum	DHS	1
	Antimony	Phase V	0.006
	Arsenic	NPDWR	0.05
	Barium	DHS/Phase II	1.0/2.0
	Beryllium	Phase V	0.004
	Boron	DHS	1.0 ^b
	Cadmium	Phase II	0.005
	Chromium	DHS/Phase II	0.05/0.1
	Copper	LCR	1.3 ^b
	Cyanide	Phase V	0.2
	Fluoride	DHS/NPDWR	2.0/4.0
	Lead	LCR	0.015 ^b
	Mercury	Phase II	0.002
	Nickel	Phase V	0.1 ^d
	Perchlorate	DHS	0.018 ^b
	Selenium	Phase II	0.05
	Thallium	Phase V	0.002
Nitrate, Nitrite (Section 64432.1)			
	Nitrate	Phase II	10 as N (45 as NO ₃)
	Nitrite	Phase II	1 as N
Asbestos (Section 64432.2)			
	Asbestos	Phase II	7 MFL (>10um)
Secondary Standards (Section 64449, Table 64449-A)			
	Aluminum	DHS	0.2
	Color	DHS	15 Units
	Copper	LCR	1
	Corrosivity	DHS	non-corrosive
	Foaming Agents	DHS	0.5
	Iron	DHS	0.3
	Manganese	DHS	0.05
	Odor-Threshold	DHS	3 Units
	Silver	DHS	0.1
	Thiobencarb	DHS	0.001
	Turbidity	SWTR	0.5/5 NTU
	Zinc	DHS	5

Table 3-3. Summary of Contaminants Currently Regulated by EPA and DHS^a

Classification	Contaminant	Regulation	MCL (mg/L)
Secondary Standards (Section 64449, Table 64449-B)			
	Total Dissolved Solids	DHS	500/1,000/1,500 ^c
	Specific Conductance	DHS	900/1,600/2,200 ^c
	Chloride	DHS	250/500/600 ^c
	Sulfate	DHS	250/500/600 ^c
General Mineral (Section 64449 (c) (2))			
	Bicarbonate	DHS	MO
	Carbonate	DHS	MO
	Hydroxide	DHS	MO
	Alkalinity	DHS	MO
	pH	DHS	MO
	Calcium	DHS	MO
	Magnesium	DHS	MO
	Sodium	DHS	MO
	Hardness	DHS	MO
(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))			
	Benzene	DHS/Phase I	0.001/0.005
	Carbon Tetrachloride	DHS/Phase I	0.0005/0.005
	o-Dichlorobenzene	Phase II	0.6
	p-Dichlorobenzene	DHS/Phase I	0.005/0.0785
	1,1-Dichloroethane	DHS	0.005
	1,2-Dichloroethane	DHS/Phase I	0.0005/0.005
	1,1-Dichloroethylene	DHS/Phase I	0.006/0.007
	cis-1,2-Dichloroethylene	DHS/Phase II	0.006/0.1
	trans-1,2-Dichloroethylene	DHS/Phase II	0.010/0.1
	Dichloromethane (Methylene chloride)	Phase V	0.005
	1,2-Dichloropropane	Phase II	0.005
	1,3-Dichloropropene	DHS	0.0005
	Ethylbenzene	Phase II	0.7
	Monochlorobenzene	DHS/Phase II	0.07/0.1
	Styrene	Phase II	0.1
	1,1,2,2-Tetrachloroethane	DHS	0.001
	Tetrachloroethylene	Phase II	0.005
	Toluene	DHS/Phase II	0.15/1.0
	1,2,4-Trichlorobenzene	Phase V	0.07
	1,1,1-Trichloroethane	Phase I	0.2
	1,1,2-Trichloroethane	Phase V	0.005
	Trichloroethylene	Phase I	0.005
	Trichlorofluoromethane	DHS	0.15
	1,1,2-Trichloro-1,2,2-Trifluoroethane	DHS	1.2
	Vinyl Chloride	DHS/Phase I	0.0005/0.002
	Xylenes (total)	DHS/Phase II	1.75/10

Table 3-3. Summary of Contaminants Currently Regulated by EPA and DHS^a

Classification	Contaminant	Regulation	MCL (mg/L)
(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))			
	Acrylamide	Phase II	TT (PAP)
	Alachlor	Phase II	0.002
	Atrazine	Phase II	0.003
	Bentazon	DHS	0.018
	Benzo(a)pyrene	Phase V	0.0002
	Carbofuran	DHS/Phase II	0.018/0.04
	Chlordane	DHS/Phase II	0.0001/0.002
	2,4,-D	Phase II	0.07
	Dalapon	Phase V	0.2
	Dibromochloropropane	Phase II	0.0002
	Di (2-ethylhexyl) Adipate	Phase V	0.4
	Di (2-ethylhexyl) Phthalate	DHS/Phase V	0.004/0.006
	Dinoseb	Phase V	0.007
	Diquat	Phase V	0.02
	Endothall	Phase V	0.1
	Endrin	Phase V	0.002
	Epichlorohydrin	Phase II	TT (PAP)
	Ethylene Dibromide	Phase II	0.00005
	Glyphosate	Phase V	0.7
	Heptachlor	DHS/Phase II	0.00001/0.0004
	Heptachlor Epoxide	DHS/Phase II	0.00001/0.0002
	Hexachlorobenzene	Phase V	0.001
	Hexachlorocyclopentadiene	Phase V	0.05
	Lindane	Phase II	0.0002
	Methoxychlor	Phase II	0.04
	Molinate	DHS	0.02
	Oxamyl (vydate)	Phase V	0.2
	Pentachlorophenol	Phase II	0.001
	Picloram	Phase V	0.5
	PCBs	Phase II	0.0005
	Simazine	Phase V	0.004
	Thiobencarb	DHS	0.07
	Toxaphene	Phase II	0.003
	2,3,7,8-TCDD (Dioxin)	Phase V	3.00E-08
	2,4,5-TP (Silvex)	Phase II	0.05
Unregulated (Volatile) Organic Chemicals (Section 64450, Table 64450-A)			
	Bromobenzene	Phase I	MO
	Bromodichloromethane	Phase I	MO
	Bromoform	Phase I	MO
	Bromomethane	Phase I	MO
	Chlorodibromomethane	Phase I	MO

Table 3-3. Summary of Contaminants Currently Regulated by EPA and DHS^a

Classification	Contaminant	Regulation	MCL (mg/L)
Unregulated (Volatile) Organic Chemicals (Section 64450, Table 64450-A) Cont'd			
	Chloroethane	Phase I	MO
	Chloroform	Phase I	MO
	Chloromethane	Phase I	MO
	o-Chlorotoluene	DHS	0.045 ^b
	p-Chlorotoluene	DHS	0.045 ^b
	Dibromomethane	Phase I	MO
	o-Dichlorobenzene	DHS	0.013 ^b
	m-Dichlorobenzene	DHS	0.013 ^b
	Dichlorodifluoromethane	DHS	1.0 ^b
	1,3-Dichloropropane	Phase I	MO
	2,2-Dichloropropane	Phase I	MO
	1,1-Dichloropropene	Phase I	MO
	1,1,1,2-Tetrachloroethane	Phase I	MO
	1,2,3-Trichloropropane	Phase I	MO
Unregulated Organic Chemicals (Section 64450, Table 64450-B)			
	Bromacil	DHS	MO (if vulnerable)
	Bromochloromethane	DHS	MO (if vulnerable)
	n-Butylbenzene	DHS	0.045 ^b
	sec-Butylbenzene	DHS	MO (if vulnerable)
	tert-Butylbenzene	DHS	MO (if vulnerable)
	Chlorothalonil	DHS	MO (if vulnerable)
	Diazinon	DHS	0.014 ^b
	Dimethoate	DHS	0.14 ^b
	Diuron	DHS	MO (if vulnerable)
	Hexachlorobutadiene	DHS	MO (if vulnerable)
	Isopropylbenzene	DHS	MO (if vulnerable)
	p-Isopropyltoluene	DHS	MO (if vulnerable)
	Naphthalene	DHS	MO (if vulnerable)
	n-Propylbenzene	DHS	MO (if vulnerable)
	Prometryn	DHS	MO (if vulnerable)
	1,2,3-Trichlorobenzene	DHS	MO (if vulnerable)
	1,2,4-Trimethylbenzene	DHS	MO (if vulnerable)
	1,3,5-Trimethylbenzene	DHS	MO (if vulnerable)
Unregulated Organic Chemicals (Section 64450, Table 64450-C)			
	Aldicarb	Phase II	0.003 (0.01 ^b)
	Aldicarb Sulfone	Phase II	0.002
	Aldicarb Sulfoxide	Phase II	0.004
	Aldrin	Phase II	0.00005 ^b
	Butachlor	Phase II	MO
	Carbaryl	Phase II	0.06 ^b

Table 3-3. Summary of Contaminants Currently Regulated by EPA and DHS^a

Classification	Contaminant	Regulation	MCL (mg/L)
Unregulated Organic Chemicals (Section 64450, Table 64450-C) Cont'd			
	Dicamba	Phase II	MO
	Dieldrin	Phase II	0.00005 ^b
	3-Hydroxycarbofuran	Phase II	MO
	Methomyl	Phase II	MO
	Metolachlor	Phase II	MO
	Metribuzin	Phase II	MO
	Propachlor	Phase II	MO
Additional Organics with Action Levels			
	Baygon	DHS	0.09 ^b
	a-Benzenehexachloride	DHS	0.0007 ^b
	b-Benzenehexachloride	DHS	0.0003 ^b
	Captan	DHS	0.35 ^b
	Chloropicrin	DHS	0.05 ^b
	2,4-Dimethylphenol	DHS	0.4 ^b
	Diphenamide	DHS	0.04 ^b
	Ethion	DHS	0.035 ^b
	Formaldehyde	DHS	0.03 ^b
	Isopropyl N carbamate	DHS	0.35 ^b
	Malathion	DHS	0.16 ^b
	Methyl isobutyl ketone	DHS	0.04 ^b
	Methyl parathion	DHS	0.03 ^b
	Methyl tertiary butyl ether	DHS	0.035 ^b
	Parathion	DHS	0.03 ^b
	Pentachloronitrobenzene	DHS	0.0009 ^b
	Phenol	DHS	0.005 ^b
	Trithion	DHS	0.007 ^b
Natural Radioactivity (Section 64441)			
	Gross Alpha Particle Activity	NPDWR	15 pCi/L
	Radium 226 & 228	NPDWR	5 pCi/L
	Uranium	DHS	20 pCi/L
Man-Made Radioactivity (Section 64443)			
	Tritium	DHS	20,000 pCi/L
	Strontium-90	DHS	8 pCi/L
	Gross Beta Particle Activity	NPDWR	50 pCi/L
Disinfection By-Products			

Table 3-3. Summary of Contaminants Currently Regulated by EPA and DHS^a

Classification	Contaminant	Regulation	MCL (mg/L)
	Total Trihalomethanes (Chloroform, Bromoform, Chlorodibromomethane, Bromodichloromethane)	NPDWR	0.1

Table 3-3. Summary of Contaminants Currently Regulated by EPA and DHS^a

Classification	Contaminant	Regulation	MCL (mg/L)
Microbial	Giardia Lamblia	SWTR	TT(3-log Reduction)
	Heterotrophic Plate Counts	SWTR	TT(<500/mL)
	Legionella	SWTR	TT
	Viruses	SWTR	TT(4-Log Reduction)
	Disinfectant Residual	SWTR	TT(0.2)
	Fecal Coliform	TCR	TT
	E. Coli	TCR	TT(<5% mo. samples pos.)
	Total Coliform	TCR	TT(<5% mo. samples pos.)
TT - Treatment Technology PAP - Polymer Addition Practices MO - Monitored Only ^a - DHS MCL may be lower than EPA MCL ^b - Action Level ^c - Recommended/Upper/Short Term MCLs ^d - DHS MCL lower than EPA, EPA remanded in 1995			

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Anticipated Regulations

The USEPA is developing new regulations needed to maintain compliance with the SDWA and its amendments. The major anticipated regulations are shown in **Table 3-4**.

A general discussion of the expected requirements of each of the regulations is provided in Appendix D.

Table 3-4. Anticipated Federal Regulations

Anticipated Regulation	Targeted Contaminants	Status
Arsenic	Arsenic	Proposed - January 1, 2000 Final - January 1, 2001
Sulfate	Sulfate	August 6, 2001
Radionuclides	Radionuclides	Final - January 1, 2001
Radon	Radon	Proposed - August 6, 1999 Final - August 6, 2000
Stage 1 and 2 D/DBP Rule	Disinfectants Disinfection by-products	Stage 1 - November 1998 Stage 2 - May 2002
Interim, Long Term 1 (LT 1), and Long Term 2 (LT 2) Enhanced Surface Water Treatment Rule	Microbial	Final Interim - Nov 1998 Final LT 1 - November 2000 Final LT 2 - May 2002
Backwash water recycling	Microbial	August 6, 2000

The two anticipated regulations of most concern to surface water agencies are the D/DBP Rule and the ESWTR.

Disinfectants/Disinfection By-Products Rule

The 1996 Amendments to the SDWA require the Stage 1 Rule to be promulgated in November 1998. The main objectives of the anticipated D/DBP Rule include minimizing the formation of DBPs, the applied dose of disinfectant, and the level of TOC present at the point(s) of disinfection.

Stage 1 of the proposed D/DBP Rule includes MCLs for THMs, HAAs, bromate, and chlorite. It also includes maximum residual disinfectant limits (MRDLs) for chlorine, chloramines, and chlorine dioxide. It will require enhanced coagulation if TOC levels are greater than 2.0 mg/L dependent on the alkalinity. Predisinfection credit will be allowed for all treatment plants. Disinfection profiling and microbial benchmarking will most likely be required of water utilities that exceed total THM levels of 64 Fg/L (80% MCL) and HAA5 levels of 48 Fg/L (80% MCL).

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Stage 2 of the D/DBP Rule is expected to be promulgated within 4 years after the Stage 1 Rule. The findings from the Information Collection Rule will be used to develop appropriate regulations. It has been proposed previously that Stage 2 may include MCLs of 40/30 Fg/L for THMs/HAA5s, respectively.

Enhanced Surface Water Treatment Rule

The 1996 Amendments to the SDWA require the ESWTR to be promulgated in three phases: Interim, Long Term 1, and Long Term 2. The Interim ESWTR will be promulgated in November 1998. The main objectives of the anticipated ESWTR are to expand the scope of the SWTR to include *Cryptosporidium* and to prevent an increase in microbial risk while utilities come into compliance with the Stage 1 of the proposed D/DBP Rule.

The Interim ESWTR will include revising the turbidity performance criteria to 0.3 NTU in 95% of measurements and never to exceed 1 NTU. It will also require continuous monitoring of individual filter effluent turbidity. It is proposed to set an MCLG of 0 for *Cryptosporidium* and require 2-log (99%) removal. Conventional treatment, direct filtration, slow sand filtration, and diatomaceous earth filtration will all receive 2-log (99%) credit for removal if the treatment plant is meeting the turbidity performance standards.

The Final ESWTR is expected to be promulgated within 4 years after the Interim ESWTR. The findings from the Information Collection Rule will be used to develop appropriate regulations or to correct existing regulations.

Other Issues

Several other issues may impact WTP operations and regulatory compliance, including:

- The DHS *Cryptosporidium* Action Plan, which addresses optimizing assessment and treatment for *Cryptosporidium* removal;
- Urgent Threats, which allows the USEPA to quickly establish interim regulations for urgent health threats;
- Effective Date of Regulations, which allows 3 years for compliance with new regulations;
- Source Water Assessment and Protection, which requires states to implement a program for assessment and protection; and
- Alternative Monitoring Guidelines, which allows states with primacy to allow water utilities alternative monitoring options.

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These issues are discussed in detail in Appendix D.

Chapter 4. Water Quality Data Review

The purpose of this chapter is to provide a summary of the raw and treated water quality data from the participating water agencies and from other monitoring programs along the American River. All of the data collected have been summarized, and selected constituents are evaluated. **Appendix E** contains much of the data and several graphs. These data are referred to in the next three chapters. For assistance with acronyms, the reader is referred to the list of abbreviations at the front of the report.

SOURCES OF DATA

Both raw and treated water data were collected from the 10 agencies currently diverting and treating American River water. Raw river data for many general water quality parameters were also collected from EBMUD. Also, river data for a variety of water quality parameters were collected from other ambient monitoring programs. A summary of the data collected from each agency is provided in **Table 4-1**. **Figure 4-1** shows the locations where the data were collected. Data used in this report were collected for the period 1993–1997.

The frequency of sample collection for the participating agencies' drinking water monitoring programs varies greatly from agency to agency and between constituents. Typically, the water agency data for general water quality parameters such as pH, temperature, and turbidity are collected daily. Coliform data are typically collected bi-monthly. THMs are collected on a quarterly basis in the distribution system. *Giardia* and *Cryptosporidium* samples have been collected bi-monthly or monthly. Other constituents, such as TOC or MTBE, are collected more irregularly.

The USGS collected data for general water quality parameters on a monthly basis for almost 2 years. The RWQCB collected 14 samples over a 5-month period with no regularity. The Sacramento Ambient Monitoring Program has collected most data on a bi-monthly or monthly basis.

Chapter 4. Water Quality Data Review

Table 4-1. Sources of Water Quality Data

Agency	Data Collected	Period of Record
Arcade Water District	General Water Quality Parameters <i>Giardia/Cryptosporidium</i>	1994–1997
Arden Cordova Water Service	General Water Quality Parameters <i>Giardia/Cryptosporidium</i>	1993–1997
Carmichael Water District	General Water Quality Parameters <i>Giardia/Cryptosporidium</i>	1993–1997
East Bay Municipal Utility District - Lower American River	General Water Quality Parameters TOC, UV ₂₅₄ , SUVA	1997
El Dorado Irrigation District	General Water Quality Parameters TOC, MTBE	1993–1997
Folsom State Prison	General Water Quality Parameters	1993–1997
City of Folsom	General Water Quality Parameters	1993–1997
Placer County Water Agency	General Water Quality Parameters	1993–1997
City of Roseville	General Water Quality Parameters	1993–1997
City of Sacramento	General Water Quality Parameters TOC, THM, HAA, TOX, MTBE <i>Giardia/Cryptosporidium/viruses</i>	1993–1998
San Juan Water District	General Water Quality Parameters TOC, THM, HAA, TOX, MTBE <i>Giardia/Cryptosporidium/viruses</i>	1993–1998
U.S. Geological Survey National Ambient Water Quality Assessment Program - Lower American River	General Water Quality Parameters Metals, uranium, TOC, DOC, simazine, diazinon, chlorpyrifos	1996–1997
Central Valley Regional Water Quality Control Board - Lower American River	Diazinon, chlorpyrifos	1994–1995
Sacramento Ambient Monitoring Program (AMP) - Lower American River	General Water Quality Parameters Metals, pesticides, MTBE TOC, DOC	1993–1998

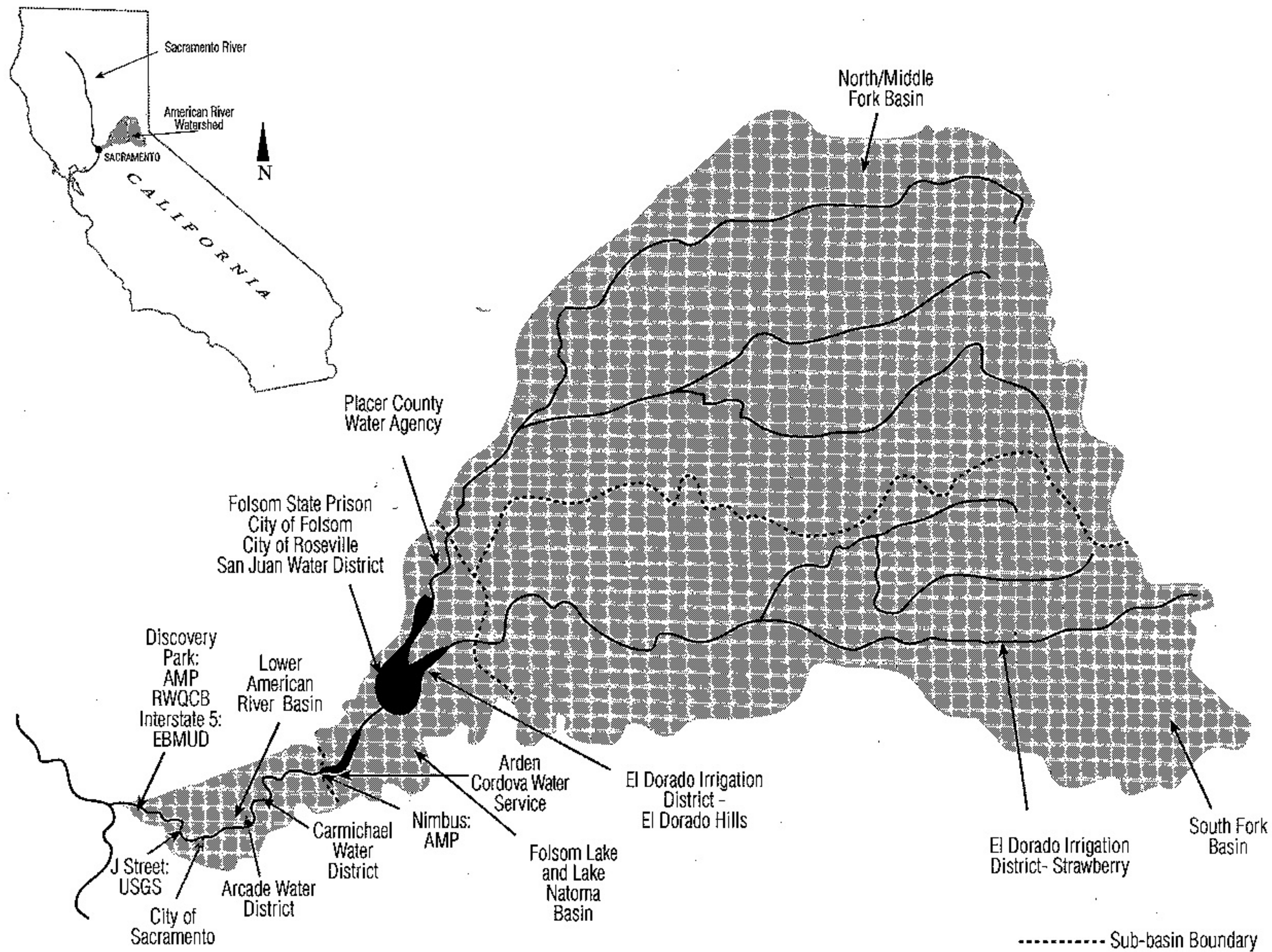


Figure 4-1. Monitoring Locations Along The American River

SUMMARY OF WATER QUALITY DATA

This section presents tabulated data. All data from the participating agencies are included. Only data from other ambient monitoring programs, which are of interest from a drinking water perspective, are included.

For each water agency providing raw or treated water quality data, data summary tables have been developed. **Tables 4-2 through 4-19** show the minimum, maximum, average, median, and 95th percentile for each of the major constituents. Data results of interest have been bolded and annotated.

The Ambient Monitoring Program has collected substantial pesticide occurrence data along the Lower American River. The data were collected between 1994 and 1997. Samples have been analyzed for over 50 pesticides with low detection limits. Samples for pesticide analyses have also been collected by the USGS and the RWQCB and, in the early 1990s, by the Sacramento Stormwater Management Program. Many of these pesticides are currently regulated by the USEPA or DHS; several are currently required to be monitored; and several have been added to the Drinking Water Candidate Contaminant List, such as alachlor, acetochlor, and EPTC. The pesticides that are currently regulated or monitored for in drinking water and those from the Drinking Water Candidate Contaminant List that were monitored by the Ambient Monitoring Program, USGS, or RWQCB are shown in **Table 4-20**. No pesticides were detected at levels near any existing or anticipated regulation. Pesticides are discussed further in Chapter 6. See Appendix E for more detailed information on the data.

MTBE has been monitored by several of the water agencies and by the Ambient Monitoring Program in the raw water. MTBE has been detected only once in the raw water. This occurred in September 1997 at EID's intake facility on Folsom Lake, where MTBE was detected at 0.92 Fg/L.

The DHS has collected some limited perchlorate data along the Lower American River. Four samples were collected from the American River at the E.A. Fairbairn WTP, all of which have been <4 Fg/L; and one sample collected from the California State University at Sacramento (CSUS) Aquatic Center on Lake Natoma, also was <4 Fg/L.

The Ambient Monitoring Program performed monthly low-level monitoring of arsenic from January 1996 to December 1997 at Discovery Park and at Nimbus Dam on the Lower American River. The total arsenic concentrations at Nimbus ranged from <0.05 to 1.16 Fg/L, with an average of 0.35 Fg/L. The total arsenic concentrations at Discovery Park ranged from <0.05 to 1.23 Fg/L, with an average of 0.37 Fg/L. Arsenic is discussed further in Chapter 6. More detailed information is available in Appendix E.

Table 4-2. Raw Water Quality Summary^a
Placer County Water Agency Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity	mg/L-CaCO3	16	34	23	na	na
Aluminum	mg/L	<0.05	0.15	0.08	<0.05	0.14
Antimony	mg/L	<0.005	<0.006	0.005	<0.005	0.006
Arsenic	mg/L	<0.001	<0.002	0.001	<0.001	0.002
Barium	mg/L	<0.01	<0.1	0.04	<0.01	0.09
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	20	34	26	24	33
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	mg/L	3.6	6.0	4.8	4.8	5.9
Carbonate	mg/L	<1.0	<1.2	1.1	<1.2	<1.2
Chloride	mg/L	1.1	1.6	1.3	1.3	1.6
Chromium	mg/L	<0.01	0.054 ^c	0.021 ^c	<0.01	0.047
Specific Conductance	umhos/cm	42	46	44	43	46
Copper	mg/L	<0.01	<0.05	0.025	0.019	0.047
Cyanide	mg/L	<0.003	<0.1	0.027	<0.003	0.085
Fluoride	mg/L	<0.1	0.1	0.1	<0.1	0.1
Hardness	mg/L-CaCO3	12	20	16	16	20
Iron	mg/L	<0.03	<0.1	0.057	0.050	0.094
Lead	mg/L	<0.001	<0.005	0.002	<0.001	0.005
Magnesium	mg/L	0.84	1.30	1.05	1.00	1.27
Manganese	mg/L	<0.01	<0.03	0.01	0.0086	0.03
Mercury	mg/L	<0.0002	<0.001	0.0005	<0.0002	0.0009
Nickel	mg/L	<0.005	<0.01	0.006	<0.005	0.009
Nitrate	mg/L-N	<0.05	<2.0	0.80	<0.5	1.70
Nitrite	mg/L-N	<0.15	<0.4	0.23	<0.15	0.38
pH ^b	--	6.8	7.7	7.2	7.1	7.5
Potassium	mg/L	0.50	0.65	0.58	0.58	0.64
Selenium	mg/L	<0.001	<0.005	0.002	<0.001	0.005
Silver	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	mg/L	1.7	5.1	2.9	2.0	4.8
Sulfate	mg/L	1.7	2.0	1.8	1.7	2.0
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	mg/L	36	53	42	38	52
Zinc	mg/L	<0.01	<0.05	0.02	0.01	0.05
ORGANIC						
Total Organic Carbon	mg/l	1.2	1.6	1.4	1.4	1.6
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	ND/W	ND/W	na	na	na
VOCs (64450-A)	ug/L	ND	ND	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	<3.0	<3.0	<3.0	<3.0	<3.0
Foaming Agent (MBAS)	mg/L	<0.01	<0.02	0.01	<0.01	0.02
Odor	TON	<1.0	<1.0	<1.0	<1.0	<1.0
Temperature ^b	C	7.78	26.67	14.07	14.44	20.47
Turbidity ^b	NTU	0.19	401.10	24.14	1.43	188.90
MICROBIOLOGICAL						
Giardia	#/100 L	NA	NA	na	na	na
Cryptosporidium	#/100 L	NA	NA	na	na	na
Total Coliform ^b	MPN/100ml	2	>1600	140	50	840

^a Based on available data from January 1993 through December 1997.

^b Based on monthly data from April 1994 through December 1997, when plant in operation.

^c Although one sample did exceed the chromium MCL, the average is well below the MCL.

ND-Non Detection, NA - Not Available, na - not applicable, W - Waived

Table 4-3. Raw Water Quality Summary^a
El Dorado Irrigation District - Strawberry Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity	mg/L-CaCO ₃	4.7	5.5	5.1	5.0	5.5
Aluminum	mg/L	0.00	0.11	0.07	0.09	0.11
Antimony	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.000	<0.005	0.002	<0.001	0.004
Barium	mg/L	0.0	0.1	0.0	0.0	0.1
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	0.0	4.7	2.4	2.4	4.5
Cadmium	mg/L	0.000	<0.001	0.000	0.000	0.001
Calcium	mg/L	0.92	1.50	1.21	1.20	1.47
Carbonate	mg/L	0.00	<1.2	0.73	1.00	1.18
Chloride	mg/L	1.3	3.0	2.4	3.0	3.0
Chromium	mg/L	0.00	0.01	0.01	0.01	0.01
Specific Conductance	umhos/cm	14.5	24.2	19.6	20.0	23.8
Copper	mg/L	0.00	0.02	0.01	0.01	0.02
Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.00	0.14	0.08	0.10	0.14
Hardness	mg/L-CaCO ₃	3.5	4.6	3.9	3.7	4.5
Iron	mg/L	0.031	0.42^d	0.1405^d	0.056	0.368
Lead	mg/L	0.000	<0.005	0.002	0.001	0.004
Magnesium	mg/L	0.11	0.21	0.17	0.18	0.21
Manganese	mg/L	0.00	<0.01	0.01	0.01	0.01
Mercury	mg/L	0.0000	0.0002	0.0002	0.0002	0.0002
Nickel	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate	mg/L-N	0.00	0.57	0.40	0.51	0.56
Nitrite	mg/L-N	<0.03	<0.15	0.09	0.09	0.14
pH	--	6.3	7.0	6.60	6.50	6.95
Potassium	mg/L	0.0	<1.0	0.50	0.50	0.95
Selenium	mg/L	0.000	<0.005	0.002	0.001	0.004
Silver	mg/L	0.00	0.01	0.01	0.01	0.01
Sodium	mg/L	1.00	3.00	1.87	1.60	2.86
Sulfate	mg/L	0	1.2	0.57	NA	NA
Thallium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Total Dissolved Solids	mg/L	14	22	18	18	22
Zinc	mg/L	0.00	0.01	0.01	0.01	0.01
ORGANIC						
Total Organic Carbon	mg/l	NA	NA	na	na	na
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	W	W	na	na	na
VOCs (64450-A)	ug/L	ND	ND	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	0	10	4	2	9
Foaming Agent (MBAS)	mg/L	0.00	<0.05	0.02	0.01	0.05
Odor	TON	0	2	1	1	2
Temperature	C	NA	NA	na	na	na
Turbidity ^b	NTU	0.08	20.71	0.50	0.34	1.11
MICROBIOLOGICAL						
Giardia	#/100 L	NA	NA	na	na	na
Cryptosporidium	#/100 L	NA	NA	na	na	na
Total Coliform ^c	MPN/100ml	<2	>2400	100	36	295

^a Based on available data from January 1993 through December 1997.

^b Based on daily data from January 1993 through December 1997, when plant in operation.

^c Based on biweekly data from January 1993 through December 1997, when plant in operation.

^d Although one sample did exceed the iron MCL, the average is well below the MCL.

ND-Non Detection, NA - Not Available, na - not applicable, W - Waived

Table 4-4. Treated Water Quality Summary^a
El Dorado Irrigation District - Strawberry Water Treatment Plant

						95th	
	Parameter	Units	Minimum	Maximum	Average	Median	Percentile
INORGANIC	Alkalinity	mg/L-CaCO3	3	9	6	6	8
	Aluminum	mg/L	<0.05	0.14	0.09	<0.085	0.13
	Antimony	mg/L	<0.001	<0.005	0.0043	<0.005	<0.005
	Arsenic	mg/L	<0.001	<0.005	0.0033	<0.004	<0.005
	Asbestos	MFL	<0.1883	<0.2	0.1912	<0.1883	0.1982
	Barium	mg/L	<0.01	<0.1	0.04	0.01	<0.1
	Beryllium	mg/L	0.001	0.001	0.001	0.001	0.001
	Bicarbonate	mg/L	<2.4	10	6	7	10
	Cadmium	mg/L	<0.0001	0.016 ^c	0.003 ^c	0.000	0.012
	Calcium	mg/L	1.2	3.1	2.4	3.1	3.1
	Carbonate	mg/L	<1.0	<1.2	1.2	<1.2	<1/2
	Chloride	mg/L	5.5	13.0	7.7	6.7	11.9
	Chromium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
	Specific Conductance	umhos/cm	30.0	71.7	45.9	44.4	67.8
	Copper	mg/L	<0.01	0.033	0.021	<0.02	0
	Cyanide	mg/L	<0.003	<0.01	0.004	<0.003	0.009
	Fluoride	mg/L	<0.1	0.15	0.11	<0.1	0.14
	Hardness	mg/L-CaCO3	4	9	7	8	9
	Iron	mg/L	<0.03	0.42 ^d	0.133 ^d	0.07	0.36
	Lead	mg/L	<0.001	<0.005	0.002	<0.001	0.004
	Magnesium	mg/L	0.2	0.4	0.3	0.3	0.4
	Manganese	mg/L	<0.005	<0.01	0.0	<0.005	0.009
	Mercury	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
	Nickel	mg/L	<0.005	<0.05	0.014	<0.005	0.041
	Nitrate	mg/L-N	0.052	<1.0	0.208	<0.11	0.689
	Nitrite	mg/L-N	<0.03	<0.5	0.174	<0.15	0.378
	pH	--	6.2	8.0	7.1	7.1	8.0
	Potassium	mg/L	<0.1	0.5	0.4	<0.5	<0.5
	Selenium	mg/L	<0.0005	<0.005	0.0	<0.001	0.004
	Silver	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
	Sodium	mg/L	2.6	8.9	5.2	4.9	8.2
	Sulfate	mg/L	<0.5	8.8	1.9	0.8	6.4
	Thallium	mg/L	<0.001	<0.005	0.002	<0.001	0.004
	Total Dissolved Solids	mg/L	24	52	34	29	49
	Zinc	mg/L	<0.005	0.035	0.016	<0.01	0.033
ORGANIC	TTHMs	ug/L	NA	NA	na	na	na
	VOCs (64444-A)	ug/L	ND	ND	na	na	na
	SOCs (64444-B)	ug/L	ND/W	ND/W	na	na	na
	VOCs (64450-A)	ug/L	ND	70	ND	ND	ND
	Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL	Color	--	<3.0	5	3	<3.0	5
	Corrosivity	mm/yr	NA	NA	na	na	na
	Foaming Agent (MBAS)	mg/L	<0.01	<0.05	0.02	0.02	0.04
	Odor	TON	<1.0	<1.0	<1.0	<1.0	<1.0
	Temperature	C	NA	NA	na	na	na
	Turbidity ^b	NTU	0.018	0.980	0.101	0.040	0.345
RADIOACTIVITY							
	Gross Alpha	pCi/L	0.57	<1.0	0.85	0.91	<1.0
^a Based on available data from January 1993 through December 1997.							
^b Based on daily data from January 1993 through December 1997, when plant in operation.							
^c Although one sample did exceed the cadmium MCL, the average is below the MCL.							
^d Although one sample did exceed the iron MCL, the average is below the MCL.							
ND-Non Detection, NA - Not Available, na - not applicable, W - Waived							

Table 4-5. Raw Water Quality Summary^a
El Dorado Irrigation District - El Dorado Hills Water Treatment Plant

95th						
Parameter	Units	Minimum	Maximum	Average	Median	Percentile
INORGANIC						
Alkalinity	mg/L-CaCO3	W	W	na	na	na
Aluminum	mg/L	0.056	1.4 ^d	0.43 ^d	0.135	1.216
Antimony	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.0000	<0.005	0.0022	0.0012	0.0048
Barium	mg/L	0.0110	<0.1	0.0363	0.0170	0.0882
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	17.0	29.0	23.3	23.5	28.7
Cadmium	mg/L	<0.0001	<0.001	0.0003	0.0001	0.0009
Calcium	mg/L	3.5	6.6	5.0	4.9	6.5
Carbonate	mg/L	<1	1.2	1.2	<1.2	1.2
Chloride	mg/L	1.6	3.0	2.4	2.6	2.9
Chromium	mg/L	<0.01	0.01	0.01	0.01	0.01
Specific Conductance	umhos/cm	39	78	57	55	75
Copper	mg/L	<0.01	0.11	0.04	0.02	0.10
Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	<0.1	0.1000	0.1000	<0.1	<0.1
Hardness	mg/L-CaCO3	15	33	22	20	32
Iron	mg/L	<0.02	1.7 ^e	0.46 ^e	0.1	1.5
Lead	mg/L	<0.001	<0.005	0.002	0.001	0.004
Magnesium	mg/L	1.4	4.1	2.3	1.8	3.8
Manganese	mg/L	0.0074	0.0430	0.0189	0.0125	0.0388
Mercury	mg/L	<0.0002	0.0002	0.0002	<0.0002	<0.0002
Nickel	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate	mg/L-N	0.00	<0.11	0.05	0.05	0.11
Nitrite	mg/L-N	0.0	1.1	0.4	0.3	1.0
pH	--	5.9	6.9	6.4	6.4	6.8
Potassium	mg/L	0.62	<1	0.81	0.81	0.97
Selenium	mg/L	<0.0005	<0.005	0.0019	0.0010	0.0044
Silver	mg/L	<0.01	0.0100	0.0100	<0.01	<0.01
Sodium	mg/L	1.9	2.9	2.4	2.4	2.9
Sulfate	mg/L	1.3	4.6	2.4	1.9	4.3
Thallium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Total Dissolved Solids	mg/L	26	52	38	37	50
Zinc	mg/L	<0.005	0.026	0.011	0.006	0.023
ORGANIC						
Total Organic Carbon	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	ND/W	ND/W	na	na	na
VOCs (64450-A)	ug/L	ND	ND	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	<3	35 ^f	12 ^f	5	31
Foaming Agent (MBAS)	mg/L	<0.01	<0.05	0.021	0.011	0.044
Odor	TON	<1	100 ^g	25.75 ^g	1	85
Temperature	C	NA	NA	na	na	na
Turbidity ^b	NTU	0.71	175.00	4.69	3.45	11.40
MICROBIOLOGICAL						
Giardia	#/100 L	NA	NA	na	na	na
Cryptosporidium	#/100 L	NA	NA	na	na	na
Total Coliform ^c	MPN/100ml	2	500	65	23	240
* Based on available data from January 1993 through December 1997.						
^b Based on daily data from September 1993 through December 1997, when plant in operation.						
^c Based on biweekly data from April 1993 through December 1997, when plant in operation.						
^d Although one sample did exceed the aluminum MCL, the average is well below the MCL.						
^e Both the maximum and the average detected values for iron were above the secondary MCL.						
^f The maximum detected color value was above the secondary MCL, but the average was below the secondary MCL.						
^g Both the maximum and the average detected values for odor were above the secondary MCL.						
ND-Non Detection, NA - Not Available, na - not applicable, W - Waived						

Table 4-6. Treated Water Quality Summary^a
El Dorado Irrigation District - El Dorado Hills Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity	mg/L-CaCO3	13	30	22	20	30
Aluminum	mg/L	<0.05	0.10	0.08	0.08	0.10
Antimony	mg/L	<0.005	<0.05	0.0125	<0.005	0.039
Arsenic	mg/L	<0.001	<0.005	0.004	0.004	0.005
Asbestos	MFL	0.1883	<0.2	0.1928	0.1900	0.1990
Barium	mg/L	<0.001	<0.1	0.0483	0.014	0.100
Beryllium	mg/L	<0.001	<0.01 ^c	0.003	<0.001	0.009
Bicarbonate	mg/L	13	37	26	24	37
Cadmium	mg/L	<0.0001	<0.001	0.001	0.001	0.001
Calcium	mg/L	2.9	7.9	5.2	6.0	7.5
Carbonate	mg/L	<1.0	<1.2	1.2	<1.2	<1.2
Chloride	mg/L	3.6	6.5	4.7	4.5	6.2
Chromium	mg/L	<0.0001	<0.01	0.006	0.008	0.010
Specific Conductance	umhos/cm	50.0	98.6	74.2	72.6	97.2
Copper	mg/L	0	<0.02	0	<0.02	0
Cyanide	mg/L	<0.003	<0.01	0.005	<0.003	0.010
Fluoride	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Hardness	mg/L-CaCO3	11	29	21	23	29
Iron	mg/L	<0.01	<0.03	0.0	<0.03	<0.03
Lead	mg/L	<0.001	<0.005	0.002	<0.001	0.004
Magnesium	mg/L	1.0	3.3	1.9	1.7	3.0
Manganese	mg/L	<0.005	<0.01	0.007	<0.005	0.010
Mercury	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/L	<0.0002	<0.025	0.008	<0.005	0.021
Nitrate	mg/L-N	0.068	<1.0	0.280	0.140	0.805
Nitrite	mg/L-N	<0.03	<0.5	0.2	<0.15	0.4
pH	--	6.4	7.5	6.9	6.9	7.4
Potassium	mg/L	<0.5	0.8	0.6	0.6	0.8
Selenium	mg/L	<0.001	<0.005	0.0	<0.001	0.004
Silver	mg/L	<0.005	<0.01	0.010	<0.01	0.013
Sodium	mg/L	2.5	8.8	5.8	5.3	8.7
Sulfate	mg/L	1.9	7.4	4.2	2.8	7.4
Thallium	mg/L	<0.0005	<0.005	0.002	<0.001	0.004
Total Dissolved Solids	mg/L	35	58	47	49	57
Zinc	mg/L	0.0	0.7	0.3	0.3	0.6
ORGANIC						
TTHMs	ug/L	28	96	49	43	79
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	ND	ND	na	na	na
VOCs (64450-A)	ug/L	ND	24	2	ND	5
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	<3.0	<3.0	<3.0	<3.0	<3.0
Corrosivity	mm/yr	NA	NA	na	na	na
Foaming Agent (MBAS)	mg/L	<0.01	<0.05	0.02	<0.01	0.04
Odor	TON	<1.0	1	1	<1.0	<1.0
Temperature	C	NA	NA	na	na	na
Turbidity ^b	NTU	0.02	2.10	0.06	0.04	0.15
RADIOACTIVITY						
Gross Alpha	pCi/L	0.34	2.40	1.11	0.85	2.19

^a Based on available data from January 1993 through December 1997.

^b Based on daily data from September 1993 through December 1997.

^c The MDL used was greater than the MCL for beryllium.

ND-Non Detection, na - not applicable, W - Waived

Table 4-7. Treated Water Quality Summary^a
City of Folsom Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity ^b	mg/L-CaCO ₃	12	40	23	24	30
Aluminum	mg/L	0.0052	0.0052	0.0052	0.0052	0.0052
Antimony	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Asbestos	MFL	<0.006	<0.006	<0.006	<0.006	<0.006
Barium	mg/L	0.0190	0.0190	0.0190	0.0190	0.0190
Beryllium	mg/L	0.0010	0.0010	0.0010	0.0010	0.0010
Bicarbonate ^b	mg/L	8	26	19	20	24
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	21	25	23	23	25
Carbonate ^b	mg/L	0	16	1	0	8
Chloride	mg/L	2.8	5.0	3.6	3.4	4.8
Chromium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Specific Conductance	umhos/cm	26	26	26	26	26
Copper	mg/L	ND	<0.02	<0.02	<0.02	<0.02
Cyanide	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoride	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Hardness ^b	mg/L-CaCO ₃	16	30	23	23	26
Iron	mg/L	0.025	0.38^d	0.2^d	0.203	0.380
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	1.9	3.0	2.6	3.0	3.0
Manganese	mg/L	ND	0.01	0.01	0.01	0.01
Mercury	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate	mg/L-N	<0.11	<0.11	<0.11	<0.11	<0.11
Nitrite	mg/L-N	<0.11	<0.11	<0.11	<0.11	<0.11
pH ^b	--	6.2	9.6	8.2	8.5	9.2
Potassium	mg/L	0.0	ND	na	na	na
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	mg/L	2.5	2.8	2.6	2.5	2.8
Sulfate	mg/L	4.4	7.7	5.6	5.1	7.3
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids ^b	mg/L	13	48	26	25	37
Zinc	mg/L	ND	ND	na	na	na
ORGANIC						
TTHMs ^c	ug/L	48	86	64	61	84
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	ND/W	ND/W	na	na	na
VOCs (64450-A)	ug/L	ND/W	63	ND	ND	ND
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	0	5	2	2	5
Corrosivity	mm/yr	NA	NA	na	na	na
Foaming Agent (MBAS)	mg/L	ND	ND	na	na	na
Odor	TON	0.0	<1.0	0.5	0.5	<1.0
Temperature ^b	C	7.7	30.0	15.7	15.0	23.7
Turbidity ^b	NTU	0.01	26.00	0.09	0.05	0.25
RADIOACTIVITY						
Gross Alpha	pCi/L	0.33	2.30	1.32	1.32	2.30

^a Based on available data from January 1993 through December 1997.
^b Based on daily data from January 1993 through December 1997, when plant in operation.
^c Based on Distribution System Data from March 1993 through November 1995.
^d Although the maximum detected value is greater than the MCL for iron, the average is below the MCL.
ND-Non Detection, NA - Not Available, na - not applicable, W - Waived

City of Roseville Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity ^b	mg/L-CaCO3	14	38	22	22	28
Aluminum	mg/L	ND	0.1	0.1	0.1	0.1
Antimony	mg/L	ND	ND	na	na	na
Arsenic	mg/L	<0.001	<0.008	0.0035	0.0025	0.0074
Barium	mg/L	ND	ND	na	na	na
Beryllium	mg/L	ND	0.0043 ^d	0.0043	0.0043	0.0043
Bicarbonate	mg/L	17.0	26.0	20.0	17.0	25.1
Cadmium	mg/L	ND	ND	na	na	na
Calcium	mg/L	3.60	5.80	4.63	4.50	5.67
Carbonate	mg/L	ND	ND	na	na	na
Chloride	mg/L	1.0	2.0	1.4	1.2	1.9
Chromium	mg/L	0.015	0.015	0.015	0.015	0.015
Specific Conductance	umhos/cm	39	56	47	45	55
Copper	mg/L	ND	ND	na	na	na
Cyanide	mg/L	ND	ND	na	na	na
Fluoride	mg/L	ND	ND	na	na	na
Hardness ^b	mg/L-CaCO3	12.0	32.0	21.8	22.0	28.0
Iron	mg/L	ND	0.052	0.052	0.052	0.052
Lead	mg/L	ND	ND	na	na	na
Magnesium	mg/L	0.90	1.60	1.30	1.40	1.58
Manganese	mg/L	ND	0.03	0.03	0.03	0.03
Mercury	mg/L	ND	ND	na	na	na
Nickel	mg/L	ND	ND	na	na	na
Nitrate	mg/L-N	ND	0.69	0.62	0.62	0.68
Nitrite	mg/L-N	ND	ND	na	na	na
pH ^b	--	6.5	7.8	7.1	7.1	7.4
Potassium	mg/L	0.54	0.76	0.69	0.73	0.76
Selenium	mg/L	ND	ND	na	na	na
Silver	mg/L	ND	0.018	0.018	0.018	0.018
Sodium	mg/L	1.00	2.40	1.63	1.50	2.31
Sulfate	mg/L	1.30	2.00	1.60	1.50	1.95
Thallium	mg/L	ND	ND	na	na	na
Total Dissolved Solids ^b	mg/L	12.4	41.3	27.0	26.6	35.4
Zinc	mg/L	ND	ND	na	na	na
ORGANIC						
Total Organic Carbon	mg/l	-	-	-	-	-
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	W	W	na	na	na
VOCs (64450-A)	ug/L	ND	ND	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	ND	15	13	13	15
Foaming Agent (MBAS)	mg/L	ND	ND	na	na	na
Odor	TON	ND	ND	na	na	na
Temperature ^b	C	9	23	14	13	20
Turbidity ^b	NTU	0.46	464	6.67	2.40	20
MICROBIOLOGICAL						
Giardia	#/100 L	-	-	-	-	-
Cryptosporidium	#/100 L	-	-	-	-	-
Total Coliform ^c	MPN/100ml	2	1600	71	23	170

Table 4-9. Treated Water Quality Summary^a
City of Roseville Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity ^b	mg/L-CaCO3	16	40	28.76	28	34
Aluminum	mg/L	ND	0.15	0.15	0.15	0.15
Antimony	mg/L	ND	ND	na	na	na
Arsenic	mg/L	0.003	0.003	0.003	0.003	0.003
Asbestos	MFL	ND	ND	na	na	na
Barium	mg/L	ND	ND	na	na	na
Beryllium	mg/L	ND	ND	na	na	na
Bicarbonate	mg/L	22	34	29.6	30	34
Cadmium	mg/L	ND	ND	na	na	na
Calcium	mg/L	9	110	30.4	12	90.4
Carbonate	mg/L	ND	1	1	1	1
Chloride	mg/L	2	3.3	2.62	2.7	3.2
Chromium	mg/L	ND	ND	na	na	na
Specific Conductance	umhos/cm	69	88.4	79.98	81.5	87.32
Copper	mg/L	ND	0.0062	0.0062	0.0062	0.0062
Cyanide	mg/L	ND	ND	na	na	na
Fluoride	mg/L	ND	0.7	0.7	0.7	0.7
Hardness ^b	mg/L-CaCO3	14	48	33.19	32	42
Iron	mg/L	ND	ND	na	na	na
Lead	mg/L	ND	ND	na	na	na
Magnesium	mg/L	1	15	4.08	1.4	12.32
Manganese	mg/L	ND	0.015	0.015	0.015	0.015
Mercury	mg/L	ND	ND	na	na	na
Nickel	mg/L	ND	ND	na	na	na
Nitrate	mg/L-N	ND	ND	na	na	na
Nitrite	mg/L-N	ND	ND	na	na	na
pH ^b	--	6.2	9.6	8.7	8.8	9.1
Potassium	mg/L	6.4	6.4	6.4	6.4	6.4
Selenium	mg/L	ND	ND	na	na	na
Silver	mg/L	ND	ND	na	na	na
Sodium	mg/L	1	16	4.58	1.9	13.28
Sulfate	mg/L	4.3	6.4	5.28	4.9	6.32
Thallium	mg/L	ND	ND	na	na	na
Total Dissolved Solids ^b	mg/L	11.9	53.7	40.95	41.3	49.6
Zinc	mg/L	ND	0.055	0.055	0.055	0.055
ORGANIC						
TTHMs	ug/L	19	70	38	37	60
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	W	W	na	na	na
VOCs (64450-A)	ug/L	ND	16	1.4	ND	3.25
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	ND	ND	na	na	na
Corrosivity	mm/yr	2.85	2.85	2.85	2.85	2.85
Foaming Agent (MBAS)	mg/L	ND	ND	na	na	na
Odor	TON	ND	ND	na	na	na
Temperature ^b	C	9	23	14.08	14	17
Turbidity ^b	NTU	0.02	0.6	0.04	0.04	0.07
RADIOACTIVITY						
Gross Alpha	pCi/L	ND	ND	na	na	na
^a Based on available data from January 1993 through December 1997.						
^b Based on daily data from January 1993 through December 1997, when plant in operation.						
ND-Non Detection, na - not applicable, W - Waived						

Table 4-10. Treated Water Quality Summary^a
Folsom State Prison Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity	mg/L-CaCO3	24	24	24	24	24
Aluminum	mg/L	ND	0.06	0.03	0.03	0.06
Antimony	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Asbestos	MFL	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056
Barium	mg/L	0.012	0.012	0.012	0.012	0.012
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	NA	NA	na	na	na
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	NA	NA	na	na	na
Carbonate	mg/L	NA	NA	na	na	na
Chloride	mg/L	3.1	3.1	3.1	3.1	3.1
Chromium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Specific Conductance	umhos/cm	NA	NA	na	na	na
Copper	mg/L	NA	NA	na	na	na
Cyanide	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003
Fluoride	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Hardness	mg/L-CaCO3	39	39	39	39	39
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03
Lead	mg/L	NA	NA	na	na	na
Magnesium	mg/L	NA	NA	na	na	na
Manganese	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate	mg/L-N	ND	0.14	0.14	0.14	0.14
Nitrite	mg/L-N	<0.15	<0.15	<0.15	<0.15	<0.15
pH	--	8.3	8.3	8.3	8.3	8.3
Potassium	mg/L	NA	NA	na	na	na
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	mg/L	NA	NA	na	na	na
Sodium	mg/L	NA	NA	na	na	na
Sulfate	mg/L	NA	NA	na	na	na
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	mg/L	51	51	51	51	51
Zinc	mg/L	NA	NA	na	na	na
ORGANIC						
TTHMs	ug/L	NA	NA	na	na	na
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	ND/W	ND/W	na	na	na
VOCs (64450-A)	ug/L	ND	ND	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
MTBE	ug/L	ND	ND	na	na	na
PHYSICAL						
Color	--	<3	<3	<3	<3	<3
Corrosivity	mm/yr	NA	NA	na	na	na
Foaming Agent (MBAS)	mg/L	NA	NA	na	na	na
Odor	TON	<1.0	<1.0	<1.0	<1.0	<1.0
Temperature	C	NA	NA	na	na	na
Turbidity	NTU	0.04	0.04	0.04	0.04	0.04
RADIOACTIVITY						
Gross Alpha	pCi/L	<1.0	<1.0	<1.0	<1.0	<1.0

* Based on Available Data from January 1993 through December 1997.

ND-Non Detection, NA - Not Available, na - not applicable, W - Waived

Table 4-11. Raw Water Quality Summary^a
San Juan Water District - Sidney N. Peterson Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity ^b	mg/L-CaCO ₃	17	42	27	27	35
Aluminum	mg/L	<0.05	0.13	0.09	0.08	0.13
Antimony	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	<0.001	<0.008	0.0035	0.0025	0.0074
Barium	mg/L	0.011	0.033	0.018	0.013	0.030
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	23	34	26	24	33
Cadmium	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium	mg/L	5.0	7.6	5.9	5.4	7.3
Carbonate	mg/L	<1.0	<1.2	1.2	<1.2	<1.2
Chloride	mg/L	1.2	3.1	2.2	2.3	3.1
Chromium	mg/L	<0.01	0.015	0.011	<0.01	0.014
Specific Conductance	umhos/cm	48.5	66.3	54.2	51.1	64.3
Copper	mg/L	<0.01	<0.02	0.0150	0.0150	<0.02
Cyanide	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Hardness	mg/L-CaCO ₃	18	26	21	21	25
Iron	mg/L	<0.03	0.098	0.060	0.055	0.095
Lead	mg/L	<0.001	0.0071	0.0025	<0.001	0.0062
Magnesium	mg/L	1.1	1.8	1.6	1.7	1.8
Manganese	mg/L	0.015	0.052	0.027	0.021	0.048
Mercury	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/L	<0.005	0.0086	0.0068	0.0068	0.0084
Nitrate	mg/L-N	<0.15	<1	0.54	0.50	0.93
Nitrite	mg/L-N	<0.1	<0.15	0.1333	<0.15	<0.15
pH ^b	--	5.67	8.28	7.01	7.00	7.54
Potassium	mg/L	0.54	0.76	0.69	0.73	0.76
Selenium	mg/L	<0.0005	<0.001	0.0009	<0.001	<0.001
Silver	mg/L	<0.01	0.018	0.012	<0.01	0.017
Sodium	mg/L	1.8	2.4	2.2	2.2	2.4
Sulfate	mg/L	0.8	2.6	1.8	1.9	2.5
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	mg/L	20	52	35	34	50
Zinc	mg/L	<0.005	0.018	0.010	0.008	0.017
ORGANIC						
Total Organic Carbon ^c	mg/l	1.0	2.4	1.4	1.4	2.0
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	W	W	na	na	na
VOCs (64450-A)	ug/L	ND	ND	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	<3	>5	4	<3	5
Foaming Agent (MBAS)	mg/L	<0.01	0.02	0.01	0.01	0.02
Odor	TON	<1.00	<1.00	<1.00	<1.00	<1.00
Temperature ^b	C	7.22	22.22	12.22	11.67	18.89
Turbidity ^b	NTU	0.41	508^f	5.98^f	2.20	19^f
MICROBIOLOGICAL						
Giardia ^d	#/100 L	ND	7	7	7	7
Cryptosporidium ^d	#/100 L	ND	19	19	19	19
Total Coliform ^e	MPN/100ml	12.4	5000	230.0	109.1	900

^a Based on available data from January 1993 through December 1997.
^b Based on daily data from January 1993 through December 1997, when plant in operation.
^c Based on data from January 1994 through December 1997.
^d Based on monthly ICR sample from July 1997 through December 1997.
^e Based on biweekly data from January 1993 through December 1997.
^f The maximum turbidity was recorded in January 1997, and is much greater than the average and 95th percentile values.
ND-Non Detection, na - not applicable, W - Waived

Table 4-12. Treated Water Quality Summary^a
San Juan Water District - Sidney N. Peterson Water Treatment Plant

95th						
Parameter	Units	Minimum	Maximum	Average	Median	Percentile
INORGANIC						
Alkalinity ^b	mg/L-CaCO3	17	47	31	31	39
Aluminum	mg/L	<0.05	0.0940	0.0577	<0.05	0.0835
Antimony	mg/L	<0.001	<0.005	0.0037	<0.005	<0.005
Arsenic	mg/L	<0.001	0.019	0.005	0.003	0.015
Asbestos	MFL	<0.006	<0.1883	0.0714	0.0198	0.1715
Barium	mg/L	0.010	0.014	0.011	0.011	0.013
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	26	37	30	29	36
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	8.5	12.0	9.9	9.4	11.8
Carbonate	mg/L	<1.2	<1.2	<1.2	<1.2	<1.2
Chloride	mg/L	2.4	4.8	3.0	2.5	4.4
Chromium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Specific Conductance	umhos/cm	65.4	96.0	76.5	73.3	92.7
Copper	mg/L	<0.01	<0.02	0.0150	0.0150	0.0200
Cyanide	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003
Fluoride	mg/L	<0.10	0.1000	<0.10	<0.10	<0.10
Hardness	mg/L-CaCO3	27.0	39.0	32.3	33.0	37.8
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	1.5	2.4	1.9	2.0	2.3
Manganese	mg/L	<0.005	0.037	0.011	<0.005	0.030
Mercury	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate	mg/L-N	<0.5	<1	0.64	0.64	0.91
Nitrite	mg/L-N	<0.11	<0.15	0.13	0.13	0.15
pH ^b	--	6.4	9.4	8.4	8.4	8.8
Potassium	mg/L	0.6	0.8	0.7	0.8	0.8
Selenium	mg/L	<0.0005	<0.001	0.0008	<0.001	<0.001
Silver	mg/L	<0.01	0.0300	0.0133	<0.01	0.0250
Sodium	mg/L	1.9	2.9	2.4	2.5	2.9
Sulfate	mg/L	4.0	9.1	6.8	7.3	9.0
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	mg/L	28	61	45	42	61
Zinc	mg/L	<0.005	<0.01	0.01	<0.005	0.01
ORGANIC						
THMs ^c	ug/L	24.0	49.0	33.6	33.0	46.5
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	ND/W	ND/W	na	na	na
VOCs (64450-A)	ug/L	ND	26	2	ND	5
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	<3	<3	<3	<3	<3
Corrosivity	mm/yr	NA	NA	na	na	na
Foaming Agent (MBAS)	mg/L	<0.01	0.015	0.011	<0.01	0.015
Odor	TON	<1	<1	<1	<1	<1
Temperature ^b	C	5.0	23.3	14.0	13.9	20.6
Turbidity ^b	NTU	0.02	0.28	0.05	0.05	0.08
RADIOACTIVITY						
Gross Alpha	pCi/L	<1.8	2.30	1.97	<1.8	2.25

^a Based on Available Data from January 1993 through December 1997.

^b Based on Daily Data from January 1993 through December 1997, when plant in operation.

^c Based on Data from December 1994 through November 1997, when plant in operation.

ND-Non Detection, NA - Not Available, na - not applicable, W - Waived

Table 4-13. Raw Water Quality Summary^a
Arden Cordova Water Service - Coloma Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity	mg/L-CaCO ₃	18	360^d	78	22	277
Aluminum	mg/L	<0.05	0.31	0.11	<0.05	0.26
Antimony	mg/L	<0.006	<0.006	<0.006	<0.006	<0.006
Arsenic	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	0.010	0.015	0.012	0.012	0.015
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	NA	NA	na	na	na
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	mg/L	4.8	7.7	5.7	5.2	7.4
Carbonate	mg/L	NA	NA	na	na	na
Chloride	mg/L	1.3	3.2	2.0	1.5	3.1
Chromium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Specific Conductance	umhos/cm	43	74	55	48	74
Copper	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Cyanide	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoride	mg/L	ND	0.1	na	na	na
Hardness	mg/L-CaCO ₃	18	31	24	24	31
Iron	mg/L	<0.1	0.3^e	0.14	<0.1	0.27
Lead	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium	mg/L	1.4	2.6	2.0	1.7	2.6
Manganese	mg/L	<0.03	0.0360	<0.03	<0.03	<0.03
Mercury	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	mg/L-N	<2.0	2.00	<2.0	<2.0	<2.0
Nitrite	mg/L-N	<0.4	<0.4	<0.4	<0.4	<0.4
pH ²	--	6.9	8.1	7.5	7.5	7.9
Potassium	mg/L	0.59	0.74	0.66	0.64	0.74
Selenium	mg/L	0.0039	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	<0.01	0.0110	<0.01	<0.01	<0.01
Sodium	mg/L	2.0	2.9	2.5	2.5	2.9
Sulfate	mg/L	1.9	4.5	2.7	2.3	4.2
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	mg/L	17	44	32	36	42
Zinc	mg/L	0.0055	<0.05	<0.05	<0.05	<0.05
ORGANIC						
Total Organic Carbon	mg/l	NA	NA	na	na	na
VOCs (6444-A)	ug/L	ND	ND	na	na	na
SOCs (6444-B)	ug/L	ND/W	ND/W	na	na	na
VOCs (64450-A)	ug/L	ND/W	ND/W	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	<3	5.0	<3	<3	<3
Foaming Agent (MBAS)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Odor	TON	<1	<1	<1	<1	<1
Temperature	C	NA	NA	na	na	na
Turbidity ^b	NTU	0.49	15.80	2.00	1.53	4.40
RADIOACTIVITY						
Gross Alpha	pCi/L	ND	1.70	1.55	1.55	1.69
MICROBIOLOGICAL						
Giardia	#/100 L	ND	ND	na	na	na
Cryptosporidium	#/100 L	ND	ND	na	na	na
Total Coliform ^c	MPN/100ml	2	1600	80	183.3	780

^a Based on available data from January 1993 through December 1997.

^b Based on daily data from June 1994 through November 1997, when plant in operation.

^c Based on weekly data from June 1994 through December 1997, when plant in operation.

^d The maximum alkalinity value does not correspond with historical data.

^e The maximum iron level was detected at the MCL.

ND-Non Detection, NA - Not Available, na - not applicable, W - Waived

Table 4-14. Treated Water Quality Summary^a
Arden Cordova Water Service - Coloma Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity	mg/L-CaCO ₃	51	100	76	76	98
Aluminum	mg/L	<0.05	0.1	0.1	0.1	0.1
Antimony	mg/L	<0.006	<0.006	<0.006	<0.006	<0.006
Arsenic	mg/L	0.0015	0.0037	0.0026	0.0026	0.0036
Asbestos	MFL	NA	NA	na	na	na
Barium	mg/L	0.0310	0.0600	0.0455	0.0455	0.0586
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	NA	NA	na	na	na
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	mg/L	13.0	28.0	20.5	20.5	27.3
Carbonate	mg/L	NA	NA	na	na	na
Chloride	mg/L	7.8	19.0	13.4	13.4	18.4
Chromium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Specific Conductance	umhos/cm	138	304	221	221	296
Copper	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Cyanide	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoride	mg/L	0.10	0.11	0.11	0.11	0.11
Hardness	mg/L-CaCO ₃	52	110	81	81	107
Iron	mg/L	0.0540	<0.1	<0.1	<0.1	<0.1
Lead	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium	mg/L	4.4	9.1	6.8	6.8	8.9
Manganese	mg/L	0.054	0.066	0.031	0.027	0.065
Mercury	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	mg/L-N	0.92	1.50	1.21	1.21	1.47
Nitrite	mg/L-N	<0.4	<0.4	<0.4	<0.4	<0.4
pH ^b	--	6.6	7.9	7.3	7.4	7.6
Potassium	mg/L	2.4	5.1	3.8	3.8	5.0
Selenium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	mg/L	7.0	15.0	11.0	11.0	14.6
Sulfate	mg/L	3.3	5.5	4.4	4.4	5.4
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	mg/L	72	190	131	131	184
Zinc	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
ORGANIC						
TTHMs	ug/L	0	12	3	1	8
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	W	W	na	na	na
VOCs (64450-A)	ug/L	ND/W	ND/W	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	<3	<3	<3	<3	<3
Corrosivity	mm/yr	-1.06	-1.06	-1.06	-1.06	-1.06
Foaming Agent (MBAS)	mg/L	<0.01	0.0120	<0.01	<0.01	<0.01
Odor	TON	<1	1.40	<1	<1	<1
Temperature	C	NA	NA	na	na	na
Turbidity ^b	NTU	0.04	0.80	0.15	0.14	0.29

^a Based on available quarterly data from January 1993 through December 1997 unless indicated otherwise.

^b Based on daily data from June 1994 through November 1997, when plant in operation.

ND-Non Detection, NA - Not Available, na - not applicable, W - Waived

Table 4-15. Raw Water Quality Summary^a
Carmichael Water District

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity	mg/L-CaCO3	12.5	28.3	18.7	18.8	23.5
Aluminum	mg/L	NA	NA	na	na	na
Antimony	mg/L	NA	NA	na	na	na
Arsenic	mg/L	NA	NA	na	na	na
Barium	mg/L	NA	NA	na	na	na
Beryllium	mg/L	NA	NA	na	na	na
Bicarbonate	mg/L	NA	NA	na	na	na
Cadmium	mg/L	NA	NA	na	na	na
Calcium	mg/L	NA	NA	na	na	na
Carbonate	mg/L	NA	NA	na	na	na
Chloride	mg/L	NA	NA	na	na	na
Chromium	mg/L	NA	NA	na	na	na
Specific Conductance	umhos/cm	NA	NA	na	na	na
Copper	mg/L	NA	NA	na	na	na
Cyanide	mg/L	NA	NA	na	na	na
Fluoride	mg/L	NA	NA	na	na	na
Hardness	mg/L-CaCO3	NA	NA	na	na	na
Iron	mg/L	NA	NA	na	na	na
Lead	mg/L	NA	NA	na	na	na
Magnesium	mg/L	NA	NA	na	na	na
Manganese	mg/L	NA	NA	na	na	na
Mercury	mg/L	NA	NA	na	na	na
Nickel	mg/L	NA	NA	na	na	na
Nitrate	mg/L-N	NA	NA	na	na	na
Nitrite	mg/L-N	NA	NA	na	na	na
pH	--	4.73	8.56	7.39	7.40	8.04
Potassium	mg/L	NA	NA	na	na	na
Selenium	mg/L	NA	NA	na	na	na
Silver	mg/L	NA	NA	na	na	na
Sodium	mg/L	NA	NA	na	na	na
Sulfate	mg/L	NA	NA	na	na	na
Thallium	mg/L	NA	NA	na	na	na
Total Dissolved Solids	mg/L	NA	NA	na	na	na
Zinc	mg/L	NA	NA	na	na	na
ORGANIC						
Total Organic Carbon	mg/l	1.5	1.8	1.66	1.7	1.78
VOCs (64444-A)	ug/L	NA	NA	na	na	na
SOCs (64444-B)	ug/L	NA	NA	na	na	na
VOCs (64450-A)	ug/L	NA	NA	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	NA	NA	na	na	na
PHYSICAL						
Color	--	NA	NA	na	na	na
Foaming Agent (MBAS)	mg/L	NA	NA	na	na	na
Odor	TON	NA	NA	na	na	na
Temperature	C	8	23	15	15	21
Turbidity	NTU	0.5	42.0	2.7	1.3	9.5
MICROBIOLOGICAL						
Giardia ^b	#/100 L	ND	37.3 ^c	na	na	na
Cryptosporidium ^b	#/100 L	ND	5.32 ^c	na	na	na
Total Coliform	MPN/100ml	NA	NA	na	na	na

^a Based on available data from January 1993 through December 1997.

^b Based on available biweekly data from August 1994 through December 1996, when plant in operation

^c These values only indicate the estimated concentration in the water based on a 100L sample volume.

ND-Non Detection, NA - Not Available, na - not applicable, W - Waived

Table 4-16. Treated Water Quality Summary^a
Carmichael Water District

95th						
Parameter	Units	Minimum	Maximum	Average	Median	Percentile
INORGANIC						
Alkalinity	mg/L-CaCO3	14.1	34.0	22.5	20.6	32.8
Aluminum	mg/L	NA	NA	na	na	na
Antimony	mg/L	NA	NA	na	na	na
Arsenic	mg/L	NA	NA	na	na	na
Asbestos	MFL	NA	NA	na	na	na
Barium	mg/L	NA	NA	na	na	na
Beryllium	mg/L	NA	NA	na	na	na
Bicarbonate	mg/L	NA	NA	na	na	na
Cadmium	mg/L	NA	NA	na	na	na
Calcium	mg/L	NA	NA	na	na	na
Carbonate	mg/L	NA	NA	na	na	na
Chloride	mg/L	NA	NA	na	na	na
Chromium	mg/L	NA	NA	na	na	na
Specific Conductance	umhos/cm	NA	NA	na	na	na
Copper	mg/L	NA	NA	na	na	na
Cyanide	mg/L	NA	NA	na	na	na
Fluoride	mg/L	NA	NA	na	na	na
Hardness	mg/L-CaCO3	NA	NA	na	na	na
Iron	mg/L	NA	NA	na	na	na
Lead	mg/L	NA	NA	na	na	na
Magnesium	mg/L	NA	NA	na	na	na
Manganese	mg/L	NA	NA	na	na	na
Mercury	mg/L	NA	NA	na	na	na
Nickel	mg/L	NA	NA	na	na	na
Nitrate	mg/L-N	NA	NA	na	na	na
Nitrite	mg/L-N	NA	NA	na	na	na
pH	--	5.32	8.77	7.33	7.30	7.60
Potassium	mg/L	NA	NA	na	na	na
Selenium	mg/L	NA	NA	na	na	na
Silver	mg/L	NA	NA	na	na	na
Sodium	mg/L	NA	NA	na	na	na
Sulfate	mg/L	NA	NA	na	na	na
Thallium	mg/L	NA	NA	na	na	na
Total Dissolved Solids	mg/L	NA	NA	na	na	na
Zinc	mg/L	NA	NA	na	na	na
ORGANIC						
TTHMs	ug/L	NA	NA	na	na	na
VOCs (64444-A)	ug/L	NA	NA	na	na	na
SOCs (64444-B)	ug/L	NA	NA	na	na	na
VOCs (64450-A)	ug/L	NA	NA	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	NA	NA	na	na	na
PHYSICAL						
Color	--	NA	NA	na	na	na
Corrosivity	mm/yr	NA	NA	na	na	na
Foaming Agent (MBAS)	mg/L	NA	NA	na	na	na
Odor	TON	NA	NA	na	na	na
Temperature	C	11.0	24.0	16.5	17.0	19.0
Turbidity	NTU	0.01	1.80	0.53	0.49	1.22
RADIOACTIVITY						
Gross Alpha	pCi/L	NA	NA	na	na	na
* Based on available data from January 1993 through December 1997.						
ND-Non Detection, NA - Not Available, na - not applicable, W - Waived						

Arcade Water District

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity	mg/L-CaCO3	NA	NA	na	na	na
Aluminum	mg/L	NA	NA	na	na	na
Antimony	mg/L	NA	NA	na	na	na
Arsenic	mg/L	NA	NA	na	na	na
Barium	mg/L	NA	NA	na	na	na
Beryllium	mg/L	NA	NA	na	na	na
Bicarbonate	mg/L	NA	NA	na	na	na
Cadmium	mg/L	NA	NA	na	na	na
Calcium	mg/L	NA	NA	na	na	na
Carbonate	mg/L	NA	NA	na	na	na
Chloride	mg/L	NA	NA	na	na	na
Chromium	mg/L	NA	NA	na	na	na
Specific Conductance	umhos/cm	NA	NA	na	na	na
Copper	mg/L	NA	NA	na	na	na
Cyanide	mg/L	NA	NA	na	na	na
Fluoride	mg/L	NA	NA	na	na	na
Hardness	mg/L-CaCO3	NA	NA	na	na	na
Iron	mg/L	NA	NA	na	na	na
Lead	mg/L	NA	NA	na	na	na
Magnesium	mg/L	NA	NA	na	na	na
Manganese	mg/L	NA	NA	na	na	na
Mercury	mg/L	NA	NA	na	na	na
Nickel	mg/L	NA	NA	na	na	na
Nitrate	mg/L-N	NA	NA	na	na	na
Nitrite	mg/L-N	NA	NA	na	na	na
pH	--	5.2	8.8	7.1	7.1	7.6
Potassium	mg/L	NA	NA	na	na	na
Selenium	mg/L	NA	NA	na	na	na
Silver	mg/L	NA	NA	na	na	na
Sodium	mg/L	NA	NA	na	na	na
Sulfate	mg/L	NA	NA	na	na	na
Thallium	mg/L	NA	NA	na	na	na
Total Dissolved Solids	mg/L	NA	NA	na	na	na
Zinc	mg/L	NA	NA	na	na	na
ORGANIC						
Total Organic Carbon	mg/l	NA	NA	na	na	na
VOCs (64444-A)	ug/L	NA	NA	na	na	na
SOCs (64444-B)	ug/L	W	W	na	na	na
VOCs (64450-A)	ug/L	NA	NA	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	NA	NA	na	na	na
PHYSICAL						
Color	--	NA	NA	na	na	na
Foaming Agent (MBAS)	mg/L	NA	NA	na	na	na
Odor	TON	NA	NA	na	na	na
Temperature	C	9	25	17	18	22
Turbidity	NTU	0.1	9.1	1.2	0.7	3.8
MICROBIOLOGICAL						
Giardia ^b	#/100 L	ND	23 ^c	na	na	na
Cryptosporidium ^b	#/100 L	ND	7.6 ^c	na	na	na
Total Coliform	MPN/100ml	1.1	8000	540	300	1600

^b Based on biweekly data from June 1995 through October 1997.

^cThese values only indicate the estimated concentration in the water based on a 100L sample volume.

ND-Non Detection, NA - Not Available, na - not applicable, W - Waived

Table 4-18. Raw Water Quality Summary^a
City of Sacramento - E. A. Fairbairn Water Treatment Plant

						95th
Parameter	Units	Minimum	Maximum	Average	Median	Percentile
INORGANIC						
Alkalinity ^b	mg/L-CaCO ₃	14	33	22	22	28
Aluminum	mg/L	0.027	<0.100	0.055	0.050	0.090
Antimony	mg/L	<0.0030	<0.006	0.0054	0.0060	0.0060
Arsenic	mg/L	<0.0020	0.0085	0.0026	0.0020	0.0044
Barium	mg/L	<0.1000	<0.1000	<0.1000	<0.1000	<0.1000
Beryllium	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bicarbonate	mg/L	21.0	32.0	25.4	24.0	30.8
Cadmium	mg/L	<0.0005	0.0051^f	<0.0005	<0.0005	<0.0005
Calcium	mg/L	3.5	7.6	5.4	5.4	7.2
Carbonate	mg/L	0.0	<0.100	0.0600	<0.100	<0.100
Chloride	mg/L	1.0	2.5	1.9	2.0	2.4
Chromium	mg/L	0.00009	0.0410	<0.0100	<0.0100	<0.0100
Specific Conductance	umhos/cm	42	68	52	50	65
Copper	mg/L	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Cyanide	mg/L	W	W	na	na	na
Fluoride	mg/L	<0.1000	<0.1000	<0.1000	<0.1000	<0.1000
Hardness	mg/L-CaCO ₃	12	26	17	15	25
Iron	mg/L	0.02	0.09	0.05	0.05	0.09
Lead	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium	mg/L	1.1	1.8	1.5	1.5	1.8
Manganese	mg/L	<0.01	0.0100	<0.0100	<0.0100	<0.0100
Mercury	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Nickel	mg/L	<0.0100	<0.0500	0.0180	<0.010	0.0420
Nitrate	mg/L-N	0.06	2.00	0.10	0.08	0.15
Nitrite	mg/L-N	<0.0200	<0.1000	0.0840	<0.1000	<0.1000
pH ^h	--	6.5	8.1	7.2	7.2	7.6
Potassium	mg/L	<1.000	1.3000	1.0800	1.0000	1.2600
Selenium	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	mg/L	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Sodium	mg/L	1.8	4.0	2.7	2.7	3.8
Sulfate	mg/L	1.4	3.2	2.3	2.1	3.1
Thallium	mg/L	<0.0010	<0.0025^g	0.0013	<0.0010	0.0022
Total Dissolved Solids	mg/L	30	51	40	39	49
Zinc	mg/L	<0.0100	0.01	<0.0100	<0.0100	<0.0100
ORGANIC						
Total Organic Carbon ^c	mg/l	0.89	2.8	1.63	1.6	1.2
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	ND/W	ND/W	na	na	na
VOCs (64450-A)	ug/L	ND	ND	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	--	3.0	22^h	na	na	na
Foaming Agent (MBAS)	mg/L	<0.5000	<0.5000	<0.5000	<0.5000	<0.5000
Odor	TON	NA	NA	na	na	na
Temperature ^b	C	8.2	24.9	16.0	16.1	22.0
Turbidity ^b	NTU	0.53	610.00	5.76	1.50	15.26
MICROBIOLOGICAL						
Giardia ^d	#/100 L	ND	71.7ⁱ	71.7	71.7	71.7
Cryptosporidium ^d	#/100 L	ND	50.2ⁱ	50.2	50.2	50.2
Total Coliform ^e	MPN/100ml	49	16000	1400	790	5000

^a Based on available data from January 1993 through December 1997.

^b Based on daily data from January 1993 through December 1997, when plant in operation.

^c Based on monthly data from January 1994 through December 1997.

^d Based on available monthly data from March 1993 through December 1997.

^e Based on weekly data from

Table 4-19. Treated Water Quality Summary^a
City of Sacramento - E. A. Fairbairn Water Treatment Plant

95th						
Parameter	Units	Minimum	Maximum	Average	Median	Percentile
INORGANIC						
Alkalinity ^b	mg/L-CaCO3	8	53	24	23	29
Aluminum	mg/L	<0.05	<0.1	0.0580	<0.05	0.093
Antimony	mg/L	<0.025	<0.006	0.0054	<0.006	<0.006
Arsenic	mg/L	<0.002	<0.005	0.003	<0.002	0.004
Asbestos	MFL	NA	NA	na	na	na
Barium	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	22	32	27	28	31
Cadmium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Calcium	mg/L	8.6	10.0	9.2	8.9	9.9
Carbonate	mg/L	<0.1	1.2	0.7	1.0	1.2
Chloride	mg/L	2.3	4.4	3.2	3.2	4.2
Chromium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Specific Conductance	umhos/cm	61	86	75	78	85
Copper	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide	mg/L	W	W	na	na	na
Fluoride	mg/L	<0.100	<0.100	<0.100	<0.100	<0.100
Hardness ^b	mg/L-CaCO3	23	34	27	28	33
Iron	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium	mg/L	1.1	2.0	1.5	1.4	1.9
Manganese	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	<0.01	<0.05	0.0180	<0.01	0.0420
Nitrate	mg/L-N	0.06	0.18	0.11	0.08	0.17
Nitrite	mg/L-N	<0.02	<0.10	0.0840	<0.10	<0.10
pH ^b	--	6.2	9.1	8.5	8.6	8.8
Potassium	mg/L	<1.0	1.3	1.1	<1.0	1.3
Selenium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	mg/L	1.7	4.0	2.6	2.7	3.8
Sulfate	mg/L	5.8	8.6	7.2	7.5	8.5
Thallium	mg/L	<0.001	<0.0025	0.0013	<0.001	0.0022
Total Dissolved Solids ^b	mg/L	39	58	51	52	58
Zinc	mg/L	<0.01	0.0100	<0.01	<0.01	<0.01
ORGANIC						
THHMs	ug/L	4.6	62.0	46.1	47.0	60.1
VOCs (64444-A)	ug/L	W	W	na	na	na
SOCs (64444-B)	ug/L	W/ND	W/ND	na	na	na
VOCs (64450-A)	ug/L	W	W	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	W/ND	W/ND	na	na	na
PHYSICAL						
Color	--	1.0	2.0	1.2	1.0	1.8
Corrosivity	mm/yr	NA	NA	na	na	na
Foaming Agent (MBAS)	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Odor	TON	<1.00	1.00	1.00	<1.00	1
Temperature ^b	C	7.7	24.0	15.4	15.4	21.5
Turbidity ^b	NTU	0.05	0.30	0.08	0.10	0.10
RADIOACTIVITY						
Gross Alpha	pCi/L	NA	NA	na	na	na
^a Based on available data from January 1993 through December 1997.						
^b Based on daily data from January 1993 through December 1997, when plant in operation.						
ND-Non Detection, NA - Not Available, na - not applicable, W - Waived						

Table 4-20. Pesticides Data for the Lower American River Ambient Monitoring Programs

Contaminant	Monitoring Station	Period of Record	Monitoring Program	Number of Samples	Detection Limit, Fg/L	Results, Fg/L
Acetochlor	DP, ND	96	AMP	2	0.002	No detects
Alachlor	DP, ND	96	USGS	2	0.002	No detects
Aldrin	DP, ND, FD	90,91	SSWP	12	0.05	No detects
Alpha BHC	DP, ND	96	AMP	2	0.002	No detects
Atrazine	DP, ND	96	AMP	2	0.001	No detects
Carbaryl	DP, ND	95, 96	USGS, AMP	6	0.003–0.14	No detects
Carbofuran	DP, ND	96	USGS	2	0.003	No detects
DCPA	DP, ND	96	AMP	2	0.002	No detects
Diazinon	DP, ND, FD, JS, LN, WA	91,92, 94, 95, 96, 97	SSWP, RWQCB, USGS, AMP	76	0.002–1	7 detects: 0.13–0.74
Dicamba	DP, ND, FD	91	SSWP	3	5	No detects
Dieldrin	DP, ND, FD	90,91,92, 96	SSWP, USGS	23	0.001–0.1	No detects
Dimethoate	DP, ND, FD	91,92	SSWP	6	1	No detects
Disulfuton	DP, ND	94,95,96	USGS, AMP	28	0.017–0.1	No detects
Diuron	DP, ND	95,96	AMP	4	0.8	1 detect: 0.2
EPTC	DP, ND	96	AMP	2	0.002	No detects
Fonofos	DP, ND	96	AMP	2	0.003	No detects
Lindane	DP, ND	96	AMP	2	0.004	No detects
Malathion	DP, ND	96	AMP	2	0.005	No detects
Methomyl	DP, ND	95,96	AMP	4	0.14	No detects
Methyl Parathion	DP, ND	96	AMP	2	0.006	No detects
Metolachlor	DP, ND	96	USGS	2	0.002	No detects
Metribuzin	DP, ND	96	USGS	2	0.004	No detects
Molinate	DP, ND	96	AMP	2	0.004	No detects
P,P DDE	DP, ND	96	AMP	2	0.006	No detects
Parathion	DP, ND	96	AMP	2	0.004	No detects
Prometon	DP, ND	94,95,96	USGS, AMP	24	0.018–0.1	No detects
Propachlor	DP, ND	95,96	AMP	4	7	No detects
Simazine	JS	96,97	USGS	21	not reported	2 detects: 0.007 and 0.032
Terbacil	DP, ND	96	AMP	2	0.007	No detects
Terbufos	DP, ND	96	AMP	2	0.013	No detects
Thiobencarb	DP, ND	96	USGS	2	0.002	No detects

DP = Discovery Park ND = Nimbus Dam FD = Folsom Dam JS = J Street LN = Lake Natoma WA = Watt Avenue SSWP = Sacramento Stormwater Monitoring Program

RWQCB = Regional Water Quality Control Board USGS = U.S. Geological Survey AMP = Ambient Monitoring Program

Chapter 4. Water Quality Data Review

The Ambient Monitoring Program has collected coliform data from Discovery Park and Nimbus Dam on the Lower American River. Eighteen samples were collected between 1995 and 1998, four of which were collected during storms. **Table 4-21** provides a summary of the data collected. Total coliform levels in samples collected by the Ambient Monitoring Program were lower than 1,000 MPN/100 mL 99% of the time at Nimbus and about 67% of the time at Discovery Park (LWA, 1998). Evaluation of Ambient Monitoring Program data has also shown consistently higher downstream concentrations of chromium, copper, lead, mercury, zinc, temperature, pH, conductivity, and total suspended solids at Discovery Park. However, the incremental increase of these constituents from upstream to downstream is very small.

**Table 4-21. Ambient Monitoring Program Total Coliform Data Summary
Lower American River**

	Nimbus Dam		Discovery Park	
	Storm Event	Dry Weather	Storm Event	Dry Weather
Average (MPN/100 mL) ^a	360	225	2,300	610
Minimum (MPN/100 mL)	35	35	80	80
Maximum (MPN/100 mL)	3,000	1,100	16,000	>1,600
^a Arithmetic average.				

Over the past 5 years, a substantial amount of *Giardia* and *Cryptosporidium* analyses have been performed on raw American River water. All of the samples collected to date have been from Folsom Lake and the Lower American River. About 100 samples were collected between 1993 and 1998. Only 19% of the *Giardia* samples were presumed to be positive, and 1% were confirmed positive. Only 12% of the *Cryptosporidium* samples were presumed to be positive, and none were confirmed positive. **Table 4-22** provides a summary of the data collected. Some limited enteric virus data were collected between 1997 and 1998 for SJWD and Sacramento in compliance with the Information Collection Rule (ICR), with only two detections of viruses both at low levels. **Table 4-23** shows the virus data collected to date.

A substantial amount of information has been developed relating to DBPs and DBP precursors. TOC and ultraviolet (UV)₂₅₄ have been monitored in Folsom Lake and along the Lower American River. The TOC levels on the American River are relatively low, usually below 2.0 mg/L. The dissolved fraction of TOC has been monitored on the Lower American River and, in conjunction with the UV₂₅₄ data, can be used to determine specific UV absorbance (SUVA). SUVA is used as an indicator of the amount of total carbon that may react to form DBPs. **Table 4-24** provides a summary of the TOC and SUVA data collected.

Table 4-22. *Giardia* and *Cryptosporidium* Data for the American River

Sampling Date	Agency	Total Giardia Count (cysts/100 L)	Total Cryptosporidium Count (oocysts/100L)	Total Giardia Count (cysts/100 L)	Total Cryptosporidium Count (oocysts/100L)	Daily Turbidity	Total Coliform
		Presumptive	Presumptive	Confirmed	Confirmed	(NTU)	(MPN/100mL)
28-Jun-95	AWD	<10	<10	<10	<10	0.6	170
03-Aug-95	AWD	<1	<1	<1	<1	0.5	900
24-Aug-95	AWD	<5	<5	<5	<5	0.5	900
07-Sep-95	AWD	<2	<2	<2	<2	0.6	300
20-Sep-95	AWD	<6.1	<6.1	<6.1	<6.1	0.56	500
05-Oct-95	AWD	3.1	<3.1	-	-	0.68	500
14-Nov-95	AWD	<9.4	<9.4	<9.4	<9.4	0.82	900
06-Dec-95	AWD	<11	<11	<11	<11	0.6	1600
21-Dec-95	AWD	18	<18	18	<18	4.8	1600
17-Jan-96	AWD	<12	<12	<12	<12	1.7	170
04-Apr-96	AWD	<0.51	<0.51	<0.51	<0.51	2	500
18-Apr-96	AWD	<5	<5	<5	<5	-	-
02-May-96	AWD	<6.7	<6.7	<6.7	<6.7	0.79	41
15-May-96	AWD	<5.1	<5.1	<5.1	<5.1	0.51	70
30-May-96	AWD	<8.1	<8.1	<8.1	<8.1	4	500
13-Jun-96	AWD	<3	3	<3	<3	1.6	130
27-Jun-96	AWD	5.1	7.6	<2.5	<2.5	1.1	>1600
11-Jul-96	AWD	8.8	<8.8	<8.8	<8.8	0.84	170
25-Jul-96	AWD	<12	<12	<12	<12	0.85	170
10-Jun-97	AWD	<12	<12	<12	<12	1.6	70
24-Jun-97	AWD	<8.1	<8.1	<8.1	<8.1	1.5	130
08-Jul-97	AWD	<4.1	<4.1	<4.1	<4.1	1.1	80
24-Jul-97	AWD	23	<23	<23	<23	1.3	220
05-Aug-97	AWD	<15	<15	<15	<15	1	50
21-Aug-97	AWD	<10	<10	<10	<10	0.8	500
03-Sep-97	AWD	<12	<12	<12	<12	0.63	1600
17-Sep-97	AWD	<3	<3	<3	<3	0.72	280
01-Oct-97	AWD	<10	<10	<10	<10	0.46	500
18-Oct-95	ACWC	<3.1	<3.1	<3.1	<3.1	-	-
05-Aug-96	ACWC	<0.8	1.6	<0.8	<0.8	-	-
17-Oct-96	ACWC	<0.9	<0.9	<0.9	<0.9	-	-
27-May-97	ACWC	<0.7	<0.7	<0.7	<0.7	-	-
23-Mar-93	City of Sacramento	ND	ND	-	-	3.1	23
13-Jul-93	City of Sacramento	ND	ND	-	-	1.5	70
10-Aug-93	City of Sacramento	ND	ND	-	-	1.6	49

Table 4-22. *Giardia* and *Cryptosporidium* Data for the American River

Sampling Date	Agency	Total Giardia Count (cysts/100 L)	Total Cryptosporidium Count (oocysts/100L)	Total Giardia Count (cysts/100 L)	Total Cryptosporidium Count (oocysts/100L)	Daily Turbidity	Total Coliform
		Presumptive	Presumptive	Confirmed	Confirmed	(NTU)	(MPN/100mL)
07-Sep-93	City of Sacramento	ND	-	-	-	1.7	460
23-Aug-94	City of Sacramento	ND	ND	-	-	1	330
02-Aug-95	City of Sacramento	<1.4	<1.4	<1.4	<1.4	1.4	280
16-Oct-95	City of Sacramento	2.2	<2.2	<2.2	<2.2	0.73	330
19-Dec-95	City of Sacramento	<1.19	<1.19	<1.19	<1.19	5.4	1300
23-Apr-96	City of Sacramento	1.65	<0.55	<0.55	<0.55	1.7	140
08-Jul-96	City of Sacramento	<1.46	<1.46	<1.46	<1.46	1.1	800
10-Sep-96	City of Sacramento	9.9	<4.95	<4.95	<4.95	0.8	800
09-Dec-96	City of Sacramento	71.7	50.2	7.1	<7.1	14	1700
11-Feb-97	City of Sacramento	7.3	<7.3	<7.3	<7.3	42	600
14-Apr-97	City of Sacramento	<9.7	<9.7	<9.7	<9.7	3.9	90
22-Jul-97	City of Sacramento	<40	<40	<40	<40	2.6	2400
18-Aug-97	City of Sacramento	<41	<41	<41	<41	1.5	700
22-Sep-97	City of Sacramento	<47	<47	<47	<47	1.4	700
20-Oct-97	City of Sacramento	<115	<115	<115	<115	1.5	5000
18-Nov-97	City of Sacramento	<152	<152	<152	<152	2.2	2400
16-Dec-97	City of Sacramento	<63	<63	<63	<63	5	3000
31-Aug-94	CWD	<0.6	<0.6	-	-	-	-
10-Jan-95	CWD	<10.9	<10.9	-	-	-	-
20-Jun-95	CWD	<0.1	<0.1	-	-	1.3	-
31-Oct-95	CWD	<0.3	<0.3	-	-	0.71	-
31-Oct-95	CWD	<0.8	<0.8	-	-	0.71	-
15-Nov-95	CWD	<0.69	<0.69	-	-	1.4	-
15-Nov-95	CWD	<0.26	<0.26	-	-	1.4	-
28-Nov-95	CWD	<0.80	<0.80	-	-	1.4	-
28-Nov-95	CWD	<0.5	<0.5	-	-	1.4	-
19-Dec-95	CWD	0.82	0.41	-	-	-	-
03-Jan-96	CWD	0.862	<0.862	-	-	-	-
30-Jan-96	CWD	<0.58	<0.58	-	-	8.5	-
30-Jan-96	CWD	1.57	<1.57	-	-	8.5	-
13-Feb-96	CWD	<0.24	<0.24	-	-	8.5	-
13-Feb-96	CWD	<0.9	<0.9	-	-	8.5	-
27-Feb-96	CWD	<0.15	<0.15	-	-	6.8	-
13-Mar-96	CWD	<0.16	<0.16	-	-	5	-
13-Mar-96	CWD	<0.96	<0.96	-	-	5	-

Table 4-22. *Giardia* and *Cryptosporidium* Data for the American River

Sampling Date	Agency	Total Giardia Count (cysts/100 L)	Total Cryptosporidium Count (oocysts/100L)	Total Giardia Count (cysts/100 L)	Total Cryptosporidium Count (oocysts/100L)	Daily Turbidity	Total Coliform
		Presumptive	Presumptive	Confirmed	Confirmed	(NTU)	(MPN/100mL)
26-Mar-96	CWD	<0.18	<0.18	-	-	2.8	-
26-Mar-96	CWD	<0.24	<0.24	-	-	2.8	-
10-Apr-96	CWD	<0.16	<0.16	-	-	1.9	-
10-Apr-96	CWD	<0.32	<0.32	-	-	1.9	-
23-Apr-96	CWD	<0.31	<0.31	-	-	1.9	-
23-Apr-96	CWD	<0.95	<0.95	-	-	1.9	-
07-May-96	CWD	<0.28	<0.28	-	-	0.91	-
07-May-96	CWD	<0.72	<0.72	-	-	0.91	-
22-May-96	CWD	<0.9	<0.9	-	-	9.1	-
04-Jun-96	CWD	<1.17	<1.17	-	-	3.3	-
18-Jun-96	CWD	<1.52	<1.52	-	-	1.7	-
01-Jul-96	CWD	<0.62	<0.62	-	-	1.5	-
16-Jul-96	CWD	<3.28	<3.28	-	-	1.3	-
30-Jul-96	CWD	<1.23	<1.23	-	-	0.67	-
14-Aug-96	CWD	<0.17	<0.17	-	-	0.65	-
27-Aug-96	CWD	<0.95	<0.95	-	-	0.61	-
10-Sep-96	CWD	<0.55	<0.55	-	-	0.58	-
24-Sep-96	CWD	<1.6	<1.6	-	-	0.6	-
09-Oct-96	CWD	3.33	<3.33	-	-	0.74	-
22-Oct-96	CWD	3.33	<3.33	-	-	1.2	-
06-Nov-96	CWD	4.72	2.36	-	-	1	-
19-Nov-96	CWD	37.3	5.32	-	-	3.5	-
04-Dec-96	CWD	4.01	<2.01	-	-	2.3	-
07-Jul-97	SJWD	7	<7	<7	<7	2.02	>200.5
04-Aug-97	SJWD	<10	<10	<10	<10	2.25	20.7
08-Sep-97	SJWD	<20	<20	<20	<20	3.95	13
06-Oct-97	SJWD	<19	19	<19	<19	2.37	60
03-Nov-97	SJWD	<35	<35	<35	<35	2.4	80
08-Dec-97	SJWD	<65	<65	<65	<65	1.49	80

"-" Indicates Analysis Not Performed

# Positive Samples/ # Total Samples	19/ 99	8/ 98	1/ 19	0/ 19

Table 4-22. *Giardia* and *Cryptosporidium* Data for the American River

Fecal Coliform
(MPN/100mL)
80
23
70
27
130
50
500
50
110
140
130
-
11
11
13
9
50
22
11
70
130
80
140
50
500
17
13
14
-
-
-
-
23
13
23

Table 4-22. *Giardia* and *Cryptosporidium* Data for the American River

[illegible]

Table 4-22. *Giardia* and *Cryptosporidium* Data for the American River

Fecal Coliform
(MPN/100mL)
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
-
0
0
<2.0
4
30
13

**Table 4-23. ICR Virus Data for the American River
(MPN/100 L)**

SJWD		City of Sacramento	
Date	Detection	Date	Detection
7/7/97	<1.02	7/22/97	<0.47
8/4/97	<1.03	8/19/97	<1.03
9/8/97	<1.03	9/22/97	<1.02
10/6/97	<1.02	10/20/97	<1.03
11/3/97	<1.02	11/18/97	<1.02
12/8/97	<1.03	12/16/97	<1.03
1/5/98	<1.03	1/20/98	--
2/2/98	8.7	2/17/98	--
3/2/98	5.79	3/17/98	<1.03
4/6/98	<1.03	4/21/98	<1.03
5/4/98	<1.04	5/19/98	<1.04

Table 4-24. TOC and SUVA Data

Agency	TOC (mg/L)			SUVA (M-L/mg)		
	Min	Ma x	Avg	Min	Max	Avg
San Juan Water District	1.0	2.4	1.4	--	--	--
City of Sacramento	0.9	2.8	1.6	--	--	--
East Bay Municipal Utility District						
Nimbus	1.1	5.2	1.5	0.7	6.62 ^a	2.9
Interstate 5	1.1	2.5	1.5	1.0	6.25	3.3
^a Maximum value of 7.0 was considered an outlier value and was not included.						

Chapter 4. Water Quality Data Review

Each water agency has THM data for their distribution system. Appendix E contains figures for each agency that show the quarterly averages for THMs in their distribution systems. The summary information for THMs is also provided in Tables 4-2 through 4-19. HAAs are not currently regulated so there has been minimal monitoring for these constituents. The ICR has required SJWD and Sacramento to monitor for THMs, HAAs, and chlorine residual on a quarterly basis. **Table 4-25** provides a summary of these data.

Several of the agencies have monitored for some of the constituents on the Drinking Water Contaminant Candidate List. A table showing what monitoring has been conducted is in Appendix E.

EVALUATION OF SELECTED PARAMETERS

Several water quality parameters pertinent to the SWTR, ESWTR, D/DBP Rule, and THM Regulation were selected for further evaluation. These parameters include coliforms, *Giardia* and *Cryptosporidium*, viruses, turbidity, DBPs, and DBP precursors.

Coliforms

The raw water coliform data from 1993 to 1997 are presented on time series plots, with precipitation, for each reach of the river on **Figures 4-2 through 4-5**. From these figures, it can be seen that high coliform levels are frequently associated with precipitation, but high coliform levels are also observed during dry weather. Within the past 5 years, there have been no major flood events along the American River that have resulted in over-topping levees. There have been periods of high precipitation associated with high river flows and localized high water levels.

Exceedance curves showing the frequency that total coliform levels exceed 1,000 MPN/100 mL were developed for each agency (see Appendix E). The California SWTR Guidance Manual uses total coliform levels as a guide for increased treatment in the absence of *Giardia* and virus data, with 1,000 MPN/100 mL as an arbitrary level for increased log removal. **Table 4-26** provides a summary of total coliform data from the water agencies.

The Ambient Monitoring Program coliform data collected on the Lower American River that were presented previously are in agreement with the numbers presented above. **Figure 4-6** was developed using the coliform data from all agencies. The coliform data must be interpreted with caution when combining so many different data sets. The reliability of the coliform data collected is influenced by the sample collection procedures as well as by the analytical procedures. The methods for coliform analysis are well established and highly reliable when the procedures are followed. Several sample collection factors, however, may impact the results. Coliform densities are typically highest near the surface of the water. When samples are collected from intake facilities, the water is typically drawn from depth. When samples are collected manually, they

Table 4-25. ICR DBP Data Summary

Location	Date	Chlorine Residual (mg/L)	THM (Fg/L)	HAA (Fg/L)
SJWD				
Finished water	8/4/97	0.6	20.4	22
D.S. minimum	8/4/97	0.6	20.3	18.3
D.S. average	8/4/97	0.4	22.4	17
D.S. average	8/4/97	0.4	--	19.2
D.S. maximum	8/4/97	0.2	--	17.9
Finished water	11/3/97	0.8	14.1	18.2
D.S. minimum	11/3/97	0.7	24.1	18.4
D.S. average	11/3/97	0.7	29.5	19
D.S. average	11/3/97	0.7	30.5	21.5
D.S. maximum	11/3/97	0.6	32.7	21.4
Finished water	2/2/98	0.6	22.8	24
D.S. minimum	2/2/98	0.5	28	26.1
D.S. average	2/2/98	0.5	30.1	20.3
D.S. average	2/2/98	0.6	31.2	28
D.S. maximum	2/2/98	0.5	32.3	29
Finished water	5/4/98	0.6	19.5	22
D.S. minimum	5/4/98	0.5	26.9	22
D.S. average	5/4/98	0.5	31	22.3
D.S. average	5/4/98	0.5	27.9	23
D.S. maximum	5/4/98	0.5	32	24
City of Sacramento				
Finished water	9/22/97	0.5	34.3	16
D.S. minimum	9/22/97	0.3	52.6	20.2
D.S. average	9/22/97	0.5	40.9	20.1
D.S. average	9/22/97	0.5	36.7	23.5
D.S. maximum	9/22/97	0.4	46.6	18.7
Finished water	11/17/97	0.7	26	16.8
D.S. minimum	11/17/97	0.5	38.4	18.4
D.S. average	11/17/97	0.8	30.1	19.1
D.S. average	11/17/97	0.7	33.3	21.7
D.S. maximum	11/17/97	0.6	35.4	18.4

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D.S. = Distribution system.

The terms minimum, average, and maximum denote locations in the distribution system where it was estimated that true minimum, average, and maximum concentrations would occur. Thus, the table shows direct sampling results, not statistical parameters.

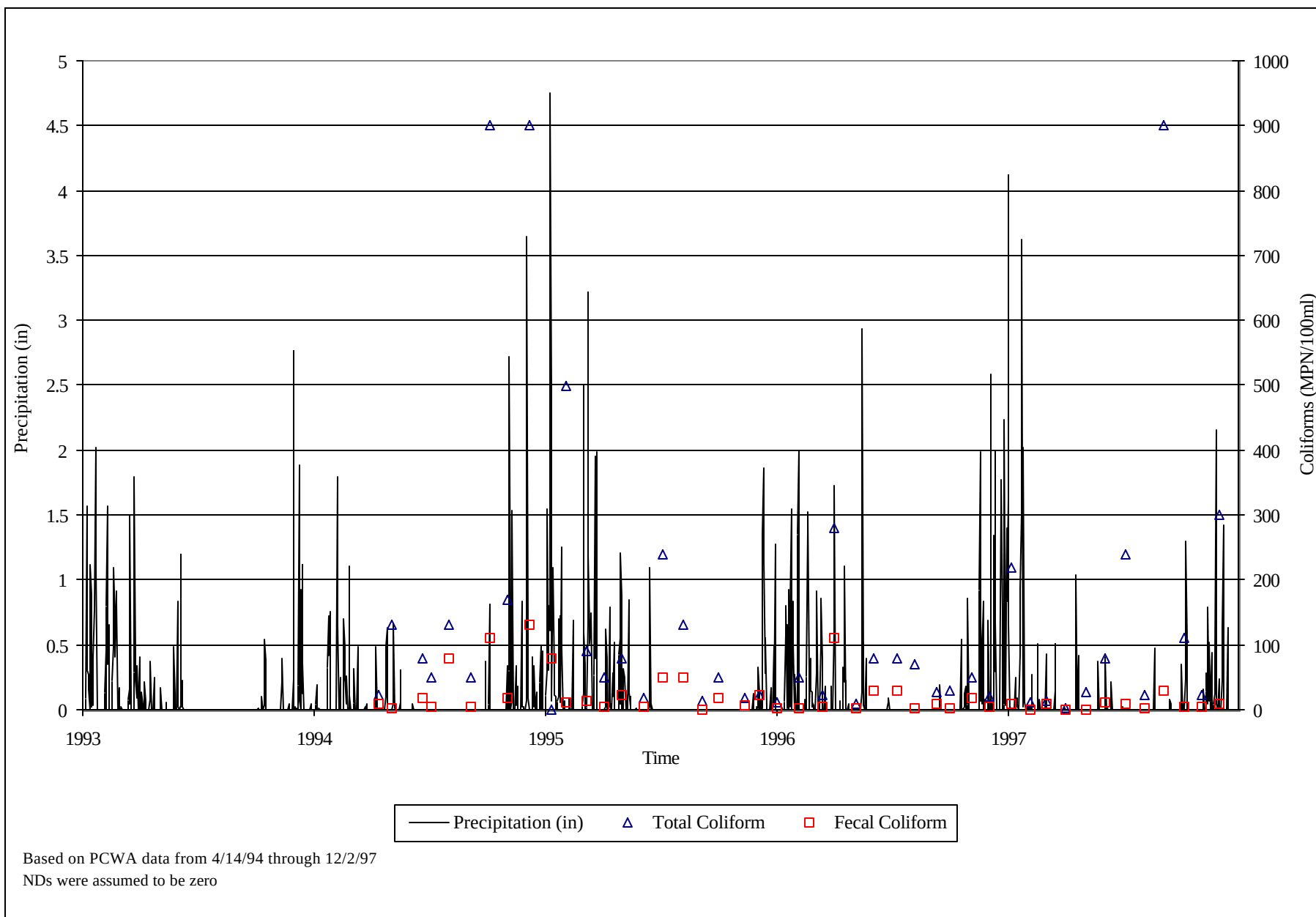


Figure 4-2. North Fork American River Precipitation and Coliforms vs. Time for Raw Water

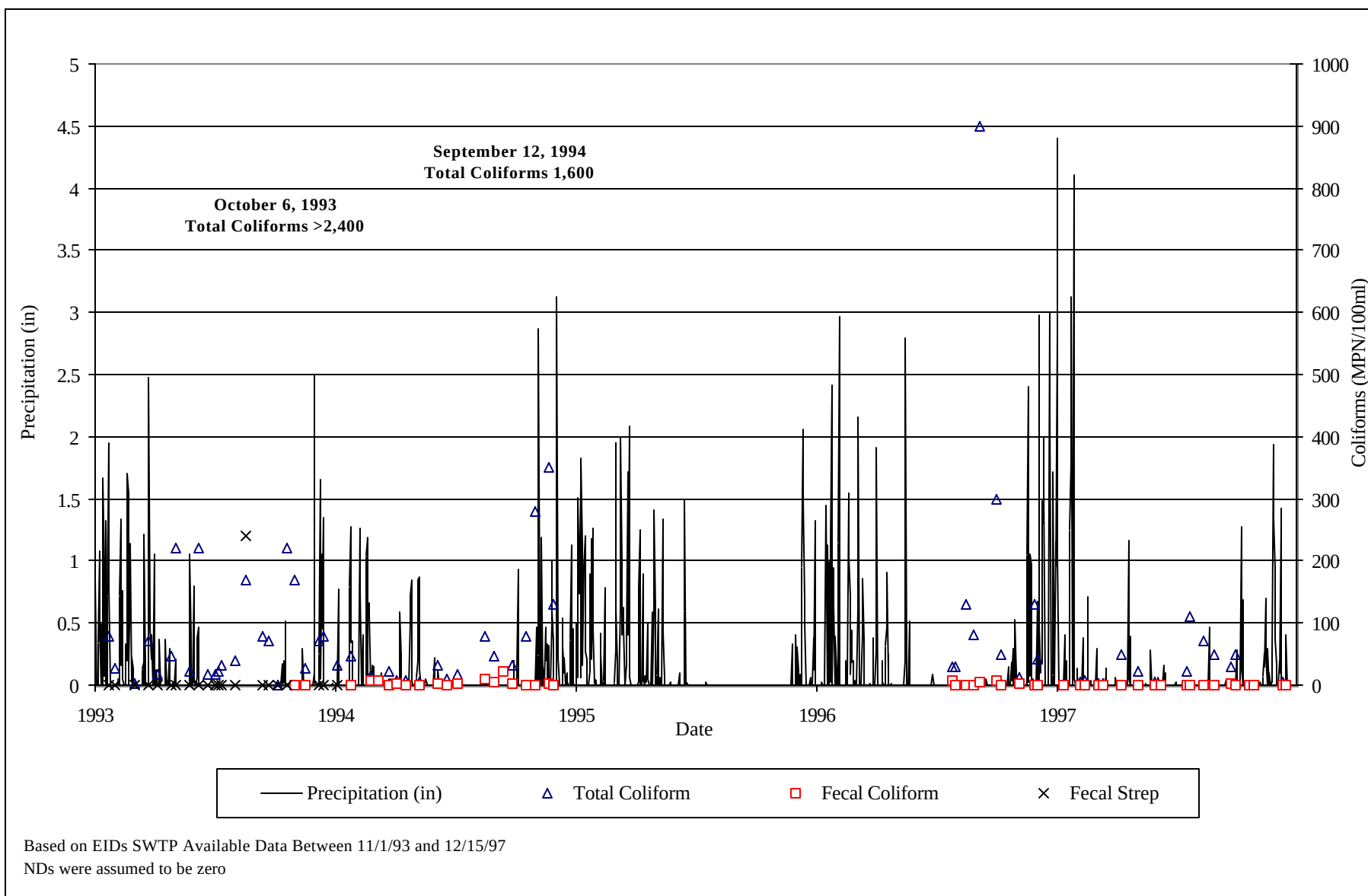


Figure 4-3. South Fork American River Precipitation and Coliforms vs. Time for Raw Water

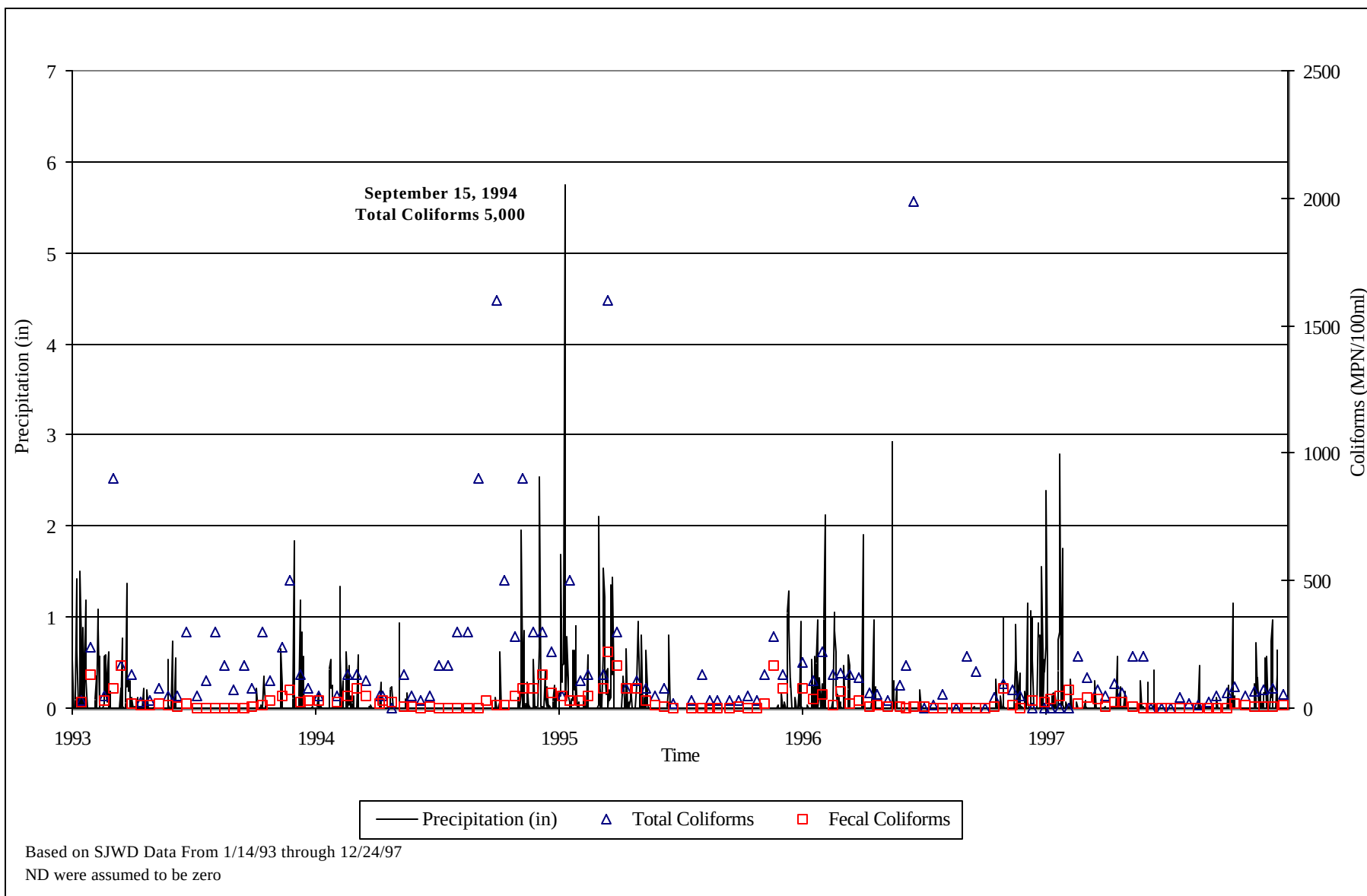


Figure 4-4. Folsom Lake Precipitation and Coliforms vs Time for Raw Water

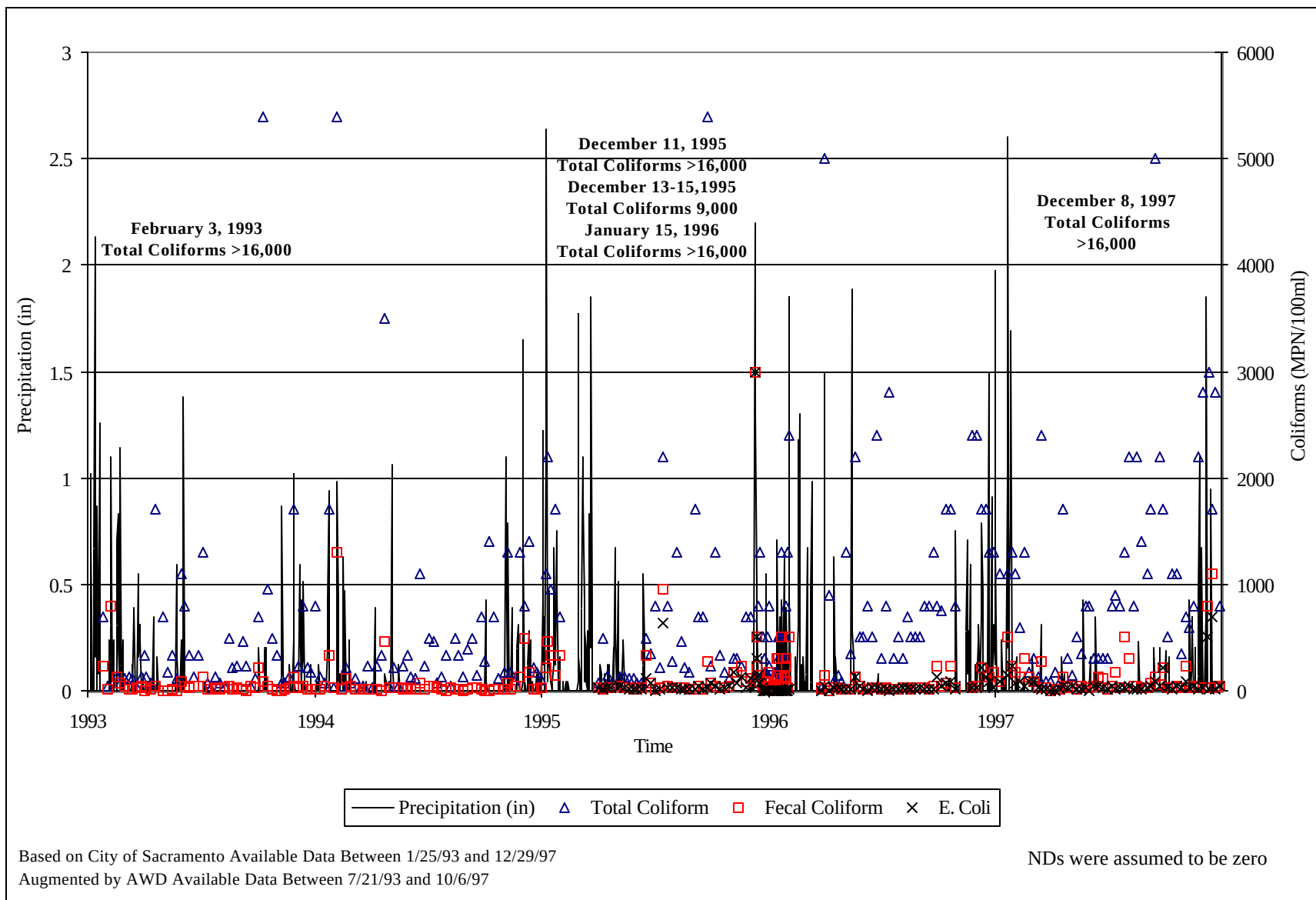


Figure 4-5. Lower American River Precipitation and Coliforms vs Time for Raw Water

Table 4-26. Summary of Total Coliform Data

Agency	Average Total Coliform (MPN/100 mL)	% Time Total Coliform >1,000 MPN/100 mL
Placer County Water Agency	145	0
El Dorado Irrigation District - Strawberry WTP	100	3
El Dorado Irrigation District - El Dorado Hills WTP	65	0
City of Roseville	71	2
San Juan Water District	230	4
Arden Cordova Water District	80	3
Arcade Water District	537	13
City of Sacramento	1,380	27
East Bay Municipal Utility District - at Interstate 5	2,330	25

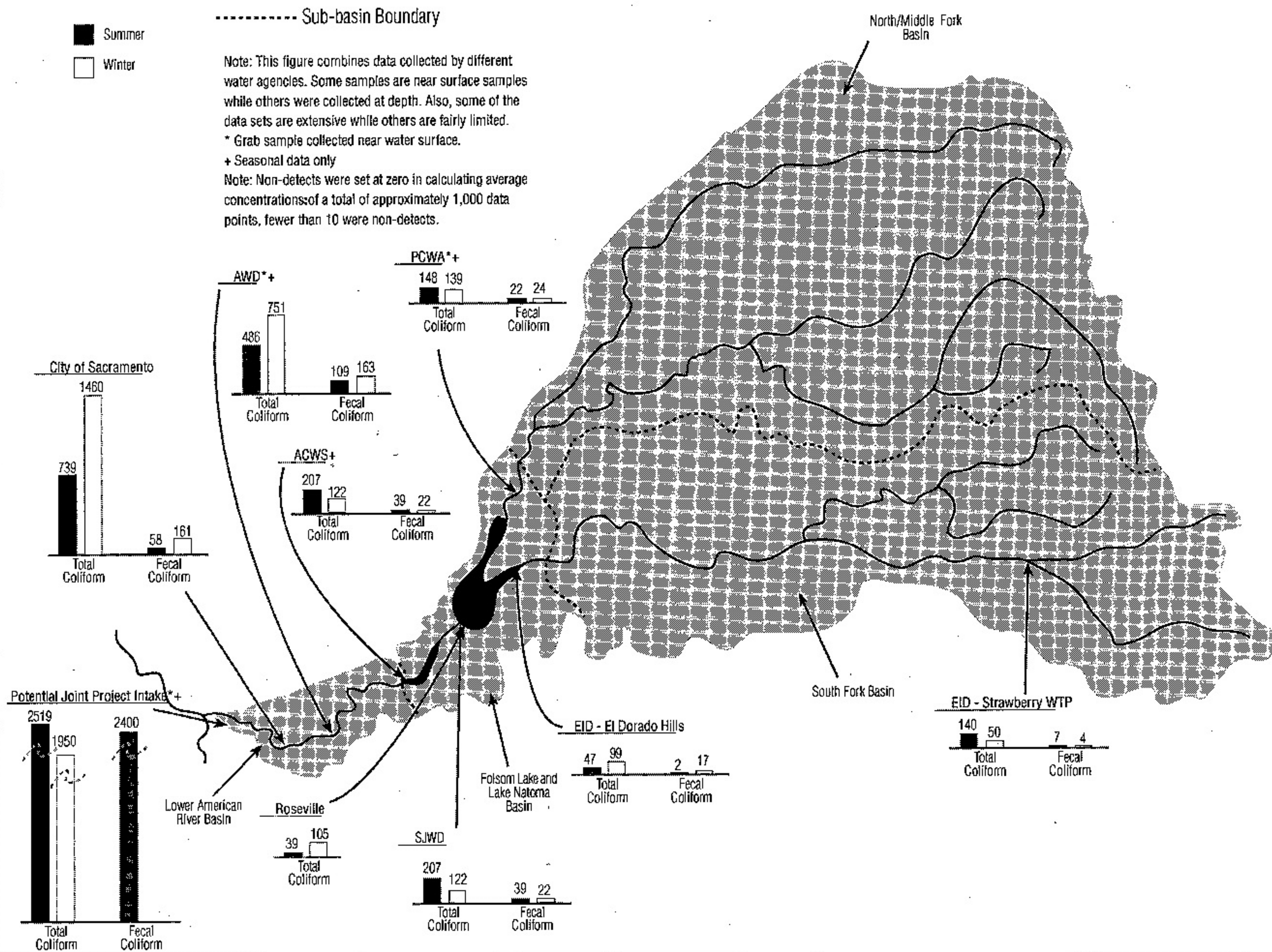


Figure 4-6. Average Total and Fecal Coliform Levels Along the American River, MPN/100ML

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are often collected at or near the surface. The Folsom Lake samples are collected at considerable depth. The EBMUD Lower American River samples are collected near the surface. In addition, the data from AWD and ACWS are only from summer months, while the EBMUD and PCWA data are fairly small data sets. Figure 4-6 depicts the summer and winter averages for total and fecal coliform levels. In all cases, the fecal coliform levels are lower than the total coliform levels. Generally speaking, the increasing trend is obvious from the upper watershed, through Folsom Lake to the Lower American River. Figure 4-6 was examined for differences in summer and winter levels, but no clear pattern emerged.

EBMUD has been implementing ambient monitoring since July 1997. This includes monitoring for total and fecal coliform levels at three locations on the American River: Nimbus Dam, E.A. Fairbairn WTP, and at the Interstate 5 bridge near the confluence with the Sacramento River. The monitoring program is designed to collect samples for 7 consecutive days, once per month. This involves collection of samples over weekends and allows for an evaluation of whether weekend recreational use appears to affect coliform levels. The data have been summarized and are presented in Appendix E. Examination of these limited data show no trend of increased coliforms levels during or after weekend use. Over the July 4, 1997 weekend, the coliform levels stayed below 500 MPN/100 mL, but at other times coliform levels went above 16,000 MPN/100 mL. Sampling was also conducted over the Labor Day and Columbus Day holidays with similar results.

Giardia and Cryptosporidium

A substantial amount of *Giardia* and *Cryptosporidium* data has been collected over the past 5 years. A summary of all the data collected to date is provided in Table 4-22. **Table 4-27** provides a summary of only the positive detections of *Giardia* or *Cryptosporidium*, along with the daily turbidity and available coliform results, as indicators of general water quality. The detection limits varied between samples based on the volume of sample collected in the field, the volume of concentrated sample read in the laboratory, and the turbidity of the raw water.

There have been limited positive findings of either protozoan. Of about 100 samples collected, only two samples have resulted in confirmed *Giardia* cysts detected, and no confirmed *Cryptosporidium* oocysts were detected. One sample that resulted in a confirmed detection of *Giardia* was collected from the E.A. Fairbairn WTP in December 1996. The raw water turbidity was slightly elevated for that time of year at 14 NTU, and the total coliform level was slightly above average at 1,700 MPN/100 mL. The other sample that resulted in a confirmed detection of *Giardia* was collected at the AWD American River well field in December 1995. The raw water turbidity was low for that time of year at 4.8 NTU, and the total coliform level was slightly above average at 1,600 MPN/100 mL.

When reviewing these data, it is important to understand the limitations related to the analytical methods currently used for detection of *Giardia* and *Cryptosporidium*. All of the samples were analyzed using the same analytical procedure, the immunofluorescence assay, but a variety of methods were used since there is no single preferred method. Some samples were analyzed using

Table 4-27. Positive *Giardia* and *Cryptosporidium* Analytical Results

Sampling Date	Agency	Total <i>Giardia</i> Count (cysts/100 L)	Total <i>Cryptosporidium</i> Count (oocysts/100L)	Total <i>Giardia</i> Count (cysts/100 L)	Total <i>Cryptosporidium</i> Count (oocysts/100L)	Daily Turbidity	Total Coliform (MPN/100mL)	Fecal Coliform (MPN/100mL)
		Presumptive	Presumptive	Confirmed	Confirmed			
05-Oct-95	AWD	3.1	<3.1	-	-	0.68	500	50
21-Dec-95	AWD	18	<18	18	<18	4.8	1600	110
13-Jun-96	AWD	<3	3	<3	<3	1.6	130	9
27-Jun-96	AWD	5.1	7.6	<2.5	<2.5	1.1	>1600	50
11-Jul-96	AWD	8.8	<8.8	<8.8	<8.8	0.84	170	22
24-Jul-97	AWD	23	<23	<23	<23	0.55	220	140
05-Aug-96	ACWC	<0.8	1.6	<0.8	<0.8	-	-	-
16-Oct-95	City of Sacramento	2.2	<2.2	<2.2	<2.2	0.73	330	23
23-Apr-96	City of Sacramento	1.65	<0.55	<0.55	<0.55	1.7	140	23
10-Sep-96	City of Sacramento	9.9	<4.95	<4.95	<4.95	0.8	800	22
09-Dec-96	City of Sacramento	71.7	50.2	7.1	<7.1	14	1700	220
11-Feb-97	City of Sacramento	7.3	<7.3	<7.3	<7.3	42	600	130
16-Mar-98	City of Sacramento	47	<47	<47	<47	5	500	30
19-Dec-95	CWD	0.82	0.41	-	-	-	-	-
03-Jan-96	CWD	0.862	<0.862	-	-	-	-	-
30-Jan-96	CWD	1.57	<1.57	-	-	8.5	-	-
09-Oct-96	CWD	3.33	<3.33	-	-	0.74	-	-
22-Oct-96	CWD	3.33	<3.33	-	-	1.2	-	-
06-Nov-96	CWD	4.72	2.36	-	-	1	-	-
19-Nov-96	CWD	37.3	5.32	-	-	3.5	-	-
04-Dec-96	CWD	4.01	<2.01	-	-	2.3	-	-
07-Jul-97	SJWD	7	<7	<7	<7	2.02	>200.5	0
06-Oct-97	SJWD	<19	19	<19	<19	2.37	60	4

"-" Indicates Analysis Not Performed

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variations of Standard Method 9110, while the recent SJWD and Sacramento analysis was performed using the ICR Method. There has been much controversy over the past few years regarding the method recoveries and reliabilities. The ICR Method has a very strict protocol; and a laboratory must receive USEPA approval, based on test results, in order to perform the analysis. However, because of the concern over estimated recoveries (*Giardia* at 30–70% and *Cryptosporidium* at 10–25%), USEPA has developed and is conducting a spiking study. Seventy ICR water agencies, including SJWD, are participating in this study; the results should provide a better evaluation of the laboratory recovery rates.

In addition, the monitoring has been conducted on a routine schedule in order to provide baseline information. Events that might affect protozoan concentrations such as storms or weekend recreation were not targeted.

Keeping in mind the above information, some evaluation can be made of the existing data. There does not appear to be high concentrations of *Giardia* or *Cryptosporidium* in the American River during any time of the year. The absence of positive detections indicates only that the presence of these protozoan is probably low. There is no clear correlation between the concentration of coliform bacteria or turbidity and either protozoan. Since there is no clear correlation it is not possible at this time to use either constituent as a surrogate for the presence of pathogens.

As follow up to the ICR, the USEPA will be conducting a voluntary sampling program for pathogens in surface water. The USEPA will be collecting 12 monthly water samples from 47 utilities around the United States for analysis of *Cryptosporidium*, and potentially *Giardia*, by the new USEPA Method 1622. This method analyzes for pathogens using a combination of filtration, immunomagnetic separation (IMS), and immunofluorescence assay (IFA), and is expected to provide higher recovery rates than the IFA method alone. The City of Sacramento has volunteered to participate as part of the study. Raw samples from E.A. Fairbairn WTP will be submitted beginning January 1999 and continue through December 1999.

Viruses

Only limited data are available for enteric viruses on the American River. Both Sacramento and SJWD have monitored the raw water for viruses on a monthly basis since July 1997 and will continue until December 1998. SJWD has detected viruses at its raw water influent on two occasions: in February and March 1998. Both times, low levels of viruses were detected: 8.7 and 5.79 MPN/100 mL, respectively. At the time of sample collection for both samples, the raw water turbidity was relatively low, less than 9 NTU, and the total coliform levels were below 1,000 MPN/100 mL–230 and 700 MPN/100 mL, respectively.

Again, it is important to remember that this parameter has been monitored only once per month for 10 months and the data are limited. The data do seem to indicate a low-level presence of enteric viruses

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in the American River that may be influenced by precipitation. There does not appear to be a clear correlation between total coliform or turbidity and viruses.

Turbidity

Turbidity has been selected for evaluation not only because it is a regulated constituent but also because it is commonly used as an indicator of general water quality. Time series plots have been developed for turbidity and streamflow from January 1, 1993, through December 31, 1998 (see **Figures 4-7 through 4-9**). From these figures, it can be seen that turbidity increases with higher in-stream flows. Increases in flow can be caused by high precipitation and/or by releases from dams.

As stated previously, there were no major events where the American River breached its levees during the past 5 years. There were multiple occasions when there were storm events with high precipitation. Some of these events were associated with high river flows. Since there are multiple reservoirs on the river system, precipitation does not directly correspond to river flows.

Exceedance curves developed for each water agency are presented in Appendix E. Generally speaking, the turbidity levels along the river exceed 10 NTU less than 10% of the time, and the turbidity levels exceed 100 NTU less than 1% of the time. **Figure 4-10** shows the minimum, maximum, and average turbidity for each intake facility. A slight increase can be seen in turbidity from upstream to downstream on the river system.

Turbidity is a parameter that can be monitored continuously with ease. Although neither turbidity nor coliform can be used as a surrogate for protozoan presence, turbidity is helpful for determining the potential for increased microbial and organic contamination. It is also helpful for determining the amount of chemicals needed to be added to remove solids. Finally, it is a parameter that can be monitored throughout the treatment plant to ensure that each process is performing efficiently. It is recommended that utilities continue to monitor turbidity closely and use it as an early indicator to warn of degraded water quality.

Disinfection By-Products and DBP Precursors

DBP precursors include TOC and SUVA. TOC has been monitored at Folsom Lake and at various locations along the Lower American River. The levels of TOC in Folsom Lake consistently range between 1.0 and 2.0 mg/L, with an average of 1.5 mg/L. TOC slightly increases downstream of Folsom Lake along the Lower American River.

Figure 4-11 shows a time series plot of available TOC data collected from the City of Sacramento E.A. Fairbairn WTP. The peaks in TOC concentrations are associated with high-precipitation events. There is no apparent increasing or decreasing trend in TOC concentrations over the past 4 years.

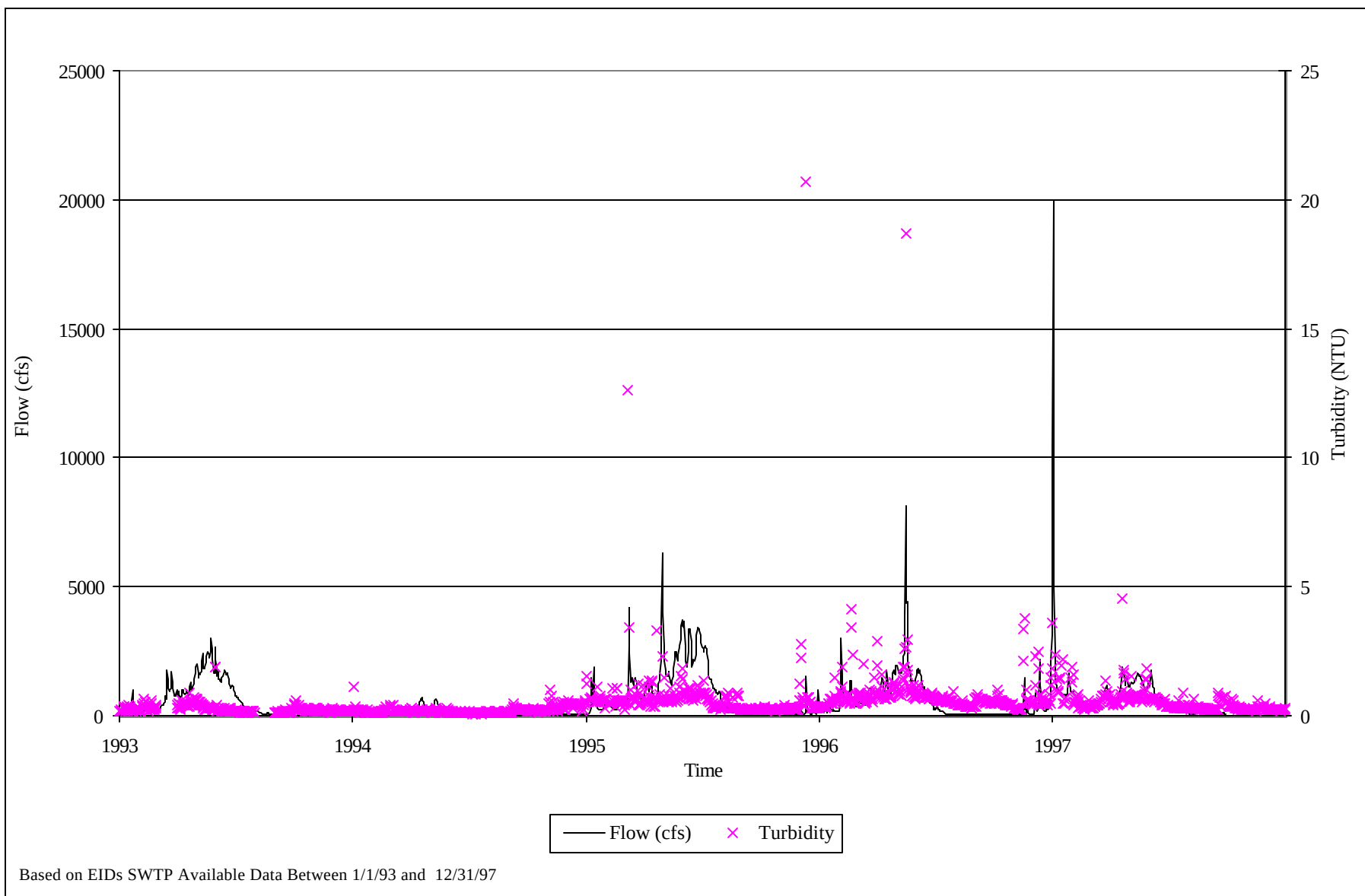


Figure 4-8. South Fork American River Turbidity and Flow vs. Time for Raw Water

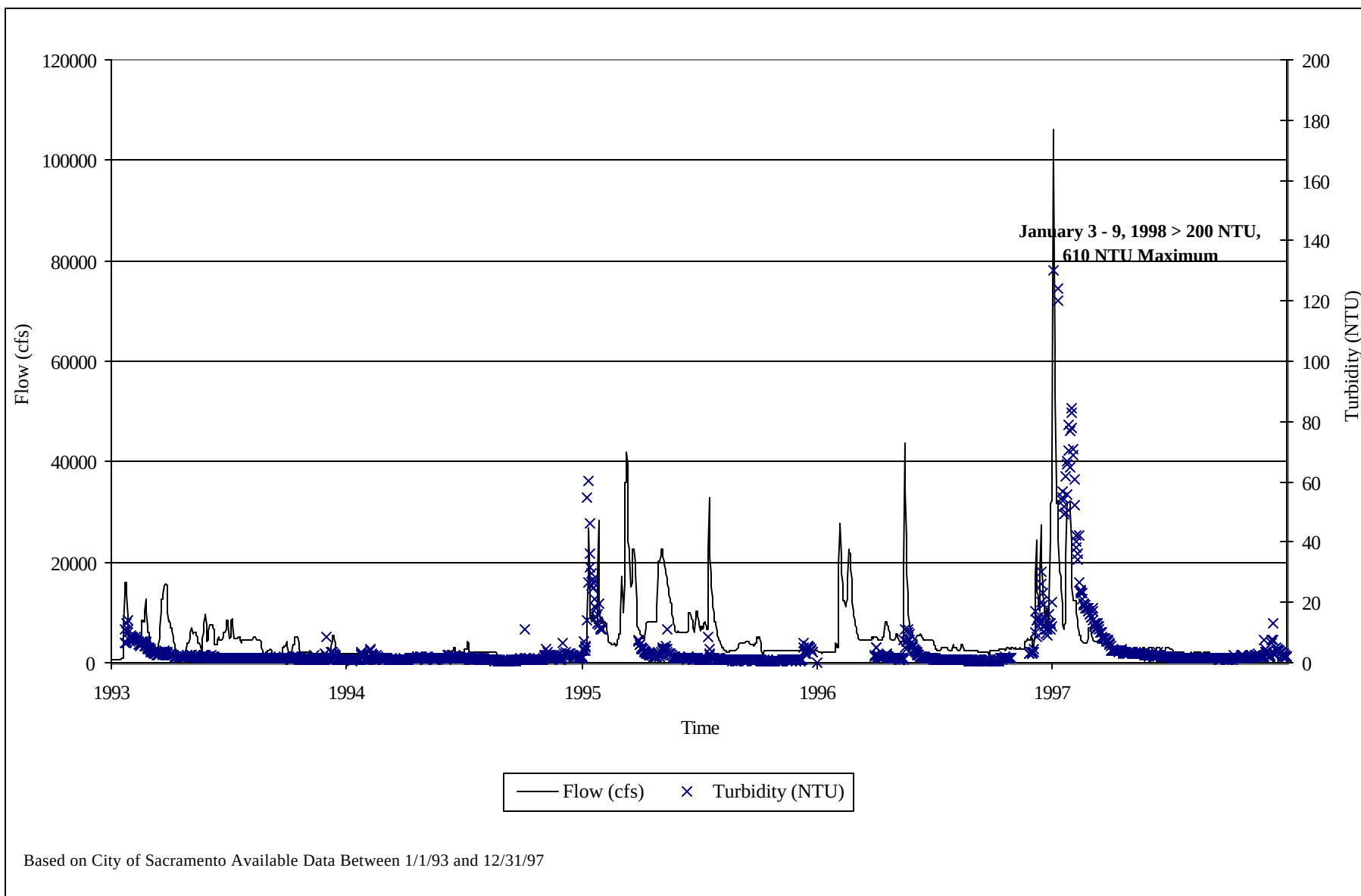


Figure 4-9. Lower American River Turbidity and Flow vs. Time for Raw Water

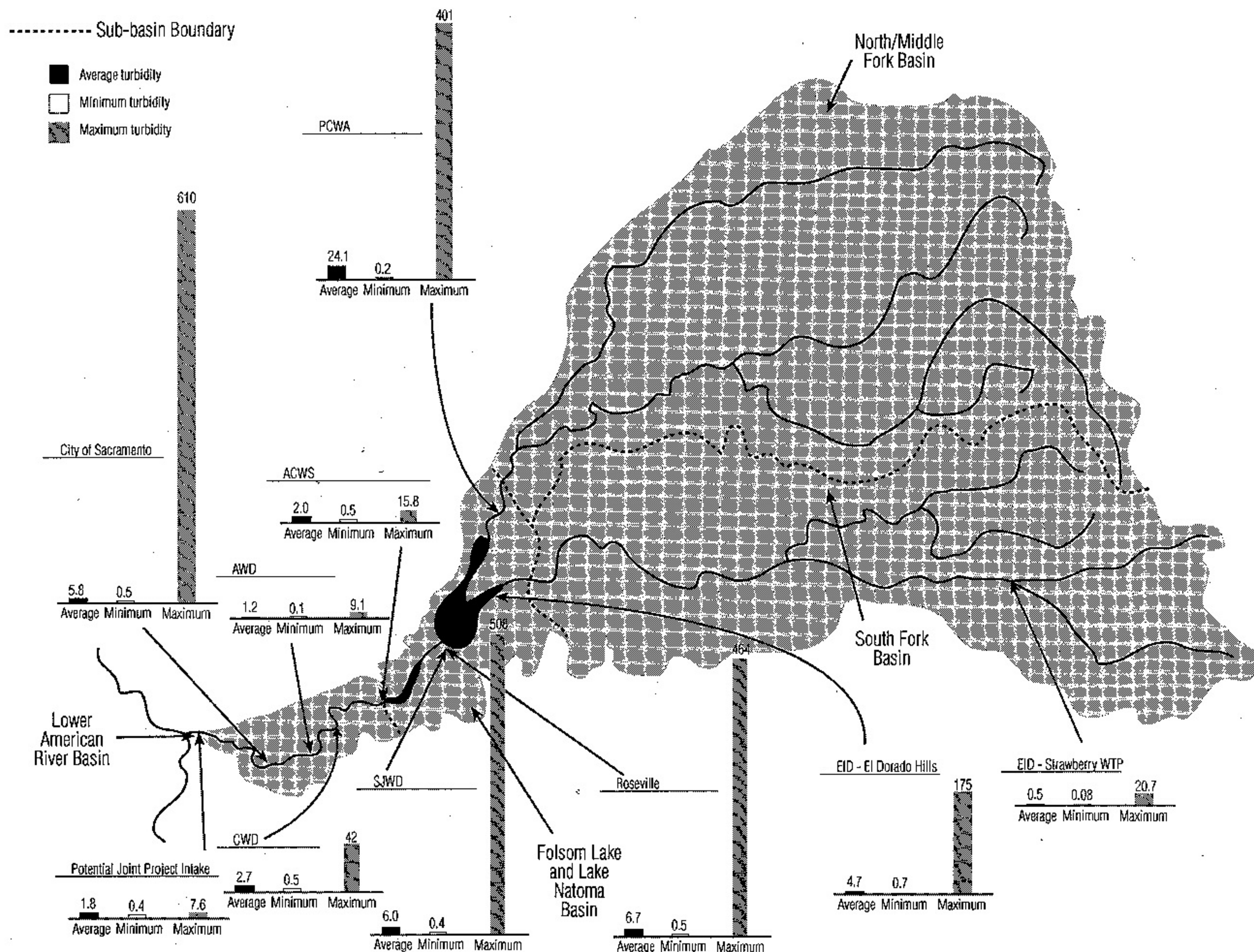


Figure 4-10. Minimum, Maximum and Average Turbidity Levels Along the American River, NTU

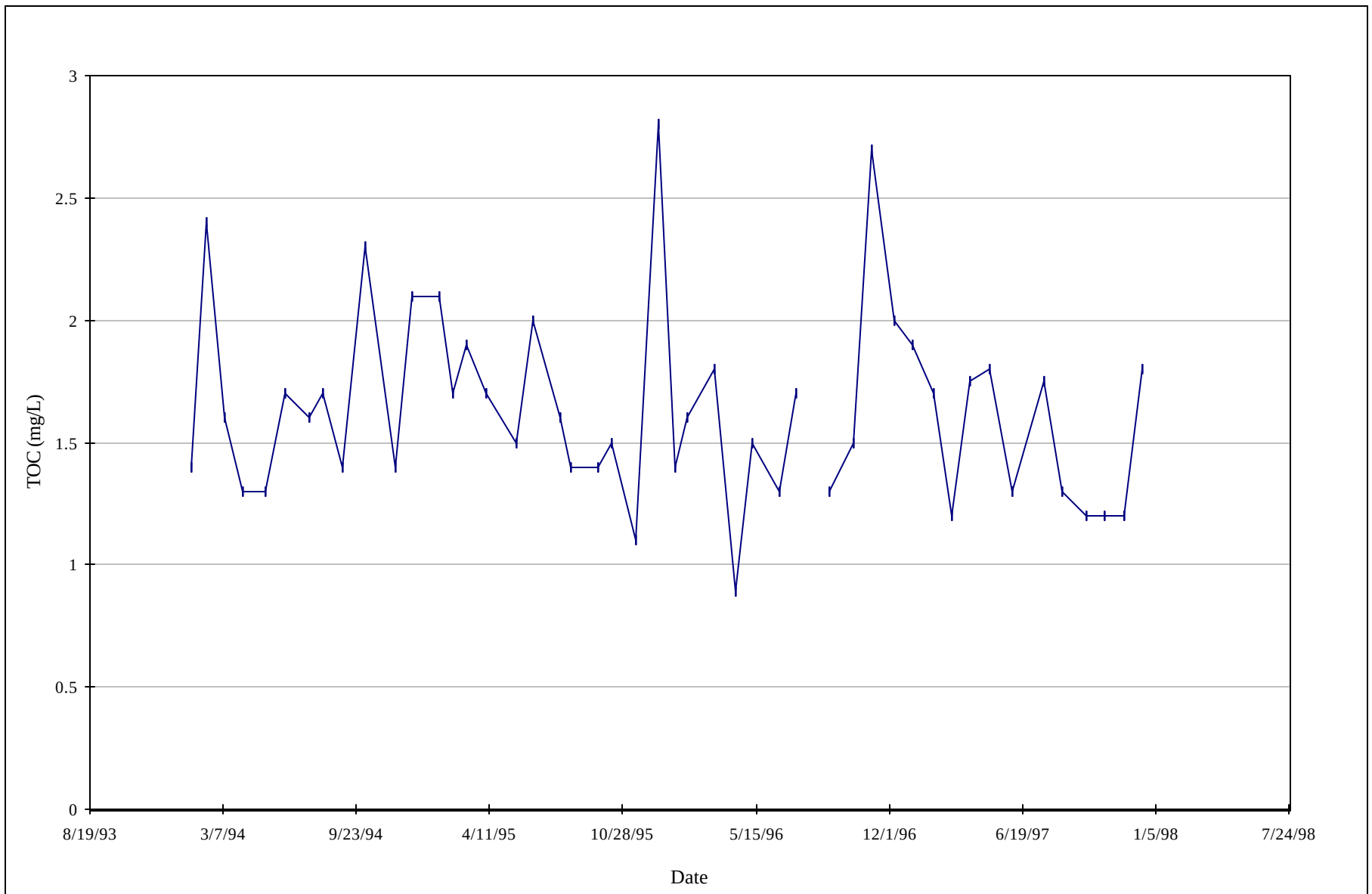


Figure 4-11. Historical TOC at E.A. Fairbairn WTP on the American River

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EBMUD has also collected TOC and SUVA data as part of their monitoring program along the Lower American River. The EBMUD TOC results correlate well with the City of Sacramento data. The SUVA data for all three locations on the American River—Nimbus Dam, E.A. Fairbairn WTP, and the Interstate 5 bridge near the confluence with the Sacramento River—are consistent with an average of 3.3 m-L/mg. Since the SUVA is greater than 3.0 m-L/mg, this indicates the water contains humic materials that can contribute to DBPs.

Many of the agencies pre-chlorinate the raw water to assist in treatment and to achieve disinfection credit. All of the agencies post-chlorinate to complete the disinfection and to maintain a disinfectant residual in their distribution system. Currently, no agencies are out of compliance with the THM regulation. It is not expected that any agency will need to revise treatment to meet Stage 1 of the proposed DBP Rule. Each agency has varying levels of THMs due to variable disinfection practices, pH, temperature, and distribution system configuration. The available HAA data from the City of Sacramento and SJWD indicate that Stage 1 of the proposed DBP Rule will not pose a problem for treated American River water.

Chapter 5. Watershed Contaminant Sources

In this chapter, contaminant sources in the American River watershed are described and discussed. The contaminant sources selected for evaluation were chosen during the scoping discussions between the TC and DHS staff based on knowledge of the watershed, including changes within the past 5 years, as well as the degree of coverage previously provided for the sources in the 1993 ARWSS Report. Contaminant sources selected for study in the 1998 Update are shown in **Table 5-1**. Information on the contaminant sources was obtained from literature reviews, file reviews, and discussions with various agencies' staff. No watershed field survey was conducted. For assistance with acronyms, the reader is referred to the list of abbreviations at the front of the report.

The 1993 ARWSS Report provided very detailed coverage of mines, the degree of risk associated with transportation corridors, and natural disasters. Transportation corridors are covered again in the 1998 Update, although the focus of the discussion has changed from the assessment of risk to preventative activities and agency response. Two other contaminant sources (mines and agriculture) are covered indirectly in Chapter 6 in the discussion of sources of arsenic, cyanide, and pesticides. Map figures from the 1993 ARWSS Report showing the location of contaminant sources are in Appendix B.

Table 5-1 shows the key relationships between the selected contaminant sources and the principal drinking water quality constituents of concern (COC). Storm events and urban runoff contribute to turbidity levels that, during major storms, require very careful attention and response at WTPs on the American River system. Storms and urban runoff carry a host of other contaminants as well, because the precipitation from the storm transports what has been deposited on land into the river system in addition to soil and sediment. Animals, recreational activities, human waste, urban runoff, and storm runoff are sources of pathogens. Although it is becoming increasingly clear that coliform bacteria are not a good indicator of pathogenic protozoa, coliform (and their sources) will probably remain an important tool in evaluating the microbiological quality of the river for some time to come, at least until more reliable protozoa analytical methods are developed. It is interesting to note that the fish hatcheries on the Lower American River may contribute to the higher coliform levels found in that reach of the river system, although they would likely not contribute pathogen species of concern to humans. Wastewater and the fish hatcheries are a potential source of TOC, along with storm runoff and urban runoff. MTBE has been found in lakes used for recreation (including Folsom Lake) and also in Sacramento urban runoff. Other organic contaminants primarily have their sources in industrial facility discharges, urban runoff, and transportation and pipeline corridors.

In addition to the contaminant sources shown in Table 5-1, each participating agency delineated their near-intake zone and identified contaminant sources of concern to them within that zone. The near-intake zone maps are in **Appendix F**. Following the discussion of each of the contaminant sources shown in Table 5-1, each agency is discussed individually, including features of their near-intake zone and a summary of the significance of the contaminant sources to each participating agency.

Chapter 5. Watershed Contaminant Sources

Table 5-1. Key Relationships of Contaminant Sources and Water Quality Constituents

	Coliform	Pathogens	Turbidity	Organic Carbon	MTBE	Other Organics
Major Storms-Turbidity and Pathogen Sources (timber harvesting, landslides, fire, wild animals, livestock)	T	T	T	T		
Recreation						
Body contact	T	T				
Boating and boat camping	T	T			T	T
Wastewater Sources						
Direct discharges		T		T		T
Non-discharging community systems	T	T		T		
Septic systems	T	T		T		
Collection systems	T	T		T		
Industrial Facilities						
Camino Lumber Mill						T
Fish hatcheries	T			T		
Office of State Printing						T
Landfills						T
Aerojet						T
Mather Field						T
Urban Runoff	T	T	T	T	T	T
Transportation and Pipeline Corridors					T	T
Note: This table shows the key relationship between the contaminant sources described in this chapter and drinking water quality constituents of concern to this study. Only significant contributions are shown. Relationships judged to be relatively minor, such as the potential for boating activities to increase turbidity or the contribution of leaking underground storage tanks to groundwater in direct communication with the river, are not shown.						

WATERSHED REGULATORY AUTHORITY

The water agencies neither own nor exercise jurisdiction regarding management of contaminant sources in the American River watershed. Several local, state, and federal agencies have regulatory responsibilities; a brief summary of these agencies' responsibilities is shown in **Table 5-2**.

The State Water Resources Control Board and Central Valley Regional Water Quality Control Board

Water pollution control and the protection of the quality of surface water and groundwater in the American River watershed is the primary responsibility of the Central Valley RWQCB. The SWRCB adopts state-wide policies and plans. The RWQCBs develop individual Basin Plans that identify beneficial uses of waterbodies, establish water quality objectives to protect the beneficial uses, and include an implementation plan to achieve those objectives. Thus, the RWQCBs have the lead permitting, enforcement, and management role in their basin for water pollution issues.

The RWQCBs regulate discharge of waste through the Waste Discharge Requirement (WDR) Program. National Pollutant Discharge Elimination System (NPDES) permits are written solely for point source discharges of waste into surface waters. The WDR Program is broader than NPDES permitting as it is applicable to any waste discharge to water or land that could affect the water quality of the waters of the state—both surface water and groundwater. Thus, in addition to point source discharges to surface waters, the WDR Program also covers landfills, sewage discharges to land, and other discharges.

The SWRCB Nonpoint Source Management Plan, adopted in 1988, provides a strategy for implementing nonpoint source best management practices (BMPs), primarily through cooperative agreements between the regulatory agencies and the parties being regulated. The strategy provides for a three-step process of escalating controls. Voluntary cooperation is the first, and preferred step. Cooperation based on regulatory encouragement is the second step. Formal permitting of nonpoint sources under the WDR program is the third step. The SWRCB has decided to implement nonpoint source control measures through incorporation into SWRCB and RWQCB workplans (as budget allows) and by fostering watershed partnerships with stakeholders such as agencies, businesses, and environmental groups. The Sacramento River Watershed Program, which includes the American River watershed as a tributary basin of the Sacramento River, is an example of a watershed partnership program.

Chapter 5. Watershed Contaminant Sources

Table 5-2. Summary of Watershed Regulatory Authority

Contaminant Source	Agency
Natural conditions and occurrences • Major storms • Landslides • Wild animals	Not applicable
Timber harvesting	• CDF regulates on private land through the Timber Harvest Plan process. • USFS regulates in federal forests.
Wild fires	• CDF and local fire departments conduct suppression on private lands. • USFS has lead for suppression in federal forests.
Livestock	• SWRCB has incorporated into the Nonpoint Source Management Plan.
Recreation	• SWRCB has incorporated marinas into the Nonpoint Source Management Plan. • County Sheriff boat patrols have law enforcement capability on the water. • Federal, state, and county park rangers have law enforcement capability on-shore in parks.
Wastewater • Direct discharges • Discharges to land • Discharges to the subsurface	RWQCB regulates through • NPDES program, • WDR permits, • WDR permits. County Environmental Management Departments permit and inspect installation of septic tanks.
Industries • Point source dischargers • Landfills • Superfund sites	RWQCB regulates though • NPDES program, • WDR permits, • NPDES and/or WDR permits. DTSC also has Superfund site authorities.
Urban runoff	• RWQCB regulates through the NPDES program.
Spill management and response	• LAAs and CUPAs are responsible for response and cleanup in their local jurisdictions. • CDF Fire Marshall has responsibility for interstate pipelines.
NPDES = National Pollutant Discharge Elimination System Permit Program WDR = Waste Discharge Requirement Permit Program USFS = U.S. Forest Service CDF = California Department of Fire and Forestry SWRCB = State Water Resources Control Board RWQCB = Regional Water Quality Control Board LAA = Local Administering Agency CUPA = Certified Unified Program Agencies DTSC = California Department of Toxic Substances Control	

Chapter 5. Watershed Contaminant Sources

California Department of Toxic Substances Control

Among the Department of Toxics Substances Control's (DTSC) responsibilities are administering California's Superfund program, including remedying contaminant releases. DTSC is not the only agency with cleanup jurisdiction of hazardous waste releases; most notable is the shared responsibility with the RWQCB, which has jurisdiction under the Porter-Cologne Act. One of the major functions of the DTSC is to place responsibility for cleanup on the responsible party. Where a responsible party is identified and accepts responsibility, the responsible party must characterize the nature and extent of a release, prepare a remedial action plan for DTSC approval, and then undertake the remedial action.

California Department of Fire and Forestry

The California Department of Fire and Forestry (CDF) is responsible for regulating timber harvesting on private lands. Sustained Yield Plans are required for lands that are zoned for timber harvesting and are greater than 2,500 acres. Timber Harvest Plans are required for each specific project and must describe roads that will be constructed, drainage and erosion control measures to be installed, and slash (i.e., vegetation debris) treatment. The CDF is also equipped to take responsibility to suppress wildland fires. Local fire districts take responsibility for fighting domestic and commercial fires in their specific service areas.

Within CDF, the State Fire Marshall has the responsibility for inspection, investigation, and emergency response concerning interstate pipelines.

Local Administering Agencies and Certified Unified Program Agencies

The term "Local Administering Agency" (LAA) has been used by the OES to signify county and city agencies with local jurisdiction and responsibilities for hazardous materials spill prevention, response, and cleanup programs. In 1997, CalEPA directed the DTSC to identify and certify a single group of local agencies, to be termed "Certified Unified Program Agencies" (CUPAs), as the lead agencies for handling hazardous materials spills. Previously, various state agencies, including OES, DTSC, and the CDF Fire Marshal, have had separate terminology and somewhat different local agencies on their lists.

County Sheriff Boat Patrols

Regarding dumping of human waste from boats, local enforcement officers can enforce the State Penal Code, which has an anti-littering law may be interpreted to cover sewage discharges. An enforcement officer must have cause to stop a vessel. Once stopped for cause, the officer can board the vessel to conduct a safety inspection that can include inspection of the sanitary system.

Chapter 5. Watershed Contaminant Sources

Park Rangers

Controlling the individual activities of park visitors is under the jurisdiction of that park's rangers. Park rangers have jurisdiction only over on-shore activities.

County Departments of Environmental Management

County departments of environmental management regulate individual septic systems on private land through septic tank permits and inspection of septic system installations. Checks are made as to the appropriateness of design and placement and then that the installation is done correctly.

U.S. Forest Service

The USFS regulates timber harvesting in national forests through requiring compliance with its management plans.

MAJOR STORM EVENTS AS SOURCES OF TURBIDITY AND PATHOGENS

Major storm events that occur in the watershed have the potential to cause increased turbidity and contaminant levels in the American River. Increased pathogen loading also occurs as materials from animal feces are transported from land into the river system. Living in the watershed are wild animals, livestock, and pet/companion animal species that can be infected with pathogens that affect humans. The severity of erosion and sediment transport caused by storm events is influenced by several conditions in the watershed, including timber harvesting, landslides, and fires. Each of these conditions may create erosion risk conditions. Maps from the 1993 ARWSS Report showing the location of forestry lands, slides, and fires are in Appendix B.

When rain from major storm events falls on bare, exposed soils and fresh animal feces, the result is erosion and transport of sediments and potentially of pathogens. The resulting sediments can also serve as a transport mechanism for other constituents such as pesticides, organic matter, and nutrients.

An increase in turbidity at the WTP results in an increase in treatment requirements (such as coagulant dosages, disinfection dosages, and filter backwashing) and may potentially reduce plant capacity. An increase in turbidity at the WTP may be accompanied by an increase in DBP precursors resulting in increased production of DBPs such as THMs and HAAs or may increase the risk of pathogens passing through the WTP.

A significant factor that will affect the impact of major storm events is the erosion potential of the soils in the watershed. **Table 5-3** shows the Natural Resources Conservation Service Erosion Hazard Classification for the various reaches of the river. These erosion classifications are determined by the slope,

Chapter 5. Watershed Contaminant Sources

climate, and soil erodibility of a specific area. The classification indicates the potential for occurrence of land disturbance. Maps showing the erosion hazard areas are in Appendix B.

Table 5-3. Erosion Hazard Classification for Each Reach of the American River

Erosion Hazard Classification	Percent of Area				
	North Fork American River	Middle Fork American River	South Fork American River	Folsom Lake	Lower American River
Very high	37	20	2	4	--
High	50	61	73	8	--
Moderate	13	19	25	75	23
Slight	--	--	--	13	77
Source: Natural Resources Conservation Service.					

Timber Harvesting

Timber harvesting is responsible primarily for the contribution of sediment to the river system through erosion from logging roads, skid trails, and cleared areas. Along with the dirt roads necessary to access the trees for harvesting, skid trails for moving logs to cleared areas and cleared areas for equipment and log storage must be constructed. After trees are felled, trunks are cleared of limbs and cut apart to be removed. Gathering and removing these logs requires heavy equipment, typically heavy tractors that cause considerable soil disturbance. It is the cumulative impact of roads (where the vegetation is stripped from the soil), skid trails (that may go directly down-slope rather than on the contour), and cleared areas that is significant. In addition, the cut area itself promotes soil erosion and may lead to landslides in steeply sloped areas.

Timber harvesters may install permanent, seasonal (the logging season within the watershed is April 15 through October 15), and/or temporary roads. Permanent roads are asphalted. Seasonal roads are destroyed before October 15. Temporary roads can remain throughout the year, but must have erosion control features (to direct drainage flow) installed by October 15. The relationship between timber harvesting and sediment yield is poorly defined and dependent on site-specific conditions, including geology, slope, stream proximity, and specific timber harvesting practices.

In addition to the physical construction and maintenance of the roads, herbicides are used extensively to maintain the roads and to suppress competing vegetation. Commonly used herbicides in timber harvest

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areas and rights-of-way within the American River watershed are diuron, glyphosate, simazine, and 2,4-D. See Chapter 6 for additional discussion of pesticide application in the watershed.

On public lands, the U.S. Forest Service regulates harvesting through requiring compliance with its management plans. The 1998 Clean Water Action Plan developed by the USEPA and the U.S. Department of Agriculture has identified several key actions to be taken by the U.S. Forest Service and the U.S. Bureau of Land Management regarding forest roads and forest health. The plan calls for (1) increased maintenance of forest roads, (2) development of new forest transportation regulations, (3) development of a pilot program for forest roads on federal land, (4) implementation of 25,000 miles of stream corridor restoration nation-wide, (5) and the conduct of forest health surveys. These are stated goals; implementation activities within the American River watershed remain to be seen.

On private lands, the California Department of Forestry regulates timber harvesting. A Sustained Yield Plan must be developed for parcels greater than 2,500 acres. A Timber Harvest Plan is prepared on specific projects; this plan must be developed by a registered forester and is reviewed by various state and local government agencies as well as other interested parties.

The ownership of the timber harvested land in the watershed is about 50% U.S. Forest Service and 50% private. Fruit Growers Inc. and Sierra Pacific (which purchased Michigan-California Lumber) are the two largest timber harvest companies in the watershed. Both these companies, as well as the U.S. Forest Service, have significantly reduced the amount of harvest in the last 3 or 4 years, for varying reasons. Fruit Growers Inc. has now paid off the loan attached to their American River watershed land purchases and no longer needs to generate income earmarked for loan payments. Sierra-Pacific has been expending energy in land-exchange deals to develop a more contiguous set of timber harvest lands; their current land ownership shows a checkerboard pattern. The USFS has reduced their harvest mostly as a result of changing policy at the national level; some of the changes in direction have been associated with Endangered Species Act concerns. However, although there has been a decrease in major harvest activities, there has been an increase in “mom and pop” harvesting of small parcels. (Keenan, CDF, pers. comm.).

The American River Watershed Group has developed a Coordinated Resource Management Program (CRMP) for the North and Middle Fork basins within Placer County. This group and the CRMP is discussed in more detail in Chapter 8. The goal of the CRMP is to improve the forest health and the overall condition of the American River watershed in Placer County. Several objectives of the CRMP are related to responsible and effective use of timber harvesting practices to improve forest health:

- manage forest resources by thinning over-crowded stands and brush fields and removing dying trees,
- prevent depletion of old-growth tree stands and design areas for re-establishment of old-growth tree communities, and

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- prevent depletion of adequate ground cover that prevents erosion and the siltation of waterways.

The CRMP is planning to implement a demonstration project that would involve selective harvesting of forested areas.

Landslides

Landslides contribute to sediment loading of the waterways, increasing turbidity and reducing dissolved oxygen content in the zone of impact. During and after periods of heavy rainfall, the soils become saturated and some areas of the upper watershed are prone to landslides (e.g., avalanches, mudslides, and rockslides). Earthquakes may also cause landslides but are not a major concern in this watershed. The entire watershed has been classified as Seismic Risk Zone 3 by the Uniform Building Code; and there are no major active, or recently active, faults.

The South Fork of the American River is especially susceptible to land disturbance near the river, with rockslides, mudslides, and avalanches occurring annually. Two major landslides that occurred in 1997 were particularly well publicized due to the fact that they were extensive enough to close U.S. Highway 50, which parallels the South Fork above Pollock Pines. Both slides resulted from the super-saturated conditions caused by the January 1997 Pineapple Express storms. The Wright's Lake Slide occurred on January 1, 1997, and the Mill Creek Slide occurred on January 24, 1997 (Miller, Caltrans, pers. comm.).

Fires

Forested areas impacted by wildfires may be subject to additional erosion and may contribute sediment and turbidity to the river system. Fires result in a loss of vegetation with direct exposure of soils to rainfall. Exposed soil results in reduced infiltration of water and increased surface runoff. The lack of vegetation also encourages greater amounts of sheet flow. Also, fires in chaparral areas often develop hydrophobic soils that increase the amount of surface runoff.

The impacts of fires may not, however, be directly measurable at downstream intake points. According to the 1993 ARWSS Report, water quality data collected by EID for the first rainfall following the very large 1992 Cleveland Fire did not show highly elevated turbidity levels in the South Fork (levels were between 1.5 and 3.5 NTU). The 1993 ARWSS Report listed the 10 largest wildfires of record in the watershed. Since 1993, there have been no major fires in the watershed, in terms of the amount of acreage burned. The largest wildfire was the Hellester Fire that burned 600 acres in the Tahoe National Forest several years ago (Kelly Keenan, CDF, pers. comm.)

Multiple fire management techniques are implemented by forest management agencies that indirectly help water quality by preventing fires and the resultant erosion effects. Vegetation control can be achieved through chemical treatment, mechanical treatment, and grazing. The type of control is usually determined

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by a site assessment. These techniques can also have a negative impact on water quality by introducing pesticides and herbicides or potential pathogens from livestock.

The American River CRMP is very concerned with the fire safety of the watershed. The CRMP has several objectives associated with fire safety:

- reduce excessive growth of fire-dependent brush species,
- implement timber management with prescribed burnings,
- develop strategic fire break locations, and
- implement defensible space standards around developed areas.

The CRMP is planning to implement a demonstration study that would establish fuel breaks in forested areas and would inspect homes for defensible space against fire conditions.

Animals in the Watershed

Wild animals, livestock, and pets/companion animals all live in the watershed. There are several important considerations in assessing the significance of these animal populations:

- To be of concern, the animal species must be infected. Age and population density are two apparently important factors. The young of livestock species are affected by protozoan infection; infection declines as the animals age and acquire immunity so there is generally a low level of infection in adult animals. Some livestock are bred at particular times of year; therefore, infection epidemic periods are limited. On the other hand, wild animals such as mice and rats appear to maintain a year-round infection rate; possibly attributable to the fact that they breed and produce young year-round, so that infection of the population is self-sustaining.
- The animal species must be infected with a pathogen species that is also infectious to humans. *Giardia lamblia* and *Cryptosporidium parvum* are the species of most concern at the present time. Animal pathogen studies, however, do not always distinguish which specific *Giardia* or *Cryptosporidium* species is present and the subject of the study. A study may simply characterize *Giardia* spp. which does not indicate whether the *Giardia* is *Giardia lamblia*, which is infectious to humans. Moreover, species differentiation is not always a clear issue. There is, for example, some discussion as to whether the *Giardia* species carried by cattle is *Giardia lamblia*. Veterinarians and other groups that work closely with cattle do not have a higher incidence of *Giardiasis*.
- The pathogen must be (1) shed by the animal, (2) transported via overland flow to the river system, and (3) remain viable during the first two steps. Although some proportion of animals will defecate directly into a stream, this proportion may actually be quite small. Dr. Robert Atwill states that, for example, only 1–2% of cattle will stand in streams; most defecate on dry land (Atwill, UCD, pers.

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comm.). Feces deposited on land are subject to inactivation through dessication and heat and may no longer be viable when transported into streams.

Wild Animals

Numerous species of wild animals are present in the watershed. Wild animals should not be thought of as pertinent only to backwoods, “pristine” areas. Even urban areas support wild animal populations of rodents, squirrels, and birds.

Presently, the relative significance of different animal species contributing to *Giardia* and *Cryptosporidium* in the watershed cannot be assessed with confidence. There is a growing body of information regarding which wild animal species may be carriers of *Giardia* and *Cryptosporidium*, but the absence of information on certain animal species may indicate only that it has not yet been the subject of enough investigation. *Giardia* spp. and/or *Cryptosporidium* spp. have been documented as present in deer, beavers, muskrats, raccoons, mice, voles, rats, rabbits, geese, turkeys, waterfowl, and snakes, species present in the American River watershed. Only mammalian wild animals may be infected with *Giardia* and *Cryptosporidium* species pathogenic to humans. Species infecting lower vertebrates are unable to establish infection in mammals; however, these lower vertebrates can be carriers. A study conducted on migrating waterfowl along the east coast showed that *Cryptosporidium* oocysts pass through the intestinal tract of waterfowl and remain infectious to mammals while not affecting the avian host. Birds feed at wastewater treatment plant lagoons, landfills, pastures, and slaughterhouses. Birds may defecate into streams, and protozoan cysts also can be rinsed from the surface of their bodies. (Fayer et al., 1997).

In addition to knowing whether a wild animal species has been documented as carrying *Giardia* and/or *Cryptosporidium*, a species’ habits may also be important. Riparian habitation, seasonal migrations, and birthing patterns may all be important since cysts and oocysts must stay moist to stay viable. For some wild animal species, the young may be the primary infected populations.

Another piece of information that is useful in assessing the significance of wild animals is their relative numbers within the watershed. However, only one wild animal population is counted in the American River watershed, namely deer herds. Maps showing the migration routes of deer herds in the upper watershed are included in Appendix B.

Livestock

Fecal waste from livestock may be a source of several pathogenic bacteria (*Campylobacter*, *Salmonella*, *E. coli*, and *Yersinia*) and protozoa (*Giardia* and *Cryptosporidium*). Livestock are not thought to be important in the transmission of pathogenic viruses to humans (Atwill, 1997). One recent exception is the avian influenza virus H5N1 that resulted in the enforced slaughter of Hong Kong chickens (although the route of transmission was not waterborne). In addition to the contribution of pathogenic microorganisms

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in fecal matter, overgrazing can remove the vegetative cover and increase soil compaction resulting in greater erosion of soils. Livestock often congregate around waterbodies due to the presence of vegetation, shade, and water; this can result in disturbance of riparian corridors and trampling of stream banks.

Cattle and sheep grazing occurs in the American River watershed, primarily in the upper watershed on both private and public lands (see Appendix A for location of grazing on public lands). Horses, goats, and other grazing animals are also present in both the upper and lower watersheds, although in limited numbers. In the 1993 ARWSS Report, the concern related to *Giardia* from grazing animals, particularly cattle, was noted. The number of grazing animals (sheep and cattle) on USFS lands was listed. No estimates of number of cattle or other livestock on private lands were provided. This information is not readily obtainable, particularly for geographic areas smaller than counties and is not necessarily reported in consistent units for different species or for different operations involving the same species, such as cattle grazing on public lands versus private lands.

The USFS manages grazing in the Tahoe and El Dorado national forests through leases that specify the number of animals allowed and provide guidelines on rotating the stock to different areas to avoid overgrazing. These lease conditions are consistent with the USFS Allotment Management Plans, prepared by certified Rangeland Managers. Generally, in the Tahoe and El Dorado national forests, grazing occurs during the dry months, from June through October. During this period, *Giardia* and *Cryptosporidium* in feces that are not directly deposited in wet areas may be expected to become desiccated and non-viable.

The 1998 Clean Water Action Plan, developed by the USEPA and the U.S. Department of Agriculture, lists two key action items to be conducted regarding grazing on public lands: (1) development of a standardized rangeland health inventory to be used by the U.S. Bureau of Land Management, the Natural Resources Conservation Service, and the USFS; and (2) development of vegetation classifications, inventories, and plans to eliminate erosion. These are stated goals; implementation activities that affect the American River watershed remain to be seen.

Since 1993, quite a bit of research has been conducted on issues related to livestock as sources of *Giardia* and *Cryptosporidium* to California river systems under the guidance of Dr. Robert Atwill at the UCD School of Veterinary Medicine. A brief summary of some of the research being conducted is as follows:

- **Horses used for backcountry recreation.** Infection of *Cryptosporidium* is primarily in foals; infection of *Giardia* is primarily in foals and lactating mares. Foals and lactating mares are not used in backcountry riding. There is, however, the possibility that a horse infected from a contaminated stream during a backcountry ride could bring the infection back to its stable.
- **Llamas used for backcountry recreation.** This is a current project that will investigate whether llamas used as backcountry stock are a significant source of *Cryptosporidium*.

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- **Cow-calf herds.** This project is studying the age groups of rangeland cattle that are likely to shed *Cryptosporidium* and *Giardia*, to clarify whether the mother cow is the source and to further identify seasonal and environmental factors associated with infected cattle. Preliminary results suggest that wildlife (perhaps field mice) play a significant role in infection epidemics among young cattle (Atwill, pers. comm.).

Another investigation being conducted by Dr. Atwill's research program involves overland and subsurface transport of *Cryptosporidium*. This project is investigating the mechanics of how oocysts move across rangeland soil. The effectiveness of best management practices (BMPs), such as buffer strips, is being investigated. Also being considered are BMPs such as manipulating the timing of birth in cow-calf herds so that young cattle (prior to infection) are on the range during the dry season. Grazing on private lands is not regulated; rather, voluntary management practices are encouraged. For cattle, the Rangeland Water Quality Management Plan was developed in 1995 as a joint effort between the Cattlemen's Association, the UCD Cooperative Extension, and the SWRCB. The Rangeland Water Quality Management Plan is implemented primarily through the Cattlemen's Association with technical assistance from the UCD Cooperative Extension and the Natural Resources Conservation Service. The principal activity at this point is to conduct short courses for ranchers to assist them in better managing their lands, especially with respect to overgrazing and erosion control. The Cattlemen's Association has provided access to their herds for Dr. Atwill's research efforts; livestock ranchers have a stake in reducing herd infections from an animal health and productivity point of view in addition to water quality concerns. It seems likely that recommended BMPs developed through Dr. Atwill's research will be incorporated into the Rangeland Water Quality Management Plan. The City of Sacramento has been tracking the work of Dr. Atwill and the implementation of the Rangeland Water Quality Management Plan, and recently sponsored a pathogen workshop where Dr. Atwill was the principal guest speaker.

Companion Animals

Dogs and cats, the two most common outdoor companion animals or pets, are known carriers of *Cryptosporidium* spp. Several studies in several different locations of the rate of *Cryptosporidium* infection among dogs suggest a 2–10% infection rate. For cats, the rate is 3–33%. (El-Ahraf, 1991, and Mtambo, 1991, respectively). Pets may live anywhere in the watershed in association with humans; thus, the largest pet populations are in urban areas. The potential for pet feces to be transported into the river system is discussed later in the section on urban runoff. Of particular interest concerning the potential for urban animals to contribute pathogens to the river system are studies in several different areas showing the infection rate for *Cryptosporidium* among rats as 58% and among mice, 30% (Klesin, 1986, and Webster, 1995, respectively). Unlike livestock, urban animals breed year-round.

Discussion

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Major storm events have the potential to cause increased sediment and pathogen loading to the American River. This increased loading may directly or indirectly impact the source water quality at WTPs. The severity of the impact of a storm event is dependent on the existing watershed conditions, previous precipitation patterns, and the magnitude and duration of the storm event.

Precipitation patterns are important factors because of the difference in erosion potential between rainfall and snowfall. Much of the area of the watershed where the soils are highly or very highly erodible is located in the higher elevations of the watershed. During normal years, precipitation will occur as snowfall at many of these locations. The snow will accumulate throughout winter and will melt during spring and summer. Therefore, cold storm events will typically have lower erosion potential in the upper watershed. A Pineapple Express storm is a warm winter storm that is typically derived from the tropics. There are circumstances when these warm Pineapple Express storms will occur after cold storms and the rainfall from the warm storm will melt the existing snow and compound the erosion impacts. This occurred during January 1997. Most of the WTPs along the American River received influent water with turbidity levels over 500 NTU. The turbidity increased to its highest levels over several days and then took as much as a month to reduce back to levels normal for that time of the year.

The magnitude and duration of a storm also impact the effect of the storm on river water quality. If a storm is a light, scattered shower, there is less chance of significant erosion and transport of contaminants to the river. If a storm persists over several days, the transport of contaminants is more likely. Storms of high intensity, whether the rain falls for a short or long period of time, increase the likelihood of erosion and transport of contaminants to the river.

Major storms, including Pineapple Express storms, cannot be prevented. Optimized treatment at the WTP is needed to respond to such events. Although storms are uncontrollable, forestry and fire management activities in the watershed can reduce the amount of soil exposed to erosion that is available for transport during major storms. The formation of the American River CRMP is a very positive development. Formation of a similar stakeholder-based land stewardship group in El Dorado County would be a long-term effort that could be encouraged and promoted.

The degree to which pathogen loading occurs during storms is not clear. There will be some level of infection of wild animals and livestock species, but the infection incidence of various species in the American River watershed is not known. Animal population density and age of the population are important factors in determining the level of infection. Even if population density and infection incidence are low, however, a small number of infected animals can shed vast quantities of cysts and/or oocysts. Mitigating factors include death of the protozoa through desiccation and filtration through overland transport. Feces shed near waterbodies during cool, wet months pose the greatest risk of remaining viable and being transported into the river system.

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During major storm events, WTPs need to optimize treatment to reduce the turbidity levels to meet regulatory requirements. This may involve changing the type of chemicals used for coagulation and flocculation, since much of the particulate matter may be small charged particles. This may also involve the use of pH adjustment to optimize the coagulation and flocculation procedures. Higher turbidity loading requires additional removal of solids from sedimentation basins and more frequent backwashing of filters. More frequent backwashing of filters may require a storage or treatment facility for backwash water, if it is not already in place, to minimize the return flow of backwash water to the headworks and improve its quality. Higher turbidity also indicates that more materials will require oxidation; therefore, the chlorine demand will probably increase. Finally, it is probable that the WTP will need sufficient hydraulic capacity to allow for longer settling times and lower loading rates to improve the performance of the treatment facilities.

RECREATION

Recreation occurs year-round in the watershed from skiing and snow sports in winter, to rafting and water sports in summer. Activities such as hiking and horseback riding may occur any time of year when the weather is fair. Water-based recreational activities occur primarily during relatively warm temperature conditions, typically from May through October. The peak recreation season, which mostly coincides with school recess, is from the Memorial Day through the Labor Day weekend. Additionally, weekend use is generally heavier than weekday use.

The American River watershed experiences a high degree of recreational use, drawing people from a fairly wide radius: the Central Valley, the foothills and mountains, the San Francisco Bay Area, and Nevada. All the reservoirs and major tributaries are accessible for recreation, and many of the premier recreational facilities and activities in the area are focused on the river system and water recreation.

Several recreational activities are sources of contaminants, including the following:

- Body-contact water recreation, such as swimming and rafting, etc., can directly contribute pathogens shed by infected humans into the river system.
- Boating activities can contribute fuel from spills, leaks, and incomplete combustion. Improper human waste disposal from boats also is an issue of concern.
- On-shore activities include picnicking, camping, fishing, trail use, and other use of on-shore facilities. On-shore restroom facilities can cause problems if poorly maintained or subject to flooding. Restroom facilities not only need to be maintained, but also an adequate number for the degree of use needs to be provided.

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- Trail activities such as hiking, horseback riding, and off-highway vehicle travel can cause erosion, resulting in increased turbidities in nearby streams.

In this section, recreational facilities and activities are described for the entire watershed and for each basin and near-intake area. There is also a discussion of the contribution of pathogens from body-contact recreation, and a discussion of marinas and boating activities with respect to fecal contamination issues and the potential for boat operations to contribute gasoline contaminants to the river system. The locations of on-shore restroom facilities are listed in this section, but the study did not survey restroom conditions in the level of detail necessary to judge their significance. Similarly the potential for erosion from trails to affect stream water quality is dependent on site-specific conditions and was not explored in detail as part of this study.

Regulation and Management

Recreational activities are a nonpoint source of contamination. As with most nonpoint sources, management is neither cohesive nor consistent and regulatory enforcement resources are limited. The following is a summary of management efforts and responsibilities with respect to recreational activities that can cause contamination.

- The RWQCBs have the primary authority and responsibility for enforcing the Porter Cologne Act prohibition on untreated sewage discharges throughout the state. They do not have the resources to operate a program to inspect or enforce their authority with respect to acts of sewage dumping from boats or resulting from individual conduct.
- One of the Technical Advisory Committees convened by the SWRCB in reviewing the state's Nonpoint Source Management Plan was the Marina and Recreational Boating Technical Advisory Committee. The Marina and Recreational Boating Technical Advisory Committee report discussed sewage facility management, solid waste management, fish waste management, liquid material management, and petroleum control management, among other topics. The final overall recommendation of the Technical Advisory Committee report was to promote public education as the best means of reducing pollution from marinas and boating recreationists. Although some work has been done by the Coastal Commission in bay and coastal waters, the Marina and Recreational Boating Technical Advisory Committee report recommendations have not been implemented much in inland waters where the Coastal Commission is not active. Since the Technical Advisory Committee reports were published in 1994, the SWRCB has refocused its nonpoint source management control efforts to promote incorporation of nonpoint source measures into RWQCB workplans and by fostering watershed partnerships, such as the Sacramento River Watershed Program (Loranzato, SWRCB, pers. comm.).

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- In the American River watershed, major recreation areas are operated and managed by the USFS, the California Department of Parks and Recreation, and the Sacramento County Department of Parks and Recreation. Controlling the individual activities of recreational users of a particular recreational area is under the jurisdiction of that park's rangers. Park rangers, however, have jurisdiction only over on-shore activities.
- For discharges from boats or for individual conduct within a waterbody, local enforcement officers (i.e., County Sheriff boat patrols) can enforce the anti-littering law of the state penal code that probably covers sewage discharges. An enforcement officer, however, must have cause to stop a boat. Once stopped for cause, the officer can board and conduct a safety inspection, which can include inspection of the sanitary system.
- The City of Sacramento is in the process of planning a boating and recreational use public education campaign that will be promoted along the Lower American River and also on the Sacramento River near the Sacramento River WTP intake facility. The public education campaign is part of follow-up work the City of Sacramento is conducting pursuant to recommendations made in the 1995 Sacramento River Sanitary Survey.

Description of Recreational Activities and Facilities in the Watershed

Annual visitor-day statistics in the watershed are shown in **Table 5-4**. These statistics provide only a partial count of recreational use. The statistics are collected by both the National Forests and by the California Department of Parks and Recreation. Visitor-day statistics are not, however, collected by the Sacramento County Parks and Recreation Department, which operates the American River Parkway. Indeed, it would be difficult to collect such statistics for the American River Parkway due to the large number of uncontrolled access points. In addition to the uncounted American River Parkway, there is considerable "dispersed use" (i.e., individual use in uncontrolled areas) that is not counted. The USFS staff estimate dispersed use within their areas is half the amount of visitor-days in the developed facility areas (Logan, El Dorado National Forest, and Petit, Tahoe National Forest, pers. comms.).

The locations of major recreation areas were identified in the 1993 ARWSS report. Figures from that report, showing the locations of recreational areas, are in Appendix B.

Upper Watershed

Recreational activities in the upper watershed include camping, picnicking, hiking, horseback riding, rafting, swimming, fishing, off-highway vehicle recreation, and many snow sports.

North Fork and Middle Fork Basins

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The North and Middle forks include recreational facilities in the Tahoe and El Dorado national forests and also include the Auburn State Recreation Area. Additionally, the North and Middle forks support considerable whitewater rafting. On the North Fork, whitewater rafting occurs from Iowa Hill Bridge to Upper Lake Clementine. This reach of the river has four boat access points and three restroom facilities. On the Middle Fork, rafting occurs from the Oxbow Access to the confluence with the North Fork, with five boat access points and three restroom facilities. Overnight camping is available for rafters on both these tributaries in restricted areas.

The marina facilities on Lake Clementine include 56 boatslips and a gas pump. There are 21 boat-in campsites on the lake in addition to 14 drive-in campsites. Three floating toilets are located on the lake, and three pit toilets and five portable toilets around the lake.

Table 5-4. Visitor-Day Use in Major Recreational Areas

Annual Visitor-Days ^{a,b}	
North and Middle Fork	
Developed recreational areas ^c in the Tahoe and El Dorado national forests	254,000
Auburn State Recreation Area	742,000
South Fork	
Developed recreational areas ^c in the El Dorado National Forest	848,000
Marshall Gold Discovery State Historic Park	330,000
Folsom Lake and Lake Natoma	
Folsom Lake State Recreation Area - Folsom Lake	791,000
Folsom Lake State Recreation Area - Lake Natoma	257,000
Lower American	
American River Parkway	5,000,000 ^d
^a A visitor-day is defined as 1 person for a 12-hour period. Thus, 1 person over a 24-hour period equals 2 visitor-days.	
^b Data for Tahoe National Forest and for most state recreational areas are for the 1996-1997 fiscal year. Data for the El Dorado National Forest and the Auburn State Recreation Area are for the 1997 calendar year.	
^c Developed recreational uses within the El Dorado and Tahoe national forests include campgrounds, picnic areas, ski resorts, organized camps, recreation residences, and observation points.	
^d Estimate of Park Rangers. No statistical data are collected.	

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Two off-highway vehicle areas are located within the North and Middle Fork basins, including the State Mammoth Bar Off-highway Vehicle Area and the Tahoe National Forest Foresthill Off-highway Vehicle Area.

Additionally, the Auburn Equestrian Staging Area is just downstream of the PCWA intake facility. The staging area provides parking and toilet facilities for horseback riders.

PCWA's intake facility is located just downstream of the confluence of the North and Middle forks of the American River. The Mammoth Bar Off-highway Vehicle Area and the recreational facilities at Lake Clementine are probable sources of turbidity and microbiological contamination to the river upstream of the PCWA intake facility. The PCWA near-intake zone maps are in Appendix F.

South Fork Basin

The South Fork includes recreational facilities in the El Dorado National Forest and also the Marshall Gold Discovery State Historic Park. Additionally, the South Fork is one of the most used whitewater rafting rivers in California. Whitewater rafting occurs from Chili Bar to Folsom Lake. Nine boat access points and 10 locations with restroom facilities are found along this reach of the river. There are two off-highway vehicle areas located within the South Fork Basin: the El Dorado National Forest Mace-Mill-Rock Creek Off-highway Vehicle Area and the Barret Lake Off-highway Vehicle Area.

In-river recreation was not identified as a significant activity on the Strawberry WTP near-intake zone map. There is some recreation upstream of EID's Strawberry WTP, including camping, fishing, hiking, and wading.

Lower Watershed

In the lower watershed, rafting, boating, fishing, swimming, beach use, and biking occur as do other activities such as camping, hiking, picnicking, and horseback riding.

Folsom Lake and Lake Natoma

Folsom Lake and Lake Natoma both experience considerable body-contact and boating recreation. The Folsom Lake State Recreation Area compiles statistics on the number of boats launched annually in each lake. In 1996-1997, 105,000 boats were launched into Folsom Lake and 4,500 boats were launched into Lake Natoma. The Folsom Lake near-intake zone area is shown in Appendix F.

Folsom Lake supports swimming, water-skiing, sailing, cruising, fishing, and jet-skiing. Major shoreline use areas include Beals Point, Granite Bay, Rattlesnake Bar, Dike 8, Mormon Island, Brown's Ravine, and the Peninsula Area. Folsom Lake also has two on-shore campgrounds with 149 campsites and allows

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overnight boat camping. Beals Point Campground has 49 campsites that can accommodate motor homes and trailers, a trailer dump station, and restrooms. The Peninsula Campground has 100 campsites that can accommodate motor homes and trailers, a trailer dump station, and restrooms. Nearby is a launch area and day-use area. The marina on the lake has about 700 boatslips, concessions, and a gas pump.

There is a sewage pumpout station for boats with on-board sanitary facilities next to the marina in Brown's Ravine. This pumpout was recently installed by the state Department of Parks and Recreation using grant funding from the state Department of Boating and Waterways. The state Department of Parks and Recreation maintains the pumpout station. The marina concessionaire operates it. According to the Department of Parks and Recreation Maintenance Chief, the pumpout station has no fees associated with it and receives a fair amount of usage (Jones, California Department of Parks and Recreation, pers. comm.).

Boat campers on Folsom Lake must register either at the Granite Bay entrance or at Folsom Lake Marina at Brown's Ravine. During registration, the vessel is inspected by the California Department of Parks and Recreation staff to verify that it meets all requirements, including the presence of a self-contained sanitary unit that is U.S. Coast Guard-approved and has a holding tank with tight and perfect closure.

About 80 miles of trails around the lake are used for hiking, horseback riding, and mountain biking.

There is substantial recreation on Folsom Lake in the vicinity of the EID El Dorado Hills WTP intake facility and in the vicinity of the combined intake facility for the SJWD, Roseville, Folsom, and FSP. Lake recreational activities, particularly body-contact recreation, are a concern because of the potential contribution of microbiological organisms. The potential for improper disposal of sewage generated by overnight boat campers on Folsom Lake is also a concern. In addition, recreation as a source of MTBE to Folsom Lake is of concern; this is discussed later in this section.

Lake Natoma is particularly known for fishing and non-motorized boat recreation. Power boats are allowed at the upstream end of the lake as long as they do not interfere with the more passive recreational pursuits that are the focus of Lake Natoma. The Negro Bar Campground, on the north shore of Lake Natoma, has 20 campsites that can accommodate motor homes and trailers, a trailer dump station, and restrooms. In addition, two group campsites at Negro Bar accommodate 50 people each; a third campsite accommodates 25 people. Lake Natoma is shown on **Plates 5 and 6** of the Lower American River near-intake zone maps in Appendix F.

Recreational facilities at Lake Natoma will be expanded in the near future. The conceptual plans for the expansion have existed for more than 20 years, but it is only recently that funding has been identified to construct the new facilities. The improvements consist primarily of bike trails along the east and south shores of Lake Natoma (called "shoreline redevelopment") and facilities (meeting rooms, education and

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training facilities, and increased docks) at the Nimbus Flats area (Le Flore, California Department of Parks & Recreation, pers. comm.).

ACWS takes American River water out of Folsom South Canal, downstream of Lake Natoma.

Lower American River

The American River Parkway is a 6,000-acre open space area that borders the entire Lower American River. The parkway contains several community parks, numerous access points for the general public, a bike and walking trail, and a horseback riding trail. Recreation includes boating (rafting, kayaking, and canoeing), fishing, swimming, and wading. The most popular reach for rafting is from Sunrise Avenue to Watt Avenue. Between Folsom Dam and the potential Joint Project near the mouth of the American River, there are 10 boat launch areas and 21 restroom facilities. The parkway is a riparian corridor preserved for its ecological benefits and is home to many wild animals. In addition, homeless people take shelter in the parkway, building transient camps. Recreational activities, wild animals, and the homeless are all sources of microbiological contamination of the river along the length of the parkway.

The permanent toilet facilities in the parkway contain double-sealed vaults and a set of pumps that remove the sewage from the second vault and pump it over the levee into the regional sanitary collection system. On rare occasions, a problem with leakage and backing up has occurred when, for example, there has been too much flushing or a power outage. Prior to the rain season, the permanent toilet facilities are “winterized” (i.e., the vault seals are checked, the electricity and water are shut off, and the restrooms are closed). Chemical toilets are stationed at a few sites on a more or less permanent basis. The chemical toilets are serviced by a contractor. When flooding seems imminent, the chemical toilets are moved to high ground, either by the contract company or by the park rangers.

There is a continuous, though shifting population of transient people in the parkway. During the rain season, many of the homeless enter shelters in the City of Sacramento or move their encampment under the cover of bridges. During clear weather, the homeless people camp in the parkway areas near bridges and close to the social support services provided in downtown Sacramento. Currently, either park rangers, the city police, or county sheriffs may require the homeless to relocate. The homeless themselves will move camp when their campsite has become fouled. Park staff state that the degree of sanitation in the homeless camps is poor. The camps become littered with debris collected from dumpsites as well as from garbage and sewage generated simply from living in the camp.

Park staff have seen a variety of wild animals in the parkway, including deer, coyote, rodents, river otters, muskrats, and beaver. Where neighborhoods are adjacent, considerable dog-walking results in dogs defecating in the parkway rather than on their owners’ property. A horse trail is adjacent to the river from Discovery Park to Hazel Avenue. The most heavily used portion of the horse trail is adjacent to horse properties in the Fair Oaks area.

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Recreational activities along the Lower American River include fishing, wading and swimming, canoeing, kayaking, rafting, trail use, and picnicking. These activities are close to the intake facilities of CWD and AWD, the City of Sacramento E.A. Fairbairn WTP, and the potential Joint Project. The following is a summary of recreational facilities and activities along the American River Parkway. The facilities and activities are shown in detail on **Plates 1–5** of the Lower American River near-intake zone maps in Appendix F.

Nimbus Dam to Carmichael Water District facilities and activities include:

- six chemical toilets and one permanent toilet;
- three boat ramps (downstream of Nimbus, near Sunrise Bridge, and at Bajamont Way); and
- low to medium swimming use; medium to high fishing, kayaking and canoeing use; and medium to low boat use.

Carmichael Water District to Arcade Water District facilities and activities include:

- three chemical toilets and one permanent toilet;
- one boat ramp; and
- medium to low swimming use, medium to high fishing use, medium to high kayaking and canoeing use, and medium boat use. Access points are at Sarah Court, Chase Drive, Ancil Hoffman Park, William B. Pond Recreation Area, Goethe Park, Waterton Way, Rogue River Way, and Gristmill Dam.

Arcade Water District to E.A. Fairbairn WTP facilities and activities include:

- one chemical toilet and four permanent toilets;
- four boat ramps (two at Harrington Park, one at Watt Avenue, and one at Howe Avenue); and
- medium to low swimming, fishing, kayaking and canoeing, and boating use. Access points include Harrington Park, Watt Avenue, Northrop Avenue, Northgate Boulevard, and Howe Avenue.

E.A. Fairbairn WTP to the potential Joint Project intake activities include:

- high swimming use at Paradise Beach.

Impacts of Body-Contact Recreation

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Until recently, the direct pathogen contribution of recreationists to a waterbody has been a known source but describable only in anecdotal and common-sense types of terms. A relatively recent modeling study conducted by the Metropolitan Water District of Southern California (MWD) on their new Eastside Reservoir has brought together information from the literature and from various experts in a pioneering attempt to quantify the risk associated with the use of drinking water sources also used for recreational purposes.

The newly constructed MWD Eastside Reservoir was projected to accommodate as many as 278,325 recreationists per year (far less, for example, than the current use of Folsom Lake).

A fate and transport model was coupled with a risk assessment model to estimate the increased level of treatment needed for Eastside Reservoir water based on the projected degree of recreational use. Data input to the model included:

- numbers of pathogens per recreationists based on the incidence of infection in the general population and reported concentrations in fecal material (from the literature),
- the frequency of accidental fecal releases (estimated),
- pathogen inactivation rates (from the literature), and
- recreation days/year (projected).

Because the risk assessment model showed that the only pathogen shed by recreationists in the Eastside Reservoir that could lead to increased treatment requirements at MWD facilities was *Cryptosporidium*, only the *Cryptosporidium* results have been published in any level of detail. Viruses would actually be shed in the largest numbers, however, unlike viruses and other pathogens studied, *Cryptosporidium* is more difficult to treat. Model input data specific to *Cryptosporidium* are shown in **Table 5-5**.

It should be noted that the conclusion that recreational use of Eastside Reservoir could lead to increased *Cryptosporidium* treatment requirements (the model predicted that at a 95% confidence level, only 32,000 recreators could be allowed in Eastside Reservoir without needing additional log removal of *Cryptosporidium*) was based on specific characteristics of Eastside Reservoir, MWD treatment facilities, and projected future regulations. The reservoir volume, seasonal operational features, and transport factors were specific to the configuration of the reservoir and the location of recreational use on the reservoir.

**Table 5-5. *Cryptosporidium* Input Data
for the Eastside Reservoir Study**

Parameter	Measurement
Infection rate	0– 5%
Feces shed	0.01–1 g per person
Pathogen content	10/gram
Accidental fecal release frequency	0–2/1,000 recreationists
Mass of fecal release	50–150 grams
Inactivation rate	0.016–0.150 per day
Source: Stewart et al., 1997.	

Although the Eastside Reservoir study results are not directly transferable to other reservoirs, the study does focus attention on the problem posed by recreational use, particularly for *Cryptosporidium* treatment. One of the other interesting pieces of information from the study is that children were estimated to contribute a disproportionate amount of pathogens both because of the incidence of infection being higher and because the frequency of accidental fecal releases was judged to be higher (Mic Stewart, MWD, pers. comm.).

Monitoring of coliform levels in Camanche Reservoir and Modesto Reservoir has been conducted respectively by EBMUD and the Modesto Irrigation District. EBMUD monitors Camanche Reservoir for total coliform bacteria near two recreational areas of the lake. When total coliform levels exceed 1,000 MPN/100 mL, EBMUD closes the areas to the public. Some of the monitoring has been done immediately before and after long summer holiday weekends (Memorial Day, July 4th, and Labor Day). Elevated coliform concentrations have been observed on an infrequent basis following holiday weekends (Enos, EBMUD, pers. comm.).

Modesto Reservoir is a relatively small, shallow off-stream reservoir on the Tuolumne River. Modesto Reservoir is essentially a regulating reservoir for Modesto Irrigation District diversions. The water from the reservoir is used both for agricultural irrigation in parts of Stanislaus County and treated for drinking water for the City of Modesto. The reservoir is multi-use; recreational activities include shore camping and day use for water-skiing, jet-skiing, fishing, and swimming.

For the past 2 years, Modesto Irrigation District has conducted monitoring for fecal coliform at recreational use areas on the lake both before and after holiday summer weekends. To date, the sampling results have shown elevated coliform levels following long holiday weekends, with fecal coliform counts as high as 5,000 MPN/100 mL in the reservoir at shallow, day-use areas. Although the intake for the WTP is in fairly shallow water (about 25 feet below the lake surface), high fecal coliform levels have not been seen at the

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intake. Modesto Irrigation District staff believe that the reservoir system is largely a “flow-through” system, with little mixing between the main channel and the shallow near-shore areas. (Ryan, Modesto Irrigation District, pers. comm.).

Impacts of Boat Recreation on Fecal Contamination of Waterbodies

Improper disposal of human waste from boats is a source of contamination for which there is mostly only observational evidence. It is difficult to actually catch someone in the act of dumping as it can be done at night or in a secluded area; and, if a boat dumps while underway, the turbulence of the wake can disguise the act. The San Francisco Estuary Project considered this to be one of the principal concerns in the San Francisco Bay and Delta, and devoted considerable resources to better understanding the problem and to developing public education materials. Information obtained from the Estuary Project is summarized in this paragraph. Within the San Francisco Bay and Delta, some marinas have enclosed, relatively stagnant conditions where it can be visibly apparent that boat owners do not avail themselves of pump-out facilities but rather dump their waste overboard. Marina owners working with the Estuary Project confirmed that, in their opinion, pump-out facilities available at marinas are generally underutilized for the number of boats and boat usage. One of the known studies that supported this concern was conducted at Avalon Harbor on Catalina Island. Fecal coliform levels in the harbor were typically measured at high levels until the harbormaster instituted a requirement that all boats, on entering the harbor, be boarded and have dye tablets put in their holding tanks. The fecal coliform levels were reduced dramatically after this practice was instituted.

Impacts of Boat Recreation on Gasoline Contamination

MTBE is an organic compound that is added to gasoline to promote more complete combustion and reduce exhaust emissions such as carbon dioxide, carbon monoxide, and ozone. MTBE was first added to gasoline in the 1970s. It has been used in gasoline since the early 1990s to meet Federal Clean Air Act requirements for oxygenates. MTBE is currently added to more than 90% of the gasoline in California.

In the past few years, MTBE has been detected in groundwater and surface waters throughout California. MTBE has contaminated groundwater supplies from leaking petroleum storage tanks and pipelines. MTBE has also contaminated surface water supplies from recreational watercraft that use two-stroke engines, from air deposition through precipitation, and from urban runoff.

MTBE is extremely soluble in water, does not adsorb onto soil organic matter, and is more resistant to biodegradation than most other chemical constituents in gasoline. MTBE concentrations can be reduced by dilution, blending, and volatilization. MTBE is relatively difficult to remove from water due to its high solubility but can be removed by air stripping, adsorption treatment, and advanced oxidation. Air stripping can be achieved by packed tower, centrifugal stripper, or spray towers. Adsorption treatment can be achieved by granular-activated carbon (GAC) or synthetic resins. Advanced oxidation can be achieved

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by UV/hydrogen peroxide, UV/ozone, or hydrogen peroxide/ozone treatment. Any treatment required for the removal of MTBE will increase the capital and operation and maintenance costs for a WTP.

Recreational watercraft that use two-stroke engines include some motor boats and nearly all jet-ski and personal use watercraft. These engines are much less fuel efficient and produce much higher levels of emissions than comparable four-stroke engines. They are also known to leak gasoline. Anywhere from 20 to 60% of the exhaust from these watercraft consists of unburned fuel.

Several studies have been and are being performed to evaluate the impact of recreational watercraft activity on MTBE levels in reservoirs and lakes. Water was analyzed from Lake Havasu and Orange County in 1996 after organized jet-ski events were held. The Orange County site showed concentrations of MTBE up to 40 Fg/L for several days after the event, while there were negligible detections of benzene and toluene. The concentrations of MTBE at Lake Havasu were much lower due to the size of the waterbody and potential dilution impacts. Many engine manufacturers are in the process of developing new technologies to reduce pollution.

Monitoring for MTBE on the American River has occurred over the past 2 years. Several agencies have been testing raw and treated American River water from Folsom Lake and the Lower American River below Folsom Lake. MTBE has been monitored by EID (El Dorado Hills WTP), SJWD (Sidney N. Peterson WTP), ACWS, Sacramento (E.A. Fairbairn WTP), and the Ambient Monitoring Program. The Ambient Monitoring Program collects samples on the Lower American River at Nimbus Dam and Discovery Park. From a total of 27 raw water samples collected over the past 2 years on Folsom Lake and the Lower American River, only one sample resulted in a positive detection of MTBE. This sample was collected in late September from the El Dorado Hills WTP raw water intake on Folsom Lake, with a concentration of 0.92 Fg/L. This detection is consistent with most studies that show detection of MTBE near lake surfaces in late summer or early fall as temperature and recreational activities increase and lake levels decrease.

MTBE recently lost the endorsement of Chevron Corporation and Tosco Oil Corporation as a gasoline additive. Tosco Oil Corporation announced in April 1998 plans to phase out the use of MTBE as a gasoline additive. Already, 50 Unocal stations in Contra Costa, Marin, and Sonoma counties are being provided with an ethanol-based gasoline.

Assembly Bill 1642 was approved by the Assembly on May 26, 1998, and is now in the Senate Transportation Committee. This bill has been developed to expand the types of fuel additives that are authorized for use in California. The California Air Resources Board must complete tests by March 1999 to determine whether the current cap on oxygen content is justifiable or whether it may be removed. This bill is backed by water districts, environmentalists, dairy farmers, rice growers, and independent oil marketers.

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Assembly Bill 2349 has been developed to ban after January 1, 2002, the retail sale of new two-stroke marine engines that discharge unburned fuel or oil as a function of their design. The bill proposes to ban the use of two-stroke engines at sites used for drinking water, such as Folsom Lake. The bill will exempt estuaries, bays, and the ocean. The bill will allow the use of newer, cleaner direct-injection two-stroke engines and short-use engines, such as those on sailboats.

The water utility industry in California (including the American River water agencies) is actively engaged in following and commenting on MTBE issues. Because of potential state-wide impacts resulting from MTBE contamination, ACWA adopted an MTBE policy in May 1998 that includes the following objectives:

- support legislation providing funding for research into MTBE treatment, occurrence, health effects, and source protection strategies;
- support efforts to ensure that the costs associated with MTBE contamination are paid by those responsible;
- support efforts to improve monitoring of underground storage tanks, prevent leaks, and accelerate cleanup;
- support state legislation providing flexibility to California to meet air quality goals without the use of oxygenates such as MTBE;
- support federal legislation for better regulation of interstate pipelines to prevent contamination by MTBE and other gas additives.
- support efforts to examine recreational practices on reservoirs and ensure that adequate controls are placed on motorized watercraft and fueling operations that may contribute to surface water contamination;
- engage in efforts to use funding under the 1996 SDWA to help protect water;
- support efforts by industry and regulatory agencies to ensure proper handling, transport, and storage of gas; and
- support legislation requiring state regulatory agencies to identify and evaluate all impacts on the environment, including water resources, that could result from any fuel specification proposed or established by the California Air Resources Board, and disapprove their use if adverse impacts are likely.

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Discussion

Body-contact recreation has a strong potential to contribute pathogens from infected recreationists directly to the river system. The Eastside Reservoir study suggests that under certain conditions, protozoa are of most concern among the pathogens that may create treatment issues at downstream WTPs. The Eastside Reservoir study also suggests that the shedding of viruses by infected individuals was estimated to be much higher than shedding of protozoa; however, viruses were assumed to be inactivated by disinfection processes at the treatment plant.

Coliform monitoring at Modesto Reservoir shows a strong link between high coliform levels and recreational use. At times, the coliform monitoring at Camanche Reservoir also shows this connection. To date based on limited data, the coliform monitoring conducted by EBMUD along the Lower American River does not show a correlation between high coliform levels and high recreational use.

Body-contact recreation is a significant concern throughout the watershed based on the high degree of use and the potential for the contribution of pathogens. The concern increases from upstream to downstream as the level of use increases. Information from the Estuary Project suggests that dumping of wastewater from boats may be common. Because of the potential for wastewater dumping, overnight boating is an issue in Folsom Lake. Presently, no known active management in the watershed addresses the concern over the contribution of pathogens from body-contact recreation except for the City of Sacramento's planned public education campaign.

The difficulties in maintaining patrols and facilities along the American River Parkway is also an issue for water agencies along the Lower American River. The concern is with (1) management of the parkway recreational facilities to insure an adequate number of well maintained restrooms and (2) the homeless people resident in the parkway who have no sanitary facilities in their camps.

Over the past 2 years, several samples have been collected and analyzed for MTBE along the American River system (in Folsom Lake and along the Lower American River). Generally, there does not appear to be much occurrence of MTBE in the American River system. The single sample where MTBE was detected was in Folsom Lake at the end of the recreational season.

As long as MTBE is used in California, it is a potential contamination threat to the American River. If MTBE concentrations in the American River reach levels where removal is required, none of the existing WTPs have adequate treatment facilities to remove the MTBE. Installation of either air stripping facilities, GAC facilities, or advanced oxidation facilities would be required. Based on the data collected to date, the threat appears to be very low; however, additional raw water monitoring at a higher frequency of sample collection (perhaps monthly) that targets recreational and storm events would be necessary to better confirm the presence or absence of MTBE and identify any potential occurrence trends. It is uncertain at

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this time whether MTBE will continue to be used in California; this will probably be determined in the near future by private industry and the legislature.

WASTEWATER CONTAMINANT SOURCES

Human wastewater generated in the American River watershed is disposed of in several different ways:

- The cities of Colfax and Placerville, in the North and South Fork basins, respectively, of the upper watershed, have direct treated effluent discharges to the American River drainage system.
- Several small community systems in the upper watershed discharge to land (i.e., evaporation ponds) or to the subsurface through leachfields.
- Numerous septic tank-leachfield systems for individual dwellings discharge to the subsurface, primarily in the upper watershed.
- In the lower watershed, wastewater is collected and conveyed outside the watershed for treatment and discharge. There is a prohibition, set by the RWQCB, on the discharge of treated domestic wastewater to the Lower American River.

Wastewater is known to contain pathogenic microorganisms (bacteria, viruses, and protozoa)—pathogens that live in the gastrointestinal system of humans and animals and are shed in their feces. Wastewater treatment plants remove and/or inactivate some, though not all, of these pathogenic organisms from the waste stream through various treatment processes. Secondary treatment of domestic sewage has been shown to remove 53–99.99% of enteric viruses, 98–99.99% of salmonella and other pathogenic bacteria, and 45–96.7% of *Giardia* cysts (Yates, 1992).

At this point, a number of studies have looked at *Giardia* and *Cryptosporidium* concentrations in wastewater discharges. **Table 5-6** summarizes information from several studies. Note that the data from wastewater treatment plants are reported as cysts or oocysts per liter, rather than per 100 liters.

Wastewater treatment plant effluent also contains DBP precursor materials. TOC data collected at the Sacramento Regional Wastewater Treatment Plant between 1990 and 1993 showed fairly constant average effluent concentrations at about 12–18 mg/L, with a range from 3 to 42 mg/L TOC (Brown and Caldwell, 1995).

Table 5-6. *Giardia* and *Cryptosporidium* in Raw Sewage Influent and Wastewater Treatment Plant Effluent

Pathogen	Raw Sewage	Treated Wastewater	Reference and Location
<i>Giardia</i> , cysts/L	26–3,033	2–3,511	Roach et al., 1993. Yukon, Canada
	87,120– 161,040	<25–46,680	Crockett et al., 1997. Philadelphia, PA
	--	664	States et al., 1997. Pittsburgh, PA
<i>Cryptosporidium</i> , oocysts/L	0–74	0–333	Roach et al., 1993. Yukon, Canada
	26,400–29,040	33–2,490	Crockett et al., 1997 Philadelphia, PA
	850–5,280	140–3,960	Madore et al., 1987 various locations
	--	924	States et al., 1997. Pittsburg, PA

Direct Discharges

Direct discharges of wastewater are regulated by the RWQCB under the National Pollutant Discharge Elimination System (NPDES) permit system. The discharge is regulated through requirements to meet effluent discharge limits and receiving stream limits. Effluent limitations for the two wastewater discharges in the upper watershed include biochemical oxygen demand, total suspended solids, settleable matter, total coliform levels, and chlorine residual. Receiving streams are monitored upstream and downstream of the discharge for pH, dissolved oxygen, ammonia, temperature, turbidity, and electrical conductivity.

Maps showing the two wastewater discharge locations are in Appendix B.

City of Colfax

The City of Colfax operates a secondary wastewater treatment plant with a treatment capacity design of 0.2 MGD. The treated effluent is discharged to 43 acres through a spray irrigation system. The system's unlined storage reservoir, however, has significant seepage that is collected, disinfected, and discharged to an unnamed tributary of Smuthers Ravine. Smuthers Ravine is tributary to Bunch Creek and the North Fork of the American River. The disinfected seepage is discharged at the rate of approximately 0.07 MGD. The total coliform effluent limit is 23 MPN/100 mL for a 30-day median and 500 MPN/100 mL for a daily maximum. Monitoring data indicate the seepage meets effluent discharge limits with the exception of total coliform levels. At times, total coliform levels have exceeded 2,400 MPN/100 mL.

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Because of non-compliance with the coliform limit, the City of Colfax has been denied permission by the RWQCB to expand its treatment capacity. In addition to high coliform levels in its seep discharge, the City has had problems with infiltration and inflow and with maintaining the spray irrigation system. (NPDES Permit CA0079529, Order No. 950058, and City of Colfax self-monitoring data).

City of Placerville

The City of Placerville's Hangtown Wastewater Treatment Plant is a tertiary treatment plant with a design capacity of 1.6 MGD during dry weather and 5.7 MGD during wet weather. Discharge is to Hangtown Creek, which is tributary to Weber Creek and the South Fork of the American River. Hangtown Creek experiences seasonal low flow conditions. During this period, tertiary treatment is required to meet effluent limits of 2.2 MPN/100 mL total coliform levels and 10 mg/L biochemical oxygen demand. The wastewater collection system has infiltration and inflow problems that can result in excessive inflow during storm conditions. In January 1997, in two separate incidents partially treated effluent was discharged to Hangtown Creek due to the plant's inability to process all the inflow. In February 1998, again in two separate incidents partially treated effluent was discharged. The City of Placerville is currently upgrading the plant to improve the process performance and expand the facility's ability to handle the inflow. (NPDES Permit No. CA0078956, Order No. 94-334, and City of Placerville self-monitoring data).

Non-Discharging Community Systems

A number of non-discharging wastewater systems in the upper watershed (and one in the Folsom Lake basin) treat domestic wastewater from mobile home parks and other small communities. All systems discharging to ponds are regulated by the RWQCB under Waste Discharge Requirement (WDR) Permits. A few of the community systems discharging to leachfield systems (the larger ones) are also regulated by the RWQCB. Smaller community systems discharging to leachfields, however, are under the jurisdiction of the local county Environmental Management Departments as are individual septic tank/leachfield systems. **Table 5-7** lists the small community wastewater systems that are regulated by the RWQCB under the WDR permit system along with their RWQCB classification code. The 1993 ARWSS Report identified and located the small community systems on maps (see Appendix B).

The RWQCB numeric rating system refers to the threat to water quality of the facility. Category 2 is a discharge that could "impair the designated beneficial uses of the receiving water, cause short-term violations of water quality objectives, cause secondary drinking water standards to be violated, or cause a nuisance." Category 3 is the lowest threat to water quality and refers to "discharges of waste which could degrade water quality without violating water quality objectives, or cause a minor impairment of beneficial uses... ." The alphabetical rating system refers to complexity. Category B

Table 5-7. Small Community Wastewater Systems

Facility Name	RWQCB Classification
North and Middle Fork Basin	
NACO West Emigrant Gap (Snowflower Ski) Campground	2/C
Auburn Lake Trails Subdivision	3/B
Gold Run Roadside Rest Stop	3/B
Castle City Mobile Home Park	3/B
Heather Glen Mobile Home Park	3/C
Skyview Terrace Mobile Home Park	2/B
Applegate, Zone 24	3/B
South Fork Basin	
American River Resort (Camp Coloma)	3/C
Growlersburg Conservation Camp	3/B
Cold Springs Mobile Manor	3/B
Rancho Ponderosa	3/C
Camino Heights	3/B
First Assembly of God Church	3/B
Iron Mountain Ski Resort	3/B
Folsom Lake Basin	
Granite Bay State Park	3/C
Source: RWQCB files and Heilman, RWQCB, pers. comm.	

is “any discharger which has physical, chemical, or biological treatment systems, or any Class II or Class III waste management units.” Category C includes “passive treatment and disposal systems such as septic systems with subsurface disposal... .”

RWQCB staff indicate that some problems with some of these systems are associated with maintenance, infiltration and inflow, and capacity. In addition, during this past 1997-1998 El Nino winter, there were some flooding problems. RWQCB staff perceive these small non-discharging systems as an area needing some attention. RWQCB staff hope to first address the flooding issue in part by investigating the status of the systems’ emergency response plans, so that when future heavy storm periods overwhelm a system, the system has a plan to control and engineer a spill to the degree possible. Attention to these systems is a resource issue, both for most of the systems and for RWQCB staff (Croyle, RWQCB, pers. comm.).

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Septic Systems

An effective septic tank and leach field system removes bacteria and other microbiological constituents within 3–6 feet of soil. Failing septic systems, however, can introduce microbiological constituents into the subsurface or surface environment where they can be transported to receiving streams.

The 1993 ARWSS Report noted the potential concern with septic systems in the watershed (particularly in the upper watershed where most of the septic systems can be found). The 1993 ARWSS Report also provided estimates of the numbers of private septic systems in the watershed as follows:

North Fork	7,000–12,000 on private land 11 on Tahoe National Forest land
Middle Fork	4,200–6,200 on private land 42 on Forest Service lands
South Fork	13,000 on private land 950 in El Dorado National Forest
Folsom and Natoma	1,400–2,000 on private land
Lower American	500 on private land

The county environmental health departments regulate individual septic systems on private land through septic tank permits. The three county departments are:

- El Dorado County Department of Environmental Management,
- Placer County Department of Environmental Management, and
- Sacramento County Environmental Management Department.

Septic systems on federal lands are not under the jurisdiction of the counties, but conformance with county standards is practiced nevertheless.

In general, county ordinances specify the separation between the bottom of the system and groundwater, depending on the type of septic system being installed. Various tests (percolation test, soil textural analysis, saturation zone) are required as part of the installation and permitting process, and at least two inspections are conducted before the installed system is approved and permitted. Setbacks from creeks and rivers are 100 feet, and systems may not be installed within river cobble. The number of septic systems is not readily identifiable within a given area. The information is available at each county department but requires a detailed file search to obtain.

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None of the counties run a regular maintenance inspection program due to resource constraints. Knowledge of problem areas and areas where county staff are particularly careful with new installations is based on the experience of field personnel. County staff have identified these areas through various means, including neighbor complaints, calls for help from the septic system owner, property transfer inspections, and house addition inspections. Also, some areas may be perceived to be problem areas based on age, soil type, and development density.

Problem areas and sensitive areas in developed or developing parts of Placer County are identified in the 1992 Placer County General Plan. According to County staff, these areas are still mostly the same problem areas today (Johnson, Placer County Department of Environmental Management, pers. comm.). These areas, within the American River watershed, are:

- Emigrant Gap/Soda Springs area,
- North Fork canyon near Colfax,
- Michigan Bluff,
- Foresthill Divide serpentine belt,
- Northeast Auburn area,
- “Shirland Tract” area,
- Horseshoe Bar/Penryn,
- Ponderosa Way serpentine belt near Weimar, and
- Folsom Lake watershed.

Septic systems are located all along the South Fork of the American River. In many small communities they are immediately adjacent to the river. These communities include Strawberry, Kyburz, Lotus, and Coloma. Other communities are also dependent on septic systems but the systems have been constructed farther from the river, primarily due to the steeper slopes along the river in those portions of the watershed. These communities include Pollock Pines; Swansboro; and parts of Camino, Placerville, and Shingle Springs. Nonetheless, the creek systems that lead to the river can be influenced by septic system failures in these areas. (Lopez-Read, EID, pers. comm.).

The community of Strawberry is in the vicinity of EID’s Strawberry WTP. As shown on the near-intake zone map for the Strawberry WTP, this community primarily consists of houses with individual septic systems. (The Strawberry WTP near-intake zone map is in Appendix F). A review of the coliform data collected at the Strawberry WTP intake shows higher total coliform levels in summer months of May through October than in winter months (see coliform data evaluation in Chapter 4). During summer, the flow in the river is low, reducing available dilution in the river and perhaps highlighting a continuous source of contamination. The Strawberry community septic systems may be the source of the higher summer coliform levels.

Collection Systems

Several collection systems (or portions of collections systems) in the watershed convey wastewater to treatment plants outside the watershed. The 1993 ARWSS Report identified these collection systems. Information on the collection systems is summarized in **Table 5-8**.

Table 5-8. Collection Systems in the Watershed^a

Basin	Collection System
North and Middle Fork	Placer County Sewer Maintenance District No. 1 Sierra Lakes County Water District
South Fork	None identified
Folsom and Lake Natoma	Placer County Sewer Maintenance District No. 2 Placer County Sewer Maintenance District No. 3 City of Folsom ^b Sacramento County Sanitation District ^b
Lower American River	Sacramento County Sanitation District ^b City of Sacramento ^b
^a From 1993 ARWSS Report. ^b Conveyed to Sacramento Regional Wastewater Treatment Plant.	

The EID El Dorado Hills WTP has 19 sewer lift stations located near the treatment plant and intake facility (see the El Dorado Hills WTP near-intake zone map in Appendix F). Any accidental spill or leak from these stations has some potential to contaminate the American River near the EID intake facilities with microbiological organisms.

The Lower American River has 28 sewage pump stations located along the river (see **Plates 1–6** in Appendix F). These facilities have the potential to leak or spill contaminants into the American River that could affect microbiological contamination in downstream intakes.

Discussion

Wastewater, even treated wastewater, contains pathogens. Recently collected data on protozoa concentrations in treated wastewater show a considerable protozoa content in treated wastewater. Therefore, wastewater discharges to the river system are of concern.

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In the upper watershed, there is not a large human population relative to the size of the watershed; therefore, the amount of wastewater generated is also relatively not large. Disposal methods vary and include direct discharge, discharges to ponds, and discharges to the subsurface. Unfortunately, maintenance issues appear to be associated with all the various methods by which wastewater is handled in the upper watershed. These maintenance issues result from a variety of resource problems. Some problems are known to be associated with the two direct discharges and with some of the small community systems. Actual problems with septic systems are difficult to assess, but it may be inferred (from the lack of oversight for systems once they are installed and from the fact that maintenance is the responsibility of individual homeowners who may or may not be knowledgeable about maintaining a septic system) that eventually many systems could experience some degree of failure. Of particular concern is the area above Strawberry because of the proximity of these septic tank systems to the river and to the Strawberry WTP intake facility. The Strawberry raw water data for total coliforms levels from the Strawberry WTP may reflect failing septic systems in the Strawberry community.

In the lower watershed, the majority of the wastewater is collected and conveyed outside the watershed; there are relatively few septic systems and only one small community system (in the Folsom Lake basin). The potential problem in the lower watershed, therefore, is not a chronic problem but the risk of episodic spills from collection systems reaching the river system. Spill notification is discussed in detail in the later section on transportation and pipeline corridors.

INDUSTRIAL FACILITIES

In this section, industrial NPDES dischargers, landfills, Aerojet, and Mather Field are discussed.

Industrial NPDES Dischargers

Three industrial facilities that discharge treated effluent are discussed in this section. A fourth industrial NPDES discharger, Aerojet, is discussed separately.

Camino Lumber Mill

Sierra Pacific Industries operates the Camino Lumber Mill. The mill is an 85-acre site with a paved area of 21 acres devoted to log storage; the logs are stacked and kept wet by a sprinkler system. Excess water from the sprinkler system flows to a wastewater control structure and may be (1) recirculated, (2) discharged untreated, or (3) treated and discharged. Storm runoff that is collected by the drainage system is applied untreated to fields. Recirculated wastewater, which becomes contaminated with tannins and lignins from the logs, is treated using chemical precipitation and sand filtration prior to discharge. Discharge is primarily land disposal, spread on 20 acres of fields covered with native vegetation either through sprinkler application or distribution via a weir system. The only two intake facilities that are not located

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downstream of this discharge are the EID Strawberry WTP intake on the South Fork of the American River and the PCWA intake on the North Fork.

During large storms from December through April, the storm runoff may be discharged to an unnamed tributary of North Canyon Creek, which is a tributary of the South Fork of the American River. Discharges to the tributary are prohibited from May through October and also in October and November following small storms (less than 5.4 inches). Large storm event runoff is first discharged to the designated field disposal area and then travels to the unnamed tributary via overland flow.

Camino Lumber Mill has approached the RWQCB in the past to inquire whether it would be permissible to add an algacide (copper sulfate) to the recirculated water in order to control algal growth that clogs the sprinkler heads. RWQCB staff have insisted that the mill would need to conduct a study of the potential ecological impacts. North Canyon Creek and its tributaries are sensitive waterbodies for rainbow trout and the California Department of Fish and Game (DFG) has expressed concerns with the effect of the Camino Mill discharge on the trout population. RWQCB staff have suggested that the Camino Mill clean the sprinkler heads mechanically on a regular basis.

Effluent limits for this discharge are shown in **Table 5-9**. The effluent consistently meets these limits (Heilman, RWQCB, pers. comm., and Camino Lumber Mill self-monitoring data).

**Table 5-9. Effluent Discharge Limits
for the Camino Lumber Mill**

Constituent	Monthly Average	Daily Maximum
Chemical oxygen demand, mg/L	30	60
Total suspended solids, mg/L	30	60
Settleable solids, mg/L	0.1	0.2
Total dissolved solids, mg/L	300	500
Color, color units	50	100
Total aluminum, mg/L		0.75
Source: NPDES Permit No. CA0078841, Order No. 97-114.		

Discussion. There is no evidence that the Camino Lumber Mill has any impact on the drinking water quality of the American River.

Fish Hatcheries

DFG operates two fish hatcheries along the lower American River just downstream of Nimbus Dam. (See **Plate 5** of the Lower American River near-intake zone maps in Appendix F.) The hatcheries are constructed on a gravel bar, which is made of previously dredged tailings and elevated approximately 30 feet above the river. Approximately 90 MGD of water is used between the two hatcheries. Approximately 40 MGD is used by the American River Trout Hatchery, and approximately 50 MGD is used by the Nimbus Salmon and Steelhead Hatchery. Both hatcheries discharge directly and indirectly, via seepage, to the American River. Intake facilities located downstream of the hatcheries include AWD, CWD, the City of Sacramento E.A. Fairbairn WTP, and the potential Joint Project.

The American River Trout Hatchery consists of 10 parallel concrete-lined rearing ponds. The Nimbus Hatchery consists of six concrete-lined rearing ponds. The hatcheries are shown on **Figure 5-1**. Fingerlings are raised all year long. Approximately 50% of the discharge from the hatcheries is diverted through settling ponds, and 50% is discharged directly to the American River through the raceways. Discharge through the raceways occurs only in fall; the rest of the year, discharge is through the settling ponds. During hatchery cleaning operations, all flow is diverted through the settling ponds. Minor waste streams from the incubator building and the Fish Disease Laboratory are discharged to the ponds. The ponds are constructed in highly permeable gravels that allow the entire flow to be discharged to the river via seepage. Waste from disease experiments is in a closed system, and wastewater is sent to a lined evaporation pond with no discharge to surface or ground waters.

Several chemicals may be added to the water in the hatcheries. Copper sulfate is added in the amount of 4 ounces, six times a year for control of algae. Formalin can be added as a disease control measure for the fish. Other compounds that can be added to the water in the hatcheries include sodium chloride, calcium chloride, potassium permanganate, hydrogen peroxide, or Chloramine-T. On occasion, fish food containing oxytetracycline can be fed to the fish.

Effluent discharge limits for the hatcheries are shown in **Table 5-10**. The effluent consistently meets these limits (Yeadon, RWQCB, pers. comm., and hatcheries self-monitoring data).

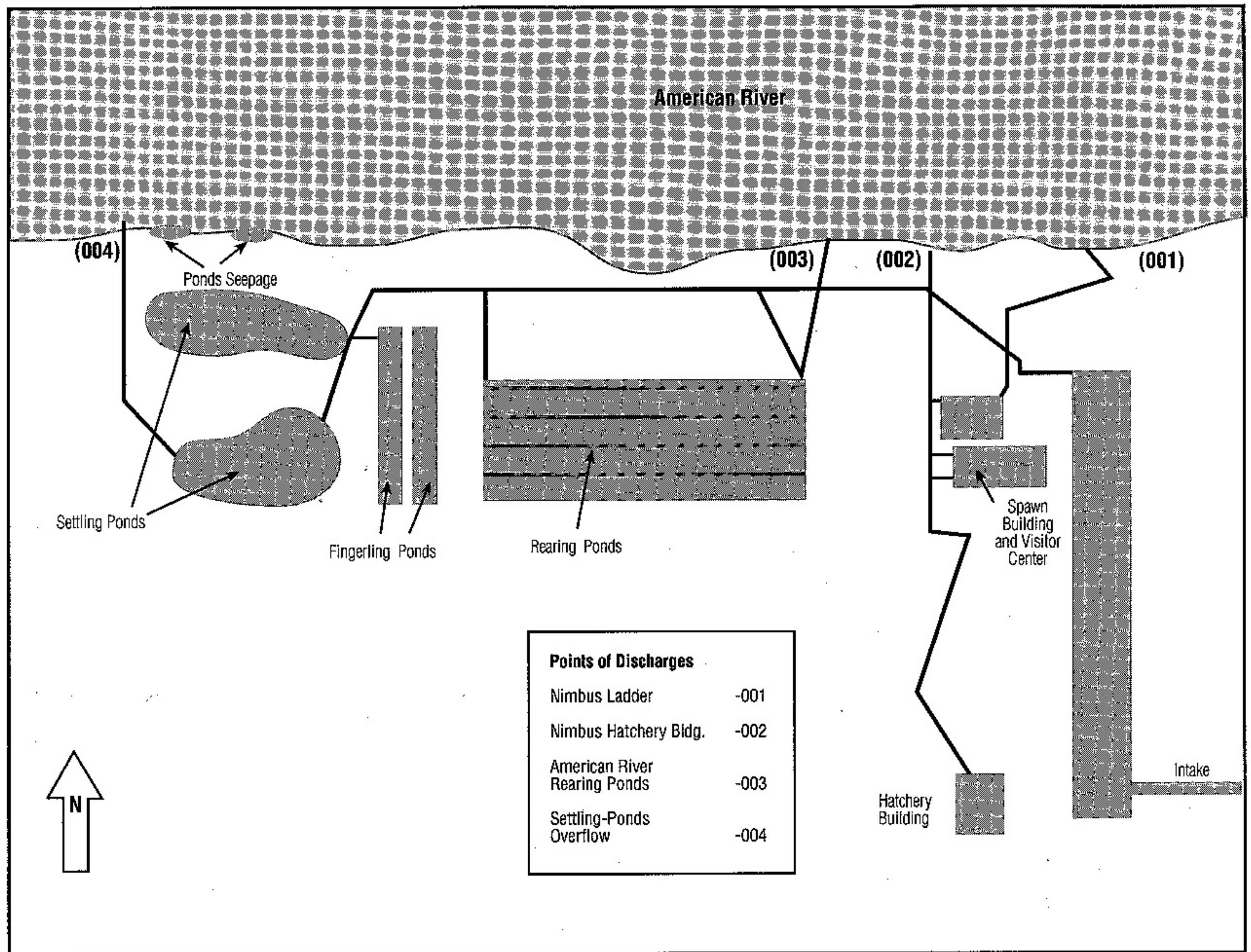


Figure 5-1. Nimbus Steelhead & Salmon Hatchery and American River Trout Hatchery

**Table 5-10. Effluent Discharge Limits for the
Lower American River Fish Hatcheries**

Constituent	30-Day Average	14-Day Average	Daily Maximum	Daily Minimum
Total suspended matter, mg/L	0.5		1.5	
Settleable matter, mg/L	0.1		0.2	
Total dissolved solids, mg/L			125	
Turbidity, NTU			10	
Dissolved oxygen, mg/L				7
Electrical conductivity, Fmhos/cm		100		
Formaldehyde, mg/L			0.03	
Source: NPDES Permit No. CA0004774, Order No. 97-241.				

Discussion. The hatcheries' discharged water usually seeps through a natural gravel filter before entering the river. When discharged directly, the discharge consistently meets its effluent limits. The hatcheries monitoring data and the effluent limits, however, do not include several constituents of concern to drinking water agencies that divert from the Lower American River. It is possible that the hatcheries are responsible for some of the coliform load in the Lower American River. Protozoa may also be discharged, but the hatcheries are probably not contributing protozoa species that are pathogenic to humans. The hatcheries may also be responsible for the discharge of DBP precursor materials, such as TOC, into the Lower American River. Monitoring of the discharge for these parameters is necessary before the significance of the hatcheries can be evaluated.

California Office of State Printing

The Office of State Printing discharges once-through cooling water from air conditioning heat exchanger coils to a storm drain that discharges to the American River about 1 mile west of the Highway 160 Bridge crossing. The Office of State Printing is shown on **Plate 1** of the Lower American River near-intake zone maps in Appendix F. The potential Joint Project is downstream of this discharge. The cooling water, used for the office and warehouse, is from wells located on-site. Water used for the cooling of print machinery is returned to Sacramento's sanitary sewer system. The average flow of the NPDES discharge is 1.02 MGD, with a design flow of 5.1 MGD. The dilution factor in the river at the point of discharge is greater than 100 to 1.

In the past, vinyl chloride has been detected in the well supply and, subsequently, in the cooling tower effluent. A study was conducted to determine whether the printing plant was the original source of the

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groundwater contamination, but the results were inconclusive. The discharger has since eliminated the use of one well, which was the largest source of the vinyl chloride. Since then, no vinyl chloride has been detected in the effluent. Monitoring is conducted of the effluent and in the river upstream and downstream of the discharge for purgeable halocarbons (USEPA 601) and purgeable aromatics (USEPA 602). VOCs have never been detected in the river samples. The only VOC detected in the effluent was the vinyl chloride, which is no longer detected, as described above. Effluent discharge limits are set, not for VOCs, but for temperature and settleable matter, as shown in **Table 5-11**. The effluent consistently meets these limits (Yeadon, RWQCB, pers. comm., and Office of State Printing self-monitoring data).

**Table 5-11. Effluent Discharge Limits
for the Office of State Printing**

Constituent	Daily Maximum
Temperature, Fahrenheit	70
Settleable matter, mg/L	0.1
Source: NPDES Permit No. CA0078875, Order No. 92-118	

Discussion. Past problems with VOCs in the cooling tower supply water being passed through to the river in the effluent appear to have been resolved. There is no evidence that the discharge has any significant impact on the drinking water quality of the river.

Landfills

Landfills generate leachate that is essentially liquid (usually infiltrating rainwater) contaminated from contact with the decomposing landfilled material. Leachate has the potential to migrate to groundwater and then into adjacent surface waters. Principal BMPs to mitigate against the production of leachate include landfill linings (in newer landfills) and capping or covering landfills upon closure. As described earlier in this chapter, the RWQCB regulates landfills under the WDR Program; the RWQCB has oversight responsibilities for monitoring, cleanup, landfill construction and design, and closure measures. The Integrated Waste Management Board writes the Facilities Permit for a landfill and has oversight for types of wastes received, capacity issues, recycling issues, and public nuisance issues.

All of the closed or inactive landfills in the American River watershed were non-hazardous solid waste disposal facilities that accepted inert wastes from residential areas, construction, and/or light industrial waste. Information on these landfills, obtained from RWQCB staff, is summarized in **Table 5-12**. The 28th Street Landfill is discussed separately in more detail because of its size and proximity to the river. The landfill locations are shown on figures in Appendix B.

Table 5-12. Summary of Inactive/Closed Landfills in the Watershed

Landfill		Summary
North and Middle Fork	City of Colfax Solid Waste Disposal Site Received Class II waste	The landfill occupies 3.3 acres. RWQCB staff believe that problems with leachate production have been resolved with the installation of a cover.
	Clipper Creek Landfill Owner is private - Mr. R. D. Sutherland Unclassified - received inert wastes	The landfill occupies 16 acres. RWQCB staff have identified no problems with the site. An approved closure plan is being implemented.
	Foresthill Sanitary Landfill Owned by U.S. Bureau of Land Management Received Class III wastes	The landfill occupies 6 acres. The landfill is currently undergoing closure. Downgradient monitoring wells give some indication of elevated iron concentrations.
Lake Folsom and Natoma Lake	Folsom State Prison Disposal Site Landfill Received Class III wastes	The landfill occupies 1.5 acres. RWQCB staff have identified no problems with the site and have rescinded the WDR permit.
	City of Folsom Corporation Yard Landfill Received Class III wastes	The landfill occupies 4 acres. Downgradient wells give some indication of elevated total dissolved solids concentrations but no other leachate migration effects. Folsom has requested rescission of its WDR permit.
Lower American River	Aerojet	There are three landfills on the Aerojet property: one is closed and two are in the process of closure. Groundwater contamination at Aerojet is discussed separately in the section "Aerojet Superfund Site."
	City of Sacramento 28th Street landfill Received Class III wastes	The landfill occupies 113 acres. See discussion in this section.
Source: Waste Discharge Requirement permits for all the landfills listed above.		

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City of Sacramento 28th Street Landfill

The City of Sacramento owns a 113-acre landfill at the north end of 28th Street that is currently undergoing closure (see landfill location on **Plate 1** of the Lower American River near-intake zone maps in Appendix F). The American River borders the north side of the landfill. The facility, which has about 30 feet of topographic relief above the surrounding area due to landfill construction, has been inactive since reaching its full capacity of about 6 million cubic yards in 1994. The landfill consists of two Class III solid waste units: (1) Waste Management Unit A (Module A) is an unlined 78-acre site and (2) Module B is a newer, clay-lined 35-acre expansion site east of and adjacent to Module A. On the west side of Module A, the smaller Dellar Property is an old landfill site that received city wastes until 1973. The Dellar Property is owned privately and, during its period of use, was operated both privately and by the City of Sacramento.

Groundwater elevations beneath the 28th Street Landfill vary seasonally and correspond to water level changes in the American River. Normally, water level elevations are 5 or more feet below the base of the modules; however, during high river flows, groundwater can rise and inundate Module A and put pressure on the bottom lining of Module B. RWQCB staff have asked for future monitoring reports to identify the periods when the water level has risen above the base of the modules. Groundwater flow direction is generally to the south/southwest away from the river in winter and spring when river levels are high and to the north/northwest toward the river in summer and autumn when river levels are low. (Archibald & Wallberg, 1995a).

Groundwater contamination was first identified beneath the site in 1985, with elevated levels of electrical conductivity, chloride, and VOCs. About 20 monitoring wells have been constructed to determine background conditions and the lateral and vertical extent of contamination. Mitigation measures have included installation of a clay cap to reduce leachate production, extraction of groundwater and leachate with discharge to the sanitary sewer, and installation of a gas extraction and flare system. The clay caps on Module A and Module B are expected to be completed in summer 1998. Groundwater is no longer extracted because the VOC levels became too low to warrant discharge to the sanitary sewer. Leachate is still collected and discharged to the sanitary sewer. The gas extraction and flare system is currently being expanded from 1,500 to 3,500 cubic feet per minute as the preferred treatment technology. Leachate gas is collected in perforated wells and pulled under vacuum to the flare where the gas is burned. VOC levels in groundwater have declined since installation of the gas extraction system. Condensate from the gas extraction system is discharged to the sanitary sewer. RWQCB staff have stated that a Cleanup and Abatement Order will most likely be necessary to allow the city access to the Dellar Property in order to install a clay cap and implement closure measures on the old landfill area west of Module A. The Dellar property is currently in probate and to date the trustees have not allowed access.

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Monitoring data show low levels of VOCs in groundwater both on-site and off-site. Maximum off-site groundwater VOC concentrations in 1996 are shown in **Table 5-13**. As can be seen in Table 5-13, vinyl chloride is the only VOC that has exceeded its MCL in the groundwater.

**Table 5-13. Maximum VOC Concentrations in Off-Site Groundwater
28th Street Landfill, 1996**

Contaminant	MCL	Maximum Off-Site Groundwater Concentration
Cyanide, mg/L	0.2	0.011
Chloroethane, Fg/L	--	0.81
Methylene chloride, Fg/L	5	3.2
1,1-dichloroethane (1,1-DCA), Fg/L	5	0.66
Diethyl ether, Fg/L	--	5.5
Vinyl chloride, Fg/L	0.5	1.1
Chloroform	100 ^a	Trace levels
Trichloroethylene	5	Trace levels

^a As part of total trihalomethanes.
Source: City of Sacramento. September 1997. Semi-Annual Water Quality Monitoring Report for the City of Sacramento 28th Street Sanitary Landfill.

River monitoring by the City of Sacramento in 1985 detected low levels of trichloroethylene (TCE) (between 0.3 and 2.5 Fg/L). No other VOCs have been detected in the river samples, and no TCE has been detected since this initial sampling (Marshall, RWQCB, pers. comm.). The TCE detected in 1985 may have been related to an upstream source of TCE (see discussion of Aerojet) rather than to the landfill.

Discussion

The landfills in the upper watershed are very small, and no significant contamination issues appear to be associated with any of them. The Aerojet landfills are just one of many sources of contamination to the groundwater plume underlying the Aerojet facility. Groundwater contamination from Aerojet past practices is discussed in a separate section.

The 28th Street Landfill is large, immediately adjacent to the American River, and close to the potential Joint Project near the mouth of the American River. The groundwater beneath the landfill has been contaminated with VOCs, clearly the American River is in communication with the groundwater, and periodically the groundwater is in communication with at least one of the landfill modules. Nevertheless, based on annual self-monitoring data, reported to the RWQCB, there is no indication that the contaminated

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groundwater contributes VOCs to the river that measurably affect the drinking water quality of the river. The principal reason is most likely that the American River affords sufficient dilution to reduce any VOC inputs from the groundwater to non-detectable levels. Additionally, active remediation efforts at the landfill have resulted in lowered VOC concentrations in the groundwater.

Aerojet Superfund Site

In the early 1950s, Aerojet General Corporation established a rocket testing and manufacturing facility on 8,500 acres east of the City of Sacramento. At the time, the area was considered remote and unsuitable for development due to land disturbance from prior dredging operations. The Aerojet facility is located about half a mile south of the American River at Nimbus Dam and is bounded on the west by the Folsom South Canal. Major activities at the site have included solid rocket manufacturing and testing, liquid rocket manufacturing and testing, and chemical manufacturing. The Aerojet facility is shown on **Figure 5-2**.

Past activities at the site have resulted in contamination of the underlying groundwater with solvents and other compounds used in rocket manufacture and testing. The level of groundwater contamination is such that the Aerojet facility is a federal Superfund site. Agencies with regulatory oversight for the Aerojet federal Superfund site cleanup include the USEPA, DTSC, and the RWQCB. The DHS stays abreast of developments that have affected drinking water well closures west of the Aerojet site. Eight major contaminated groundwater plumes underlie the Aerojet facility.

The hydrogeology of the underlying aquifers is very complex as the Aerojet facility appears to straddle a regional groundwater divide. In addition, regional groundwater flow direction is influenced by municipal well pumping fields west and north of the facility. Different plumes, therefore, move in different directions.

Two of the plumes that have migrated beyond the Aerojet property boundaries to the north and northwest are of potential concern as contaminant sources to the American River. One of these two plumes has resulted in the shut down of several municipal drinking water supply wells on the leading edge of the plume. Aerojet has installed approximately 1,000 monitoring wells to characterize and track the plumes and currently operates five groundwater extraction and treatment (GET) facilities, with a sixth GET to become operational in 1998. To date, these GETs have extracted about 38 billion gallons of groundwater and removed, through treatment, about 300,000 pounds of the solvent TCE and other VOCs.

Aerojet discharges surface runoff from about 40% of the facility area to one of three waterbodies (or to one of their tributaries): Buffalo Creek, Alder Creek, and Rebel Hill Ditch. The southern part of the facility has no natural drainage (drainage patterns were significantly altered by the previous dredging operations), and runoff on the southern part of the facility accumulates in ponds and puddles and then evaporates and/or percolates. Buffalo Creek is tributary to the American River just east of Sunrise Bridge, and Alder Creek is tributary to Lake Natoma. These two creeks are shown on **Plates 4 and 5**, respectively, of the Lower

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American River near-intake zone maps in Appendix F. Rebel Hill Ditch empties onto land south of the Aerojet property and is not a tributary of the American River.

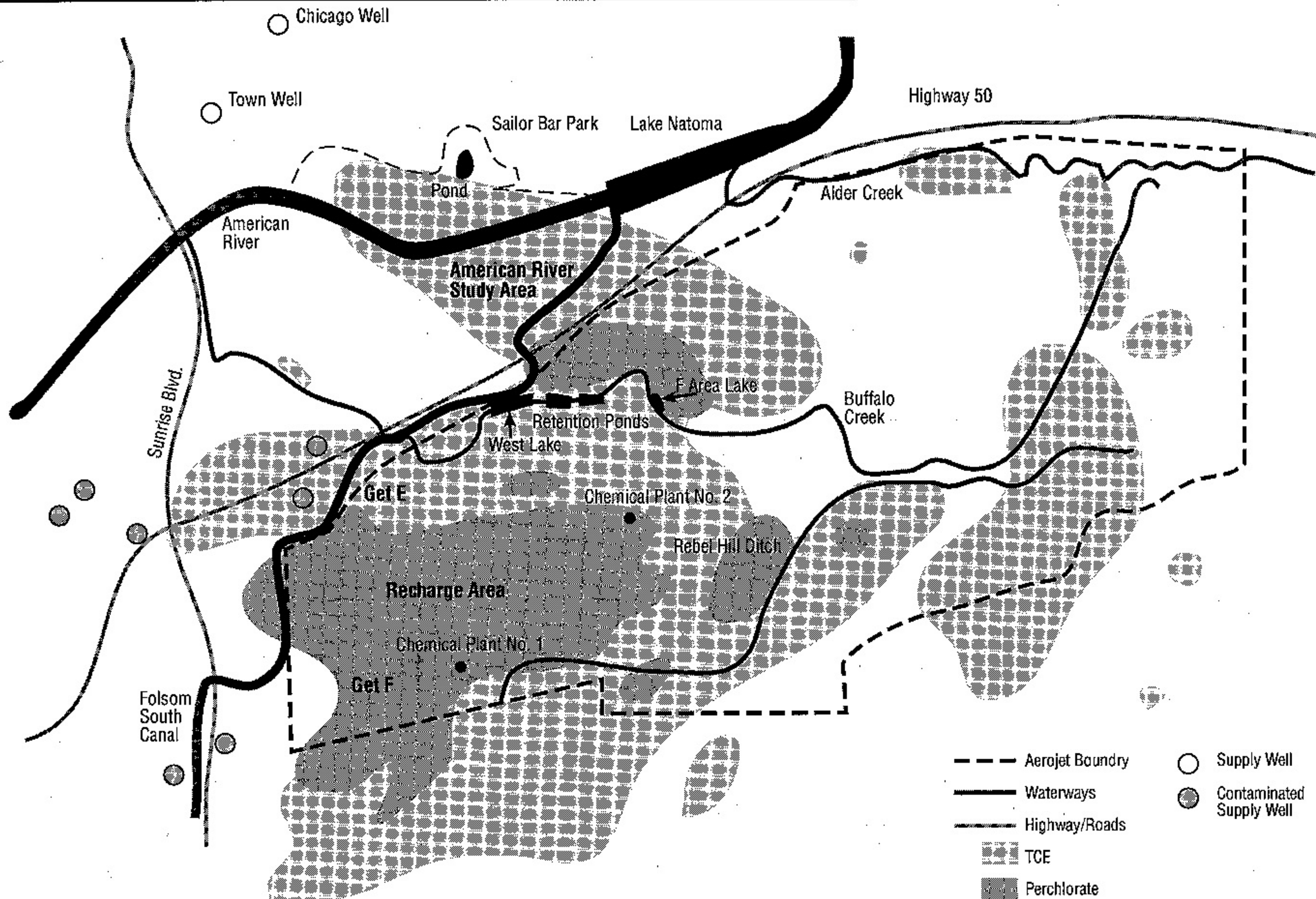


Figure 5-2. Groundwater Plume Map, Aerojet General Corporation

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In addition to storm runoff, Aerojet discharges cooling tower effluent and boiler waste streams to Buffalo and Alder creeks. Also, wastewater generated by rocket testing operations on the east side of the property and containing rocket propellant residues can be discharged to the Buffalo Creek system if the water meets effluent discharge limits. All Aerojet surface stream discharges are regulated under an NPDES Permit. Additional discharges of treated groundwater from the site to Buffalo Creek are currently in the process of being permitted by the RWQCB. (McDonald, RWQCB, pers. comm.; also Aerojet, 1984). Water intake facilities located downstream of Buffalo Creek include AWD, CWD, the City of Sacramento at the E.A. Fairbairn WTP, and the potential Joint Project near the confluence with the Sacramento River.

Groundwater Contamination

About 350 different areas at the Aerojet facility have contributed to the groundwater contamination plumes. These source areas have originated from one of four types of activities.

1. The solid rocket fuel (“propellant”) areas have been a source of solvents. During manufacture and loading of the propellant into motor casings, large quantities of solvents are used to ensure cleanliness and minimize explosion and fire hazard.
2. The liquid rocket fuel manufacture and testing areas have been a source of solvents and n-Nitrosodimethylamine (NDMA). Liquid rocket fuel testing involves metal parts fabrication, which involves the use of cutting oils and solvents. Liquid rocket fuel testing also involves cleaning the test apparatus with solvents directly on the test stand. NDMA is an ingredient of liquid rocket fuel.
3. Two chemical manufacturing plants on-site have been a source of several compounds. The plants produce specialty chemicals used in the manufacture of rocket propellant. Plant No. 1 discharged its waste stream to five evaporation ponds constructed in the native clay. The waste stream from Plant No. 2 was discharged into a deep injection well and intermittently (between 1976 and 1978) to a dredge pit. Today, waste from the chemical plants is pre-treated and discharged to the sanitary sewer.
4. Waste handling activities have been a source of perchlorate. To avoid the hazards of transporting materials with a high fire and explosion hazard, waste from solid rocket fuel testing has been burned on-site in open air pits at very high temperatures (5,000 degrees Fahrenheit). The residue, which contained perchlorate, was landfilled on-site. Other inert materials were also landfilled on-site. Of three landfills, one is closed and the other two are in the process of closure.

Principal Groundwater Constituents of Concern. There are numerous volatile and synthetic organic compounds identified in the groundwater contamination plumes. The principal compounds of concern are described below.

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- TCE, which is a solvent, is a suspected human carcinogen. The MCL for TCE is 5 Fg/L. TCE can be effectively removed through air stripping or GAC treatment.

Air stripping involves pumping the extracted contaminated water through towers that are packed with material designed to provide maximum surface area. Air is forced through the tower in the opposite direction of the water flow, causing the transfer of many VOCs from the aqueous phase to the air phase. The towers are often run in series so the second tower polishes the effluent from the first tower. Air stripping requires evaluation of air emissions controls.

GAC treatment involves passing the extracted contaminated water through carbon filter beds. VOCs are transferred from the aqueous phase to the surface of the carbon through adsorption transfer. This treatment is usually effective for low concentrations of VOCs.

- Perchlorate is part of the ammonium perchlorate compound, a rocket propellant ingredient. Perchlorate is extremely soluble and does not bind to soils. It is only within the past year that laboratories have been able to test for perchlorate at low detection limits. Although health risk data for perchlorate are limited at this time, it appears that perchlorate at high doses can interfere with the thyroid function. There is no existing MCL for perchlorate. The DHS uses a concentration of 18 Fg/L in recommending when to shut off a municipal supply well contaminated with perchlorate.

Perchlorate is not amenable to standard treatment processes. Aerojet has recently developed a biological treatment process for perchlorate. The process involves passing the extracted contaminated water through carbon filter beds that are injected with anaerobic bacteria along with nutrients. The bacteria break down the perchlorate to inert by-products.

- NDMA, a liquid rocket fuel component, is a suspected human carcinogen. There is no existing MCL for NDMA; the USEPA one-in-a-million cancer risk level is 2.2 ng/L. NDMA has a half life of 3–79 hours in the surface aquatic environment; the degradation process is primarily photolytic degradation. NDMA does not air strip or adsorb to GAC but can be removed by UV/oxidation treatment.

UV/oxidation is a two-step treatment process. In the first step, an oxidizer (such as peroxide or ozone) is introduced into the aqueous stream. In the second step, the oxidized stream is exposed to UV energy, which reacts with the oxidizer to produce a radical that breaks down oxidizable contaminants such as NDMA and many VOCs.

- 1,4-dioxane is a suspected carcinogen but is currently not a regulated contaminant. 1,4-dioxane is of concern mostly because air stripping does not remove it; UV/oxidation treatment will remove 1,4-dioxane.

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American River Study Area. The American River Study Area is the name given to the plume that extends north from the Aerojet facility under the American River just west of Lake Natoma. The northernmost part of the plume underlies Sailor Bar Park on the north shore of the American River. Because TCE is the most prevalent chemical in the plume and its distribution encompasses that of the other chemicals, TCE is used as the indicator to define the configuration of the American River Study Area VOC plume. The most common VOCs detected within the plume are TCE (85%), freon-113 (6%), cis,- and/or trans-1,2 dichloroethylene (c/t-1,2-DCE) (4%), 1,1-dichloroethylene (1,1-DCE) (3%), and perchloroethylene (PCE) (1%). Maximum concentrations in the American River Study Area plume and MCLs for these contaminants are shown in **Table 5-14**.

Table 5-14. Maximum Contaminant Concentrations in the American River Study Area Groundwater Plume

Contaminant	MCL, Fg/L	Maximum Detected Concentration, Fg/L
TCE	5	4,000
cis-1,2-DCA	6	220
1,1-DCE	6	110
Perchloroethylene	Not a regulated contaminant	36
Source: Aerojet, 1996.		

Other VOCs that have been detected include 1,4-dioxane, n-butyl-benzene-sulfonamide, and 1-methyl-2-pyrrolidinone, none of which are regulated drinking water contaminants. The compound 1,4-dioxane has been found on the south side of the river only, with a maximum concentration of 29 Fg/L. Perchlorate has also been detected on the south side of the river only, with concentrations ranging from <4 to 150 Fg/L and a median concentration of <4 Fg/L .

Three main aquifers in the American River Study Area (Upper, Middle, and Lower) contain the majority of the chemical mass. The Upper Aquifer is 25–100 feet below ground surface. The Upper Aquifer is both unconfined and semi-confined with groundwater flow direction to the west-northwest. The unconfined to semi-confined nature of this aquifer suggests some hydraulic connection with the American River. The presence of chemical contamination north of the river and the potentiometric surface of the upper aquifer, however, suggest the river is not a significant interceptor of the Upper Aquifer plume or flow direction. Most VOCs have been identified at depths of 50–250 feet below ground surface with the highest concentrations and widest distribution in the underlying Middle Aquifer.

About 160 wells have been installed in the American River Study Area, including monitoring wells, recharge test wells, extraction wells, and water supply wells. The Fair Oaks Water District has two wells at the

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western edge of Sailor Bar Park (Chicago Well and Town Well). To date, no VOCs have been detected in either of these wells.

In 1996, the RWQCB issued a Cleanup and Abatement Order to Aerojet for the American River Study Area. The RWQCB required Aerojet to extract and treat groundwater in the American River Study Area in order to control further migration of the plume and remove chemicals from the groundwater. In response, Aerojet implemented interim treatment. Also, Aerojet is now in the process of finalizing plans for full extraction and treatment, including permitting of the treated groundwater for discharge to Buffalo Creek. The treatment facility will treat 3,500 gpm and is expected to be operational sometime during 1998.

Interim treatment consisted of extraction of 500 gpm of contaminated groundwater, treatment with GAC, and discharge (under an interim NPDES permit) to a small man-made fishing pond in Sailor Bar Park. This interim treatment has occurred for the past 1½ years. The pond overflow discharges to an unnamed tributary of the American River. The Sacramento County Department of Parks and Recreation found that the discharged treated effluent enhanced the quality of the pond, which had previously been fed by urban runoff. The County has asked Aerojet to continue to discharge to the pond. Under the new NPDES permit for the American River Study Area, Aerojet will continue to fill the pond but will use a shallow extraction well with no history of detected VOCs, rather than the GAC treated groundwater. Aerojet will be required to monitor this shallow well monthly for VOCs.

Aerojet evaluated several discharge options during the design of the American River Study Area treatment facilities. The estimated volume of treated groundwater is 3,450 gpm. Three recharge wells were installed at the western edge of Sailor Bar Park to evaluate the potential for recharge of the treated water; recharge, however, was determined not to be a viable option. Available dilution in the American River and Folsom South Canal was also estimated. Under maximum discharge and minimum flow conditions, Aerojet estimated that the American River would provide a 30-fold reduction in the concentration of compounds in the treated groundwater and the Folsom South Canal would provide a two-fold reduction. In addition to offering lower dilution, the U.S. Bureau of Reclamation stated that it would charge a fee for discharge to Folsom South Canal. To date, no discharge to Folsom South Canal has occurred. The selected discharge alternative was to Buffalo Creek and thence to the American River.

Treatment of the American River Study Area will involve extraction of contaminated groundwater on both sides of the river and conveyance via a pipeline system back to Aerojet for treatment. Treatment will include air stripping with part of the extracted water from the plume on the south side of the river undergoing pre-treatment with UV/oxidation for the removal of 1,4-dioxane. The selection of the treatment technology was based on removing those detected chemicals that exceed published drinking water standards. Air stripping will not remove 1,4-dioxane or perchlorate (UV/oxidation will remove 1,4-dioxane). Aerojet has calculated estimated concentrations of 1,4-dioxane and perchlorate in the mixed extracted groundwater and has estimated concentrations of VOCs in the treated groundwater. Aerojet estimates that 1,4-dioxane will be <10 Fg/L in the influent to the treatment system and perchlorate will be

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<5 Fg/L; thus, perchlorate is expected to be reduced to non-detectable levels through dilution. VOCs are expected to be non-detectable in the treated groundwater at a detection limit of 0.5 Fg/L. Effluent limits and MCLs for compounds in the American River Study Area discharge are shown in **Table 5-15**.

**Table 5-15. Aerojet Effluent Limits for American River Study Area
Discharge to Buffalo Creek**

	MCL	Effluent Limit
VOCs, Fg/L		0.5
TCE	5	
Freon-113	Not regulated	
Cis-1,2-DCE	6	
Trans-1,2-DCE	10	
1,1-DCE	6	
PCE	Not regulated	
1,4-dioxane, Fg/L	Not regulated	15 ^a
Perchlorate, Fg/L	Not regulated	18 ^b
^a Proposition 65 limit.		
^b Level recommended by DHS for well closure.		

Required monitoring for VOCs and perchlorate will include the inlet and outlet to the treatment system and monthly monitoring of the American River at two locations (100 feet upstream of the Buffalo Creek confluence and downstream of the Sunrise bridge crossing). The cleanup of the American River Study Area plume is projected to take 20 years.

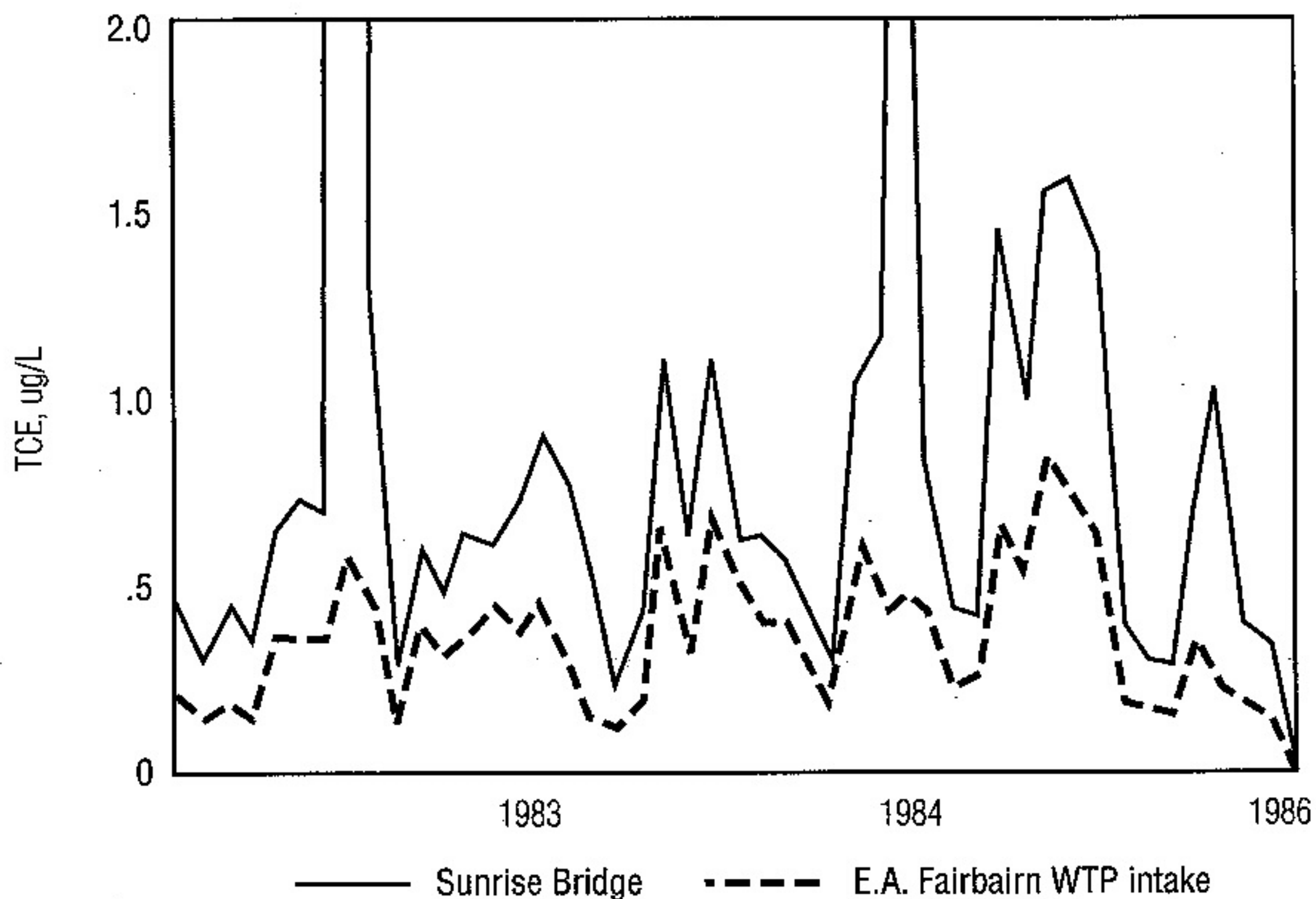
Seepage of Contaminated Groundwater into American River. During the 1980s, TCE was found at detectable concentrations in the American River. TCE has not been detected in the American River since then. The City of Sacramento monitored the river for TCE at the Sunrise Bridge crossing and at the E.A. Fairbairn WTP intake from 1983 to 1987. The detected TCE concentrations and a graph with the TCE concentrations plotted against river flow are shown on **Figure 5-3**. Concentrations were found to be strongly correlated to flow (i.e., high flows diluted the TCE input in a predictable way).

During the period when TCE was detected in the river, the City of Sacramento also found occasional detectable TCE in its treated water at concentrations ranging from <0.1 to 0.60 Fg/L, all below the MCL. The source of the TCE was considered to be groundwater contamination from seeps into the American River across from Sailor Bar Park. The City of Sacramento collected one sample from the seeps in September 1986; the TCE concentration was 3,300 Fg/L.

In addition to monitoring for TCE, the City of Sacramento also monitored PCE at the Sunrise Bridge crossing and at the E.A. Fairbairn WTP intake. PCE concentrations in the American River at Sunrise

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ranged from 0.002 to 0.015 Fg/L. At the E.A. Fairbairn WTP intake, PCE concentrations ranged from <0.001 to 0.005 Fg/L. All PCE concentrations in treated city water were <0.001 Fg/L.



TCE Concentrations in the American River (1983-1986).

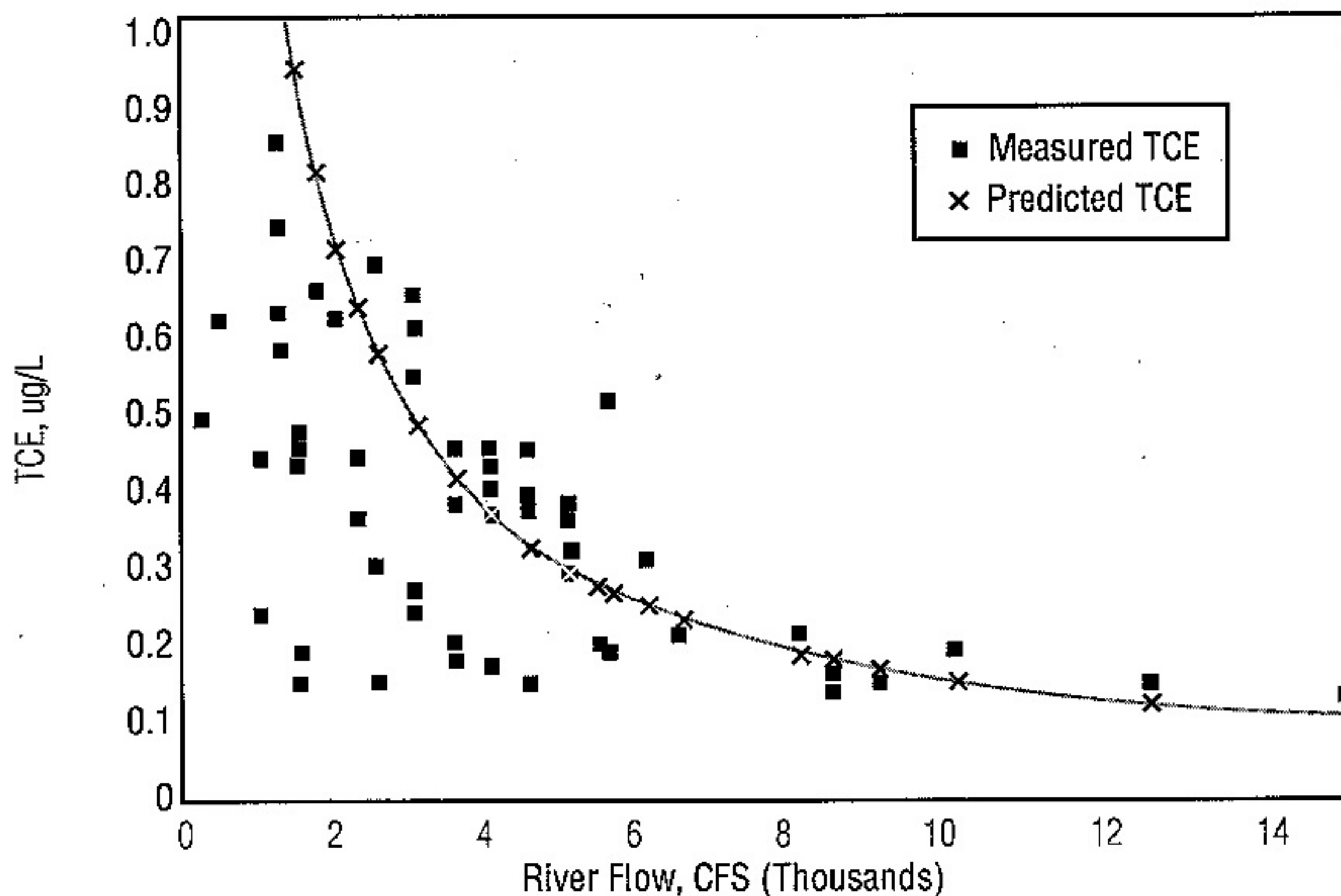


Figure 5-3. Measured and Predicted TCE Concentrations at the E.A. Fairbairn WTP Intake (1983-1986).

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PCE or TCE has not been detected in the American River since the mid-1980s. It appears that the contamination in the groundwater that was communicated to the American River through the seeps has been depleted.

Aerojet monitors the American River downstream of the American River Study Area and also in the vicinity of the E.A. Fairbairn WTP for VOCs during low-flow conditions. Since 1987, VOCs have not been detected at a detection level of 0.5 Fg/L. In 1997, DHS conducted some monitoring of the American River for perchlorate. Samples were collected at the E.A. Fairbairn WTP (four samples) and at the CSUS Aquatic Center (one sample). All results were <4.0 Fg/L for perchlorate.

GET E and GET F Plume. GET E and GET F extract water from a contaminated groundwater plume that has migrated west and southwest from the Aerojet property. Between GET E and GET F, a recharge area receives the effluent from the GET E and GET F treatment systems. The groundwater is treated using air stripping. GET E, which became operational in 1985, extracts and treats about 2.9 MGD, removing about 15 pounds of VOCs per day. GET F, which became operational in 1984, extracts and treats about 2.1 MGD, removing about 48 pounds of VOCs per day. (Aerojet, 1996.)

Five aquifers in the western plume have been contaminated with TCE, 1,2-DCA, perchlorate, and chloroform. The middle aquifer is referred to as the pumped aquifer; however, the GETs affect the other aquifers as well. The plume is separated by the recharge field into two leading edges. The leading edge of the north section appears to be migrating southwest underlying U.S. Highway 50. The leading edge of the south section appears to be migrating southwest in the direction of Mather Field. Although the regional groundwater flow direction is to the west/southwest, flow directions at the leading edge of the plume are also affected by the municipal drinking water well field west of Aerojet. Several municipal drinking water supply wells in the path of the plume have been shut down recently. Their non-operation may affect groundwater flow directions. There is no evidence to suggest this westernmost plume has communication with the American River.

As Aerojet was re-injecting the treated water from the GET facilities, compounds that were not removed by the air stripping treatment process were also being reinjected. Perchlorate and NDMA have been transported, through re-injection, to the deeper aquifers in the re-injected area and have now affected several municipal drinking water supply wells west of Aerojet. This consequence of reinjection was not known until recently when laboratory detection limits for perchlorate and NDMA were lowered. The re-injected perchlorate contamination was discovered in 1997, and the NDMA re-injection contamination was discovered in spring 1998. Six municipal drinking water supply wells have been shut down as a result of the detection of perchlorate at concentrations greater than 18 Fg/L (two Sacramento County wells and four ACWS wells). Two wells have been shut down as a result of detecting NDMA. NDMA is carcinogenic at such low concentrations (the USEPA one-in-a-million cancer risk level is 2.2 ng/L) that if the compound is present in sufficient concentration to be detected, it is present at levels greater than the

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USEPA Human Health criteria. Aerojet is currently developing plans to characterize the extent of the NDMA contamination. (Lancaster, DHS, pers. comm.).

Aerojet has developed a treatment process for perchlorate that is expected to be operational sometime in 1998. The perchlorate treatment system is sized to handle all extracted water from GET E and GET F. Initially, GET F water will be treated for perchlorate. The discovery of NDMA is recent and the extent is currently unknown; treatment plans have not yet been developed. Aerojet would like to install two additional extraction wells in GET E and GET F; however, it does not yet have a system capable of treating all the water that could be generated by additional extraction wells.

Surface Drainage

As mentioned at the beginning of this section, Aerojet discharges surface runoff to one of three waterbodies (or to one of their tributaries): Buffalo Creek, Alder Creek, and Rebel Hill Ditch. Buffalo Creek originates near the eastern edge of the property and traverses the property exiting at its northwest boundary (see Figure 5-2). The previous dredging operations have profoundly altered natural drainage on the site so that Buffalo Creek does not have a well-defined tributary system. Also, Buffalo Creek has been realigned and impounded in three areas: F-Area Lake, the West Lake, and two retention ponds. The creek has been realigned to flow into West Lake or the retention ponds. This regulation of Buffalo Creek provides control on the release of flows exiting the Aerojet property. The last cell of West Lake (there are three cells altogether), which is immediately adjacent to the Folsom South Canal, is kept empty, earmarked for storm runoff flood control. The east retention cell is reserved to contain any spills or handle emergency situations. This retention cell has not been needed much for spill control; Aerojet has been able to contain and control most spills at the source. The northeast corner of the Aerojet property drains to Alder Creek. Buffalo Creek enters the American River at the Sunrise Bridge crossing, and Alder Creek enters Lake Natoma. Rebel Hill Ditch discharges onto land and does not carry surface flow into the American River.

Aerojet discharges surface runoff at 170 discharge locations: 141 discharges to Buffalo Creek, 18 discharges to the Administration Ditch (which is tributary to Buffalo Creek), seven discharges to Alder Creek, and four discharges to Rebel Hill Ditch. The discharges include storm water runoff, cooling tower overflow, and boiler blowdown water. Aerojet operates under a Stormwater Pollution Prevention Plan that identifies and describes BMPs employed to prevent storm runoff pollution.

In addition to storm runoff and cooling tower and boiler blowdown, wastewater treated by neutralization and chemical oxidation is discharged to F-Area Lake. The wastewater is collected as a batch and analyzed for compliance with effluent specifications. It is discharged, depending on the analytical results, to F-Area Lake or to the sanitary sewer, or it is hauled to a Class I disposal site. Estimated average flow of all surface runoff is 35.8 MGD. About 17.4 MGD of this runoff is discharged during storms.

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The wastewater is generated by rocket testing operations on the east side of the property and contains rocket propellant residues. The water is used to cool rocket exhaust deflector plates during test firing and may also have been used to operate propellant vapor scrubbers when tanks were vented and to draw a vacuum on propellant-contaminated components prior to disassembly. The water contains hydrazines, oxides of nitrogen, and NDMA.

Hydrazine (there are three forms of hydrazine) is a strong skin irritant, convulsant, hepatotoxin, and hemolytic agent. There are no water quality criteria for hydrazine. The USEPA suggests using 18 Fg/L as an effluent limit for total hydrazines; and an effluent limit of 2 Fg/L is suggested for methylhydrazine, which is the most toxic form of hydrazine. The current best detection limit for hydrazine is 10 Fg/L, and this is set as the effluent standard for discharge to F-Area Lake. The detection limit for NDMA is 0.15 Fg/L, and this is set as the effluent standard for discharge into F-Area Lake.

The RWQCB has set effluent limits for Aerojet's discharge from West Lake into Buffalo Creek downstream of the lake. Those limits are shown in **Table 5-16**. The effluent limit for NDMA described above is into F-Area Lake only. Aerojet consistently meets its effluent limits.

Table 5-16. Aerojet Effluent Limits for Discharge from West Lake into Buffalo Creek

Constituent	Monthly Average
Chemical oxygen demand, mg/L	20
Total suspended solids, mg/L	80
Total dissolved solids, mg/L	250
Hydrazine, Fg/L	10
Methylhydrazine, Fg/L	10
1,1-Dimethylhydrazine, Fg/L	10
Total hydrazines, Fg/L	10
Hydrogen ion, pH units	6–9 instantaneous
Source: NPDES Permit No CA0004111, Order No 95-259	

Monitoring stations for surface runoff from Aerojet include locations at F-Area Lake, at Buffalo Creek downstream of West Area Lake, and at Alder Creek as it leaves the Aerojet property. F-Area Lake is sampled weekly for those constituents for which effluent limits are set for F-Area Lake, including hydrazines and NDMA. Buffalo Creek is sampled weekly for general water quality parameters, metals, perchlorate, and USEPA Method 624 for VOCs, including TCE. Buffalo Creek is also sampled monthly for USEPA

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Method 625, semi-volatile organics. Alder Creek is sampled quarterly for general water quality parameters and perchlorate; and is sampled twice yearly for metals, USEPA Method 624, USEPA Method 625, hydrazines and NDMA.

Discussion

The American River Study Area groundwater contaminant plume is very large and has high contaminant levels of several regulated drinking water contaminants and additional currently unregulated drinking water contaminants. Part of the plume underlies the river itself, and the contamination in this plume appears to have migrated vertically as well as laterally to the northwest. The contaminated seepage into the American River appears to have been depleted and there is no longer resulting detectable concentrations of TCE or PCE in the river.

The GET E and GET F plumes appear to have no hydraulic communication with the river at this time. These plumes are of concern to the well field west of Aerojet but do not currently pose a water quality concern to the American River. It may be noted that groundwater treatment is important to surface water quality. If left untreated, the groundwater plumes may eventually discharge to the American or Sacramento river systems.

Treated groundwater and process wastewater are discharged into Buffalo Creek, a tributary of the American River. These discharges meet effluent limits that are set, essentially at the detection limit, and in no case do the effluent limits exceed an MCL. Additionally, considerable dilution is available in the river even under low-flow conditions. The primary concerns with these discharges are with (1) unknown contaminants and (2) known contaminants (such as NDMA) that pose health problems at concentrations below the detection limit. The NDMA would most likely be mitigated to some degree in surface water through photolytic degradation. Nevertheless, there is a history at Aerojet of identification of contaminants at potential problem levels (perchlorate and NDMA) as laboratory detection limits have been lowered; other problem contaminants may be identified in the future.

An additional concern is the volume of treated groundwater that will need to be disposed of over time. The groundwater cleanup effort is currently focused on controlling the leading edge of the plumes to prevent further migration. Extraction and treatment of the core plume is to come later. One of the issues that Aerojet will clearly continue to face as cleanup progresses is what to do with the volume of the extracted and treated groundwater. Currently, the options being considered include spray irrigation, reinjection, discharge to Buffalo or Alder Creek, and discharge to Folsom South Canal. RWQCB staff state that much of the water should be reinjected to avoid depleting the groundwater basin. Reinjection has posed problems though, as seen with the perchlorate and NDMA contamination of the GET E and GET F recharge area. Also, the complex array of plumes make reinjection at the upgradient edge of plumes problematic. Discharge to surface waters is a relatively simple, relatively cheap alternative for Aerojet to dispose of the treated groundwater.

Mather Field Superfund Site

Past activities at Mather Field have resulted in contamination of the underlying groundwater with VOCs. The northernmost groundwater plume is about 1 mile south of the Lower American River near Bradshaw Road. Water intake facilities located downstream of this point include AWD, the E.A. Fairbairn WTP intake, and the potential Joint Project. The Mather Field groundwater contamination has affected five municipal drinking water supply wells west of Mather Field and currently threatens one additional municipal drinking water supply well in the same general area. Mather Field is a Superfund site.

Mather Field was an active military air field/air base from 1918 until 1993 when it was decommissioned. Past activities that have resulted in the groundwater contamination problems include fuel storage and use, and disposal of degreasing solvents for vehicles and aircraft maintenance.

There are five plumes of groundwater contamination (see **Figure 5-4**). The combined Main Base/Strategic Air Command (SAC) Plumes are associated with the airstrip, hangar, and equipment maintenance operations. The three other plumes are the Aircraft Control and Warning Plume, which resulted from industrial activity at the radar installation, and the Northeast Plume and Site 7 Plumes, which were associated with landfills and past land disposal practices. There are five closed landfills at Mather Field.

The Main Base/SAC Plumes have migrated about 1 mile to the west/southwest. The outside edge of these plumes is predominately carbon tetrachloride and PCE. Other contaminants that have been detected off base include TCE, chloromethane, and cis-1,2-dichloroethene. The detection limit for most of the VOCs is 0.2 Fg/L. The Main Base/SAC Plumes move about 200–300 feet a year, laterally.

Five municipal drinking water supply wells immediately west of Mather Field have been contaminated by the Main Base/SAC Plumes. These are three Citizens Utility wells (Explorer, Moonbeam, and Mars) and two Sacramento County wells that supplied Juvenile Hall (JH-1 and JH-2). An additional Citizens Utilities well (Oaken Bucket) is in the path of the migrating plume and may be affected in the future. Several individual private wells have also been contaminated by the Main Base/SAC Plumes. Maximum concentrations of carbon tetrachloride and PCE concentrations in four of the five municipal supply wells are shown in **Table 5-17**.

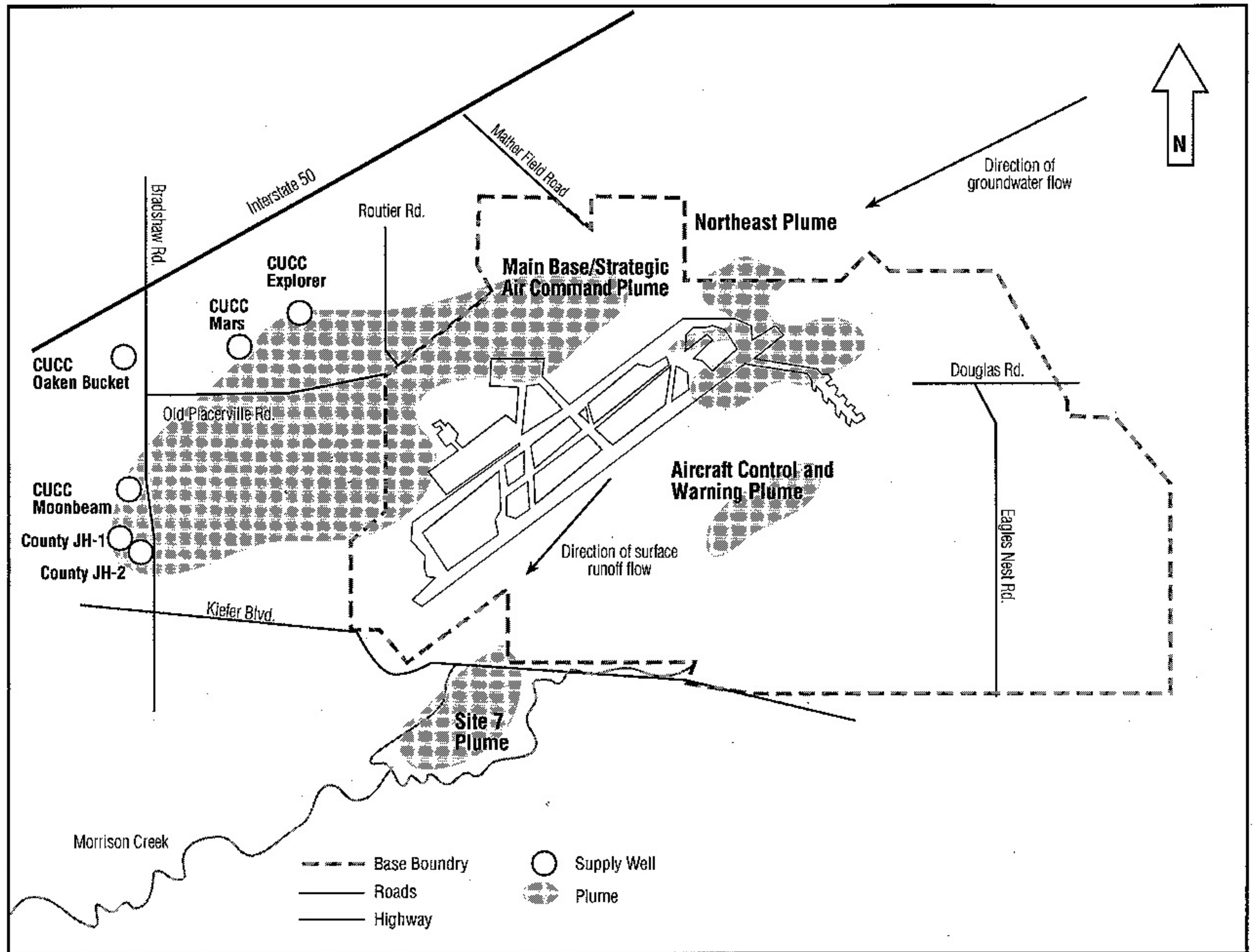


Figure 5-4. Groundwater Plume Map, Mather Field

**Table 5-17. Maximum Carbon Tetrachloride and PCE Concentrations
in Four Municipal Supply Wells West of Mather Field^a**

	Carbon Tetrachloride, Fg/L Maximum Detected	PCE, Fg/L Maximum Detected
MCL	0.5	5
Citizens Utilities - Explorer well shut down September 1994	0.1	0.8
Citizens Utilities - Moonbeam well	0.4	<0.2
Sacramento County - JH-1	0.54	<0.1
Sacramento County - JH-2	0.46	<0.1
^a There are no data for the Mars well as it was shut down. Source: Montgomery Watson, 1998.		

The Air Force has installed GAC treatment systems on the Moonbeam well and the two county wells. The Air Force and Citizens Utilities are currently working out a settlement on the Explorer well. The Mars well was shut down in October 1997; no treatment or settlement has been arranged to date for the Mars well. For the private residences with contaminated wells, the Air Force has paid for connection to the nearest water utility service.

The vertical and lateral extent of the Mather Field groundwater plumes has not yet been fully characterized. The Main Base/SAC Plume has migrated in at least two of the upper aquifers with probable, though unconfirmed, contamination of deeper zones. The surface of the uppermost aquifer is at about 80 feet below ground surface. Regional groundwater flow is to the west/southwest; however, plume migration has also been influenced by the complex pumping depression created by the municipal drinking water supply well field west of the base. The drinking water supply wells in this well field are mostly screened at about 200–300 feet below ground surface (some are screened in more than one zone). The contaminated drinking water supply wells have likely pulled the plume both laterally and vertically, acting as conduits to deeper zones. The Air Force has installed a packer at the Explorer well to minimize downward migration.

Other detected VOCs in groundwater under the base itself include 1,2-dichloropropane, cis-1,2,-dichloroethene, 1,1-dichloroethene, 1,1,1-trichloroethane, 1,4-dichlorobenzene, methylene chloride, chloromethane, vinyl chloride, dichlorodifluoromethane, 1,2-dichloroethane, 1,1,2,2-tetrachloroethane, and TCE. Detected hydrocarbon compounds include total petroleum hydrocarbons (TPH) as diesel, TPH as gasoline, lead (which is associated with the TPH-gasoline), and aromatic

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hydrocarbons (benzene, toluene, xylenes, and ethylbenzene). These other contaminants are not as prevalent as carbon tetrachloride and PCE.

There is no evidence that the Main Base /SAC Plume is in communication with the American River. The plume is about 1 mile south of the river and about 80 feet below ground surface. Monitoring by the City of Sacramento at the E.A. Fairbairn WTP has resulted in no detection of carbon tetrachloride or PCE in the river.

Regulatory Activities and Cleanup Efforts

Mather Field is a federal Superfund site. Characterization and cleanup is being conducted by the responsible party, the Department of the Air Force. Agencies with regulatory oversight responsibilities include USEPA, DTSC, and the RWQCB.

Surface source control has been completed with the cleanup and closure of the five landfills on-site (the landfills have been capped). Plume characterization is still occurring; over 300 monitoring wells have been installed to date, and more monitoring wells are being added.

Groundwater extraction and treatment will be accomplished in several phases. The treatment system (air stripping) for the Main Base/SAC Plumes is expected to be fully operational between 2001 and 2006. Air stripping is expected to treat all the contaminants found to date with the possible exception of gasoline, which is found in some locations. Gasoline is predicted to be below detection limit in the extracted water. Phase 1, which involves extraction and treatment of the Main Base/SAC Plumes' "hot spots" which are on-site, began in April 1998. During startup, the treated water is being discharged to the sanitary sewer. Once the startup procedures are complete and laboratory tests confirm that the treated water is non-detect for VOCs and gasoline, the water will be reinjected on-site. Later phases will expand the Main Base/SAC Plumes extraction and treatment to the portion of the plumes that have migrated off-site. Treatment plans for the other plumes are currently being developed. Cleanup is projected to take as long as 30 years.

The RWQCB and the Air Force disagree concerning the issue of the level of contamination in a drinking water supply well that will determine whether the Air Force will be responsible for replacing the contaminated well. The RWQCB promotes the use of levels lower than the MCLs to trigger installation of an alternate drinking water supply or wellhead treatment. To enforce its position, the RWQCB has drafted a Cleanup and Abatement Order (CAO) that addresses (1) alternate supply replacement, (2) containment of vertical migration, and (3) a long-term monitoring plan. One of the conditions of the CAO is to better determine the influence of the operation of a complex municipal drinking water supply well field and to recommend actions to minimize plume migration. At this point, the RWQCB believes the Air Force is in substantial compliance with the terms of the CAO. (Taylor, RWQCB, pers. comm.; also RWQCB draft CAO).

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Surface Drainage

Several on-site stormwater ditches are contaminated from having received storm runoff from industrial activity areas. These ditches have high levels of PCBs, dioxin, gasoline, organochlorine pesticides, and solvents. Contaminated soil in these ditches is to be scraped out and hauled off to an appropriate landfill. Cleanup of the storm ditches has begun and may be completed in 1998 or 1999, depending on weather conditions. Cleanup of contaminated soils is to include the upper end of Morrison Creek. Discussions are underway between the Air Force and the regulatory oversight agencies concerning how to remove the contaminated soil without damaging the habitat and aquatic life in the creek. Surface runoff from the base is to the west/southwest into Morrison Creek, a tributary of the Sacramento River and, thus, is not within the American River watershed.

Discussion

There is currently no expectation that contaminant concentrations will decrease in the short term; remediation is years away. Although the full lateral and vertical extent of the contamination has not been fully defined, it has been sufficiently defined for RWQCB staff to feel confident that the plume has not communicated with the American River. The surface drainage, although currently contaminated to some degree, has no relevance to the American River as the surface drainage is to Morrison Creek, a tributary of the Sacramento River.

URBAN RUNOFF

Urban land uses contribute a variety of contaminants to runoff. Residential land uses can contribute pesticides, fertilizers, and detergents; road surfaces contribute bacteria, metals, and hydrocarbon compounds; landscaped areas (such as parks and golf courses) can contribute pesticides and fertilizers; industrial land uses can contribute metals and other contaminants specific to the industrial process; and the urban animal population (which includes pets, some livestock, and wild animals such as squirrels and birds) contributes fecal waste that may contain pathogens. In addition to picking up contaminants through sheet flow, urban runoff is also susceptible to contamination from negligent or deliberate dumping of wastes into storm drain inlets.

Because of the high degree of imperviousness, urban areas generate higher volumes of runoff than undeveloped or agricultural lands. Due to the disturbance of the vegetative cover, new developing areas undergoing construction can contribute a higher percentage of sediment than established developments.

Urban runoff is generally channeled into gutters and storm drains, and from there it flows through pipelines or ditches to its point of discharge into a nearby creek or river. Although a few drainage areas have detention basins, where the runoff collects and contaminants may adsorb onto particulate matter and settle before discharge, most runoff is discharged without treatment. Above Lake Natoma, urban runoff drains

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by gravity into the river system. Along the Lower American River, gravity drainage is interspersed with a drainage system where much of the urban runoff is collected in sumps and then pumped over the levee system into the river.

Urban runoff occurs on a year-round basis. It has been estimated that over the course of a year, about an equal load of many contaminants is discharged in dry weather runoff as in wet weather runoff (LWA, 1992). Wet weather runoff results from seasonal winter storms. Dry weather runoff results from activities such as over-irrigation and car washing. Wet weather runoff is of relatively short duration, exceeding the length of the storm by several hours to several days. The highest concentrations of most contaminants occur in wet weather runoff following extended dry periods and during the first few hours of runoff from individual storms due to the accumulation of contaminants during periods of dry weather. Wet weather runoff also can have highly variable contaminant concentrations. Dry weather runoff is generally characterized by a narrower range of contaminant concentrations than wet weather runoff.

Urban areas in the watershed are shown on **Figure 5-5**. Colfax, Foresthill, Georgetown, and parts of Auburn lie in the North and Middle Fork basin. Placerville, Coloma, Cool, and Pollock Pines are urban centers in the South Fork basin. These urban areas occupy a relatively small percent of the upper watershed area. Growth is occurring in the upper watershed at a fairly rapid pace, especially in the foothills, and urban runoff may become more important as a contaminant source in the upper watershed in the future. Parts of El Dorado Hills, Folsom, urban unincorporated Placer County, and urban unincorporated Sacramento County are tributary to Folsom Lake and Lake Natoma. A relatively high percent of the land in the Folsom Lake and Lake Natoma basin is urban. Growth in this area is also occurring at a rapid pace. Much of unincorporated Sacramento County and the City of Sacramento are tributary to the Lower American River. The Lower American River basin is virtually entirely urban with both the piped storm drain system and the small creeks that drain into the Lower American River consisting of urban runoff. Growth is not much of an issue in this basin because the tributary land is almost completely built out. Because the area tributary to the Folsom Lake and Lake Natoma basin and to the Lower American River includes portions of cities and portions of counties, an estimate for the urban population in these two basins is not readily available.

In addition to the major urban areas shown on Figure 5-5, **Plates 1–6** of the Lower American River near-intake zone maps in Appendix F show most of the urban runoff discharge points and urban creek drainage into Lake Natoma and into the Lower American River. As can be seen from these plate figures, there are over 40 urban runoff discharges along the Lower American River. It is not clearly and comprehensively understood whether some portions of the urban area may have better or worse water quality than other areas. Generally, urban runoff water quality is so variable that real distinctions between one discharge and another are not possible without a very large amount of data. Without a clear ability to discern real differences within the urban area, most water agencies are understandably most concerned with the urban runoff discharges closest to their intakes or areas with

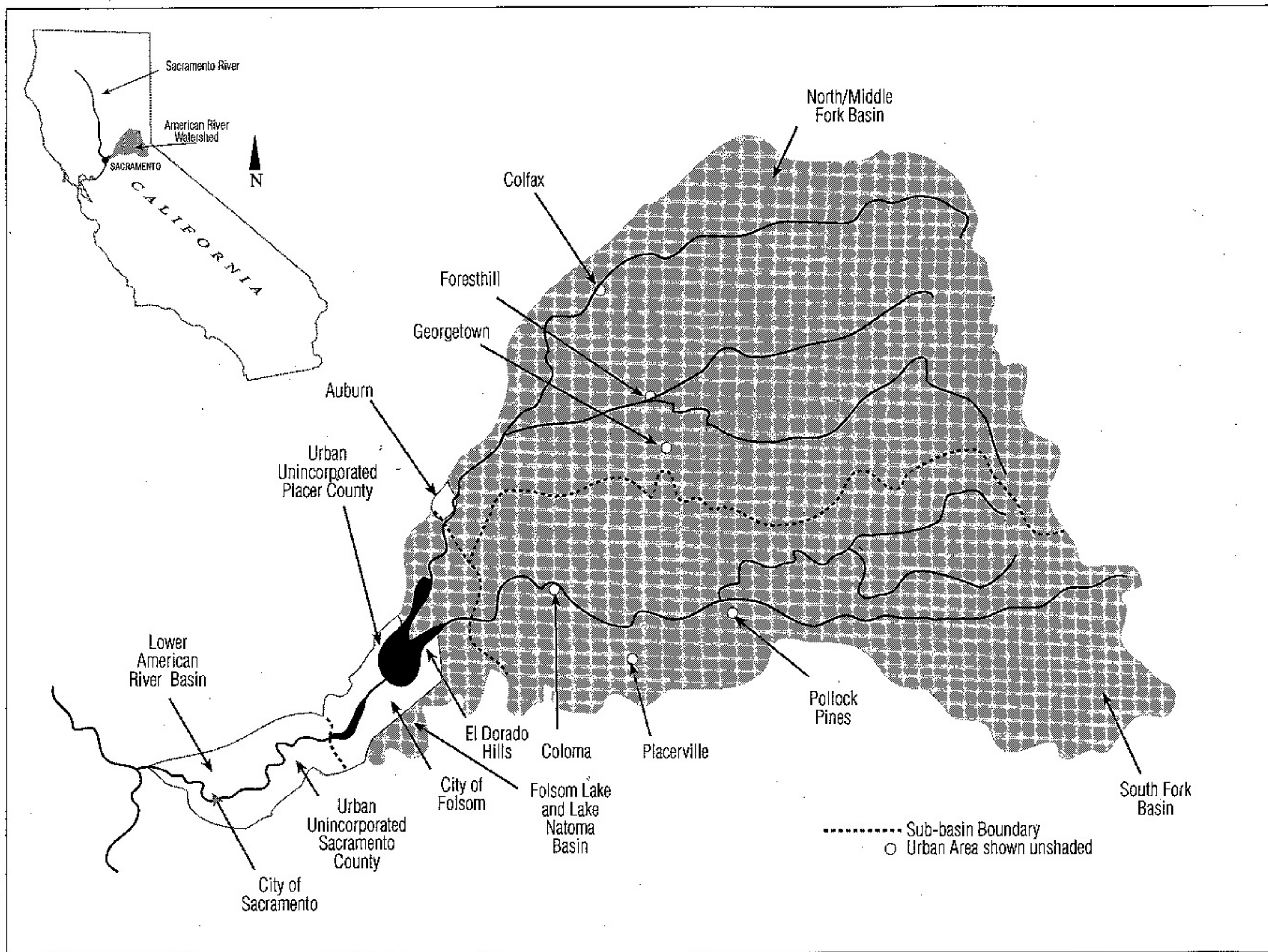


Figure 5-5. Urban Areas in the Watershed

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historical incidents of dumping or other contamination. The CWD is concerned with a lot just upstream of their intake facilities that has historically been used for dumping. The City of Sacramento has been concerned about specific dumping incidents in urban areas close to the E.A. Fairbairn WTP (see **Plates 2 and 3** of the Lower American River near-intake zone maps in Appendix F). The City of Sacramento has previously been concerned about urban drainage from the Orangevale/Fair Oaks area because of a massive pesticide application (most likely malathion) to control beetles in those areas in the early 1980s. This pesticide application, however, occurred 15 to 20 years ago; malathion is not persistent in soil and degrades in water in 1 to 2 weeks. Current monitoring data for the Lower American River (see Chapter 4) shows very few detects of pesticides in the river and no detects of malathion.

Urban runoff is regulated under the NPDES permit program, overseen by the RWQCBs. At this time, under the federal Phase 1 Stormwater regulations, only large municipalities (population greater than 100,000), certain categories of industries, and construction sites greater than 5 acres are under permit. When the Phase 2 regulations are promulgated, it is likely that smaller municipalities and possibly smaller construction sites will also be brought into the permit program. Regulated classes of industries include manufacturers (food, textiles, lumber, paper, chemicals, petroleum, rubber, plastic, metal, stone, clay, glass, machinery, electric, electronic, equipment, instruments, cement, phosphate, asphalt, and fertilizers), confined animal facilities with over 700 animals, printing operations, recyclers, landfills, mining operations, transportation businesses (such as trucking companies), petroleum bulk plants, all NPDES wastewater dischargers, Superfund sites, and steam electric power generation plants.

Municipalities receive individual permits for their discharges. The municipal permits require implementation of a BMP program that addresses new development, construction, industries, municipal good housekeeping practices, control of illicit discharges, and public education. The municipal permittee is also required to conduct monitoring. Unlike wastewater NPDES permittees, stormwater NPDES permittees do not have effluent limits for their discharges. Implementation of an approved BMP program constitutes compliance with the permit. The two principal objectives of the BMPs implemented must be to (1) eliminate non-stormwater discharges into the system and (2) reduce pollutants in urban runoff to the maximum extent practicable. Industries and construction sites must individually apply for coverage under state general permits and are also subject to control programs implemented by a municipal permittee if they are within the jurisdiction of a municipal permittee. The state general permits essentially require implementation of good housekeeping practices and some limited monitoring. The RWQCBs have few resources for oversight of industries and construction sites; in general, industries and construction sites are unlikely to receive much attention unless they are within the jurisdiction of a municipal permittee. The existence of the permitting program, however, provides the necessary process to correct any identified problems. Within the American River watershed, the Sacramento urban area is under permit with the County of Sacramento and the cities of Sacramento, Folsom, and Galt as co-permittees. Thus, most of the urban area within the watershed is under permit. The question of whether implementation of a BMP program results in measurable water quality improvements has, at this time, not been ascertained.

Sacramento Stormwater Management

The Sacramento Stormwater Permittees have implemented several BMPs pursuant to the requirements to address new development, construction, industries, municipal good housekeeping practices, control of illicit discharges, and public education. Some of the BMPs being implemented include installing detention basins and other control measures in new developing areas, inspecting and enforcing compliance with erosion and sediment control ordinances for construction activities, implementing outreach programs for high priority industries, street cleaning, labeling storm drain inlets and responding to reports of illegal dumping, as well as numerous public education efforts. (City of Sacramento, 1998; County of Sacramento, 1998; City of Folsom, 1998; and City of Galt, 1998) Because management efforts to control sediment runoff from construction sites and to address illicit discharges is of particular interest to drinking water quality, these management efforts are described further below.

In addition to implementing these basic BMPs, the Sacramento Stormwater Management Program has identified and prioritized COC for reduction. The top tier of COC includes two organophosphate pesticides (diazinon and chlorpyrifos), fecal coliform levels as an indicator of pathogenic microorganisms, copper, and lead. The second tier of COC includes zinc, cadmium, chromium, and carbaryl. Reduction strategies for the top tier COC are being developed at this time through a process of source identification and BMP selection. The reduction strategy for fecal coliform level is of interest to drinking water quality and so is described further below. Because the Sacramento Stormwater Management Program intends to conduct a periodic (once every 5 years) re-prioritization of its COC, the list of COC (which will be addressed through developing reduction strategies) may change over time. The next re-prioritization effort is scheduled to be conducted in 1999–2000.

In addition to implementing a suite of basic BMPs and developing reduction strategies that target specific COC, the Sacramento Stormwater Management Program has been collecting monitoring data since 1990. Data have been collected on physical and mineral parameters, metals, coliform bacteria, and a variety of organic chemicals. No virus, *Giardia*, or *Cryptosporidium* data have been collected. To date, far more data have been collected on wet weather runoff than on dry weather runoff; additional dry weather data collection was conducted in 1998; however, the data will not be available to include in this report. Data have been collected on the urban runoff discharge, the American and Sacramento rivers, several urban creeks, and on the effectiveness (i.e., removal efficiency) of specific BMPs. Rather than operating an independent river monitoring effort, the Sacramento Stormwater Management Program currently supports the Ambient Monitoring Program for the collection of river data pertinent to its program. The Ambient Monitoring Program data are included with other river data in the water quality evaluation (Chapter 4). The discharge data are summarized in **Table 5-18**. Metals data are not shown except for arsenic. All metals in urban runoff are well below drinking water standards.

Table 5-18. Sacramento Urban Runoff Water Quality

Constituent	MCL	Dry Weather ^a		Wet Weather ^b	
		Range	Median	Range	Median
Microbiological Organisms					
Total coliform, MPN/100 mL	--	>1,600→1,600	>1,600	240–23,000,000	>160,000
Fecal coliform, MPN/100 mL	--	80→1,600	1,600	240–9,000,000	160,000
DBP Precursor Constituents					
TOC, mg/L	--	--	--	2.9–42	8.2
DOC, mg/L	--	--	--	3.5–36	6.3
UV ₂₅₄ , nm (cm-1)	--	--	--	0.070-0.297	0.240
THMFP, Fg/L ^c	--	--	--		
Chloroform				200–840	670
Bromodichloromethane				<5–9	6
Dibromochloromethane				<5–5	<5
Bromoform				<5–5	<5
Organic Constituents ^d					
MTBE, Fg/L ^e	--	--	--	<5.0–47	<5.0
2,4-dinitrotoluene, Fg/L	--	--	--	<0.05–3.7	ND
Polynuclear Aromatic Hydrocarbons					
Benzo(a)pyrene, Fg/L	0.2	<0.0017–0.029	ND	0.072–0.13	ND
Napthalene, Fg/L	--	<0.0054–0.041	0.019	<0.05–0.93	ND
Phenols					
2-methyl phenol, Fg/L	--	--	--	<0.05–0.54	ND
2,4-dinitrophenol, Fg/L	--	--	--	<0.25–3.7	ND
Pentachlorophenol	1	--	--	<0.25–0.57	ND
Pesticides					
Carbaryl, Fg/L	--	--	--	<0.07–0.4	0.07
Carbofuran, Fg/L	18	--	--	<0.07–0.08	ND
Diazinon, Fg/L	--	--	--	<0.05–0.96	0.38
Diuron, Fg/L	--	--	--	<1.2–15	0.8
Prometon, Fg/L	--	--	--	<0.1–0.24	ND
Simazine, Fg/L	4	--	--	<0.5–6.1	0.27
Other Constituents					
Arsenic, mg/L	0.05	<0.001–0.007	0.003	<0.0005–0.0065	0.002
Cyanide, mg/L	0.2	<0.005–0.007	<0.005	<0.003	<0.003
Total suspended solids, mg/L	--	2–300	24	23–1,300	96-100

Source: Brown and Caldwell, 1991 and 1992; Archibald & Wallberg, 1994, 1995, 1996, and 1997.

Note: ND = not detected. For several of the organic constituents, detection levels varied.

^a Dry weather data were collected by the Sacramento Stormwater Monitoring Program in 1990, 1991, and 1992.

^b Wet weather data were collected by the Sacramento Stormwater Monitoring Program in 1993-1994, 1994-1995, 1995-1996, and 1996-1997.

^c Additional data for DBP precursor analyses were collected by DWR in 1993-1994 and 1994-1995 and are included in the table.

^d Numerous different organic contaminant scans have been conducted including USEPA Method 608, 614, 615, 624, 625, 632, 8140, and 8141. Generally, the detection levels for constituents with MCLs, measured in the Stormwater Monitoring Program, have been below drinking water standards. Several additional organic contaminants (including some that are neither regulated nor considered for regulation for drinking water and therefore not shown on the above table) have been detected at varying frequencies, including several phenols, PAHs, phthalates, and pesticides.

^e MTBE data were collected in 1997-1998.

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In the river system, even the maximum concentrations of metals (with a few exceptions) are below their respective MCLs. In addition to the parameters shown below, urban runoff (especially wet weather runoff) carries considerable suspended sediment. Turbidity was measured in the early years of data collection in the early 1990s but is no longer measured.

An examination of the data in Table 5-18 reveals the following:

- The coliform levels are very high, especially in wet weather runoff. It may be noted that the dry weather total coliform data were not analyzed with sufficient dilutions to provide enumeration of coliform levels; therefore, all that is known is that they are greater than 1,600 MPN/100 mL. The high fecal coliform levels are most likely caused by fecal contamination from the urban animal population. These high coliform levels raise concerns about the presence of pathogens.
- All the samples collected for TOC and dissolved organic carbon (DOC) showed concentrations greater than 2 mg/L. 2 mg/L is the TOC concentration that will potentially trigger enhanced coagulation requirements for WTPs as discussed in Appendix D. The median concentrations were high, indicating that urban runoff is a source of TOC and DOC.
- A few samples have been analyzed for ultraviolet absorbance (UV_{254}) (TOC and DOC are routinely analyzed; UV_{254} is not). The UV_{254} data, together with the DOC data, can be used to determine the SUVA of the runoff. The SUVA calculation is UV_{254} divided by DOC and is an indicator of whether the organic carbon present is humic in nature. SUVA concentrations greater than 3 L/mg-m indicate that the organic carbon contains humic materials. These humic materials can contribute to the development of DBPs during water treatment. The average SUVA in Sacramento urban runoff, calculated from the data in Table 5-18, is about 3.8 m-L/mg.
- Only a few of the pesticides and other organic contaminants have MCLs. For those that do have MCLs, the urban runoff discharge is below the MCL, except for simazine which has a maximum detected value of 6.1 Fg/L in Sacramento urban runoff.
- Over the past year, the Sacramento Stormwater Management Program has been monitoring three urban runoff discharges to the American River for MTBE concentrations. Samples were collected on October 9, 1997 and January 29, 1998, during storm events. Of the six samples collected, MTBE was detected in two of the urban runoff samples, at 33 and 47 Fg/L; the median value is a non-detect. These samples indicate that urban runoff is a source for MTBE, most likely derived from fuel spills and leaks contributing to road runoff.
- Several agencies have been testing raw and treated American River water from Folsom Lake and the Lower American River below Folsom Lake. MTBE has been monitored by EID (El Dorado Hills WTP), SJWD (Sidney N. Peterson WTP), ACWS, Sacramento (E.A. Fairbairn WTP), and the

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Ambient Monitoring Program. The Ambient Monitoring Program collects samples on the Lower American River at Nimbus Dam and Discovery Park. A total of 27 raw water samples from Folsom Lake and the Lower American River were collected over the past 2 years, with only one sample resulting in a positive detection of MTBE. This sample was collected in late September from the El Dorado Hills WTP raw water intake on Folsom Lake, with a concentration of 0.92 Fg/L. Samples collected by the Ambient Monitoring Program along the Lower American River during the same storms monitored for Sacramento urban runoff (see above bullet) showed no detectable MTBE.

- Arsenic and cyanide are shown in Table 5-18 as they were Title 22 constituents included in the scope for specific attention (see Chapter 6). Cyanide has not been detected in Sacramento urban runoff. Arsenic has been detected but well below the current MCL.

The Sacramento Stormwater Management Program efforts of most interest to drinking water quality are illicit discharges control activities, the Construction Program Element, and the Coliform/Pathogen Investigation. The illicit discharge activities have as their goal prevention and response to illegal dumping into the storm drain system and elimination of connections such as wastewater cross connections. The Construction Program Element targets sediment and erosion control at construction sites where land disturbance makes the site vulnerable to contributing highly turbid runoff and sediment to the storm drain system. The Coliform/Pathogen Investigation is addressing the microbiological quality of the runoff and identification of potential control measures.

Illicit Discharges Control Activities

Several activities have been conducted regarding the control and minimization of illicit discharges in the Sacramento urban area, including:

- Spill response coordination and training including (1) hotline numbers to provide the general public a simple means to report spill or dumping incidents and (2) improved coordination among different departments with spill response responsibilities.
- Public education, including numerous materials with the “don’t dump” message.
- Stenciling of storm drain inlets that specify that the inlet flows to the river.
- Support of the Sacramento County Household Hazardous Waste Collection Program.
- A series of investigations into whether illicit connections to the sanitary sewer system are particularly prevalent. These investigations were conducted in both the City of Sacramento and the County of Sacramento and included numerous observations, mapping, and sample collection along the storm drain pipeline and ditch system. Both investigations concluded that illicit connections were not a prevalent

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problem. This suggests that there is probably minimal human fecal waste loading to Sacramento urban runoff.

Construction Program Element

The major goal of the Construction Program Element is to control erosion and sediment at construction sites. To accomplish this, erosion and sediment control ordinances have been adopted by the City of Sacramento and the County of Sacramento, and are being developed in Folsom. Implementation of the ordinances has involved training plan check staff and on-site inspectors. In addition to enforcement of these ordinances, the Sacramento Stormwater Management Program has conducted special studies to measure the effectiveness of specific control measures such as inlet filters. To date, the special studies have highlighted the importance of erosion control rather than reliance on measures to mitigate the transport of sediment once it is generated. The Sacramento Stormwater Management Program has also published several brochures and fact sheets on different construction activities as outreach efforts to both contractors and individual residents.

Coliform Investigation

The Sacramento Stormwater Management Program is currently deciding how to address the microbiological quality of their runoff. The Sacramento Stormwater Management Program is concerned both about potential impacts to drinking water use and to recreational users of the river system.

Some of the concerns in dealing with this issue have been:

- whether the coliform data truly indicate the presence of pathogens, and
- whether the sources of the coliform bacteria (and potentially pathogens) are controllable.

To date, the permittees have conducted a literature review to identify information on these subjects, developed an issues paper that includes a list of possible options for better problem identification and for management practices, and conducted a workshop with a panel of invited experts. Based on the results of the illicit connections investigations, the permittees feel comfortable that the sources of fecal contamination to Sacramento urban runoff are primarily animal rather than human. This is pertinent to the selection of potential control measures and is also pertinent in determining the type of pathogens that may be present in urban runoff. Animals may contribute bacteria and protozoa that may be infectious to humans, but viruses are mostly not transmissible from animals to humans. The next steps to be taken include development of a specific approach and workplan.

Caltrans is also planning to further investigate pathogens associated with storm drain discharges. A proposed 3-year study to be conducted in the San Diego area will examine the association of pathogens with urban land use patterns, investigate sources, and recommend control measures.

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Discussion

The coliform levels in the runoff are quite high and suggest the potential for input of pathogens. Along with recreation and other activities along the parkway, urban runoff is the most likely source of pathogens to the lower watershed. Along the Lower American River, some of the highest coliform levels are associated with precipitation. Coliform levels in the river are discussed in Chapter 4.

The TOC, DOC, and UV data collected to date indicate that the runoff is contributing organic carbon and humic acids to the American River. Additional UV data would be helpful to better evaluate the impact of this source and the potential influence on DBP formation.

Few organic contaminants have been detected in the American River. Benzo(a) pyrene was detected once in the American River, during a storm, at a level (2.7 Fg/L) that exceeded the MCL. The USGS NAWQA monitoring program has detected simazine at levels below the MCL in the Lower American River. Of 27 samples, five samples contained detectable simazine with a maximum concentration of 0.032 Fg/L. Diazinon, although it is consistently detected in urban runoff, has not been detected very frequently in the Lower American River. A total of 67 samples were collected along the Lower American River from 1994 through 1997 under the Ambient Monitoring Program and RWQCB monitoring. Diazinon was detected in nine of these samples at low concentrations (2–74 ng/L). There is no current MCL for diazinon although it is on the USEPA's Drinking Water Contaminant Candidate List for future evaluation for regulation. Overall, there appears to be adequate dilution available in the Lower American River so that organic contaminants and pesticides in urban runoff are not of significance to the drinking water quality of the river. This same overall evaluation would be expected to be true of the Folsom Lake and Lake Natoma basins.

Urban runoff appears to be a potentially contributing source of MTBE. Over the past 2 years, however, several samples have been collected and analyzed for MTBE along the American River system (in Folsom Lake and along the Lower American River). Generally, there does not appear to be much occurrence of MTBE in the Lower American River. The single sample where MTBE was detected was in Folsom Lake at the end of the recreational season.

Although turbidity is no longer monitored in the runoff, TSS are monitored and provide an indication of the turbidity of urban runoff. The runoff, especially wet weather runoff, has high levels of suspended sediment. It is not practical or reliable to perform turbidity measurements on the runoff samples since the measurements would need to be performed in the field throughout the runoff event. Also, the runoff is already monitored for TOC and coliform levels, which cover the two major constituents related to turbidity.

The Sacramento Stormwater Management Program intends to develop a comprehensive annual monitoring report in 1998-1999 that should add to our understanding of the impact of urban runoff on the rivers.

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Urban runoff has high levels of coliform bacteria and suspended sediment, and is susceptible to carrying hazardous materials illegally dumped into storm drain inlets. Therefore, urban runoff is a significant concern where the basin is wholly or largely urbanized and where discharges are close to intakes. In the American River watershed, this includes the entire length of the Lower American River and, perhaps to a lesser degree since it is not as urbanized, the Folsom Lake and Lake Natoma basin. The Folsom Lake basin, moreover, is especially vulnerable to being impacted by erosion and sediment from construction sites, partly because of the high level of ongoing development and partly because of the topography.

Most of the urban area in the Folsom Lake basin and all the urban area in the Lake Natoma basin and Lower American River basin is under permit. The Sacramento Stormwater Management Programs have active construction and active illicit discharge programs. In addition, the permittees are evaluating the high coliform levels and considering BMPs to address the controllable portion of fecal contamination of their urban runoff. Construction sites greater than 5 acres that are outside the urban permitted area are subject to the state general permit but may not receive much actual oversight from the RWQCB.

TRANSPORTATION AND PIPELINE CORRIDORS

Multiple transportation and pipeline corridors are located within the American River watershed. The main transportation corridors include Interstates 5 and 80; Capital City Freeway; and Highways 49, 50, 88, 160, and 193. Railroad tracks owned by Union Pacific Railroad traverse the watershed; the major track runs parallel to Interstate 80. Each of the seven refined oil pipelines is less than 12 inches in diameter. There are multiple road, pipeline, and railroad crossings of the American River.

Principal water quality concerns related to transportation corridors and pipelines include road surface runoff that may contain metals, oils, fluids, grease, and other hydrocarbons from general automobile use, and potentially herbicides used in weed control along rights-of-way. However, for drinking water concerns, the continual impacts are not reflected in the source water quality. The greatest threat to water quality, however, is the potential for accidents that may lead to spilled material entering the river system. The impact of an accident is potentially greater when the accident is adjacent to the river. Appropriate reporting and notification procedures for spills are critical to prevent entry of spilled material into the downstream WTPs.

Interstate and Highway Corridors

There are eight major interstate and highway corridors within the watershed. Approximately 195 miles of roadway on these corridors are within the American River watershed, as well as hundreds of miles of additional smaller state and county roads. These major transportation corridors have eight crossings of the American River, as shown in **Table 5-19**.

Table 5-19. Interstate/Highway Corridors^a

Interstate/Highway Corridor	Miles within Watershed	River Crossings
Interstate 5	3	Lower American River - Sacramento
Interstate 80	35	None
Capital City Freeway	5	Lower American River - Sacramento
U.S. Highway 50	75	South Fork American River - Riverton
Highway 49	30	North Fork American River - Auburn South Fork American River - Coloma
Highway 88	16	Silver Fork American River - Kit Carson
Highway 160	3	Lower American River - Sacramento
Highway 193	28	South Fork American River - Kelsey
^a Source: AAA Bay and Mountain Section Map.		

The North Fork system of the American River has a total of five road crossings. The Middle Fork system of the American River has a total of four road crossings. The South Fork system of the American River has a total of 19 road crossings. Folsom Lake has one road crossing at the dam. The Lower American River has a total of nine road crossings, including the new bridge at Folsom. This makes a total of 38 road crossings of the American River system.

Hazardous materials transport is allowed within the watershed on all of the major interstate and highway corridors.

The major concern related to interstate and highway corridors is the potential for vehicle accidents that may lead to a hazardous materials spill. Multiple factors impact the potential for vehicle accidents, including traffic volume, volume of hazardous materials in transit, highway characteristics, and weather conditions. Stringent regulations are applied to the transit of hazardous materials and handling procedures, but there is a large (though unquantified) volume of materials being transported. Also, the volume of traffic continues to increase annually. Interstate 5, U.S. Highway 50, and Interstate 80 are main routes for the transport of many hazardous materials.

Traffic accident rates were obtained from the TASUS Selective Accident Retrieval System maintained by Caltrans. **Table 5-20** presents the total number of accidents and hazardous materials spill information for the major transportation corridors within the American River watershed. A total of eight hazardous materials spills occurred in the watershed during the past 5 years. Two of these spills were located near the Lower American River, but did not cause contamination of the river.

Table 5-20. Caltrans Highway Accident Data^a—January 1, 1993, through December 31, 1997

Roadway	Total Number of Accidents	Total Number of Hazardous Material Spills	Location of Hazardous Material Spills	Hazardous Material Type and Amount
Interstate 5 Richards Blvd. to Garden Highway	162	1	Near the American River Overpass	Diesel - 240 gallons
Highway 49 Mother Lode Drive to Interstate 80	383	1	Placer County	Diesel - Amount Unknown
Highway 50 Stockton Blvd. to Hazel Avenue North Shingle Springs to Twin Bridges	3,853	4	1) Sacramento near Howe Avenue 2) Near Placerville 3) Sacramento County west of Sunrise Blvd. 4) Sacramento County at Stockton Blvd.	1) Gasoline - 8,800 gallons 2) Diesel - 100/150 gallons 3) Diesel - 40/70 gallons 4) Diesel - 30 gallons
Capitol City Freeway B Street to Marconi Avenue	1,426	2	1) Near the American River Overpass 2) Near Highway 50	1) Xylene-Cement Sealing Material - Amount Unknown 2) Diesel - Amount Unknown
Interstate 80 Newcastle to Bowman Lake Road	1,841	0	-	-
Highway 88 Cooks Station to Kirkwood	341	0	-	-
Highway 160 Richards Blvd. to Arden Way	130	0	-	-
Highway 193 Interstate 80 to Highway 50	197	0	-	-
^a Source: Caltrans TASUS Selective Record Retrieval and Hazardous Material Accident Database.				

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In the 1993 ARWSS Report, a risk assessment was performed to determine which reaches of highways presented the greatest risk for contamination to the American River system. Based on this assessment, it was determined that Highway 50 along the South Fork of the American River would present a much greater risk than the other highways. Figures in Appendix B show the high-risk highway corridors.

Caltrans is conducting a two-part study to assess (1) the risk of spills and (2) the feasibility of spill containment. During the first phase, a risk-assessment model will be developed to evaluate spill probability within Caltrans facilities near sensitive waterbodies. In the second phase, Caltrans will evaluate the feasibility of constructing spill containment structures at high-risk locations.

Railroad Corridors

There is one primary railroad corridor within the watershed. A major east/west railroad owned by Union Pacific Railroad running parallel to Interstate 80 from Sacramento east toward Donner Pass. There are two bridge crossings of the American River. Both are owned by Union Pacific Railroad. One crossing is parallel to Highway 160 on the Lower American River in Sacramento, and the other crossing is parallel to the Capital City Freeway on the Lower American River in Sacramento. There are no restrictions as to what materials may be transported on these railroad tracks. Hazardous and radioactive materials may be transported in accordance with federal Department of Transportation guidelines. Radioactive materials (spent fuel rods) from the Concord Naval Weapons Station to the Idaho National Engineering and Environmental Laboratory are transported through Sacramento and cross the Sacramento River upstream of the confluence with the American River on the route to Marysville. This route is not within the American River watershed.

Due to a resource constraint, Union Pacific Railroad was unable to provide any information regarding hazardous materials spills within the American River watershed. No spills were reported by OES.

Recently, the state Public Utilities Commission (PUC) evaluated the safety of the various railroad corridors throughout California. The Union Pacific Railroad corridor near Donner Pass was identified as a “local safety hazard” based on accident history, grade and curvature of the track, and environmental vulnerability. Based on this identification, train crews running this section must undergo special operational training and the PUC must approve any changes to railroad weight limits and train makeup for this section. A July 15, 1998 Sacramento Bee article reported that the railroad companies plan to challenge this state requirement, citing the difficulty of complying with state regulations layered on top of their federal requirements.

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Pipeline Corridors

Since a large portion of the watershed consists of mountainous terrain, there are limited underground pipelines within the American River watershed. There are seven refined oil pipelines (diesel, gasoline, and jet fuel). All of these pipelines are owned by Kinder Morgan (previously Santa Fe Pipeline). There are also small-diameter (less than 12 inches), low-pressure natural gas lines in the Sacramento metropolitan area and other developed communities, but these lines are of less concern since a spill would most likely volatilize and not contaminate the river. Three 8-inch PG&E gas mains cross the Lower American River at the Rainbow Bridge, Sunrise Bridge, and the Highway 160 Bridge, respectively. Wastewater collection pipelines are discussed previously in this chapter in the section on wastewater contaminant sources.

Two major fuel lines (an 8-inch pipe and a 10-inch pipe) are located in an easement parallel to Interstate 80. The pipelines begin in Roseville and follow Interstate 80 east to the Nevada state border. These pipelines do not directly cross the American River. A group of three fuel lines (a 10-inch pipe, a 4-inch pipe and a 3-inch pipe) are located in Bradshaw Road in Sacramento County. These pipelines all cross the American River on Bradshaw Road and then run west on Arden Way. The 10-inch pipeline meets up with Arcade Creek and travels northeast along the creek to the edge of the watershed. This line has been abandoned and is filled with nitrogen to prevent movement of the pipeline and entry of foreign matter. The 4- and 3-inch pipelines are placed in street easements at the edge of the watershed. The 4-inch pipeline contains JP8, jet fuel, and the 3-inch pipeline contains oil. Another 10-inch pipeline travels east/west in Folsom Boulevard.

Kinder Morgan has installed cathodic protection on each of these pipelines. The lines are inspected regularly and are also inspected whenever a problem is detected or construction occurs near the pipelines. The California State Fire Marshal inspects the pipelines at least once every 2–3 years, depending on resources. Kinder Morgan monitors the pipelines for spills by checking for pressure changes along the pipeline and also by comparing flow in and flow out. If these show discontinuities, the line is inspected. Although the lines are monitored, there is still the chance of an unknown leak, such as occurred near Donner Lake in March 1997. A skier in the area reported a petroleum odor, and Nevada County and DFG staff responded and discovered a thin crack in a pipeline that leaked diesel fuel to nearby Summit Creek, a tributary of Donner Lake.

Hazardous Material Spill Notification and Reporting

When a hazardous material spill or leak of a reportable quantity occurs, notification of emergency response agencies is required by state and federal law. A hazardous material spill or leak could occur as the result of a vehicular traffic accident, railroad accident, pipeline leak or spill, or wastewater treatment plant spill.

A sewage spill is required to be reported if 1,000 gallons or more are released. An oil or petroleum product spill is required to be reported if 42 gallons or more are released. Any other hazardous material

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spill is required to be reported if there is a reasonable belief that the release poses significant present or potential hazard to human health and safety, property, or the environment.

When a hazardous material spill or leak occurs, it is the owner's or operator's responsibility to notify the Local Administering Agency (LAA) or Certified Unified Program Agencies (CUPAs) and OES. Often notification is first made to 9-1-1 which then notifies the next appropriate agency, such as the California Highway Patrol (CHP) or the local fire department.

The OES Warning Center is a clearinghouse for all emergency notifications. The OES is responsible for general planning, notification, and coordination in response to hazardous material incidents. The OES is not responsible for direct notification to WTPs. OES maintains a database, the California Hazardous Materials Incident Reporting System (CHMIRS), that records all commercial, industrial, and residential hazardous materials spills reported. California adopted a Standardized Emergency Management System (SEMS) in 1996. The purpose of this program is to manage response to a multi-agency or multi-jurisdictional emergency. SEMS unifies all levels of response—state, regional, operational, local, and field—into a single integral system. The program functions to manage, operate, plan logistics, and track costs of emergencies. Local governments implement SEMS in order to recover costs associated with the emergency.

If the spill has occurred on a state highway, the CHP will take the lead as Incident Commander. Caltrans is authorized to direct the method of abatement of the hazardous material. This may be performed by Caltrans or a private contractor. As Incident Commander, the CHP determines which other agencies will be notified. OES is always notified of any hazardous material spill. If a waterway is impacted, the DFG and RWQCB are notified. OES staff have previously stated that they expect the RWQCB to notify DHS and for DHS to then notify local water agencies that may be affected. DHS staff, however, also have stated that they are unaware of this as an official role and that, in any event, they do not staff their phone lines except during regular business hours. Proposition 65 requires that county health officers and board of supervisors be notified if the health, safety, property, or environment in the county is threatened.

If a spill has occurred on other than a state highway, the LAA or CUPA with jurisdiction is responsible. Within the American River watershed five LAAs/CUPAs have jurisdiction, including:

- Alpine County Health Department,
- Amador County Environmental Health,
- El Dorado County Environmental Health,
- Placer County Environmental Health, and
- Sacramento County Environmental Health.

When a hazardous material spill occurs on a railroad, reporting is required for spills of 42 gallons or more. Union Pacific Railroad has developed Instructions for Handling Hazardous Materials, Spill Prevention

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Control and Countermeasures Policy and Guidelines, and Locomotive Fuel Leaks and Spills Policy and Guidelines. Union Pacific Railroad has an Environmental Management Group that is to be notified and involved in any spills or leaks. It is expected that the LAA or CUPA will provide assistance to abate the spill as necessary.

OES maintains an emergency plan for guiding and managing emergency response activities in the state. OES is also responsible for the management of the California Hazardous Substances Incident Response Training and Education Program, which provides standardized training and education programs for LAAs and CUPAs. The CHP has developed an Emergency Incident Management Planning and Operations Manual for dealing with hazardous material spills. Caltrans has developed a Hazardous Material Spill Contingency Plan. Each of the LAAs or CUPAs have developed emergency response plans that identify the specific notification procedures, coordination procedures, and response procedures.

In 1994 the PUC developed a program called the Railroad Accident Prevention and Incident Deployment (RAPID). RAPID was formed in response to the devastating effects of the 1991 Dunsmuir railroad accident north of Lake Shasta. The Dunsmuir spill released nearly 20,000 gallons of a soil sterilant into the river. The purpose of RAPID is to develop a state-wide response to large hazardous materials incidents and to help local agencies to respond. This program covers all means of surface transportation of hazardous materials, including roads and railroads. The DTSC implements the program. In an annual event, a hazardous material spill is simulated to practice coordination and response. The RAPID program is notified of all reported railroad hazardous material spills, but responds only when requested by the LAA or CUPA.

Among the agencies participating in this study, PCWA will be notified directly by the Placer County CUPA in the event that an inland waterway or waterbody is affected by a hazardous material spill in Placer County. The City of Sacramento has obtained agreement for direct notification from the Placer County, Sacramento County, and the City of Sacramento CUPAs and LAAs, and for direct notification of the wastewater treatment and collection facilities downstream of Folsom Lake. The City of Sacramento has requested notification in the event a spill enters a waterbody or threatens to enter a waterbody. For all the other participating agencies, when a hazardous material spill threatens a waterbody, it is expected that the RWQCB will notify the DHS, which then will directly notify the water agencies, as mentioned previously. Emergency contacts for several of the participating water agencies are shown in **Appendix G**.

Discussion

Of particular concern is the potential for high-level contamination from a leak or spill along a transportation corridor. Over the past 5 years, eight hazardous material spills have occurred on major roadways within the watershed. No reported spills have been associated with the railroad or pipeline facilities. However, railroad spills (Dunsmuir) and pipeline spills (Donner Lake) in other areas have resulted in significant contamination of water supplies. Three of the hazardous material spills occurred near river crossings but

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did not reach the river system. Only eight of the 38 road crossings of the American River system occur on major roads, but accidents may occur on any crossing.

In the event of a leak or spill, the notification and response procedures are critical in ensuring that the water agencies are provided with sufficient time and information to understand how to mitigate potential treatment concerns. Currently, only PCWA and the City of Sacramento are provided direct notification by upstream CUPAs of a hazardous material spill that may impact a waterbody. The City of Sacramento has obtained agreement to receive direct notification from Placer County, Sacramento County, the City of Sacramento, and the wastewater treatment collection facilities downstream of Folsom Lake. PCWA will receive direct notification from Placer County. The other water utilities are to be notified by DHS; however, this appears to be an unreliable procedure.

OVERALL SUMMARY

Land use, activities, and discharges close to a WTP intake facility are of particular concern because of the short travel time and less dilution than for contaminant sources farther upstream. This consideration is incorporated into this 1998 Update both (1) as a near-intake zone mapping effort and (2) as one of the criteria used to judge the significance of the contaminant sources to each of the individual participating agencies.

Initially, near-intake zones for the participating agencies were determined based roughly on river travel time; however, this method did not yield zones that were of real interest to each of the agencies. Therefore, each agency delineated its own near-intake zone based on the agency's judgment concerning the area upstream of its intake facility of particular interest to the agency. The near-intake zones are listed below.

- PCWA - the near-intake zone includes the intake canal and tunnel and the American River from PCWA's intake upstream to Lake Clementine on the North Fork and to Mammoth Bar on the Middle Fork. The intake canal and tunnel were addressed by PCWA in a separate sanitary survey and are not discussed further here.
- EID Strawberry WTP - the near-intake zone extends upstream from the intake facility through the community of Strawberry on the South Fork.
- EID EL Dorado Hills WTP - the near-intake zone extends upstream from the intake facility to Salmon Falls Bridge on the South Fork.
- Folsom, Roseville, SJWD, and FSP - the near-intake zone consists of the Folsom Lake area.
- ACWS - the near-intake zone consists of the Folsom South Canal upstream of the intake facility and Lake Natoma.

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- AWD, CWD, the City of Sacramento E.A. Fairbairn WTP, and the potential Joint Project - the near-intake zone consists of the Lower American River upstream of each intake facility and Lake Natoma.

For this study, activities, discharges, and facilities were identified and displayed on large-scale maps. Many of the activities, discharges, and facilities are discussed in the previous sections on contaminant sources. The maps showing these features within the near-intake zones are in Appendix F.

The project team spent considerable time discussing which contaminant sources were of most concern, including discussions on which criteria to use in making these judgments. The criteria used include:

- proximity of the source to the agency's intake facility,
- relative magnitude of the source (i.e., size, amount of discharge if applicable, and historical record of any problems),
- whether the contaminant source contributes a contaminant that is addressed under drinking watershed regulations, and
- whether the contaminant source contributes a contaminant that may pose challenges at the WTP.

Essentially, all the agencies share a concern regarding the potential for hazardous materials spills or wastewater spills, the potential impact from the high recreational use of the river system, and the effect of major storms on river water quality. Certain groups of agencies also have common interests. The agencies that divert water from Folsom Lake are especially interested in the recreational use of Folsom Lake. The agencies that divert water from the Lower American River have common concerns about recreational use along the American River Parkway, urban runoff discharges, and the potential for increasing future discharges from Aerojet to the Lower American River system.

Contaminant sources examined for this update which, based on the information currently available, do not appear to be of much concern to any agency include most of the industrial facilities: the Camino Lumber Mill, the Office of State Printing, the few landfills, and Mather Field.

Among the contaminant sources addressed in this update, the potential effect of failing septic systems was most difficult to evaluate due to a lack of data. The fish hatcheries on the Lower American River were also difficult to evaluate, also due to a lack of data. Although the hatcheries are unlikely to contribute pathogen species of concern to humans, they may be a part of the explanation for the higher coliform levels along the Lower American River.

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Table 5-21 lists the contaminant sources of concern to each agency. The remainder of this section expands on this with a discussion (in the same order as throughout this chapter) for each of the participating agencies. Table 5-21 summarizes the results of an exercise conducted by the TC in classifying the contaminant sources according to different concerns for each contaminant source for each participating agency. Details on this TC exercise are in a table contained in **Appendix H**. Essentially, contaminant sources classified by the TC as being of medium significance, and some sources which were either un-ranked or of an episodic (spill) nature, are shown in Table 5-21.

Table 5-21. Contaminant Sources of Concern

	P C W A	E I D S R	E I D D H	F S P	City of Fol- som	City of Rose- ville	S J W D	A C W S	C W D	A W D	City of Sac	EB M U D
1. Major storms	T		T	T	T	T	T	T	T	T	T	T
2. Body-contact recreation	T		T	T	T	T	T		T	T	T	T
3. Boating and boat camping/houseboating			T	T	T	T						T
4. Septic systems		T										
5. Potential for future Aerojet discharges								T	T	T	T	T
6. Urban runoff								T	T	T	T	T
7. Potential for spills	T	T	T	T	T	T	T	T	T	T	T	T

Placer County Water Agency

Near-Intake Zone

Activities within the near-intake zone include recreation and three bridge crossings. Recreational activities and facilities include use of Lake Clementine; on-shore recreational activities within the Auburn State Recreation Area (including the Mammoth Bar Off-highway Vehicle Area and the Auburn Equestrian Staging Area); and in-river recreation activities, including swimming, rafting, kayaking, fishing, and gold panning. Although dredging is not allowed within the Auburn State Recreation Area, PCWA staff have occasionally seen dredging operations. The bridge crossings are on Foresthill Road, Old Foresthill Road, and Highway 49. See PCWA near-intake zone maps in Appendix F.

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Three contaminant sources of most concern upstream of PCWA's intake location on the American River include the effect of major storms, body-contact recreation in the river, and potential for spills.

- **Major Storms.** Storm runoff contributes to high turbidity levels in the source water and also carries fecal material shed by wild and domestic animals into the river system. Storms are unpredictable and are not controllable. Better management of two of the major sources of sediment (timber harvesting and fires) are being addressed in Placer County through the American River CRMP (of which PCWA is a member). Better management of livestock is an area of active research and investigation state-wide, principally through work sponsored by the U.C. Cooperative Extension. The Cattlemen's Association assisted by the U.C. Cooperative Extension is now sponsoring workshops to assist private ranchers in better land management; cattle are the principal livestock species in the American River watershed. As the U.C. work progresses, management activities promoted by other livestock organizations may be developed.
- **Body-Contact Recreation.** There is considerable use of the North and Middle forks for body-contact recreation, including rafting as well as recreational facilities on Lake Clementine. Body-contact recreation, although clearly a source of pathogens, is a beneficial use of the American River system; any restriction of use is extremely unlikely. Public education about responsible use might, over the long term, mitigate recreational impacts.
- **Spills.** The potential for spills of hazardous materials exists throughout the watershed. Upstream of PCWA's intake location there are highway corridors, a major railroad route, and pipelines. In addition, a potential spill from the Colfax wastewater treatment system upstream is of concern. In the event of a spill, it is important that PCWA receives timely notification. PCWA has notification procedures in place in the event a significant spill occurs in Placer County but they do not have notification procedures in place for a spill in El Dorado County.

There is one bridge crossing of the PCWA near-intake zone canal—the Lozanos Road bridge. The surrounding area is predominantly cattle grazing. This area is slated for residential development at which time drainage issues will be addressed by the developer. Pesticide use along the canal is discussed in Chapter 6.

El Dorado Irrigation District

Near-Intake Zone - Strawberry Water Treatment Plant

Contaminant sources within the Strawberry WTP near-intake zone include the proximity to U.S. Highway 50 with the potential for hazardous materials spills resulting from a traffic accident, recreational activities (camping, hiking, and fishing), private domestic septic systems (the entire community of Strawberry), and illegal dumping. See the Strawberry WTP near-intake zone map in Appendix F.

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Near-Intake Zone - El Dorado Hills Water Treatment Plant

Contaminant sources within the El Dorado Hills WTP near-intake zone are the proximity to recreational trails (horseback riding and hiking), 19 nearby sewer lift stations, the Salmon Falls Road bridge crossing, and illegal dumping. See the El Dorado Hills WTP near-intake zone map in Appendix F.

Four contaminant sources are of greatest concern for EID: the effect of major storms; body-contact recreation in the South Fork and the Folsom Lake; boating on Folsom Lake; and the potential for spills, including spills in the wastewater collection system near the El Dorado Hills WTP.

- **Major Storms.** Storm runoff contributes to high turbidity levels in the source water and also carries fecal material shed by wild and domestic animals into the river system. Storms are unpredictable and are not controllable. The activities of the American River CRMP in promoting better management of two of the major sources of sediment (timber harvesting and fires) are currently confined to Placer County. Better management of livestock is an area of active research and investigation state-wide, principally through work sponsored by the U.C. Cooperative Extension. The Cattlemen's Association assisted by the U.C. Cooperative Extension is now sponsoring workshops to assist private ranchers in better land management; cattle are the principal livestock species in the American River watershed. As the U.C. work progresses, management activities promoted by other livestock organizations may be developed.
- **Body-Contact Recreation.** There is considerable use of the South Fork for rafting and swimming and Folsom Lake for swimming and water-skiing. Body-contact recreation, although clearly a source of pathogens, is a beneficial use of the American River system; any restriction of use is extremely unlikely. Public education about responsible use might, over the long term, mitigate recreational impacts.
- **Boating and Boat Camping.** Folsom Lake is very popular with boaters, both for day use and for some boat camping. Boats include jet-skis and boats with two-stroke engines that are sources of incompletely combusted gasoline discharged directly into the lake. MTBE is being addressed state-wide through legislative initiatives and activities and policies put forward by organizations such as ACWA. Boat camping is a potential source of pathogens if the sewage generated by the campers is not disposed of properly.
- **Spills.** The potential for spills of hazardous materials exists throughout the watershed. Upstream of EID's intake locations there are highway corridors including Highway 50 which, upstream of Folsom Lake, mostly runs along the South Fork canyon. In addition, a potential spill from the wastewater collection system serving El Dorado Hills is of concern at EID's El Dorado Hills WTP as well as potential spills from wastewater treatment systems upstream. In the event of a spill, it is important that EID receives timely notification.

City of Folsom, City of Roseville, San Juan Water District, and Folsom State Prison

Near-Intake Zone

Folsom Lake is heavily used for recreation and includes the Folsom Lake Marina, in-lake recreation, and on-shore recreation. In-lake recreation activities include swimming, water-skiing, sailing, cruising, fishing, jet-skiing, and boat camping. On-shore recreation activities include 80 miles of trails (hiking, horseback riding, mountain biking), two campgrounds, and picnicking. See Folsom Lake near-intake zone map in Appendix F.

Four contaminant sources are of greatest concern for the water agencies diverting water from Folsom Dam: the effect of major storms, body-contact recreation in the lake, boating on Folsom Lake, and the potential for spills.

- **Major Storms.** Storm runoff contributes to high turbidity levels in the source water and also carries fecal material shed by wild and domestic animals into the river system. Storms are unpredictable and are not controllable. Better management of two of the major sources of sediment (timber harvesting and fires) are being addressed in Placer County through the American River CRMP. Better management of livestock is an area of active research and investigation state-wide, principally through work sponsored by the U.C. Cooperative Extension. The Cattlemen's Association and the U.C. Cooperative Extension are now sponsoring workshops to assist private ranchers in better land management; cattle are the principal livestock species in the American River watershed. As the U.C. work progresses, management activities promoted by other livestock organizations may be developed.
- **Body-Contact Recreation.** There is considerable use of Folsom Lake for body-contact recreation, including swimming and water-skiing. Body-contact recreation, although clearly a source of pathogens, is a beneficial use of the American River system; any restriction of use is extremely unlikely. Public education about responsible use might, over the long term, mitigate recreational impacts.
- **Boating and Boat Camping.** Folsom Lake is very popular with boaters, both for day use and for some boat camping. Boats include jet-skis and boats with two-stroke engines that are sources of incompletely combusted gasoline discharged directly into the lake. MTBE is being addressed state-wide through legislative initiatives and activities and policies put forward by organizations such as ACWA. Boat camping is a potential source of pathogens if the sewage generated by the campers is not disposed of properly.
- **Spills.** The potential for spills of hazardous materials exists throughout the watershed. Upstream of Folsom Lake there are highway corridors, a major railroad route, and pipelines. In addition, a potential

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spill from wastewater treatment systems upstream is a concern. In the event of a spill, it is important that these four agencies receive timely notification.

Arden Cordova Water Service

Near-Intake Zone

On Lake Natoma there are two bridge crossings (Rainbow Bridge and new Folsom Bridge,) a campground at Negro Bar, and two boat launches. See **Plates 5** and **6** of the Lower American River near-intake zone maps in Appendix F. The Folsom South Canal is lined and fenced between Lake Natoma and the ACWS intake facility. The Folsom South Canal near-intake zone maps is also in Appendix F.

Four contaminant sources are of greatest concern upstream of the ACWS intake facility: the effect of major storms, the potential for future Aerojet discharges to the Folsom South Canal, urban runoff, and the potential for spills.

- **Major Storms.** Storm runoff contributes to high turbidity levels in the source water and also carries fecal material shed by wild and domestic animals into the river system. Storms are unpredictable and are not controllable. Storm effects along this reach of the river system are the result of sediment loading from the upper watershed exacerbated by turbid urban runoff discharges. Wild animals inhabit the riparian area near the lake.
- **Potential for Future Aerojet Discharges.** This concern is speculative at this point and is based on the conclusion that the Aerojet cleanup will eventually generate a very large volume of treated groundwater and that increased surface discharges, perhaps including the Folsom South Canal, may be authorized by the RWQCB. The concern involves the potential “unknowns” in any treated discharge water.
- **Urban Runoff.** There is considerable existing urbanization of the area upstream of the ACWS intake facility and a rapid rate of increasing urbanization in Folsom around Lake Natoma. Urban runoff contributes coliform, probably pathogens, turbidity, organic carbon, MTBE, and other hydrocarbon-related organics. Municipal urban runoff in this upstream area is managed under a Sacramento area-wide NPDES permit issued to the Sacramento Stormwater Permittees.
- **Spills.** The potential for spills of hazardous materials exists throughout the watershed. Upstream of ACWS’s intake facility are the Rainbow Bridge and the new Folsom Bridge crossings. In addition, there are several sewer lift stations in Folsom. In the event of a spill, it is important that ACWS receives timely notification.

Carmichael Water District

Near-Intake Zone

In the near-intake zone between the CWD intake facility and Nimbus Dam there are two bridge crossings (Hazel Avenue Bridge and Sunrise Bridge), two boat launches, the Nimbus fish hatcheries (see previous section on Industrial Facilities), boating, swimming, fishing, kayaking, and rafting. Also, Buffalo Creek, which carries discharges from Aerojet (see previous section on Industrial Facilities), enters the river.

Five contaminant sources are of greatest concern upstream of the CWD intake facility: the effect of major storms, in-river recreation, the potential for future Aerojet discharges to Buffalo Creek and thence to the Lower American River, urban runoff, and the potential for spills. See **Plates 4** and **5** of the Lower American River near-intake zone maps in Appendix F.

- **Major Storms.** Storm runoff contributes to high turbidity levels in the source water and also carries fecal material shed by wild and domestic animals into the river system. Storms are unpredictable and are not controllable. Storm effects along the Lower American River are the result of sediment loading from the upper watershed exacerbated by turbid urban runoff discharges.
- **Body-Contact Recreation.** There is considerable use of the Lower American River (an estimated 5 million visitor days per year) for body-contact recreation, including rafting as well as swimming. Body-contact recreation, although clearly a source of pathogens, is a beneficial use of the American River system; restriction of use is unlikely. Public education about responsible use might, over the long term, mitigate recreational impacts. Ensuring a sufficient number of adequately maintained restrooms may also mitigate impacts
- **Potential for Future Aerojet Discharges.** This concern is speculative at this point and is based on the conclusion that the Aerojet cleanup will eventually generate a very large volume of treated groundwater and that increased surface discharges may be authorized by the RWQCB. The concern involves the potential “unknowns” in the treated water.
- **Urban Runoff.** The area upstream of CWD is essentially completely urban. Urban runoff contributes coliform bacteria, probably pathogens, turbidity, organic carbon, MTBE, and other hydrocarbon-related organics. Municipal urban runoff in this upstream area is managed under a Sacramento area-wide NPDES permit issued to the Sacramento Stormwater Management Permittees.
- **Spills.** The potential for spills of hazardous materials exists throughout the watershed. Upstream of CWD’s intake facility there are highway corridors and bridge crossings, in addition to a number of sewer lift stations. In the event of a spill, it is important that CWD receives timely notification.

Arcade Water District

Near-Intake Zone

In the zone between CWD and AWD, there are two boat launches, boating, swimming, fishing, kayaking, and rafting.

Five contaminant sources are of greatest concern upstream of the AWD intake facility: the effect of major storms, in-river recreation, the potential for future Aerojet discharges to Buffalo Creek and thence to the Lower American River, urban runoff, and the potential for spills. See **Plates 3** and **4** of the Lower American River near-intake zone maps in Appendix F.

- **Major Storms.** Storm runoff contributes to high turbidity levels in the source water and also carries fecal material shed by wild and domestic animals into the river system. Storms are unpredictable and are not controllable. Storm effects along the Lower American River are the result of sediment loading from the upper watershed exacerbated by turbid urban runoff discharges.
- **Body-Contact Recreation.** There is considerable use of the Lower American River (an estimated 5 million visitor days per year) for body-contact recreation, including rafting as well as swimming. Body-contact recreation, although clearly a source of pathogens, is a beneficial use of the American River system; restriction of use is unlikely. Public education about responsible use might, over the long term, mitigate recreational impacts. Ensuring a sufficient number of adequately maintained restrooms may also mitigate impacts.
- **Potential for Future Aerojet Discharges.** This concern is speculative at this point and is based on the conclusion that the Aerojet cleanup will eventually generate a very large volume of treated groundwater and that increased surface discharges may be authorized by the RWQCB. The concern relates to potential “unknowns” in the treated discharge water.
- **Urban Runoff.** The area upstream of AWD is essentially completely urban. Urban runoff contributes coliform bacteria, probably pathogens, turbidity, organic carbon, MTBE, and other hydrocarbon-related organics. Municipal urban runoff in this upstream area is managed under a Sacramento area-wide NPDES permit issued to the Sacramento Stormwater Permittees.
- **Spills.** The potential for spills of hazardous materials exists throughout the watershed. Upstream of AWD’s intake facility there are highway corridors and bridge crossings, in addition to a number of sewer lift stations. In the event of a spill, it is important that AWD receives timely notification.

City of Sacramento

Near-Intake Zone

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In the zone between the AWD and the Sacramento E.A. Fairbairn WTP there are two bridge crossings (Watt Avenue Bridge and Howe Avenue Bridge), four boat launches, boating, swimming, fishing, kayaking, and rafting. See **Plates 2** and **3** of the Lower American River near-intake zone maps in Appendix F.

Five contaminant sources are of greatest concern upstream of the Sacramento E.A. Fairbairn WTP intake: the effect of major storms, in-river recreation, the potential for future Aerojet discharges to Buffalo Creek and thence to the Lower American River, urban runoff, and the potential for spills.

- **Major Storms.** Storm runoff contributes to high turbidity levels in the source water and also carries fecal material shed by wild and domestic animals into the river system. Storms are unpredictable and are not controllable. Storm effects along the Lower American River are the result of sediment loading from the upper watershed exacerbated by turbid urban runoff discharges.
- **Body-Contact Recreation.** There is considerable use of the Lower American River for body-contact recreation, including rafting as well as swimming (an estimated 5 million visitor days per year). Body-contact recreation, although clearly a source of pathogens, is a beneficial use of the American River system; restriction of use is unlikely. Public education about responsible use might, over the long term, mitigate recreational impacts. Ensuring a sufficient number of adequately maintained restrooms may also mitigate impacts.
- **Potential for Future Aerojet Discharges.** This concern is speculative at this point and is based on the conclusion that the Aerojet cleanup will eventually generate a very large volume of treated groundwater and that increased surface discharges may be authorized by the RWQCB. The concern relates to potential “unknowns” in the treated discharge water.
- **Urban Runoff.** The area upstream of the E.A. Fairbairn WTP is essentially completely urban. Urban runoff contributes coliform bacteria, probably pathogens, turbidity, organic carbon, MTBE, and other hydrocarbon-related organics. Urban runoff in this upstream area is managed under a Sacramento area-wide NPDES permit issued to the Sacramento Stormwater Permittees.
- **Spills.** The potential for spills of hazardous materials exists throughout the watershed. Upstream of the E.A. Fairbairn WTP intake there are highway corridors and bridge crossings, in addition to a number of sewer lift stations. In the event of a spill, it is important that Sacramento receives timely notification.

Potential Joint Project Agencies

Near-Intake Zone

In the zone between the E.A. Fairbairn WTP and the location of the potential Joint Project there are five bridge crossings (the H Street Bridge, the Capitol City Freeway Bridge, the Highway 160 Bridge, and two railroad bridges), homeless camps, the City of Sacramento Landfill, and the State Office of Printing (see Industrial Facilities section), boating, houseboating, swimming, and fishing. See **Plates 1** and **2** of the Lower American River near-intake zone maps in Appendix F. The City of Sacramento Landfill was evaluated only with respect to the potential for VOC contamination.

Agencies proposing to share the potential Joint Project intake include the City of Sacramento, EBMUD, and the County of Sacramento. Six contaminant sources are of greatest concern upstream of the potential Joint Project intake location: the effect of major storms, in-river recreation, boating and houseboating, the potential for future Aerojet discharges to Buffalo Creek and thence to the Lower American River, urban runoff, and the potential for spills.

- **Major Storms.** Storm runoff contributes to high turbidity levels in the source water and also carries fecal material shed by wild and domestic animals into the river system. Storms are unpredictable and are not controllable. Storm effects along the Lower American River are the result of sediment loading from the upper watershed exacerbated by turbid urban runoff discharges.
- **Body-Contact Recreation.** There is considerable use of the Lower American River (an estimated 5 million visitor days per year) for body-contact recreation, including swimming. Body-contact recreation, although clearly a source of pathogens, is a beneficial use of the American River system; restriction of use is unlikely. Public education about responsible use might, over the long term, mitigate recreational impacts. Additionally, an adequate number of well maintained restroom facilities in the American River Parkway should assist in mitigating recreational impacts.
- **Houseboating.** The Lower American River below the Highway 160 Bridge crossing is frequently used for mooring houseboats. Houseboats are a potential source of pathogens if the sewage generated by the houseboats is not disposed of properly.
- **Potential for Future Aerojet Discharges.** This concern is speculative at this point and is based on the conclusion that the Aerojet cleanup will eventually generate a very large volume of treated groundwater and that increased surface discharges may be authorized by the RWQCB. The concern relates to potential “unknowns” in the treated discharge water.
- **Urban Runoff.** The area upstream of the potential Joint Project location is essentially completely urban. Urban runoff contributes coliform bacteria, probably pathogens, turbidity, organic carbon,

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MTBE, and other hydrocarbon-related organics. Municipal urban runoff in this upstream area is managed under a Sacramento area-wide NPDES permit issued to the Sacramento Stormwater Permittees.

- **Spills.** The potential for spills of hazardous materials exists throughout the watershed. Upstream of the potential Joint Project location there are highway corridors, bridge crossings, and railroad crossings, in addition to a number of sewer lift stations. In the event of a spill, it is important that the Joint Project agencies receive timely notification.

Chapter 6. Potentially Waivable Title 22 Constituents

In this chapter, watershed-wide information on potentially waivable Title 22 constituents is collected and documented. The information includes:

- a summary of raw and treated water monitoring data collected by the participating agencies for all these constituents;
- summary information on general use and environmental persistence of constituents;
- ambient monitoring data for drinking water organic contaminants, collected by non-drinking water monitoring programs along the Lower American River; and
- specific American River watershed occurrence and use information for asbestos, arsenic, cyanide, and pesticides.

The DHS has the authority to grant a monitoring waiver by rule or by vulnerability assessment.

- A waiver by rule is based on the analytical results of previously collected samples. For most eligible constituents, a waiver may be granted if three rounds of monitoring show concentrations below the MCL. In the case of nitrate and nitrite, the requirement is that four consecutive quarterly samples are less than 50% of the MCL.
- Two types of vulnerability assessment waivers may be granted: a Use Waiver or a Susceptibility Waiver.
 - A Use Waiver may be granted for a constituent where it can be demonstrated that there has been no presence of the constituent in the watershed based on manufacture, use, storage, transport, or disposal information. This level of information may be readily available for a closed, controlled watershed or for a small watershed. However, for a large watershed like the American River watershed, the level of effort required to collect information to substantiate a use waiver could be greater than the cost of monitoring. For example, to establish that there has been no transport of a particular constituent in the watershed would require the identification of all railroad and trucking companies that transit within the watershed and some type of credible survey of those companies or review of shipping manifests.
 - A Susceptibility Waiver may be granted for a constituent based on analytical results of previously collected samples, pesticide use (for certain SOCs) within the watershed, environmental persistence and transport of the constituent, source protection activities, knowledge of land use (industries, sewage disposal systems, landfills, underground tanks, and recreation), and proximity

Chapter 6. Potentially Waivable Title 22 Constituents

of the use of the constituent to an agency's intake facility. This type of waiver allows the DHS more flexibility in determining whether to grant a waiver for a constituent.

The monitoring data presented in this chapter provide a basis for determining which constituents may be eligible for a Susceptibility Waiver. The monitoring data, general constituent use information, information on environmental persistence of constituents, and the specific American River watershed use and occurrence information provide information to determine which constituents may be eligible for Susceptibility Waivers. Information on watershed occurrence and use was obtained only for constituents that might reasonably be expected to be eligible for Susceptibility Waivers. No effort was made to collect information pertinent to Use Waivers. For assistance with acronyms, the reader is referred to the list of abbreviations at the front of the report.

TABULATION OF MONITORING DATA, GENERAL USES, AND ENVIRONMENTAL PERSISTENCE FOR ALL POTENTIALLY WAIVABLE CONSTITUENTS

Tables 6-1 through 6-7 summarize the raw and treated water monitoring data collected for the participating agencies for the four reaches of the river: North Fork, South Fork, Folsom Lake, and the Lower American River. General information on use and environmental persistence is also included in these tables. Minimum and maximum concentrations are shown. Minimum and maximum concentrations show the range; average values probably reflect more typical conditions. Average values were calculated for metals, general minerals, and other appropriate constituents such as TOC. In calculating average values, the value of the detection limit was used when a constituent was not detected. Average values were not calculated for most organic constituents as there were so many non-detects that the calculation of an average value would not provide useful information.

Constituent concentrations greater than their respective MCL are bolded. An examination of the tables shows that in only a few instances constituent concentrations have exceeded MCLs and that these were maximum detected values. No average concentrations of any constituents monitored by the participating agencies over the past 5 years in either raw or treated water have exceeded an MCL anywhere in the river system.

Details on data collected by individual agencies may be found in Chapter 4.

Table 6-8 is a summary of organic contaminant monitoring data collected by other monitoring programs along the Lower American River. The other monitoring programs include the Sacramento Stormwater Management Program, the NAWQA Monitoring Program conducted by the USGS, monitoring conducted by the RWQCB, and Ambient Monitoring Program monitoring. Monitoring data from 1990 through 1997 are summarized in this table. An examination of Table 6-8 shows that, even when analyzed at ultra-low detection limits, most organic contaminants have not been detected in the American River. Exceptions are benzo(a) pyrene, diazinon, diuron, and simazine. Of these, only a single detection of benzo(a)pyrene in 1993 from a sample collected during a storm event exceeded its MCL.

Table 6-1. North/Middle Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
Inorganics (Section 64432)								
	Aluminum	mg/L	1	<0.05	0.15	0.075	MW	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Antimony	mg/L	0.006	<0.005	<0.006	0.0053	MW	Fire retardant, ceramics, electronics, fireworks, solder
✓	Arsenic	mg/L	0.05	<0.001	<0.002	0.0013	MW	combustion
	Barium	mg/L	1 ^a	<0.01	<0.1	0.04	MW	Natural deposits, pigments, epoxy sealants, spent coal
	Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	MW	Electrical, aerospace, defense industries, fluorescent lights
	Cadmium	mg/L	0.005	<0.001	<0.001	<0.001	MW	Galvanized pipe corrosion, natural deposits, batteries, paints
	Chromium	mg/L	0.05 ^a	<0.01	0.054	0.021	MW	Natural deposits, mining, electroplating, pigments, steel fabrication
✓	Cyanide	mg/L	0.2	<0.003	<0.1	0.0273	MW, UW, SW	Electroplating, steel, plastics, mining, fertilizer
	Fluoride	mg/L	1.4 to 2.4 ^a	<0.1	0.1	0.1	MW	Natural deposits, fertilizer, aluminum industries, drinking water additive
	Lead	mg/L	0.015 ^b	<0.001	<0.005	0.0023	MW	Natural/industrial deposits, plumbing, solder, brass alloy faucets, batteries
	Mercury	mg/L	0.002	<0.0002	<0.001	0.0005	MW	Crop runoff, natural deposits, batteries, electrical switches, gold mining
	Nickel	mg/L	0.1 ^c	<0.005	<0.01	0.0063	MW	Metal alloys, electroplating, batteries, chemical production
	Selenium	mg/L	0.05	<0.001	<0.005	0.0023	MW	Natural deposits, mining, smelting, coal/oil combustion
	Thallium	mg/L	0.002	<0.001	<0.001	<0.001	MW	Electronics, drugs, alloys, glass, rodenticide, fungicide
Nitrate, Nitrite (Section 64432.1)								
	Nitrate	mg/L	10 (as N)	<0.05	<2	0.8	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
	Nitrite	mg/L	1 (as N)	<0.15	<0.4	0.233	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
Asbestos (Section 64432.2)								
✓	Asbestos	MFL	7 (>10um)	<0.2	<0.2	<0.2	VA	linings
Secondary Standards (Section 64449, Table 64449-A)								
	Aluminum	mg/L	0.2	<0.05	0.15	0.075	MW, CAEC	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Color	units	15	<3	<3	<3	MW, CAEC	Industrial waste, organic debris
	Copper	mg/L	1.0 ^b	<0.01	<0.05	0.0245	MW, CAEC	Natural/industrial deposits, wood preservatives, plumbing, algicides, mining
	Foaming Agents	mg/L	0.5	<0.01	<0.02	0.0133	MW, CAEC	Detergents, septic tanks, sewage
	Iron	mg/L	0.3	<0.03	<0.1	0.0573	MW, CAEC	Natural deposits
	Manganese	mg/L	0.05	<0.01	<0.03	0.0145	MW, CAEC	Natural deposits, alloys, batteries, fertilizer additive
	Odor-Threshold	units	3	<1.0	<1.0	<1.0	MW, CAEC	Decaying organic matter, wastewater treatment
	Silver	mg/L	0.1	<0.01	<0.01	<0.01	MW, CAEC	Mining, electroplating
	Thiobencarb	ug/L	1				MW, CAEC	Herbicide on grasses and broadleaf weeds which infest rice fields
	Turbidity	NTU	0.5/5	0.27	0.34	0.303	MW, CAEC	Erosion
	Zinc	mg/L	5	<0.01	<0.05	0.0195	MW, CAEC	Motor oil, electroplating, smelting, steel fabrication
Secondary Standards (Section 64449, Table 64449-B)								
	Total Dissolved Solids	mg/L	500/1,000/1,500 ^e	35	53	42.3	MW	Car washes, inorganic salts, organic matter and dissolved gases
	Specific Conductance	umho/cm	900/1,600/2,200 ^e	42	46	43.6	MW	ionizable compounds (salts, etc.)
	Chloride	mg/L	250/500/600 ^e	1.1	1.6	1.33	MW	Industrial wastewater, agricultural runoff, oil well wastes, wastewater treatment plant effluent, road salting, natural deposits,
	Sulfate	mg/L	250/500/600 ^e	1.7	2	1.8	MW	Natural deposits, sewage treatment plant effluent, pulp and textile mills, tanneries, fertilized agricultural lands
General Mineral (Section 64449 (c) (2))								
	Bicarbonate	mg/L	MO	20	34	26	MW	Natural/industrial deposits
	Carbonate	mg/L	MO	<1.0	<1.2	1.13	MW	Natural/industrial deposits

Table 6-1. North/Middle Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Hydroxide	mg/L	MO	16	34	23.3	MW	Natural/industrial deposits
	Alkalinity	mg/L	MO				MW	Natural/industrial deposits
	pH	Units	MO	6.1	7.3	6.77	MW	
	Calcium	mg/L	MO	3.6	6	4.8	MW	Natural/industrial deposits, sewage
	Magnesium	mg/L	MO	0.84	1.3	1.05	MW	Natural/industrial deposits, sewage
	Sodium	mg/L	MO	1.7	5.1	2.93	MW	Sea water, natural deposits
	Potassium	mg/L	MO	0.5	0.65	0.575	MW	Natural deposits
	Hardness	mg/L	MO	12	20	16	MW	Calcium and Magnesium deposits
(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))								
	Benzene	ug/L	1000 ^a	<0.5	<0.5		UW,SW	Foods, gas, drugs, pesticide, paint, plastic industries. Slightly soluble in water
	Carbon Tetrachloride	ug/L	0.5 ^a	<0.5	<0.5		UW,SW	Fire extinguishers, dry cleaning solvent, degreasing and manufacturing of refrigerants, aerosols, and propellants. Very slow degradation rate, highly mobile in soil.
	o-Dichlorobenzene	ug/L	600	<0.5	<0.5		UW,SW	Paints, engine cleaning compounds, dyes, chemical wastes. Moderately adsorbed to soil, adsorbs to sediment in water.
	p-Dichlorobenzene	ug/L	5 ^a	<0.5	<0.5		UW,SW	Room/water deodorant, mothballs. Moderately adsorbed to soil, adsorbs to sediment in water.
	1,1-Dichloroethane	ug/L	5	<0.5	<0.5		UW,SW	Pain, varnish and finish removers, degreasing, ore floatation. rapidly degrades.
	1,2-Dichloroethane	ug/L	0.5 ^a	<0.5	<0.5		UW,SW	Leaded gas additive, fumigants, paints, tobacco flavoring. Evaporates quickly, persists for a long time in groundwater.
	1,1-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5		UW,SW	Plastics, dyes, perfumes, paints
	cis-1,2-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5		UW,SW	Waste industrial extraction solvents
	trans-1,2-Dichloroethylene	ug/L	10 ^a	<0.5	<0.5		UW,SW	Waste industrial extraction solvents
	Dichloromethane	ug/L	5	<0.5	<3.0		UW,SW	Paint stripper, metal degreaser, propellant, extraction
	1,2-Dichloropropane	ug/L	5	<0.5	<0.5		UW,SW	Soil fumigant for nematode control, waste industrial solvent
	1,3-Dichloropropene	ug/L	0.5	<0.5	<0.5		UW,SW	Soil fumigant for nematode control
	Ethylbenzene	ug/L	700	<0.5	<5.0		UW,SW	Gasoline, insecticides, chemical manufacturing wastes. Evaporation and biodegradation is significant in water.
	Monochlorobenzene	ug/L	70 ^a	<0.5	<1.0		UW,SW	Waste solvent from metal degreasing processes, pesticide manufacturing. Moderate degradation rate in sediment.
	Styrene	ug/L	100	<0.5	<0.5		UW,SW	Plastics, rubber, resin, drug industries, leachate from landfills
	1,1,2,2-Tetrachloroethane	ug/L	1	<0.5	<0.5		UW,SW	Rubber solvent, insecticides, bleach, paint, varnish, rust remover, degreasing
	Tetrachloroethylene	ug/L	5	<0.5	<0.5		UW,SW	Industrial and dry cleaning solvent
	Toluene	ug/L	150 ^a	<0.5	<10		UW,SW	Gasoline additive, manufacturing and solvent operations
	1,2,4-Trichlorobenzene	ug/L	70	<0.5	<0.5		UW,SW	dyes, cleaners, lubricants. Mixes poorly in water, slow degradation rate
	1,1,1-Trichloroethane	ug/L	200	<0.5	<1.0		UW,SW	Adhesives, aerosols, textiles, paints, inks, metal degreasers
	1,1,2-Trichloroethane	ug/L	5	<0.5	<1.0		UW,SW	Solvent in rubber, other organic products, chemical production wastes
	Trichloroethylene	ug/L	5	<0.5	<0.5		UW,SW	Textiles, adhesives and metal degreasers
	Trichlorofluoromethane	ug/L	150	<1.0	<5.0		UW,SW	Industrial solvent and refrigerant, aerosol sprays
	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	1200	<1.0	<10		UW,SW	Dry cleaning solvent and refrigerant
	Vinyl Chloride	ug/L	0.5 ^a	<0.5	<0.5		UW,SW	Solvents, PVC pipe
	Xylenes (total)	ug/L	1750 ^a	<0.5	<10		UW,SW	Gasoline refining, paints, inks, detergents. Dominant removal process is volatilization, mobile in soil.
(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))								
	Acrylamide	ug/L	TT (PAP)				UW,SW	Polymer used in water/wastewater treatment, adhesives, printing ink emulsion stabilizers, thickening agents for agricultural sprays. Does not bind well with soil, soluble in water.
√	Alachlor	ug/L	2	<1.0	<1.0		UW,SW	Herbicide for corn, soybeans, other crops. Degrades readily, soluble in water

Table 6-1. North/Middle Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Atrazine	ug/L	3				UW,SW	Herbicide for corn and non-cropland
√	Bentazon	ug/L	18	<2.0	<2.0		UW,SW	Herbicide for peas, alfalfa, and other crops. Rapid degradation in soil and water, highly soluble in water, does not bind to or adsorb to soil particles.
	Benzo(a)pyrene	ug/L	0.2				UW,SW	Coal tar coatings, burning organic matter, volcanoes, fossil fuels
√	Carbofuran	ug/L	18 ^a				UW,SW	Soil fumigant on corn, cotton and other vegetable crops. Soluble in water, Hard to degrade in water, mobile in soil, moderately degrades in soil.
√	Chlordane	ug/L	0.1 ^a	<0.1	<0.1		UW,SW	Insecticide for termite control that is no longer distributed in the US. Not water soluble, rapidly binds to topsoil, slow degradation rate in soil and water.
√	2,4,-D	ug/L	70	<10	<10		UW,SW	Herbicide on wheat, corn, rangelands, lawns; control broadleaf weeds. Degrades rapidly.
√	Dalapon	ug/L	200				UW,SW	Herbicide on orchards, beans, coffee, lans, road/railways. Moves quickly through soil, highly soluble in water, degrades rapidly.
√	Dibromochloropropane	ug/L	0.2				UW,SW	Soil fumigant for nematode control on soybeans, cotton, pineapple, orchards
	Di (2-ethylhexyl) Adipate	ug/L	400				UW,SW	Synthetic rubber, food packaging, cosmetics
	Di (2-ethylhexyl) Phthalate	ug/L	4 ^a				UW,SW	Plasticizer in PVC and other plastics
√	Dinoseb	ug/L	7	<2.0	<2.0		UW,SW	Pesticide for orchards, vineyards, alfalfa, onions, almonds and other crops. Not soluble in water, degrades rapidly.
√	Diquat	ug/L	20				UW,SW	Land/Aquatic weed herbicide
√	Endothall	ug/L	100				UW,SW	Herbicide/defoliant/desiccant/algacide on crops, land/aquatic weeds. Highly soluble in water, moves quickly through soil, degrades rapidly.
√	Endrin	ug/L	2	<0.1	<0.1		UW,SW	Pesticide on insects, rodents, birds
	Epichlorohydrin	ug/L	TT (PAP)				UW,SW	Water treatment chemicals, waste epoxy resins, coatings
√	Ethylene Dibromide	ug/L	0.05				UW,SW	Leaded gas additive, soil fumigant. Moves slowly through soil, soluble in water, degrades rapidly in water.
√	Glyphosate	ug/L	700				UW,SW	Herbicide on grasses, weeds, brush. Adsorbs quickly to soil, moderate degradation rates in water.
√	Heptachlor	ug/L	0.01 ^a	<0.01	<0.01		UW,SW	Insecticide for termites. Not water soluble, rapidly degrades in water.
	Heptachlor Epoxide	ug/L	0.01 ^a	<0.01	<0.01		UW,SW	Biodegradation of Heptachlor. Not water soluble
√	Hexachlorobenzene	ug/L	1	<0.5	<0.5		UW,SW	Pesticide production waste by-product, wood preservative, fungicide. Not water soluble.
	Hexachlorocyclopentadiene	ug/L	50	<1.0	<1.0		UW,SW	Pesticide production intermediate
√	Lindane	ug/L	0.2	<0.2	<0.2		UW,SW	Insecticide on cattle, lumber, gardens. Slightly soluble in water.
√	Methoxychlor	ug/L	40	<10	<10		UW,SW	Insecticide for fruits, vegetables, alfalfa, livestock, pets. Insoluble in water, movement occurs through adsorption to soil particles in runoff.
√	Molinate	ug/L	20				UW,SW	Herbicide. Highly soluble in water.
√	Oxamyl (vydate)	ug/L	200				UW,SW	Insecticide on apples, potatoes, tomatoes. Mobile in soil, highly soluble in water, rapidly degrades in soil and water.
√	Pentachlorophenol	ug/L	1	<0.02	<0.02		UW,SW	Wood preservatives, herbicide, cooling tower wastes. Moderately degrades
√	Picloram	ug/L	500	<1.0	<1.0		UW,SW	Herbicide on broadleaf and woody plants, mobile in soil, soluble in water.
	PCBs	ug/L	0.5	<0.5	<0.5		UW,SW	Coolant oils from electrical transformers, plasticizers
√	Simazine	ug/L	4				UW,SW	Herbicide on grass sod, crops, aquatic algae. Mobile in soil, low water solubility, moderate degradation rate in water.
√	Thiobencarb	ug/L	70				UW,SW	Herbicide on grasses and broadleaf weeds which infest rice fields
√	Toxaphene	ug/L	3	<1.0	<1.0		UW,SW	Insecticide/herbicide for cotton and soybeans
	2,3,7,8-TCDD (Dioxin)	ug/L	3.00E-05				UW,SW	Chemical production by-product (pulp and paper industry), herbicides
√	2,4,5-TP (Silvex)	ug/L	50	<1.0	<1.0		UW,SW	Herbicide on crops, right-of-way, golf courses
Unregulated Organic Chemicals (Section 64450, Table 64450-B)								

Table 6-1. North/Middle Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
✓	Bromacil	ug/L	MO (if vulnerable)				UW,SW	Herbicide on noncrop areas, soil sterilant. Leaches readily through soil, slow degradation rate in soil, soluble in water, moderate degradation in water.
	Bromochloromethane	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Fire extinguishing agent
	n-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Resin/rubber additive, solvent in synthesis of insecticides. Insoluble in water.
	sec-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	pharmaceutical. Insoluble in water.
	tert-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Used in organic synthesis, polymer linking agent. Insoluble in water
✓	Chlorothalonil	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Fungicide (control fungus in nurseries). Not water soluble, moderate degradation rate.
✓	Diazinon	ug/L	MO (if vulnerable)				UW,SW	Insecticide for home, lawn, garden, pets, and flies. Not water soluble, low soil mobility, degrades slowly in soil.
✓	Dimethoate	ug/L	MO (if vulnerable)				UW,SW	Insecticide on alfalfa, apples, corn and other crops. Mobile in soil, highly soluble in water, rapidly degrades.
✓	Diuron	ug/L	MO (if vulnerable)				UW,SW	Herbicide for non crop areas such as industrial sites, railways, footpaths and pavements, farm buildings. Slightly soluble in water.
	Hexachlorobutadiene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Rubber solvent, synthetic rubber, heat transfer liquid, transformer liquid, hydraulic fluid
	Isopropylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Phenol (an intermediate chemical used to manufacture building materials and plastics) and acetone production. Not water soluble.
	p-Isopropyltoluene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Sulfite mills
	Naphthalene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Petroleum refining, coal tar distillation, pesticides, fungicides, dyes, detergents, and wetting agents
	n-Propylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Textile dyeing and printing, solvent, gasoline, diesel, incinerators. Very slightly soluble in water, volatile, degrades readily.
✓	Prometryn	ug/L	MO (if vulnerable)				UW,SW	Herbicide on carrots, corn, and other crops. Mobile in soil, moderately degrades in soil, degrades slowly in water.
	1,2,3-Trichlorobenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Insecticide, coolant in electrical installations and glass tempering, polyester dyeing, lubricants, solvent for high melting products
	1,3,4-Trichlorobenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Solvent in dyes, lubricants, cleaners, and dielectric fluids
	1,2,4-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Gasoline and paint additive, slightly water soluble, does not bind well with soil.
	1,3,5-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Paints, polymers. Not water soluble.
Unregulated Organic Chemicals (Section 64450, Table 64450-C)								
✓	Aldicarb	ug/L	3				UW,SW	Insecticide on cotton, potatoes, and other crops. Soluble and mobile in soil, soluble in water.
	Aldicarb Sulfone	ug/L	2				UW,SW	Biodegradation of aldicarb
	Aldicarb Sulfoxide	ug/L	4				UW,SW	Biodegradation of aldicarb
✓	Aldrin	ug/L	MO	<0.075	<0.075		UW,SW	Insecticide, fumigant
✓	Butachlor	ug/L	MO				UW,SW	Herbicide on weeds
✓	Carbaryl	ug/L	MO				UW,SW	Insecticide used in pet shampoos and for agriculture. Not water soluble, readily degrades in soil and water.
✓	Dicamba	ug/L	MO	<0.081	<0.081		UW,SW	Herbicide. Highly mobile in soil, Highly water soluble, degrades readily.
✓	Dieldrin	ug/L	MO				UW,SW	Insecticide, wood preservative, oxidation product of Aldrin
	3-Hydroxycarbofuran	ug/L	MO				UW,SW	Biodegradation of carbofuran
✓	Methomyl	ug/L	MO				UW,SW	Insecticide on corn, potatoes, and other crops. Highly soluble in water, degrades slowly in water.
✓	Metolachlor	ug/L	MO				UW,SW	Herbicide used in agriculture. Mobile in soil, water soluble, degrades slowly.
✓	Metribuzin	ug/L	MO				UW,SW	Herbicide used in agriculture. Water soluble, degrades rapidly in water.
✓	Propachlor	ug/L	MO				UW,SW	Herbicide used in agriculture. Virtually no degradation in water.

^a - DHS MCL lower than EPA

^b - Action Level

^c - DHS MCL lower than EPA, EPA remanded in 1995

Table 6-1. North/Middle Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence

^d - Monitoring Waivers are Available for Results < 50% of the MCL

^e - Recommended/Upper/Short Term MCLs

^v - Indicates Which Constituents Have Use/Occurrence Information for American River Watershed

MW - Monitoring Waiver Potentially Available

UW - Use Waiver Potentially Available

SW - Susceptibility Waiver Potentially Available

CAEC - Consumer Acceptance and Economic Considerations Evaluated

VA - Vulnerability Assessment Required

TT - Treatment Technology

PAP - Polymer Addition Practices

MO - Monitoring Required Only

Data Provided by Placer County Water Agency (1993 - 97)

Table 6-2. South Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
Inorganics (Section 64432)								
	Aluminum	mg/L	1	0	0.11	0.0703	MW	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Antimony	mg/L	0.006	<0.005	<0.005	<0.005	MW	Fire retardant, ceramics, electronics, fireworks, solder
√	Arsenic	mg/L	0.05	0	<0.005	0.0018	MW	combustion
	Barium	mg/L	1 ^a	0	0.1	0.0313	MW	Natural deposits, pigments, epoxy sealants, spent coal
	Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	MW	Electrical, aerospace, defense industries, fluorescent lights
	Cadmium	mg/L	0.005	0	<0.001	0.0003	MW	Galvanized pipe corrosion, natural deposits, batteries, paints
	Chromium	mg/L	0.05 ^a	0	0.01	0.0075	MW	Natural deposits, mining, electroplating, pigments, steel fabrication
√	Cyanide	mg/L	0.2	<0.01	<0.01	<0.01	MW, UW, SW	Electroplating, steel, plastics, mining, fertilizer
	Fluoride	mg/L	1.4 to 2.4 ^a	0	0.14	0.08	MW	Natural deposits, fertilizer, aluminum industries, drinking water additive
	Lead	mg/L	0.015 ^b	0	<0.005	0.0018	MW	Natural/industrial deposits, plumbing, solder, brass alloy faucets, batteries
	Mercury	mg/L	0.002	0	0.0002	0.0002	MW	Crop runoff, natural deposits, batteries, electrical switches, gold mining
	Nickel	mg/L	0.1 ^c	<0.05	<0.05	<0.05	MW	Metal alloys, electroplating, batteries, chemical production
	Selenium	mg/L	0.05	0	<0.005	0.0016	MW	Natural deposits, mining, smelting, coal/oil combustion
	Thallium	mg/L	0.002	<0.005	<0.005	<0.005	MW	Electronics, drugs, alloys, glass, rodenticide, fungicide
Nitrate, Nitrite (Section 64432.1)								
	Nitrate	mg/L	10 (as N)	0	0.57	0.3975	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
	Nitrite	mg/L	1 (as N)	<0.03	<0.15	0.09	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
Asbestos (Section 64432.2)								
√	Asbestos	MFL	7 (>10um)	<0.1883	<0.2	0.1942	VA	linings
Secondary Standards (Section 64449, Table 64449-A)								
	Aluminum	mg/L	0.2	0	0.11	0.0703	MW, CAEC	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Color	units	15	0	10	4	MW, CAEC	Industrial waste, organic debris
	Copper	mg/L	1.0 ^b	0	0.02	0.01	MW, CAEC	Natural/industrial deposits, wood preservatives, plumbing, algaecides, mining
	Foaming Agents	mg/L	0.5	0	<0.05	0.0207	MW, CAEC	Detergents, septic tanks, sewage
	Iron	mg/L	0.3	0.031	0.42	0.1405	MW, CAEC	Natural deposits
	Manganese	mg/L	0.05	0	<0.01	0.0055	MW, CAEC	Natural deposits, alloys, batteries, fertilizer additive
	Odor-Threshold	units	3	0	2	1	MW, CAEC	Decaying organic matter, wastewater treatment
	Silver	mg/L	0.1	0	0.01	0.0075	MW, CAEC	Mining, electroplating
	Thiobencarb	ug/L	1				MW, CAEC	Herbicide on grasses and broadleaf weeds which infest rice fields
	Turbidity	NTU	0.5/5	0.3	1	0.5767	MW, CAEC	Erosion
	Zinc	mg/L	5	0	0.01	0.005	MW, CAEC	Motor oil, electroplating, smelting, steel fabrication
Secondary Standards (Section 64449, Table 64449-B)								
	Total Dissolved Solids	mg/L	500/1,000/1,500 ^e	14	22	18	MW	Car washes, inorganic salts, organic matter and dissolved gases
	Specific Conductance	umho/cm	900/1,600/2,200 ^e	14.5	24.2	19.6	MW	ionizable compounds (salts, etc.)
	Chloride	mg/L	250/500/600 ^e	1.3	3	2.43	MW	Industrial wastewater, agricultural runoff, oil well wastes, wastewater treatment plant effluent, road salting, natural deposits,
	Sulfate	mg/L	250/500/600 ^e	0	1.2	0.57	MW	Natural deposits, sewage treatment plant effluent, pulp and textile mills, tanneries, fertilized agricultural lands
General Mineral (Section 64449 (c) (2))								
	Bicarbonate	mg/L	MO	0	4.7	2.37	MW	Natural/industrial deposits

Table 6-2. South Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Carbonate	mg/L	MO	0	<1.2	0.73	MW	Natural/industrial deposits
	Hydroxide	mg/L	MO	0	<1.0	0.59	MW	Natural/industrial deposits
	Alkalinity	mg/L	MO	4.7	5.5	5.07	MW	Natural/industrial deposits
	pH	Units	MO	6.3	7	6.6	MW	
	Calcium	mg/L	MO	0.92	1.5	1.21	MW	Natural/industrial deposits, sewage
	Magnesium	mg/L	MO	0.11	0.21	0.167	MW	Natural/industrial deposits, sewage
	Sodium	mg/L	MO	1	3	1.87	MW	Sea water, natural deposits
	Potassium	mg/L	MO	0	<1.0	0.5	MW	Natural deposits
	Hardness	mg/L	MO	3.5	4.6	3.93	MW	Calcium and Magnesium deposits
(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))								
	Benzene	ug/L	1000 ^a				UW,SW	Foods, gas, drugs, pesticide, paint, plastic industries. Slightly soluble in water
	Carbon Tetrachloride	ug/L	0.5 ^a	0	<0.5		UW,SW	Fire extinguishers, dry cleaning solvent, degreasing and manufacturing of refrigerants, aerosols, and propellants. Very slow degradation rate, highly mobile in soil.
	o-Dichlorobenzene	ug/L	600	0	<0.5		UW,SW	Paints, engine cleaning compounds, dyes, chemical wastes. Moderately adsorbed to soil, adsorbs to sediment in water.
	p-Dichlorobenzene	ug/L	5 ^a	0	<0.5		UW,SW	Room/water deodorant, mothballs. Moderately adsorbed to soil, adsorbs to sediment in water.
	1,1-Dichloroethane	ug/L	5	0	<0.5		UW,SW	Pain, varnish and finish removers, degreasing, ore floatation. rapidly degrades.
	1,2-Dichloroethane	ug/L	0.5 ^a	0	<0.5		UW,SW	Leaded gas additive, fumigants, paints, tobacco flavoring. Evaporates quickly, persists for a long time in groundwater.
	1,1-Dichloroethylene	ug/L	6 ^a	0	<0.5		UW,SW	Plastics, dyes, perfumes, paints
	cis-1,2-Dichloroethylene	ug/L	6 ^a	0	<0.5		UW,SW	Waste industrial extraction solvents
	trans-1,2-Dichloroethylene	ug/L	10 ^a	0	<0.5		UW,SW	Waste industrial extraction solvents
	Dichloromethane	ug/L	5	0	<0.5		UW,SW	Paint stripper, metal degreaser, propellant, extraction
	1,2-Dichloropropane	ug/L	5	0	<0.5		UW,SW	Soil fumigant for nematode control, waste industrial solvent
	1,3-Dichloropropene	ug/L	0.5	0	<0.5		UW,SW	Soil fumigant for nematode control
	Ethylbenzene	ug/L	700	0	<0.5		UW,SW	Gasoline, insecticides, chemical manufacturing wastes. Evaporation and biodegradation is significant in water.
	Monochlorobenzene	ug/L	70 ^a	0	<0.5		UW,SW	Waste solvent from metal degreasing processes, pesticide manufacturing. Moderate degradation rate in sediment.
	Styrene	ug/L	100	0	<0.5		UW,SW	Plastics, rubber, resin, drug industries, leachate from landfills
	1,1,2,2-Tetrachloroethane	ug/L	1	0	<0.5		UW,SW	Rubber solvent, insecticides, bleach, paint, varnish, rust remover, degreasing
	Tetrachloroethylene	ug/L	5	0	<0.5		UW,SW	Industrial and dry cleaning solvent
	Toluene	ug/L	150 ^a	0	<0.5		UW,SW	Gasoline additive, manufacturing and solvent operations
	1,2,4-Trichlorobenzene	ug/L	70	0	<0.5		UW,SW	dyes, cleaners, lubricants. Mixes poorly in water, slow degradation rate
	1,1,1-Trichloroethane	ug/L	200	0	<0.5		UW,SW	Adhesives, aerosols, textiles, paints, inks, metal degreasers
	1,1,2-Trichloroethane	ug/L	5	0	<0.5		UW,SW	Solvent in rubber, other organic products, chemical production wastes
	Trichloroethylene	ug/L	5	0	<0.5		UW,SW	Textiles, adhesives and metal degreasers
	Trichlorofluoromethane	ug/L	150	0	<5.0		UW,SW	Industrial solvent and refrigerant, aerosol sprays
	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	1200	0	<10		UW,SW	Dry cleaning solvent and refrigerant
	Vinyl Chloride	ug/L	0.5 ^a	0	<0.5		UW,SW	Solvents, PVC pipe
	Xylenes (total)	ug/L	1750 ^a	0	<0.5		UW,SW	Gasoline refining, paints, inks, detergents. Dominant removal process is volatilization, mobile in soil.
(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))								

Table 6-2. South Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Acrylamide	ug/L	TT (PAP)				UW,SW	Polymer used in water/wastewater treatment, adhesives, printing ink emulsion stabilizers, thickening agents for agricultural sprays. Does not bind well with soil, soluble in water.
✓	Alachlor	ug/L	2				UW,SW	Herbicide for corn, soybeans, other crops. Degrades readily, soluble in water
	Atrazine	ug/L	3				UW,SW	Herbicide for corn and non-cropland
✓	Bentazon	ug/L	18				UW,SW	Herbicide for peas, alfalfa, and other crops. Rapid degradation in soil and water, highly soluble in water, does not bind to or adsorb to soil particles.
	Benzo(a)pyrene	ug/L	0.2				UW,SW	Coal tar coatings, burning organic matter, volcanoes, fossil fuels
✓	Carbofuran	ug/L	18 ^a				UW,SW	Soil fumigant on corn, cotton and other vegetable crops. Soluble in water, Hard to degrade in water, mobile in soil, moderately degrades in soil.
✓	Chlordane	ug/L	0.1 ^a				UW,SW	Insecticide for termite control that is no longer distributed in the US. Not water soluble, rapidly binds to topsoil, slow degradation rate in soil and water.
✓	2,4,-D	ug/L	70				UW,SW	Herbicide on wheat, corn, rangelands, lawns; control broadleaf weeds. Degrades rapidly.
✓	Dalapon	ug/L	200				UW,SW	Herbicide on orchards, beans, coffee, lans, road/railways. Moves quickly through soil, highly soluble in water, degrades rapidly.
✓	Dibromochloropropane	ug/L	0.2				UW,SW	Soil fumigant for nematode control on soybeans, cotton, pineapple, orchards
	Di (2-ethylhexyl) Adipate	ug/L	400				UW,SW	Synthetic rubber, food packaging, cosmetics
	Di (2-ethylhexyl) Phthalate	ug/L	4 ^a				UW,SW	Plasticizer in PVC and other plastics
✓	Dinoseb	ug/L	7				UW,SW	Pesticide for orchards, vineyards, alfalfa, onions, almonds and other crops. Not soluble in water, degrades rapidly.
✓	Diquat	ug/L	20				UW,SW	Land/Aquatic weed herbicide
✓	Endothall	ug/L	100				UW,SW	Herbicide/defoliant/desiccant/algicide on crops, land/aquatic weeds. Highly soluble in water, moves quickly through soil, degrades rapidly.
✓	Endrin	ug/L	2				UW,SW	Pesticide on insects, rodents, birds
	Epichlorohydrin	ug/L	TT (PAP)				UW,SW	Water treatment chemicals, waste epoxy resins, coatings
✓	Ethylene Dibromide	ug/L	0.05				UW,SW	Leaded gas additive, soil fumigant. Moves slowly through soil, soluble in water, degrades rapidly in water.
✓	Glyphosate	ug/L	700				UW,SW	Herbicide on grasses, weeds, brush. Adsorbs quickly to soil, moderate degradation rates in water.
✓	Heptachlor	ug/L	0.01 ^a				UW,SW	Insecticide for termites. Not water soluble, rapidly degrades in water.
	Heptachlor Epoxide	ug/L	0.01 ^a				UW,SW	Biodegradation of Heptachlor. Not water soluble
✓	Hexachlorobenzene	ug/L	1				UW,SW	Pesticide production waste by-product, wood preservative, fungicide. Not water soluble.
	Hexachlorocyclopentadiene	ug/L	50				UW,SW	Pesticide production intermediate
✓	Lindane	ug/L	0.2				UW,SW	Insecticide on cattle, lumber, gardens. Slightly soluble in water.
✓	Methoxychlor	ug/L	40				UW,SW	Insecticide for fruits, vegetables, alfalfa, livestock, pets. Insoluble in water, movement occurs through adsorption to soil particles in runoff.
✓	Molinate	ug/L	20				UW,SW	Herbicide. Highly soluble in water.
✓	Oxamyl (vydate)	ug/L	200				UW,SW	Insecticide on apples, potatoes, tomatoes. Mobile in soil, highly soluble in water, rapidly degrades in soil and water.
✓	Pentachlorophenol	ug/L	1				UW,SW	Wood preservatives, herbicide, cooling tower wastes. Moderately degrades
✓	Picloram	ug/L	500				UW,SW	Herbicide on broadleaf and woody plants, mobile in soil, soluble in water.
	PCBs	ug/L	0.5				UW,SW	Coolant oils from electrical transformers, plasticizers
✓	Simazine	ug/L	4				UW,SW	Herbicide on grass sod, crops, aquatic algae. Mobile in soil, low water solubility, moderate degradation rate in water.
✓	Thiobencarb	ug/L	70				UW,SW	Herbicide on grasses and broadleaf weeds which infest rice fields
✓	Toxaphene	ug/L	3				UW,SW	Insecticide/herbicide for cotton and soybeans
	2,3,7,8-TCDD (Dioxin)	ug/L	3.00E-05				UW,SW	Chemical production by-product (pulp and paper industry), herbicides

Table 6-2. South Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
✓	2,4,5-TP (Silvex)	ug/L	50				UW,SW	Herbicide on crops, right-of-way, golf courses
Unregulated Organic Chemicals (Section 64450, Table 64450-B)								
✓	Bromacil	ug/L	MO (if vulnerable)				UW,SW	Herbicide on noncrop areas, soil sterilant. Leaches readily through soil, slow degradation rate in soil, soluble in water, moderate degradation in water.
	Bromochloromethane	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Fire extinguishing agent
	n-Butylbenzene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Resin/rubber additive, solvent in synthesis of insecticides. Insoluble in water.
	sec-Butylbenzene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	pharmaceutical. Insoluble in water.
	tert-Butylbenzene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Used in organic synthesis, polymer linking agent. Insoluble in water
✓	Chlorothalonil	ug/L	MO (if vulnerable)				UW,SW	Fungicide (control fungus in nurseries). Not water soluble, moderate degradation rate.
✓	Diazinon	ug/L	MO (if vulnerable)				UW,SW	Insecticide for home, lawn, garden, pets, and flies. Not water soluble, low soil mobility, degrades slowly in soil.
✓	Dimethoate	ug/L	MO (if vulnerable)				UW,SW	Insecticide on alfalfa, apples, corn and other crops. Mobile in soil, highly soluble in water, rapidly degrades.
✓	Diuron	ug/L	MO (if vulnerable)				UW,SW	Herbicide for non crop areas such as industrial sites, railways, footpaths and pavements, farm buildings. Slightly soluble in water.
	Hexachlorobutadiene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Rubber solvent, synthetic rubber, heat transfer liquid, transformer liquid, hydraulic fluid
	Isopropylbenzene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Phenol (an intermediate chemical used to manufacture building materials and plastics) and acetone production. Not water soluble.
	p-Isopropyltoluene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Sulfite mills
	Naphthalene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Petroleum refining, coal tar distillation, pesticides, fungicides, dyes, detergents, and wetting agents
	n-Propylbenzene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Textile dyeing and printing, solvent, gasoline, diesel, incinerators. Very slightly soluble in water, volatile, degrades readily.
✓	Prometryn	ug/L	MO (if vulnerable)				UW,SW	Herbicide on carrots, corn, and other crops. Mobile in soil, moderately degrades in soil, degrades slowly in water.
	1,2,3-Trichlorobenzene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Insecticide, coolant in electrical installations and glass tempering, polyester dyeing, lubricants, solvent for high melting products
	1,3,4-Trichlorobenzene	ug/L	MO (if vulnerable)				UW,SW	Solvent in dyes, lubricants, cleaners, and dielectric fluids
	1,2,4-Trimethylbenzene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Gasoline and paint additive, slightly water soluble, does not bind well with soil.
	1,3,5-Trimethylbenzene	ug/L	MO (if vulnerable)	0	<0.5		UW,SW	Paints, polymers. Not water soluble.
Unregulated Organic Chemicals (Section 64450, Table 64450-C)								
✓	Aldicarb	ug/L	3				UW,SW	Insecticide on cotton, potatoes, and other crops. Soluble and mobile in soil, soluble in water.
	Aldicarb Sulfone	ug/L	2				UW,SW	Biodegradation of aldicarb
	Aldicarb Sulfoxide	ug/L	4				UW,SW	Biodegradation of aldicarb
✓	Aldrin	ug/L	MO				UW,SW	Insecticide, fumigant
✓	Butachlor	ug/L	MO				UW,SW	Herbicide on weeds
✓	Carbaryl	ug/L	MO				UW,SW	Insecticide used in pet shampoos and for agriculture. Not water soluble, readily degrades in soil and water.
✓	Dicamba	ug/L	MO				UW,SW	Herbicide. Highly mobile in soil, Highly water soluble, degrades readily.
✓	Dieldrin	ug/L	MO				UW,SW	Insecticide, wood preservative, oxidation product of Aldrin
	3-Hydroxycarbofuran	ug/L	MO				UW,SW	Biodegradation of carbofuran
✓	Methomyl	ug/L	MO				UW,SW	Insecticide on corn, potatoes, and other crops. Highly soluble in water, degrades slowly in water.
✓	Metolachlor	ug/L	MO				UW,SW	Herbicide used in agriculture. Mobile in soil, water soluble, degrades slowly.
✓	Metribuzin	ug/L	MO				UW,SW	Herbicide used in agriculture. Water soluble, degrades rapidly in water.
✓	Propachlor	ug/L	MO				UW,SW	Herbicide used in agriculture. Virtually no degradation in water.

Table 6-2. South Fork American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence

^a - DHS MCL lower than EPA

^b - Action Level

^c - DHS MCL lower than EPA, EPA remanded in 1995

^d - Monitoring Waivers are Available for Results < 50% of the MCL

^e - Recommended/Upper/Short Term MCLs

^j - Indicates Which Constituents Have Use/Occurrence Information for American River Watershed

MW - Monitoring Waiver Potentially Available

UW - Use Waiver Potentially Available

SW - Susceptibility Waiver Potentially Available

CAEC - Consumer Acceptance and Economic Considerations Evaluated

VA - Vulnerability Assessment Required

TT - Treatment Technology

PAP - Polymer Addition Practices

MO - Monitoring Required Only

Data Provided by El Dorado Irrigation District (1993 - 97)

Table 6-3. South Fork American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
Inorganics (Section 64432)								
	Aluminum	mg/L	1	<0.05	0.14	0.0892	MW	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Antimony	mg/L	0.006	<0.001	<0.005	0.0043	MW	Fire retardant, ceramics, electronics, fireworks, solder
√	Arsenic	mg/L	0.05	<0.001	<0.005	0.0033	MW	combustion
	Barium	mg/L	1 ^a	<0.01	<0.1	0.037	MW	Natural deposits, pigments, epoxy sealants, spent coal
	Beryllium	mg/L	0.004	0.001	0.0014	0.0011	MW	Electrical, aerospace, defense industries, fluorescent lights
	Cadmium	mg/L	0.005	<0.0001	0.016	0.0026	MW	Galvanized pipe corrosion, natural deposits, batteries, paints
	Chromium	mg/L	0.05 ^a	<0.01	<0.01	<0.01	MW	Natural deposits, mining, electroplating, pigments, steel fabrication
√	Cyanide	mg/L	0.2	<0.003	<0.01	0.0044	MW, UW, SW	Electroplating, steel, plastics, mining, fertilizer
	Fluoride	mg/L	1.4 to 2.4 ^a	<0.1	0.15	0.1125	MW	Natural deposits, fertilizer, aluminum industries, drinking water additive
	Lead	mg/L	0.015 ^b	<0.001	<0.005	0.0018	MW	Natural/industrial deposits, plumbing, solder, brass alloy faucets, batteries
	Mercury	mg/L	0.002	<0.0002	<0.0002	<0.0002	MW	Crop runoff, natural deposits, batteries, electrical switches, gold mining
	Nickel	mg/L	0.1 ^c	<0.005	<0.05	0.014	MW	Metal alloys, electroplating, batteries, chemical production
	Selenium	mg/L	0.05	<0.0005	<0.005	0.0014	MW	Natural deposits, mining, smelting, coal/oil combustion
	Thallium	mg/L	0.002	<0.001	<0.005	0.0018	MW	Electronics, drugs, alloys, glass, rodenticide, fungicide
Nitrate, Nitrite (Section 64432.1)								
	Nitrate	mg/L	10 (as N)	0.052	<1.0	0.2075	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
	Nitrite	mg/L	1 (as N)	<0.03	<0.5	0.1738	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
Asbestos (Section 64432.2)								
√	Asbestos	MFL	7 (>10um)	<0.1883	<0.2	0.1912	VA	linings
Secondary Standards (Section 64449, Table 64449-A)								
	Aluminum	mg/L	0.2	<0.05	0.14	0.0892	MW, CAEC	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Color	units	15	<3	5	3.4	MW, CAEC	Industrial waste, organic debris
	Copper	mg/L	1.0 ^b	<0.01	0.033	0.0206	MW, CAEC	Natural/industrial deposits, wood preservatives, plumbing, algacides, mining
	Foaming Agents	mg/L	0.5	<0.01	<0.05	0.024	MW, CAEC	Detergents, septic tanks, sewage
	Iron	mg/L	0.3	<0.03	0.42	0.133	MW, CAEC	Natural deposits
	Manganese	mg/L	0.05	<0.005	<0.01	0.006	MW, CAEC	Natural deposits, alloys, batteries, fertilizer additive
	Odor-Threshold	units	3	<1	<1	<1	MW, CAEC	Decaying organic matter, wastewater treatment
	Silver	mg/L	0.1	<0.01	<0.01	<0.01	MW, CAEC	Mining, electroplating
	Thiobencarb	ug/L	1				MW, CAEC	Herbicide on grasses and broadleaf weeds which infest rice fields
	Turbidity	NTU	0.5/5	0.1	2.6	0.746	MW, CAEC	Erosion
	Zinc	mg/L	5	<0.005	0.035	0.0164	MW, CAEC	Motor oil, electroplating, smelting, steel fabrication
Secondary Standards (Section 64449, Table 64449-B)								
	Total Dissolved Solids	mg/L	500/1,000/1,500 ^e	24	52	33.8	MW	Car washes, inorganic salts, organic matter and dissolved gases
	Specific Conductance	umho/cm	900/1,600/2,200 ^e	30	71.7	45.88	MW	ionizable compounds (salts, etc.)
	Chloride	mg/L	250/500/600 ^e	5.5	13	7.7	MW	Industrial wastewater, agricultural runoff, oil well wastes, wastewater treatment plant effluent, road salting, natural deposits,
	Sulfate	mg/L	250/500/600 ^e	<0.5	8.8	1.8813	MW	Natural deposits, sewage treatment plant effluent, pulp and textile mills, tanneries, fertilized agricultural lands
General Mineral (Section 64449 (c) (2))								
	Bicarbonate	mg/L	MO	<2.4	10	6.32	MW	Natural/industrial deposits

Table 6-3. South Fork American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Carbonate	mg/L	MO	<1	<1.2	1.16	MW	Natural/industrial deposits
	Hydroxide	mg/L	MO	<0.2	<1.0	0.36	MW	Natural/industrial deposits
	Alkalinity	mg/L	MO	2.7	8.5	6.14	MW	Natural/industrial deposits
	pH	Units	MO	6.2	8	7.1	MW	
	Calcium	mg/L	MO	1.2	3.1	2.4	MW	Natural/industrial deposits, sewage
	Magnesium	mg/L	MO	0.16	0.39	0.262	MW	Natural/industrial deposits, sewage
	Sodium	mg/L	MO	2.6	8.9	5.22	MW	Sea water, natural deposits
	Potassium	mg/L	MO	<0.1	0.5	0.39	MW	Natural deposits
	Hardness	mg/L	MO	3.6	9.3	6.9	MW	Calcium and Magnesium deposits
(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))								
	Benzene	ug/L	1000 ^a				UW,SW	Foods, gas, drugs, pesticide, paint, plastic industries. Slightly soluble in water
	Carbon Tetrachloride	ug/L	0.5 ^a	<0.5	<0.5		UW,SW	Fire extinguishers, dry cleaning solvent, degreasing and manufacturing of refrigerants, aerosols, and propellants. Very slow degradation rate, highly mobile in soil.
	o-Dichlorobenzene	ug/L	600	<0.5	<0.5		UW,SW	Paints, engine cleaning compounds, dyes, chemical wastes. Moderately adsorbed to soil, adsorbs to sediment in water.
	p-Dichlorobenzene	ug/L	5 ^a	<0.5	<0.5		UW,SW	Room/water deodorant, mothballs. Moderately adsorbed to soil, adsorbs to sediment in water.
	1,1-Dichloroethane	ug/L	5	<0.5	<0.5		UW,SW	Pain, varnish and finish removers, degreasing, ore floatation. rapidly degrades
	1,2-Dichloroethane	ug/L	0.5 ^a	<0.5	<0.5		UW,SW	Leaded gas additive, fumigants, paints, tobacco flavoring. Evaporates quickly, persists for a long time in groundwater.
	1,1-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5		UW,SW	Plastics, dyes, perfumes, paints
	cis-1,2-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5		UW,SW	Waste industrial extraction solvents
	trans-1,2-Dichloroethylene	ug/L	10 ^a	<0.5	<0.5		UW,SW	Waste industrial extraction solvents
	Dichloromethane	ug/L	5	<0.5	<0.5		UW,SW	Paint stripper, metal degreaser, propellant, extraction
	1,2-Dichloropropane	ug/L	5	<0.5	<0.5		UW,SW	Soil fumigant for nematode control, waste industrial solvent
	1,3-Dichloropropene	ug/L	0.5	<0.5	<0.5		UW,SW	Soil fumigant for nematode control
	Ethylbenzene	ug/L	700	<0.5	<0.5		UW,SW	Gasoline, insecticides, chemical manufacturing wastes. Evaporation and biodegradation is significant in water.
	Monochlorobenzene	ug/L	70 ^a	<0.5	<0.5		UW,SW	Waste solvent from metal degreasing processes, pesticide manufacturing. Moderate degradation rate in sediment.
	Styrene	ug/L	100	<0.5	<0.5		UW,SW	Plastics, rubber, resin, drug industries, leachate from landfills
	1,1,2,2-Tetrachloroethane	ug/L	1	<0.5	<0.5		UW,SW	Rubber solvent, insecticides, bleach, paint, varnish, rust remover, degreasing
	Tetrachloroethylene	ug/L	5	<0.5	<0.5		UW,SW	Industrial and dry cleaning solvent
	Toluene	ug/L	150 ^a	<0.5	<10		UW,SW	Gasoline additive, manufacturing and solvent operations
	1,2,4-Trichlorobenzene	ug/L	70	<0.5	<0.5		UW,SW	dyes, cleaners, lubricants. Mixes poorly in water, slow degradation rate
	1,1,1-Trichloroethane	ug/L	200	<0.5	<0.5		UW,SW	Adhesives, aerosols, textiles, paints, inks, metal degreasers
	1,1,2-Trichloroethane	ug/L	5	<0.5	<0.5		UW,SW	Solvent in rubber, other organic products, chemical production wastes
	Trichloroethylene	ug/L	5	<0.5	<0.5		UW,SW	Textiles, adhesives and metal degreasers
	Trichlorofluoromethane	ug/L	150	<0.5	<5.0		UW,SW	Industrial solvent and refrigerant, aerosol sprays
	1,1,2-Trichloro-1,2,2-Trifluoroeth	ug/L	1200	<0.5	<10		UW,SW	Dry cleaning solvent and refrigerant
	Vinyl Chloride	ug/L	0.5 ^a	<0.5	<0.5		UW,SW	Solvents, PVC pipe
	Xylenes (total)	ug/L	1750 ^a	<0.5	<10		UW,SW	Gasoline refining, paints, inks, detergents. Dominant removal process is volatilization, mobile in soil.
(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))								

Table 6-3. South Fork American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Acrylamide	ug/L	TT (PAP)				UW,SW	Polymer used in water/wastewater treatment, adhesives, printing ink emulsion stabilizers, thickening agents for agricultural sprays. Does not bind well with soil, soluble in water.
✓	Alachlor	ug/L	2	<1.0	<1.0		UW,SW	Herbicide for corn, soybeans, other crops. Degrades readily, soluble in water
	Atrazine	ug/L	3	<1.0	<1.0		UW,SW	Herbicide for corn and non-cropland
✓	Bentazon	ug/L	18	<2.0	<2.0		UW,SW	Herbicide for peas, alfalfa, and other crops. Rapid degradation in soil and water, highly soluble in water, does not bind to or adsorb to soil particles.
	Benzo(a)pyrene	ug/L	0.2	<0.1	<0.1		UW,SW	Coal tar coatings, burning organic matter, volcanoes, fossil fuels
✓	Carbofuran	ug/L	18 ^a	<5.0	<5.0		UW,SW	Soil fumigant on corn, cotton and other vegetable crops. Soluble in water, Hard to degrade in water, mobile in soil, moderately degrades in soil.
✓	Chlordane	ug/L	0.1 ^a	<0.1	<0.1		UW,SW	Insecticide for termite control that is no longer distributed in the US. Not water soluble, rapidly binds to topsoil, slow degradation rate in soil and water.
✓	2,4,-D	ug/L	70	<10	<10		UW,SW	Herbicide on wheat, corn, rangelands, lawns; control broadleaf weeds. Degrades rapidly.
✓	Dalapon	ug/L	200	<10	<10		UW,SW	Herbicide on orchards, beans, coffee, lans, road/railways. Moves quickly through soil, highly soluble in water, degrades rapidly.
✓	Dibromochloropropane	ug/L	0.2	<0.01	<0.01		UW,SW	Soil fumigant for nematode control on soybeans, cotton, pineapple, orchards
	Di (2-ethylhexyl) Adipate	ug/L	400	<5.0	<5.0		UW,SW	Synthetic rubber, food packaging, cosmetics
	Di (2-ethylhexyl) Phthalate	ug/L	4 ^a	<3.0	<3.0		UW,SW	Plasticizer in PVC and other plastics
✓	Dinoseb	ug/L	7	<2.0	<2.0		UW,SW	Pesticide for orchards, vineyards, alfalfa, onions, almonds and other crops. Not soluble in water, degrades rapidly.
✓	Diquat	ug/L	20	<4.0	<4.0		UW,SW	Land/Aquatic weed herbicide
✓	Endothall	ug/L	100				UW,SW	Herbicide/defoliant/desiccant/algaecide on crops, land/aquatic weeds. Highly soluble in water, moves quickly through soil, degrades rapidly.
✓	Endrin	ug/L	2	<0.1	<0.1		UW,SW	Pesticide on insects, rodents, birds
	Epichlorohydrin	ug/L	TT (PAP)				UW,SW	Water treatment chemicals, waste epoxy resins, coatings
✓	Ethylene Dibromide	ug/L	0.05	<0.02	<0.02		UW,SW	Leaded gas additive, soil fumigant. Moves slowly through soil, soluble in water, degrades rapidly in water.
✓	Glyphosate	ug/L	700	<25	<25		UW,SW	Herbicide on grasses, weeds, brush. Adsorbs quickly to soil, moderate degradation rates in water.
✓	Heptachlor	ug/L	0.01 ^a	<0.01	<0.01		UW,SW	Insecticide for termites. Not water soluble, rapidly degrades in water.
	Heptachlor Epoxide	ug/L	0.01 ^a	<0.01	<0.01		UW,SW	Biodegradation of Heptachlor. Not water soluble
✓	Hexachlorobenzene	ug/L	1	<0.5	<0.5		UW,SW	Pesticide production waste by-product, wood preservative, fungicide. Not water soluble.
	Hexachlorocyclopentadiene	ug/L	50	<1.0	<1.0		UW,SW	Pesticide production intermediate
✓	Lindane	ug/L	0.2	<0.2	<0.2		UW,SW	Insecticide on cattle, lumber, gardens. Slightly soluble in water.
✓	Methoxychlor	ug/L	40	<10	<10		UW,SW	Insecticide for fruits, vegetables, alfalfa, livestock, pets. Insoluble in water, movement occurs through adsorption to soil particles in runoff.
✓	Molinate	ug/L	20	<2.0	<2.0		UW,SW	Herbicide. Highly soluble in water.
✓	Oxamyl (vydate)	ug/L	200	<20	<20		UW,SW	Insecticide on apples, potatoes, tomatoes. Mobile in soil, highly soluble in water, rapidly degrades in soil and water.
✓	Pentachlorophenol	ug/L	1	<0.2	<0.2		UW,SW	Wood preservatives, herbicide, cooling tower wastes. Moderately degrades
✓	Picloram	ug/L	500	<1.0	<1.0		UW,SW	Herbicide on broadleaf and woody plants, mobile in soil, soluble in water.
	PCBs	ug/L	0.5	<0.5	<0.5		UW,SW	Coolant oils from electrical transformers, plasticizers
✓	Simazine	ug/L	4	<1.0	<1.0		UW,SW	Herbicide on grass sod, crops, aquatic algae. Mobile in soil, low water solubility, moderate degradation rate in water.
✓	Thiobencarb	ug/L	70	<1.0	<1.0		UW,SW	Herbicide on grasses and broadleaf weeds which infest rice fields
✓	Toxaphene	ug/L	3	<1.0	<1.0		UW,SW	Insecticide/herbicide for cotton and soybeans
	2,3,7,8-TCDD (Dioxin)	ug/L	3.00E-05	<0.005	<0.005		UW,SW	Chemical production by-product (pulp and paper industry), herbicides
✓	2,4,5-TP (Silvex)	ug/L	50	<1.0	<1.0		UW,SW	Herbicide on crops, right-of-way, golf courses

Table 6-3. South Fork American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
Unregulated Organic Chemicals (Section 64450, Table 64450-B)								
✓	Bromacil	ug/L	MO (if vulnerable)	<10	<10		UW,SW	Herbicide on noncrop areas, soil sterilant. Leaches readily through soil, slow degradation rate in soil, soluble in water, moderate degradation in water.
	Bromochloromethane	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Fire extinguishing agent
	n-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Resin/rubber additive, solvent in synthesis of insecticides. Insoluble in water.
	sec-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	pharmaceutical. Insoluble in water.
	tert-Butylbenzene	ug/L	MO (if vulnerable)				UW,SW	Used in organic synthesis, polymer linking agent. Insoluble in water
✓	Chlorothalonil	ug/L	MO (if vulnerable)	<5.0	<5.0		UW,SW	Fungicide (control fungus in nurseries). Not water soluble, moderate degradation rate.
✓	Diazinon	ug/L	MO (if vulnerable)	<0.25	<0.25		UW,SW	Insecticide for home, lawn, garden, pets, and flies. Not water soluble, low soil mobility, degrades slowly in soil.
✓	Dimethoate	ug/L	MO (if vulnerable)	<10	<10		UW,SW	Insecticide on alfalfa, apples, corn and other crops. Mobile in soil, highly soluble in water, rapidly degrades.
✓	Diuron	ug/L	MO (if vulnerable)				UW,SW	Herbicide for non crop areas such as industrial sites, railways, footpaths and pavements, farm buildings. Slightly soluble in water.
	Hexachlorobutadiene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Rubber solvent, synthetic rubber, heat transfer liquid, transformer liquid, hydraulic fluid
	Isopropylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Phenol (an intermediate chemical used to manufacture building materials and plastics) and acetone production. Not water soluble.
	p-Isopropyltoluene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Sulfite mills
	Naphthalene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Petroleum refining, coal tar distillation, pesticides, fungicides, dyes, detergents, and wetting agents
	n-Propylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Textile dyeing and printing, solvent, gasoline, diesel, incinerators. Very slightly soluble in water, volatile, degrades readily.
✓	Prometryn	ug/L	MO (if vulnerable)	<2.0	<2.0		UW,SW	Herbicide on carrots, corn, and other crops. Mobile in soil, moderately degrades in soil, degrades slowly in water.
	1,2,3-Trichlorobenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Insecticide, coolant in electrical installations and glass tempering, polyester dyeing, lubricants, solvent for high melting products
	1,3,4-Trichlorobenzene	ug/L	MO (if vulnerable)				UW,SW	Solvent in dyes, lubricants, cleaners, and dielectric fluids
	1,2,4-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Gasoline and paint additive, slightly water soluble, does not bind well with soil.
	1,3,5-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Paints, polymers. Not water soluble.
Unregulated Organic Chemicals (Section 64450, Table 64450-C)								
✓	Aldicarb	ug/L	3	<3.0	<3.0		UW,SW	Insecticide on cotton, potatoes, and other crops. Soluble and mobile in soil, soluble in water.
	Aldicarb Sulfone	ug/L	2	<3.0	<3.0		UW,SW	Biodegradation of aldicarb
	Aldicarb Sulfoxide	ug/L	4	<4.0	<4.0		UW,SW	Biodegradation of aldicarb
✓	Aldrin	ug/L	MO	<0.75	<0.75		UW,SW	Insecticide, fumigant
✓	Butachlor	ug/L	MO	<0.38	<0.38		UW,SW	Herbicide on weeds
✓	Carbaryl	ug/L	MO	<5.0	<5.0		UW,SW	Insecticide used in pet shampoos and for agriculture. Not water soluble, readily degrades in soil and water.
✓	Dicamba	ug/L	MO	<0.081	<0.081		UW,SW	Herbicide. Highly mobile in soil, Highly water soluble, degrades readily.
✓	Dieldrin	ug/L	MO	<0.02	<0.02		UW,SW	Insecticide, wood preservative, oxidation product of Aldrin
	3-Hydroxycarbofuran	ug/L	MO	<3.0	<3.0		UW,SW	Biodegradation of carbofuran
✓	Methomyl	ug/L	MO	<2.0	<2.0		UW,SW	Insecticide on corn, potatoes, and other crops. Highly soluble in water, degrades slowly in water.
✓	Metolachlor	ug/L	MO				UW,SW	Herbicide used in agriculture. Mobile in soil, water soluble, degrades slowly.
✓	Metribuzin	ug/L	MO				UW,SW	Herbicide used in agriculture. Water soluble, degrades rapidly in water.
✓	Propachlor	ug/L	MO	<0.5	<0.5		UW,SW	Herbicide used in agriculture. Virtually no degradation in water.

^a - DHS MCL lower than EPA

Table 6-3. South Fork American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence

^b - Action Level

^c - DHS MCL lower than EPA, EPA remanded in 1995

^d - Monitoring Waivers are Available for Results < 50% of the MCL

^e - Recommended/Upper/Short Term MCLs

^v - Indicates Which Constituents Have Use/Occurrence Information for American River Watershed

MW - Monitoring Waiver Potentially Available

UW - Use Waiver Potentially Available

SW - Susceptibility Waiver Potentially Available

CAEC - Consumer Acceptance and Economic Considerations Evaluated

VA - Vulnerability Assessment Required

TT - Treatment Technology

PAP - Polymer Addition Practices

MO - Monitoring Required Only

Data Provided by El Dorado Irrigation District (1993 - 97)

Table 6-4. Folsom Lake - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
Inorganics (Section 64432)							
	Aluminum	mg/L	1	<0.05	1.4	MW	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Antimony	mg/L	0.006	<0.005	<0.005	MW	Fire retardant, ceramics, electronics, fireworks, solder
✓	Arsenic	mg/L	0.05	<0.001	<0.008	MW	combustion
	Barium	mg/L	1 ^a	0.011	<0.1	MW	Natural deposits, pigments, epoxy sealants, spent coal
	Beryllium	mg/L	0.004	<0.001	0.0043	MW	Electrical, aerospace, defense industries, fluorescent lights
	Cadmium	mg/L	0.005	<0.00001	<0.001	MW	Galvanized pipe corrosion, natural deposits, batteries, paints
	Chromium	mg/L	0.05 ^a	<0.01	0.015	MW	Natural deposits, mining, electroplating, pigments, steel fabrication
✓	Cyanide	mg/L	0.2	<0.003	<0.01	MW, UW, SW	Electroplating, steel, plastics, mining, fertilizer
	Fluoride	mg/L	1.4 to 2.4 ^a	<0.1	0.1	MW	Natural deposits, fertilizer, aluminum industries, drinking water additive
	Lead	mg/L	0.015 ^b	<0.001	0.0071	MW	Natural/industrial deposits, plumbing, solder, brass alloy faucets, batteries
	Mercury	mg/L	0.002	<0.0002	<0.0002	MW	Crop runoff, natural deposits, batteries, electrical switches, gold mining
	Nickel	mg/L	0.1 ^c	<0.005	<0.05	MW	Metal alloys, electroplating, batteries, chemical production
	Selenium	mg/L	0.05	<0.005	<0.005	MW	Natural deposits, mining, smelting, coal/oil combustion
	Thallium	mg/L	0.002	<0.001	<0.005	MW	Electronics, drugs, alloys, glass, rodenticide, fungicide
Nitrate, Nitrite (Section 64432.1)							
	Nitrate	mg/L	10 (as N)	<0.15	<1	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
	Nitrite	mg/L	1 (as N)	<0.1	1.1	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
Asbestos (Section 64432.2)							
✓	Asbestos	MFL	7 (>10um)	<0.1883	0.94	VA	linings
Secondary Standards (Section 64449, Table 64449-A)							
	Aluminum	mg/L	0.2	<0.05	1.4	MW, CAEC	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Color	units	15	<3	35	MW, CAEC	Industrial waste, organic debris
	Copper	mg/L	1.0 ^b	<0.01	0.11	MW, CAEC	Natural/industrial deposits, wood preservatives, plumbing, algacides, mining
	Foaming Agents	mg/L	0.5	<0.01	<0.05	MW, CAEC	Detergents, septic tanks, sewage
	Iron	mg/L	0.3	<0.02	1.7	MW, CAEC	Natural deposits
	Manganese	mg/L	0.05	0.0074	0.052	MW, CAEC	Natural deposits, alloys, batteries, fertilizer additive
	Odor-Threshold	units	3	<1	100	MW, CAEC	Decaying organic matter, wastewater treatment
	Silver	mg/L	0.1	<0.01	0.018	MW, CAEC	Mining, electroplating
	Thiobencarb	ug/L	1			MW, CAEC	Herbicide on grasses and broadleaf weeds which infest rice fields
	Turbidity	NTU	0.5/5	0.6	16	MW, CAEC	Erosion
	Zinc	mg/L	5	<0.005	0.026	MW, CAEC	Motor oil, electroplating, smelting, steel fabrication
Secondary Standards (Section 64449, Table 64449-B)							
	Total Dissolved Solids	mg/L	500/1,000/1,500 ^e	16	52	MW	Car washes, inorganic salts, organic matter and dissolved gases
	Specific Conductance	umho/cm	900/1,600/2,200 ^e	39	77.9	MW	ionizable compounds (salts, etc.)
	Chloride	mg/L	250/500/600 ^e	1	3.1	MW	Industrial wastewater, agricultural runoff, oil well wastes, wastewater treatment plant effluent, road salting, natural deposits,
	Sulfate	mg/L	250/500/600 ^e	0.8	4.6	MW	Natural deposits, sewage treatment plant effluent, pulp and textile mills, tanneries, fertilized agricultural lands
General Mineral (Section 64449 (c) (2))							
	Bicarbonate	mg/L	MO	17	34	MW	Natural/industrial deposits
	Carbonate	mg/L	MO	<1	1.2	MW	Natural/industrial deposits

Table 6-4. Folsom Lake - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Hydroxide	mg/L	MO	<0.2	13	MW	Natural/industrial deposits
	Alkalinity	mg/L	MO	19	28	MW	Natural/industrial deposits
	pH	Units	MO	5.9	7.5	MW	
	Calcium	mg/L	MO	5	7.6	MW	Natural/industrial deposits, sewage
	Magnesium	mg/L	MO	1.4	4.1	MW	Natural/industrial deposits, sewage
	Sodium	mg/L	MO	1.9	2.9	MW	Sea water, natural deposits
	Potassium	mg/L	MO	0.54	<1.0	MW	Natural deposits
	Hardness	mg/L	MO	13	33	MW	Calcium and Magnesium deposits
(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))							
	Benzene	ug/L	1000 ^a	<0.5	<0.5	UW,SW	Foods, gas, drugs, pesticide, paint, plastic industries. Slightly soluble in water
	Carbon Tetrachloride	ug/L	0.5 ^a	<0.5	<0.5	UW,SW	Fire extinguishers, dry cleaning solvent, degreasing and manufacturing of refrigerants, aerosols, and propellants. Very slow degradation rate, highly mobile in soil.
	o-Dichlorobenzene	ug/L	600	<0.5	<0.5	UW,SW	Paints, engine cleaning compounds, dyes, chemical wastes. Moderately adsorbed to soil, adsorbs to sediment in water.
	p-Dichlorobenzene	ug/L	5 ^a	<0.5	<0.5	UW,SW	Room/water deodorant, mothballs. Moderately adsorbed to soil, adsorbs to sediment in water.
	1,1-Dichloroethane	ug/L	5	<0.5	<0.5	UW,SW	Pain, varnish and finish removers, degreasing, ore floatation. rapidly degrades.
	1,2-Dichloroethane	ug/L	0.5 ^a	<0.5	<0.5	UW,SW	Leaded gas additive, fumigants, paints, tobacco flavoring. Evaporates quickly, persists for a long time in groundwater.
	1,1-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5	UW,SW	Plastics, dyes, perfumes, paints
	cis-1,2-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5	UW,SW	Waste industrial extraction solvents
	trans-1,2-Dichloroethylene	ug/L	10 ^a	<0.5	<0.5	UW,SW	Waste industrial extraction solvents
	Dichloromethane	ug/L	5	<0.5	<3.0	UW,SW	Paint stripper, metal degreaser, propellant, extraction
	1,2-Dichloropropane	ug/L	5	<0.5	<0.5	UW,SW	Soil fumigant for nematode control, waste industrial solvent
	1,3-Dichloropropene	ug/L	0.5	<0.5	<0.5	UW,SW	Soil fumigant for nematode control
	Ethylbenzene	ug/L	700	<0.5	<5.0	UW,SW	Gasoline, insecticides, chemical manufacturing wastes. Evaporation and biodegradation is significant in water.
	Monochlorobenzene	ug/L	70 ^a	<0.5	<1.0	UW,SW	Waste solvent from metal degreasing processes, pesticide manufacturing. Moderate degradation rate in sediment.
	Styrene	ug/L	100	<0.5	<0.5	UW,SW	Plastics, rubber, resin, drug industries, leachate from landfills
	1,1,2,2-Tetrachloroethane	ug/L	1	<0.5	<0.5	UW,SW	Rubber solvent, insecticides, bleach, paint, varnish, rust remover, degreasing
	Tetrachloroethylene	ug/L	5	<0.5	<0.5	UW,SW	Industrial and dry cleaning solvent
	Toluene	ug/L	150 ^a	<0.5	<10	UW,SW	Gasoline additive, manufacturing and solvent operations
	1,2,4-Trichlorobenzene	ug/L	70	<0.5	<0.5	UW,SW	dyes, cleaners, lubricants. Mixes poorly in water, slow degradation rate
	1,1,1-Trichloroethane	ug/L	200	<0.5	<1.0	UW,SW	Adhesives, aerosols, textiles, paints, inks, metal degreasers
	1,1,2-Trichloroethane	ug/L	5	<0.5	<1.0	UW,SW	Solvent in rubber, other organic products, chemical production wastes
	Trichloroethylene	ug/L	5	<0.5	<0.5	UW,SW	Textiles, adhesives and metal degreasers
	Trichlorofluoromethane	ug/L	150	<5.0	<5.0	UW,SW	Industrial solvent and refrigerant, aerosol sprays
	1,1,2-Trichloro-1,2,2-Trifluoroeth	ug/L	1200	<10	<10	UW,SW	Dry cleaning solvent and refrigerant
	Vinyl Chloride	ug/L	0.5 ^a	<0.5	<0.5	UW,SW	Solvents, PVC pipe
	Xylenes (total)	ug/L	1750 ^a	<0.5	<10	UW,SW	Gasoline refining, paints, inks, detergents. Dominant removal process is volatilization, mobile in soil.
(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))							
	Acrylamide	ug/L	TT (PAP)			UW,SW	Polymer used in water/wastewater treatment, adhesives, printing ink emulsion stabilizers, thickening agents for agricultural sprays. Does not bind well with soil, soluble in water.
✓	Alachlor	ug/L	2			UW,SW	Herbicide for corn, soybeans, other crops. Degrades readily, soluble in water
	Atrazine	ug/L	3			UW,SW	Herbicide for corn and non-cropland

Table 6-4. Folsom Lake - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
✓	Bentazon	ug/L	18			UW,SW	Herbicide for peas, alfalfa, and other crops. Rapid degradation in soil and water, highly soluble in water, does not bind to or adsorb to soil particles.
	Benzo(a)pyrene	ug/L	0.2			UW,SW	Coal tar coatings, burning organic matter, volcanoes, fossil fuels
✓	Carbofuran	ug/L	18 ^a			UW,SW	Soil fumigant on corn, cotton and other vegetable crops. Soluble in water, Hard to degrade in water, mobile in soil, moderately degrades in soil.
✓	Chlordane	ug/L	0.1 ^a			UW,SW	Insecticide for termite control that is no longer distributed in the US. Not water soluble, rapidly binds to topsoil, slow degradation rate in soil and water.
✓	2,4,-D	ug/L	70	<10	<10	UW,SW	Herbicide on wheat, corn, rangelands, lawns; control broadleaf weeds. Degrades rapidly.
✓	Dalapon	ug/L	200			UW,SW	Herbicide on orchards, beans, coffee, lans, road/railways. Moves quickly through soil, highly soluble in water, degrades rapidly.
✓	Dibromochloropropane	ug/L	0.2			UW,SW	Soil fumigant for nematode control on soybeans, cotton, pineapple, orchards
	Di (2-ethylhexyl) Adipate	ug/L	400			UW,SW	Synthetic rubber, food packaging, cosmetics
	Di (2-ethylhexyl) Phthalate	ug/L	4 ^a			UW,SW	Plasticizer in PVC and other plastics
✓	Dinoseb	ug/L	7			UW,SW	Pesticide for orchards, vineyards, alfalfa, onions, almonds and other crops. Not soluble in water, degrades rapidly.
✓	Diquat	ug/L	20			UW,SW	Land/Aquatic weed herbicide
✓	Endothall	ug/L	100			UW,SW	Herbicide/defoliant/desiccant/algaecide on crops, land/aquatic weeds. Highly soluble in water, moves quickly through soil, degrades rapidly.
✓	Endrin	ug/L	2	<0.1	<0.1	UW,SW	Pesticide on insects, rodents, birds
	Epichlorohydrin	ug/L	TT (PAP)			UW,SW	Water treatment chemicals, waste epoxy resins, coatings
✓	Ethylene Dibromide	ug/L	0.05			UW,SW	Leaded gas additive, soil fumigant. Moves slowly through soil, soluble in water, degrades rapidly in water.
✓	Glyphosate	ug/L	700			UW,SW	Herbicide on grasses, weeds, brush. Adsorbs quickly to soil, moderate degradation rates in water.
✓	Heptachlor	ug/L	0.01 ^a			UW,SW	Insecticide for termites. Not water soluble, rapidly degrades in water.
	Heptachlor Epoxide	ug/L	0.01 ^a			UW,SW	Biodegradation of Heptachlor. Not water soluble
✓	Hexachlorobenzene	ug/L	1			UW,SW	Pesticide production waste by-product, wood preservative, fungicide. Not water soluble.
	Hexachlorocyclopentadiene	ug/L	50			UW,SW	Pesticide production intermediate
✓	Lindane	ug/L	0.2	<0.2	<0.2	UW,SW	Insecticide on cattle, lumber, gardens. Slightly soluble in water.
✓	Methoxychlor	ug/L	40	<10	<10	UW,SW	Insecticide for fruits, vegetables, alfalfa, livestock, pets. Insoluble in water, movement occurs through adsorption to soil particles in runoff.
✓	Molinate	ug/L	20			UW,SW	Herbicide. Highly soluble in water.
✓	Oxamyl (vydate)	ug/L	200			UW,SW	Insecticide on apples, potatoes, tomatoes. Mobile in soil, highly soluble in water, rapidly degrades in soil and water.
✓	Pentachlorophenol	ug/L	1			UW,SW	Wood preservatives, herbicide, cooling tower wastes. Moderately degrades
✓	Picloram	ug/L	500			UW,SW	Herbicide on broadleaf and woody plants, mobile in soil, soluble in water.
	PCBs	ug/L	0.5			UW,SW	Coolant oils from electrical transformers, plasticizers
✓	Simazine	ug/L	4			UW,SW	Herbicide on grass sod, crops, aquatic algae. Mobile in soil, low water solubility, moderate degradation rate in water.
✓	Thiobencarb	ug/L	70			UW,SW	Herbicide on grasses and broadleaf weeds which infest rice fields
✓	Toxaphene	ug/L	3	<1.0	<1.0	UW,SW	Insecticide/herbicide for cotton and soybeans
	2,3,7,8-TCDD (Dioxin)	ug/L	3.00E-05			UW,SW	Chemical production by-product (pulp and paper industry), herbicides
✓	2,4,5-TP (Silvex)	ug/L	50	<1.0	<1.0	UW,SW	Herbicide on crops, right-of-way, golf courses
Unregulated Organic Chemicals (Section 64450, Table 64450-B)							
✓	Bromacil	ug/L	MO (if vulnerable)			UW,SW	Herbicide on noncrop areas, soil sterilant. Leaches readily through soil, slow degradation rate in soil, soluble in water, moderate degradation in water.
	Bromochloromethane	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Fire extinguishing agent

Table 6-4. Folsom Lake - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	n-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Resin/rubber additive, solvent in synthesis of insecticides. Insoluble in water.
	sec-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	pharmaceutical. Insoluble in water.
	tert-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Used in organic synthesis, polymer linking agent. Insoluble in water
√	Chlorothalonil	ug/L	MO (if vulnerable)			UW,SW	Fungicide (control fungus in nurseries). Not water soluble, moderate degradation rate.
√	Diazinon	ug/L	MO (if vulnerable)			UW,SW	Insecticide for home, lawn, garden, pets, and flies. Not water soluble, low soil mobility, degrades slowly in soil.
√	Dimethoate	ug/L	MO (if vulnerable)			UW,SW	Insecticide on alfalfa, apples, corn and other crops. Mobile in soil, highly soluble in water, rapidly degrades.
√	Diuron	ug/L	MO (if vulnerable)			UW,SW	Herbicide for non crop areas such as industrial sites, railways, footpaths and pavements, farm buildings. Slightly soluble in water.
	Hexachlorobutadiene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Rubber solvent, synthetic rubber, heat transfer liquid, transformer liquid, hydraulic fluid
	Isopropylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Phenol (an intermediate chemical used to manufacture building materials and plastics) and acetone production. Not water soluble.
	p-Isopropyltoluene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Sulfite mills
	Naphthalene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Petroleum refining, coal tar distillation, pesticides, fungicides, dyes, detergents, and wetting agents
	n-Propylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Textile dyeing and printing, solvent, gasoline, diesel, incinerators. Very slightly soluble in water, volatile, degrades readily.
√	Prometryn	ug/L	MO (if vulnerable)			UW,SW	Herbicide on carrots, corn, and other crops. Mobile in soil, moderately degrades in soil, degrades slowly in water.
	1,2,3-Trichlorobenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Insecticide, coolant in electrical installations and glass tempering, polyester dyeing, lubricants, solvent for high melting products
	1,3,4-Trichlorobenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Solvent in dyes, lubricants, cleaners, and dielectric fluids
	1,2,4-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Gasoline and paint additive, slightly water soluble, does not bind well with soil.
	1,3,5-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Paints, polymers. Not water soluble.
Unregulated Organic Chemicals (Section 64450, Table 64450-C)							
√	Aldicarb	ug/L	3			UW,SW	Insecticide on cotton, potatoes, and other crops. Soluble and mobile in soil, soluble in water.
	Aldicarb Sulfone	ug/L	2			UW,SW	Biodegradation of aldicarb
	Aldicarb Sulfoxide	ug/L	4			UW,SW	Biodegradation of aldicarb
√	Aldrin	ug/L	MO			UW,SW	Insecticide, fumigant
√	Butachlor	ug/L	MO			UW,SW	Herbicide on weeds
√	Carbaryl	ug/L	MO			UW,SW	Insecticide used in pet shampoos and for agriculture. Not water soluble, readily degrades in soil and water.
√	Dicamba	ug/L	MO			UW,SW	Herbicide. Highly mobile in soil, Highly water soluble, degrades readily.
√	Dieldrin	ug/L	MO			UW,SW	Insecticide, wood preservative, oxidation product of Aldrin
	3-Hydroxycarbofuran	ug/L	MO			UW,SW	Biodegradation of carbofuran
√	Methomyl	ug/L	MO			UW,SW	Insecticide on corn, potatoes, and other crops. Highly soluble in water, degrades slowly in water.
√	Metolachlor	ug/L	MO			UW,SW	Herbicide used in agriculture. Mobile in soil, water soluble, degrades slowly.
√	Metribuzin	ug/L	MO			UW,SW	Herbicide used in agriculture. Water soluble, degrades rapidly in water.
√	Propachlor	ug/L	MO			UW,SW	Herbicide used in agriculture. Virtually no degradation in water.

^a - DHS MCL lower than EPA

^b - Action Level

^c - DHS MCL lower than EPA, EPA remanded in 1995

^d - Monitoring Waivers are Available for Results < 50% of the MCL

Table 6-4. Folsom Lake - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence

^e - Recommended/Upper/Short Term MCLs

^v - Indicates Which Constituents Have Use/Occurrence Information for American River Watershed

MW - Monitoring Waiver Potentially Available

UW - Use Waiver Potentially Available

SW - Susceptibility Waiver Potentially Available

CAEC - Consumer Acceptance and Economic Considerations Evaluated

VA - Vulnerability Assessment Required

TT - Treatment Technology

PAP - Polymer Addition Practices

MO - Monitoring Required Only

Data Provided by San Juan Water District, City of Roseville and El Dorado Irrigation District (1993 - 97)

Table 6-5. Folsom Lake - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
Inorganics (Section 64432)							
	Aluminum	mg/L	1	0.0052	0.15	MW	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Antimony	mg/L	0.006	<0.001	<0.05	MW	Fire retardant, ceramics, electronics, fireworks, solder
√	Arsenic	mg/L	0.05	<0.001	<0.005	MW	combustion
	Barium	mg/L	1 ^a	<0.001	<0.1	MW	Natural deposits, pigments, epoxy sealants, spent coal
	Beryllium	mg/L	0.004	<0.001	<0.01	MW	Electrical, aerospace, defense industries, fluorescent lights
	Cadmium	mg/L	0.005	<0.0001	<0.001	MW	Galvanized pipe corrosion, natural deposits, batteries, paints
	Chromium	mg/L	0.05 ^a	<0.0001	<0.01	MW	Natural deposits, mining, electroplating, pigments, steel fabrication
√	Cyanide	mg/L	0.2	<0.003	<0.1	MW, UW, SW	Electroplating, steel, plastics, mining, fertilizer
	Fluoride	mg/L	1.4 to 2.4 ^a	<0.1	0.7	MW	Natural deposits, fertilizer, aluminum industries, drinking water additive
	Lead	mg/L	0.015 ^b	<0.001	<0.005	MW	Natural/industrial deposits, plumbing, solder, brass alloy faucets, batteries
	Mercury	mg/L	0.002	<0.0002	<0.0002	MW	Crop runoff, natural deposits, batteries, electrical switches, gold mining
	Nickel	mg/L	0.1 ^c	<0.0002	<0.025	MW	Metal alloys, electroplating, batteries, chemical production
	Selenium	mg/L	0.05	<0.0005	<0.005	MW	Natural deposits, mining, smelting, coal/oil combustion
	Thallium	mg/L	0.002	<0.001	<0.005	MW	Electronics, drugs, alloys, glass, rodenticide, fungicide
Nitrate, Nitrite (Section 64432.1)							
	Nitrate	mg/L	10 (as N)	0.068	<1.0	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
	Nitrite	mg/L	1 (as N)	<0.03	<0.5	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
Asbestos (Section 64432.2)							
√	Asbestos	MFL	7 (>10um)	<0.0056	0.1883	VA	linings
Secondary Standards (Section 64449, Table 64449-A)							
	Aluminum	mg/L	0.2	0.0052	0.15	MW, CAEC	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Color	units	15	0	5	MW, CAEC	Industrial waste, organic debris
	Copper	mg/L	1.0 ^b	<0.01	<0.02	MW, CAEC	Natural/industrial deposits, wood preservatives, plumbing, algacides, mining
	Foaming Agents	mg/L	0.5	<0.01	<0.05	MW, CAEC	Detergents, septic tanks, sewage
	Iron	mg/L	0.3	<0.01	0.38	MW, CAEC	Natural deposits
	Manganese	mg/L	0.05	<0.005	0.037	MW, CAEC	Natural deposits, alloys, batteries, fertilizer additive
	Odor-Threshold	units	3	0	<1.0	MW, CAEC	Decaying organic matter, wastewater treatment
	Silver	mg/L	0.1	<0.005	<0.01	MW, CAEC	Mining, electroplating
	Thiobencarb	ug/L	1			MW, CAEC	Herbicide on grasses and broadleaf weeds which infest rice fields
	Turbidity	NTU	0.5/5	<0.01	0.24	MW, CAEC	Erosion
	Zinc	mg/L	5	<0.005	0.055	MW, CAEC	Motor oil, electroplating, smelting, steel fabrication
Secondary Standards (Section 64449, Table 64449-B)							
	Total Dissolved Solids	mg/L	500/1,000/1,500 ^e	28	82	MW	Car washes, inorganic salts, organic matter and dissolved gases
	Specific Conductance	umho/cm	900/1,600/2,200 ^e	26	98.6	MW	ionizable compounds (salts, etc.)
	Chloride	mg/L	250/500/600 ^e	2	6.5	MW	Industrial wastewater, agricultural runoff, oil well wastes, wastewater treatment plant effluent, road salting, natural deposits,
	Sulfate	mg/L	250/500/600 ^e	1.9	9.1	MW	Natural deposits, sewage treatment plant effluent, pulp and textile mills, tanneries, fertilized agricultural lands
General Mineral (Section 64449 (c) (2))							
	Bicarbonate	mg/L	MO	13	37	MW	Natural/industrial deposits
	Carbonate	mg/L	MO	<1.0	<1.2	MW	Natural/industrial deposits

Table 6-5. Folsom Lake - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Hydroxide	mg/L	MO	<0.2	25	MW	Natural/industrial deposits
	Alkalinity	mg/L	MO	13	30	MW	Natural/industrial deposits
	pH	Units	MO	6	8.9	MW	
	Calcium	mg/L	MO	2.9	110	MW	Natural/industrial deposits, sewage
	Magnesium	mg/L	MO	1	15	MW	Natural/industrial deposits, sewage
	Sodium	mg/L	MO	1	16	MW	Sea water, natural deposits
	Potassium	mg/L	MO	<0.5	6.4	MW	Natural deposits
	Hardness	mg/L	MO	11	39	MW	Calcium and Magnesium deposits
	(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))						
	Benzene	ug/L	1000 ^a	<0.5	<0.5	UW,SW	Foods, gas, drugs, pesticide, paint, plastic industries. Slightly soluble in water
	Carbon Tetrachloride	ug/L	0.5 ^a	<0.5	<0.5	UW,SW	Fire extinguishers, dry cleaning solvent, degreasing and manufacturing of refrigerants, aerosols, and propellants. Very slow degradation rate, highly mobile in soil.
	o-Dichlorobenzene	ug/L	600	<0.5	<0.5	UW,SW	Paints, engine cleaning compounds, dyes, chemical wastes. Moderately adsorbed to soil, adsorbs to sediment in water.
	p-Dichlorobenzene	ug/L	5 ^a	<0.5	<0.5	UW,SW	Room/water deodorant, mothballs. Moderately adsorbed to soil, adsorbs to sediment in water.
	1,1-Dichloroethane	ug/L	5	<0.5	<0.5	UW,SW	Pain, varnish and finish removers, degreasing, ore floatation. rapidly degrades,
	1,2-Dichloroethane	ug/L	0.5 ^a	<0.5	<0.5	UW,SW	Leaded gas additive, fumigants, paints, tobacco flavoring. Evaporates quickly, persists for a long time in groundwater.
	1,1-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5	UW,SW	Plastics, dyes, perfumes, paints
	cis-1,2-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5	UW,SW	Waste industrial extraction solvents
	trans-1,2-Dichloroethylene	ug/L	10 ^a	<0.5	<0.5	UW,SW	Waste industrial extraction solvents
	Dichloromethane	ug/L	5	<0.5	<3.0	UW,SW	Paint stripper, metal degreaser, propellant, extraction
	1,2-Dichloropropane	ug/L	5	<0.5	<0.5	UW,SW	Soil fumigant for nematode control, waste industrial solvent
	1,3-Dichloropropene	ug/L	0.5	<0.5	<0.5	UW,SW	Soil fumigant for nematode control
	Ethylbenzene	ug/L	700	<0.5	<5.0	UW,SW	Gasoline, insecticides, chemical manufacturing wastes. Evaporation and biodegradation is significant in water.
	Monochlorobenzene	ug/L	70 ^a	<0.5	<1.0	UW,SW	Waste solvent from metal degreasing processes, pesticide manufacturing. Moderate degradation rate in sediment.
	Styrene	ug/L	100	<0.5	<0.5	UW,SW	Plastics, rubber, resin, drug industries, leachate from landfills
	1,1,2,2-Tetrachloroethane	ug/L	1	<0.5	<0.5	UW,SW	Rubber solvent, insecticides, bleach, paint, varnish, rust remover, degreasing
	Tetrachloroethylene	ug/L	5	<0.5	<0.5	UW,SW	Industrial and dry cleaning solvent
	Toluene	ug/L	150 ^a	<0.5	<10	UW,SW	Gasoline additive, manufacturing and solvent operations
	1,2,4-Trichlorobenzene	ug/L	70	<0.5	<0.5	UW,SW	dyes, cleaners, lubricants. Mixes poorly in water, slow degradation rate
	1,1,1-Trichloroethane	ug/L	200	<0.5	<0.5	UW,SW	Adhesives, aerosols, textiles, paints, inks, metal degreasers
	1,1,2-Trichloroethane	ug/L	5	<0.5	<1.0	UW,SW	Solvent in rubber, other organic products, chemical production wastes
	Trichloroethylene	ug/L	5	<0.5	<0.5	UW,SW	Textiles, adhesives and metal degreasers
	Trichlorofluoromethane	ug/L	150	<0.5	<5.0	UW,SW	Industrial solvent and refrigerant, aerosol sprays
	1,1,2-Trichloro-1,2,2-Trifluoroeth	ug/L	1200	<0.5	<10	UW,SW	Dry cleaning solvent and refrigerant
	Vinyl Chloride	ug/L	0.5 ^a	<0.5	<0.5	UW,SW	Solvents, PVC pipe
	Xylenes (total)	ug/L	1750 ^a	<0.5	<10	UW,SW	Gasoline refining, paints, inks, detergents. Dominant removal process is volatilization, mobile in soil.
	(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))						
	Acrylamide	ug/L	TT (PAP)			UW,SW	Polymer used in water/wastewater treatment, adhesives, printing ink emulsion stabilizers, thickening agents for agricultural sprays. Does not bind well with soil, soluble in water.
√	Alachlor	ug/L	2	<1.0	<1.0	UW,SW	Herbicide for corn, soybeans, other crops. Degrades readily, soluble in water

Table 6-5. Folsom Lake - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Atrazine	ug/L	3	<1.0	<1.0	UW,SW	Herbicide for corn and non-cropland
√	Bentazon	ug/L	18	<2.0	<2.0	UW,SW	Herbicide for peas, alfalfa, and other crops. Rapid degradation in soil and water, highly soluble in water, does not bind to or adsorb to soil particles.
	Benzo(a)pyrene	ug/L	0.2	<0.1	<0.1	UW,SW	Coal tar coatings, burning organic matter, volcanoes, fossil fuels
√	Carbofuran	ug/L	18 ^a	<5.0	<5.0	UW,SW	Soil fumigant on corn, cotton and other vegetable crops. Soluble in water, Hard to degrade in water, mobile in soil, moderately degrades in soil.
√	Chlordane	ug/L	0.1 ^a	<0.1	<0.1	UW,SW	Insecticide for termite control that is no longer distributed in the US. Not water soluble, rapidly binds to topsoil, slow degradation rate in soil and water.
√	2,4,-D	ug/L	70	<10	<10	UW,SW	Herbicide on wheat, corn, rangelands, lawns; control broadleaf weeds. Degrades rapidly.
√	Dalapon	ug/L	200	<10	<10	UW,SW	Herbicide on orchards, beans, coffee, lans, road/railways. Moves quickly through soil, highly soluble in water, degrades rapidly.
√	Dibromochloropropane	ug/L	0.2	<0.01	<0.01	UW,SW	Soil fumigant for nematode control on soybeans, cotton, pineapple, orchards
	Di (2-ethylhexyl) Adipate	ug/L	400	<5.0	<5.0	UW,SW	Synthetic rubber, food packaging, cosmetics
	Di (2-ethylhexyl) Phthalate	ug/L	4 ^a	<3.0	<3.0	UW,SW	Plasticizer in PVC and other plastics
√	Dinoseb	ug/L	7	<2.0	<2.0	UW,SW	Pesticide for orchards, vineyards, alfalfa, onions, almonds and other crops. Not soluble in water, degrades rapidly.
√	Diquat	ug/L	20	<4.0	<4.0	UW,SW	Land/Aquatic weed herbicide
√	Endothall	ug/L	100	ND	ND	UW,SW	Herbicide/defoliant/desiccant/algaecide on crops, land/aquatic weeds. Highly soluble in water, moves quickly through soil, degrades rapidly.
√	Endrin	ug/L	2	<0.1	<0.1	UW,SW	Pesticide on insects, rodents, birds
	Epichlorohydrin	ug/L	TT (PAP)			UW,SW	Water treatment chemicals, waste epoxy resins, coatings
√	Ethylene Dibromide	ug/L	0.05	<0.02	<0.02	UW,SW	Leaded gas additive, soil fumigant. Moves slowly through soil, soluble in water, degrades rapidly in water.
√	Glyphosate	ug/L	700	<25	<25	UW,SW	Herbicide on grasses, weeds, brush. Adsorbs quickly to soil, moderate degradation rates in water.
√	Heptachlor	ug/L	0.01 ^a	<0.01	<0.01	UW,SW	Insecticide for termites. Not water soluble, rapidly degrades in water.
	Heptachlor Epoxide	ug/L	0.01 ^a	<0.01	<0.01	UW,SW	Biodegradation of Heptachlor. Not water soluble
√	Hexachlorobenzene	ug/L	1	<0.5	<0.5	UW,SW	Pesticide production waste by-product, wood preservative, fungicide. Not water soluble.
	Hexachlorocyclopentadiene	ug/L	50	<1.0	<1.0	UW,SW	Pesticide production intermediate
√	Lindane	ug/L	0.2	<0.2	<0.2	UW,SW	Insecticide on cattle, lumber, gardens. Slightly soluble in water.
√	Methoxychlor	ug/L	40	<10	<10	UW,SW	Insecticide for fruits, vegetables, alfalfa, livestock, pets. Insoluble in water, movement occurs through adsorption to soil particles in runoff.
√	Molinate	ug/L	20	<2.0	<2.0	UW,SW	Herbicide. Highly soluble in water.
√	Oxamyl (vydate)	ug/L	200	<5.0	<5.0	UW,SW	Insecticide on apples, potatoes, tomatoes. Mobile in soil, highly soluble in water, rapidly degrades in soil and water.
√	Pentachlorophenol	ug/L	1	<0.2	<0.2	UW,SW	Wood preservatives, herbicide, cooling tower wastes. Moderately degrades
√	Picloram	ug/L	500	<1.0	<1.0	UW,SW	Herbicide on broadleaf and woody plants, mobile in soil, soluble in water.
	PCBs	ug/L	0.5	<0.5	<0.5	UW,SW	Coolant oils from electrical transformers, plasticizers
√	Simazine	ug/L	4	<1.0	<1.0	UW,SW	Herbicide on grass sod, crops, aquatic algae. Mobile in soil, low water solubility, moderate degradation rate in water.
√	Thiobencarb	ug/L	70	<1.0	<1.0	UW,SW	Herbicide on grasses and broadleaf weeds which infest rice fields
√	Toxaphene	ug/L	3	<1.0	<1.0	UW,SW	Insecticide/herbicide for cotton and soybeans
	2,3,7,8-TCDD (Dioxin)	ug/L	3.00E-05	<0.005	<0.005	UW,SW	Chemical production by-product (pulp and paper industry), herbicides
√	2,4,5-TP (Silvex)	ug/L	50	<1.0	<1.0	UW,SW	Herbicide on crops, right-of-way, golf courses
Unregulated Organic Chemicals (Section 64450, Table 64450-B)							

Table 6-5. Folsom Lake - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
√	Bromacil	ug/L	MO (if vulnerable)	<10	<10	UW,SW	Herbicide on noncrop areas, soil sterilant. Leaches readily through soil, slow degradation rate in soil, soluble in water, moderate degradation in water.
	Bromochloromethane	ug/L	MO (if vulnerable)	<0.5	1.1	UW,SW	Fire extinguishing agent
	n-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Resin/rubber additive, solvent in synthesis of insecticides. Insoluble in water.
	sec-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	pharmaceutical. Insoluble in water.
	tert-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Used in organic synthesis, polymer linking agent. Insoluble in water
√	Chlorothalonil	ug/L	MO (if vulnerable)	<5.0	<5.0	UW,SW	Fungicide (control fungus in nurseries). Not water soluble, moderate degradation rate.
√	Diazinon	ug/L	MO (if vulnerable)	<0.25	<0.25	UW,SW	Insecticide for home, lawn, garden, pets, and flies. Not water soluble, low soil mobility, degrades slowly in soil.
√	Dimethoate	ug/L	MO (if vulnerable)	<10	<10	UW,SW	Insecticide on alfalfa, apples, corn and other crops. Mobile in soil, highly soluble in water, rapidly degrades.
√	Diuron	ug/L	MO (if vulnerable)			UW,SW	Herbicide for non crop areas such as industrial sites, railways, footpaths and pavements, farm buildings. Slightly soluble in water.
	Hexachlorobutadiene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Rubber solvent, synthetic rubber, heat transfer liquid, transformer liquid, hydraulic fluid
	Isopropylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Phenol (an intermediate chemical used to manufacture building materials and plastics) and acetone production. Not water soluble.
	p-Isopropyltoluene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Sulfite mills
	Naphthalene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Petroleum refining, coal tar distillation, pesticides, fungicides, dyes, detergents, and wetting agents
	n-Propylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Textile dyeing and printing, solvent, gasoline, diesel, incinerators. Very slightly soluble in water, volatile, degrades readily.
√	Prometryn	ug/L	MO (if vulnerable)	<2.0	<2.0	UW,SW	Herbicide on carrots, corn, and other crops. Mobile in soil, moderately degrades in soil, degrades slowly in water.
	1,2,3-Trichlorobenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Insecticide, coolant in electrical installations and glass tempering, polyester dyeing, lubricants, solvent for high melting products
	1,3,4-Trichlorobenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Solvent in dyes, lubricants, cleaners, and dielectric fluids
	1,2,4-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Gasoline and paint additive, slightly water soluble, does not bind well with soil.
	1,3,5-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5	UW,SW	Paints, polymers. Not water soluble.
Unregulated Organic Chemicals (Section 64450, Table 64450-C)							
√	Aldicarb	ug/L	3	<3.0	<5.0	UW,SW	Insecticide on cotton, potatoes, and other crops. Soluble and mobile in soil, soluble in water.
	Aldicarb Sulfone	ug/L	2	<3.0	<5.0	UW,SW	Biodegradation of aldicarb
	Aldicarb Sulfoxide	ug/L	4	<4.0	<5.0	UW,SW	Biodegradation of aldicarb
√	Aldrin	ug/L	MO	<0.75	<0.75	UW,SW	Insecticide, fumigant
√	Butachlor	ug/L	MO	<0.38	<0.38	UW,SW	Herbicide on weeds
√	Carbaryl	ug/L	MO	<5.0	<5.0	UW,SW	Insecticide used in pet shampoos and for agriculture. Not water soluble, readily degrades in soil and water.
√	Dicamba	ug/L	MO	<0.081	<0.081	UW,SW	Herbicide. Highly mobile in soil, Highly water soluble, degrades readily.
√	Dieldrin	ug/L	MO	<0.02	<0.02	UW,SW	Insecticide, wood preservative, oxidation product of Aldrin
	3-Hydroxycarbofuran	ug/L	MO	<3.0	<3.0	UW,SW	Biodegradation of carbofuran
√	Methomyl	ug/L	MO	<2.0	<2.0	UW,SW	Insecticide on corn, potatoes, and other crops. Highly soluble in water, degrades slowly in water.
√	Metolachlor	ug/L	MO	ND	ND	UW,SW	Herbicide used in agriculture. Mobile in soil, water soluble, degrades slowly.
√	Metribuzin	ug/L	MO			UW,SW	Herbicide used in agriculture. Water soluble, degrades rapidly in water.
√	Propachlor	ug/L	MO	<0.5	<0.5	UW,SW	Herbicide used in agriculture. Virtually no degradation in water.

^a - DHS MCL lower than EPA

Table 6-5. Folsom Lake - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence

^b - Action Level

^c - DHS MCL lower than EPA, EPA remanded in 1995

^d - Monitoring Waivers are Available for Results < 50% of the MCL

^e - Recommended/Upper/Short Term MCLs

[√] - Indicates Which Constituents Have Use/Occurrence Information for American River Watershed

MW - Monitoring Waiver Potentially Available

UW - Use Waiver Potentially Available

SW - Susceptibility Waiver Potentially Available

CAEC - Consumer Acceptance and Economic Considerations Evaluated

VA - Vulnerability Assessment Required

TT - Treatment Technology

PAP - Polymer Addition Practices

MO - Monitoring Required Only

Data Provided by San Juan Water District, City of Roseville, El Dorado Irrigation District, City of Folsom, and California State Prison Folsom (1993 - 97)

Table 6-6. Lower American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
Inorganics (Section 64432)								
	Aluminum	mg/L	1	0.027	<0.1	0.0554	MW	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Antimony	mg/L	0.006	<0.003	<0.006	0.0054	MW	Fire retardant, ceramics, electronics, fireworks, solder
✓	Arsenic	mg/L	0.05	<0.00005	0.0085		MW	combustion
	Barium	mg/L	1 ^a	<0.1	<0.1	<0.1	MW	Natural deposits, pigments, epoxy sealants, spent coal
	Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	MW	Electrical, aerospace, defense industries, fluorescent lights
	Cadmium	mg/L	0.005	<0.00001	0.0051		MW	Galvanized pipe corrosion, natural deposits, batteries, paints
	Chromium	mg/L	0.05 ^a	0.00009	0.041		MW	Natural deposits, mining, electroplating, pigments, steel fabrication
✓	Cyanide	mg/L	0.2				MW, UW, SW	Electroplating, steel, plastics, mining, fertilizer
	Fluoride	mg/L	1.4 to 2.4 ^a	<0.1	<0.1	<0.1	MW	Natural deposits, fertilizer, aluminum industries, drinking water additive
	Lead	mg/L	0.015 ^b	<0.0001	<0.005		MW	Natural/industrial deposits, plumbing, solder, brass alloy faucets, batteries
	Mercury	mg/L	0.002	0.00074	<0.001		MW	Crop runoff, natural deposits, batteries, electrical switches, gold mining
	Nickel	mg/L	0.1 ^c	0.00018	<0.05		MW	Metal alloys, electroplating, batteries, chemical production
	Selenium	mg/L	0.05	<0.005	<0.005	<0.005	MW	Natural deposits, mining, smelting, coal/oil combustion
	Thallium	mg/L	0.002	<0.001	<0.0025	0.0013	MW	Electronics, drugs, alloys, glass, rodenticide, fungicide
Nitrate, Nitrite (Section 64432.1)								
	Nitrate	mg/L	10 (as N)	<0.003	2		MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
	Nitrite	mg/L	1 (as N)	<0.003	<0.1		MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
Asbestos (Section 64432.2)								
✓	Asbestos	MFL	7 (>10um)	<0.2	<0.2	<0.2	VA	linings
Secondary Standards (Section 64449, Table 64449-A)								
	Aluminum	mg/L	0.2	0.027	<0.1	0.0554	MW, CAEC	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Color	units	15	3	22		MW, CAEC	Industrial waste, organic debris
	Copper	mg/L	1.0 ^b	0.00038	<0.01		MW, CAEC	Natural/industrial deposits, wood preservatives, plumbing, algacides, mining
	Foaming Agents	mg/L	0.5	<0.5	<0.5	<0.5	MW, CAEC	Detergents, septic tanks, sewage
	Iron	mg/L	0.3	0.02	0.09	0.0524	MW, CAEC	Natural deposits
	Manganese	mg/L	0.05	<0.01	0.01	<0.01	MW, CAEC	Natural deposits, alloys, batteries, fertilizer additive
	Odor-Threshold	units	3				MW, CAEC	Decaying organic matter, wastewater treatment
	Silver	mg/L	0.1	<0.01	<0.01	<0.01	MW, CAEC	Mining, electroplating
	Thiobencarb	ug/L	1				MW, CAEC	Herbicide on grasses and broadleaf weeds which infest rice fields
	Turbidity	NTU	0.5/5	0.37	11		MW, CAEC	Erosion
	Zinc	mg/L	5	<0.0001	0.23		MW, CAEC	Motor oil, electroplating, smelting, steel fabrication
Secondary Standards (Section 64449, Table 64449-B)								
	Total Dissolved Solids	mg/L	500/1,000/1,500 ^e	21	62		MW	Car washes, inorganic salts, organic matter and dissolved gases
	Specific Conductance	umho/cm	900/1,600/2,200 ^e	17	123		MW	ionizable compounds (salts, etc.)
	Chloride	mg/L	250/500/600 ^e	1	2.5		MW	Industrial wastewater, agricultural runoff, oil well wastes, wastewater treatment plant effluent, road salting, natural deposits,
	Sulfate	mg/L	250/500/600 ^e	1.4	3.2		MW	Natural deposits, sewage treatment plant effluent, pulp and textile mills, tanneries, fertilized agricultural lands
General Mineral (Section 64449 (c) (2))								
	Bicarbonate	mg/L	MO	21	32	24.5	MW	Natural/industrial deposits
	Carbonate	mg/L	MO	0	<0.1		MW	Natural/industrial deposits

Table 6-6. Lower American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Hydroxide	mg/L	MO				MW	Natural/industrial deposits
	Alkalinity	mg/L	MO	16	26		MW	Natural/industrial deposits
	pH	Units	MO	5.82	9.68		MW	
	Calcium	mg/L	MO	3.5	7.6		MW	Natural/industrial deposits, sewage
	Magnesium	mg/L	MO	1.1	1.9		MW	Natural/industrial deposits, sewage
	Sodium	mg/L	MO	1.75	4		MW	Sea water, natural deposits
	Potassium	mg/L	MO	<1.0	6.24		MW	Natural deposits
	Hardness	mg/L	MO	12	64		MW	Calcium and Magnesium deposits
(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))								
	Benzene	ug/L	1000 ^a	<0.5	<0.5		UW,SW	Foods, gas, drugs, pesticide, paint, plastic industries. Slightly soluble in water
	Carbon Tetrachloride	ug/L	0.5 ^a	<0.5	<0.5		UW,SW	Fire extinguishers, dry cleaning solvent, degreasing and manufacturing of refrigerants, aerosols, and propellants. Very slow degradation rate, highly mobile in soil.
	o-Dichlorobenzene	ug/L	600	<0.5	<0.5		UW,SW	Paints, engine cleaning compounds, dyes, chemical wastes. Moderately adsorbed to soil, adsorbs to sediment in water.
	p-Dichlorobenzene	ug/L	5 ^a	<0.5	<0.5		UW,SW	Room/water deodorant, mothballs. Moderately adsorbed to soil, adsorbs to sediment in water.
	1,1-Dichloroethane	ug/L	5	<0.5	<0.5		UW,SW	Pain, varnish and finish removers, degreasing, ore floatation. rapidly degrades.
	1,2-Dichloroethane	ug/L	0.5 ^a	<0.5	<0.5		UW,SW	Leaded gas additive, fumigants, paints, tobacco flavoring. Evaporates quickly, persists for a long time in groundwater.
	1,1-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5		UW,SW	Plastics, dyes, perfumes, paints
	cis-1,2-Dichloroethylene	ug/L	6 ^a	<0.5	<0.5		UW,SW	Waste industrial extraction solvents
	trans-1,2-Dichloroethylene	ug/L	10 ^a	<0.5	<0.5		UW,SW	Waste industrial extraction solvents
	Dichloromethane	ug/L	5	<0.5	<0.5		UW,SW	Paint stripper, metal degreaser, propellant, extraction
	1,2-Dichloropropane	ug/L	5	<0.5	<0.5		UW,SW	Soil fumigant for nematode control, waste industrial solvent
	1,3-Dichloropropene	ug/L	0.5	<0.5	<0.5		UW,SW	Soil fumigant for nematode control
	Ethylbenzene	ug/L	700	<0.5	<0.5		UW,SW	Gasoline, insecticides, chemical manufacturing wastes. Evaporation and biodegradation is significant in water.
	Monochlorobenzene	ug/L	70 ^a	<1.0	<1.0		UW,SW	Waste solvent from metal degreasing processes, pesticide manufacturing. Moderate degradation rate in sediment.
	Styrene	ug/L	100	<0.5	<0.5		UW,SW	Plastics, rubber, resin, drug industries, leachate from landfills
	1,1,2,2-Tetrachloroethane	ug/L	1	<0.5	<0.5		UW,SW	Rubber solvent, insecticides, bleach, paint, varnish, rust remover, degreasing
	Tetrachloroethylene	ug/L	5	<0.5	<0.5		UW,SW	Industrial and dry cleaning solvent
	Toluene	ug/L	150 ^a	<0.5	<0.5		UW,SW	Gasoline additive, manufacturing and solvent operations
	1,2,4-Trichlorobenzene	ug/L	70	<0.5	<0.5		UW,SW	dyes, cleaners, lubricants. Mixes poorly in water, slow degradation rate
	1,1,1-Trichloroethane	ug/L	200	<1.0	<1.0		UW,SW	Adhesives, aerosols, textiles, paints, inks, metal degreasers
	1,1,2-Trichloroethane	ug/L	5	<1.0	<1.0		UW,SW	Solvent in rubber, other organic products, chemical production wastes
	Trichloroethylene	ug/L	5	<0.5	<0.5		UW,SW	Textiles, adhesives and metal degreasers
	Trichlorofluoromethane	ug/L	150	<5.0	<5.0		UW,SW	Industrial solvent and refrigerant, aerosol sprays
	1,1,2-Trichloro-1,2,2-Trifluoroeth	ug/L	1200	<10	<10		UW,SW	Dry cleaning solvent and refrigerant
	Vinyl Chloride	ug/L	0.5 ^a	<0.5	<0.5		UW,SW	Solvents, PVC pipe
	Xylenes (total)	ug/L	1750 ^a	<0.5	<0.5		UW,SW	Gasoline refining, paints, inks, detergents. Dominant removal process is volatilization, mobile in soil.
(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))								
	Acrylamide	ug/L	TT (PAP)				UW,SW	Polymer used in water/wastewater treatment, adhesives, printing ink emulsion stabilizers, thickening agents for agricultural sprays. Does not bind well with soil, soluble in water.
✓	Alachlor	ug/L	2				UW,SW	Herbicide for corn, soybeans, other crops. Degrades readily, soluble in water

Table 6-6. Lower American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Atrazine	ug/L	3	<1.0	<1.0		UW,SW	Herbicide for corn and non-cropland
✓	Bentazon	ug/L	18				UW,SW	Herbicide for peas, alfalfa, and other crops. Rapid degradation in soil and water, highly soluble in water, does not bind to or adsorb to soil particles.
	Benzo(a)pyrene	ug/L	0.2				UW,SW	Coal tar coatings, burning organic matter, volcanoes, fossil fuels
✓	Carbofuran	ug/L	18 ^a				UW,SW	Soil fumigant on corn, cotton and other vegetable crops. Soluble in water, Hard to degrade in water, mobile in soil, moderately degrades in soil.
✓	Chlordane	ug/L	0.1 ^a	<0.1	<0.1		UW,SW	Insecticide for termite control that is no longer distributed in the US. Not water soluble, rapidly binds to topsoil, slow degradation rate in soil and water.
✓	2,4,-D	ug/L	70	<0.1	<10		UW,SW	Herbicide on wheat, corn, rangelands, lawns; control broadleaf weeds. Degrades rapidly.
✓	Dalapon	ug/L	200				UW,SW	Herbicide on orchards, beans, coffee, lans, road/railways. Moves quickly through soil, highly soluble in water, degrades rapidly.
✓	Dibromochloropropane	ug/L	0.2				UW,SW	Soil fumigant for nematode control on soybeans, cotton, pineapple, orchards
	Di (2-ethylhexyl) Adipate	ug/L	400				UW,SW	Synthetic rubber, food packaging, cosmetics
	Di (2-ethylhexyl) Phthalate	ug/L	4 ^a				UW,SW	Plasticizer in PVC and other plastics
✓	Dinoseb	ug/L	7				UW,SW	Pesticide for orchards, vineyards, alfalfa, onions, almonds and other crops. Not soluble in water, degrades rapidly.
✓	Diquat	ug/L	20				UW,SW	Land/Aquatic weed herbicide
✓	Endothall	ug/L	100				UW,SW	Herbicide/defoliant/desiccant/algaecide on crops, land/aquatic weeds. Highly soluble in water, moves quickly through soil, degrades rapidly.
✓	Endrin	ug/L	2	<0.1	<0.1		UW,SW	Pesticide on insects, rodents, birds
	Epichlorohydrin	ug/L	TT (PAP)				UW,SW	Water treatment chemicals, waste epoxy resins, coatings
✓	Ethylene Dibromide	ug/L	0.05				UW,SW	Leaded gas additive, soil fumigant. Moves slowly through soil, soluble in water, degrades rapidly in water.
✓	Glyphosate	ug/L	700				UW,SW	Herbicide on grasses, weeds, brush. Adsorbs quickly to soil, moderate degradation rates in water.
✓	Heptachlor	ug/L	0.01 ^a	<0.01	<0.01		UW,SW	Insecticide for termites. Not water soluble, rapidly degrades in water.
	Heptachlor Epoxide	ug/L	0.01 ^a	<0.01	<0.01		UW,SW	Biodegradation of Heptachlor. Not water soluble
✓	Hexachlorobenzene	ug/L	1				UW,SW	Pesticide production waste by-product, wood preservative, fungicide. Not water soluble.
	Hexachlorocyclopentadiene	ug/L	50				UW,SW	Pesticide production intermediate
✓	Lindane	ug/L	0.2	<0.2	<0.2		UW,SW	Insecticide on cattle, lumber, gardens. Slightly soluble in water.
✓	Methoxychlor	ug/L	40	<10	<10		UW,SW	Insecticide for fruits, vegetables, alfalfa, livestock, pets. Insoluble in water, movement occurs through adsorption to soil particles in runoff.
✓	Molinate	ug/L	20				UW,SW	Herbicide. Highly soluble in water.
✓	Oxamyl (vydate)	ug/L	200				UW,SW	Insecticide on apples, potatoes, tomatoes. Mobile in soil, highly soluble in water, rapidly degrades in soil and water.
✓	Pentachlorophenol	ug/L	1				UW,SW	Wood preservatives, herbicide, cooling tower wastes. Moderately degrades
✓	Picloram	ug/L	500				UW,SW	Herbicide on broadleaf and woody plants, mobile in soil, soluble in water.
	PCBs	ug/L	0.5				UW,SW	Coolant oils from electrical transformers, plasticizers
✓	Simazine	ug/L	4	ND	<1.0		UW,SW	Herbicide on grass sod, crops, aquatic algae. Mobile in soil, low water solubility, moderate degradation rate in water.
✓	Thiobencarb	ug/L	70				UW,SW	Herbicide on grasses and broadleaf weeds which infest rice fields
✓	Toxaphene	ug/L	3	<1.0	<1.0		UW,SW	Insecticide/herbicide for cotton and soybeans
	2,3,7,8-TCDD (Dioxin)	ug/L	3.00E-05				UW,SW	Chemical production by-product (pulp and paper industry), herbicides
✓	2,4,5-TP (Silvex)	ug/L	50	<1.0	<1.0		UW,SW	Herbicide on crops, right-of-way, golf courses
Unregulated Organic Chemicals (Section 64450, Table 64450-B)								

Table 6-6. Lower American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
✓	Bromacil	ug/L	MO (if vulnerable)				UW,SW	Herbicide on noncrop areas, soil sterilant. Leaches readily through soil, slow degradation rate in soil, soluble in water, moderate degradation in water.
	Bromochloromethane	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Fire extinguishing agent
	n-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Resin/rubber additive, solvent in synthesis of insecticides. Insoluble in water.
	sec-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	pharmaceutical. Insoluble in water.
	tert-Butylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Used in organic synthesis, polymer linking agent. Insoluble in water
✓	Chlorothalonil	ug/L	MO (if vulnerable)				UW,SW	Fungicide (control fungus in nurseries). Not water soluble, moderate degradation rate.
✓	Diazinon	ug/L	MO (if vulnerable)				UW,SW	Insecticide for home, lawn, garden, pets, and flies. Not water soluble, low soil mobility, degrades slowly in soil.
✓	Dimethoate	ug/L	MO (if vulnerable)				UW,SW	Insecticide on alfalfa, apples, corn and other crops. Mobile in soil, highly soluble in water, rapidly degrades.
✓	Diuron	ug/L	MO (if vulnerable)				UW,SW	Herbicide for non crop areas such as industrial sites, railways, footpaths and pavements, farm buildings. Slightly soluble in water.
	Hexachlorobutadiene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Rubber solvent, synthetic rubber, heat transfer liquid, transformer liquid, hydraulic fluid
	Isopropylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Phenol (an intermediate chemical used to manufacture building materials and plastics) and acetone production. Not water soluble.
	p-Isopropyltoluene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Sulfite mills
	Naphthalene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Petroleum refining, coal tar distillation, pesticides, fungicides, dyes, detergents, and wetting agents
	n-Propylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Textile dyeing and printing, solvent, gasoline, diesel, incinerators. Very slightly soluble in water, volatile, degrades readily.
✓	Prometryn	ug/L	MO (if vulnerable)				UW,SW	Herbicide on carrots, corn, and other crops. Mobile in soil, moderately degrades in soil, degrades slowly in water.
	1,2,3-Trichlorobenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Insecticide, coolant in electrical installations and glass tempering, polyester dyeing, lubricants, solvent for high melting products
	1,3,4-Trichlorobenzene	ug/L	MO (if vulnerable)				UW,SW	Solvent in dyes, lubricants, cleaners, and dielectric fluids
	1,2,4-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Gasoline and paint additive, slightly water soluble, does not bind well with soil.
	1,3,5-Trimethylbenzene	ug/L	MO (if vulnerable)	<0.5	<0.5		UW,SW	Paints, polymers. Not water soluble.
Unregulated Organic Chemicals (Section 64450, Table 64450-C)								
✓	Aldicarb	ug/L	3				UW,SW	Insecticide on cotton, potatoes, and other crops. Soluble and mobile in soil, soluble in water.
	Aldicarb Sulfone	ug/L	2				UW,SW	Biodegradation of aldicarb
	Aldicarb Sulfoxide	ug/L	4				UW,SW	Biodegradation of aldicarb
✓	Aldrin	ug/L	MO	<0.075	<0.075		UW,SW	Insecticide, fumigant
✓	Butachlor	ug/L	MO				UW,SW	Herbicide on weeds
✓	Carbaryl	ug/L	MO				UW,SW	Insecticide used in pet shampoos and for agriculture. Not water soluble, readily degrades in soil and water.
✓	Dicamba	ug/L	MO				UW,SW	Herbicide. Highly mobile in soil, Highly water soluble, degrades readily.
✓	Dieldrin	ug/L	MO	<0.02	<0.02		UW,SW	Insecticide, wood preservative, oxidation product of Aldrin
	3-Hydroxycarbofuran	ug/L	MO				UW,SW	Biodegradation of carbofuran
✓	Methomyl	ug/L	MO				UW,SW	Insecticide on corn, potatoes, and other crops. Highly soluble in water, degrades slowly in water.
✓	Metolachlor	ug/L	MO				UW,SW	Herbicide used in agriculture. Mobile in soil, water soluble, degrades slowly.
✓	Metribuzin	ug/L	MO				UW,SW	Herbicide used in agriculture. Water soluble, degrades rapidly in water.
✓	Propachlor	ug/L	MO				UW,SW	Herbicide used in agriculture. Virtually no degradation in water.

^a - DHS MCL lower than EPA^b - Action Level

Table 6-6. Lower American River - Raw Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence

^c - DHS MCL lower than EPA, EPA remanded in 1995

^d - Monitoring Waivers are Available for Results < 50% of the MCL

^e - Recommended/Upper/Short Term MCLs

^v - Indicates Which Constituents Have Use/Occurrence Information for American River Watershed

MW - Monitoring Waiver Potentially Available

UW - Use Waiver Potentially Available

SW - Susceptibility Waiver Potentially Available

CAEC - Consumer Acceptance and Economic Considerations Evaluated

VA - Vulnerability Assessment Required

TT - Treatment Technology

PAP - Polymer Addition Practices

MO - Monitoring Required Only

Data Provided by City of Sacramento (1993 - 97), East Bay Municipal Utilities District (1997), USGS NAWQA Program (1996 - 97), and Sacramento Regional CMP (1993 - 97)

Table 6-7. Lower American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
Inorganics (Section 64432)								
	Aluminum	mg/L	1	<0.05	<0.1	0.058	MW	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Antimony	mg/L	0.006	<0.0025	<0.006	0.0054	MW	Fire retardant, ceramics, electronics, fireworks, solder
√	Arsenic	mg/L	0.05	<0.002	<0.005	0.0026	MW	combustion
	Barium	mg/L	1 ^a	<0.1	<0.1	<0.1	MW	Natural deposits, pigments, epoxy sealants, spent coal
	Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	MW	Electrical, aerospace, defense industries, fluorescent lights
	Cadmium	mg/L	0.005	<0.0005	<0.0005	<0.0005	MW	Galvanized pipe corrosion, natural deposits, batteries, paints
	Chromium	mg/L	0.05 ^a	<0.01	<0.01	<0.01	MW	Natural deposits, mining, electroplating, pigments, steel fabrication
√	Cyanide	mg/L	0.2				MW, UW, SW	Electroplating, steel, plastics, mining, fertilizer
	Fluoride	mg/L	1.4 to 2.4 ^a	<0.1	<0.1	<0.1	MW	Natural deposits, fertilizer, aluminum industries, drinking water additive
	Lead	mg/L	0.015 ^b	<0.005	<0.005	<0.005	MW	Natural/industrial deposits, plumbing, solder, brass alloy faucets, batteries
	Mercury	mg/L	0.002	<0.001	<0.001	<0.001	MW	Crop runoff, natural deposits, batteries, electrical switches, gold mining
	Nickel	mg/L	0.1 ^c	<0.01	<0.05	0.018	MW	Metal alloys, electroplating, batteries, chemical production
	Selenium	mg/L	0.05	<0.005	<0.005	<0.005	MW	Natural deposits, mining, smelting, coal/oil combustion
	Thallium	mg/L	0.002	<0.001	<0.0025	0.0013	MW	Electronics, drugs, alloys, glass, rodenticide, fungicide
Nitrate, Nitrite (Section 64432.1)								
	Nitrate	mg/L	10 (as N)	0.06	0.18	0.108	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
	Nitrite	mg/L	1 (as N)	<0.02	<0.1	0.084	MW ^d	Animal waste, fertilizer, natural deposits, septic tanks, sewage
Asbestos (Section 64432.2)								
√	Asbestos	MFL	7 (>10um)				VA	linings
Secondary Standards (Section 64449, Table 64449-A)								
	Aluminum	mg/L	0.2	<0.05	<0.1	0.058	MW, CAEC	Industrial waste, water treatment plant's wash water, natural deposits. Very low water solubility
	Color	units	15	1	2	1.2	MW, CAEC	Industrial waste, organic debris
	Copper	mg/L	1.0 ^b	<0.01	<0.01	<0.01	MW, CAEC	Natural/industrial deposits, wood preservatives, plumbing, algicides, mining
	Foaming Agents	mg/L	0.5	<0.5	<0.5	<0.5	MW, CAEC	Detergents, septic tanks, sewage
	Iron	mg/L	0.3	<0.01	<0.01	<0.01	MW, CAEC	Natural deposits
	Manganese	mg/L	0.05	<0.01	<0.01	<0.01	MW, CAEC	Natural deposits, alloys, batteries, fertilizer additive
	Odor-Threshold	units	3	<1	1	1	MW, CAEC	Decaying organic matter, wastewater treatment
	Silver	mg/L	0.1	<0.01	<0.01	<0.01	MW, CAEC	Mining, electroplating
	Thiobencarb	ug/L	1				MW, CAEC	Herbicide on grasses and broadleaf weeds which infest rice fields
	Turbidity	NTU	0.5/5	0.05	0.11	0.092	MW, CAEC	Erosion
	Zinc	mg/L	5	<0.01	0.01	<0.01	MW, CAEC	Motor oil, electroplating, smelting, steel fabrication
Secondary Standards (Section 64449, Table 64449-B)								
	Total Dissolved Solids	mg/L	500/1,000/1,500 ^e	39	58	51	MW	Car washes, inorganic salts, organic matter and dissolved gases
	Specific Conductance	umho/cm	900/1,600/2,200 ^e	61	86	75	MW	ionizable compounds (salts, etc.)
	Chloride	mg/L	250/500/600 ^e	2.3	4.4	3.2	MW	Industrial wastewater, agricultural runoff, oil well wastes, wastewater treatment plant effluent, road salting, natural deposits,
	Sulfate	mg/L	250/500/600 ^e	5.8	8.6	7.2	MW	Natural deposits, sewage treatment plant effluent, pulp and textile mills, tanneries, fertilized agricultural lands
General Mineral (Section 64449 (c) (2))								
	Bicarbonate	mg/L	MO	22	32	27	MW	Natural/industrial deposits

Table 6-7. Lower American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Carbonate	mg/L	MO	<0.1	1.2	0.68	MW	Natural/industrial deposits
	Hydroxide	mg/L	MO				MW	Natural/industrial deposits
	Alkalinity	mg/L	MO	20	28	23.4	MW	Natural/industrial deposits
	pH	Units	MO	8.2	8.8	8.6	MW	
	Calcium	mg/L	MO	8.6	10	9.2	MW	Natural/industrial deposits, sewage
	Magnesium	mg/L	MO	1.1	2	1.5	MW	Natural/industrial deposits, sewage
	Sodium	mg/L	MO	1.7	4	2.6	MW	Sea water, natural deposits
	Potassium	mg/L	MO	<1.0	1.3	1.1	MW	Natural deposits
	Hardness	mg/L	MO	23	34	27.4	MW	Calcium and Magnesium deposits
(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))								
	Benzene	ug/L	1000 ^a				UW,SW	Foods, gas, drugs, pesticide, paint, plastic industries. Slightly soluble in water
	Carbon Tetrachloride	ug/L	0.5 ^a				UW,SW	Fire extinguishers, dry cleaning solvent, degreasing and manufacturing of refrigerants, aerosols, and propellants. Very slow degradation rate, highly mobile in soil.
	o-Dichlorobenzene	ug/L	600				UW,SW	Paints, engine cleaning compounds, dyes, chemical wastes. Moderately adsorbed to soil, adsorbs to sediment in water.
	p-Dichlorobenzene	ug/L	5 ^a				UW,SW	Room/water deodorant, mothballs. Moderately adsorbed to soil, adsorbs to sediment in water.
	1,1-Dichloroethane	ug/L	5				UW,SW	Pain, varnish and finish removers, degreasing, ore floatation. rapidly degrades.
	1,2-Dichloroethane	ug/L	0.5 ^a				UW,SW	Leaded gas additive, fumigants, paints, tobacco flavoring. Evaporates quickly, persists for a long time in groundwater.
	1,1-Dichloroethylene	ug/L	6 ^a				UW,SW	Plastics, dyes, perfumes, paints
	cis-1,2-Dichloroethylene	ug/L	6 ^a				UW,SW	Waste industrial extraction solvents
	trans-1,2-Dichloroethylene	ug/L	10 ^a				UW,SW	Waste industrial extraction solvents
	Dichloromethane	ug/L	5				UW,SW	Paint stripper, metal degreaser, propellant, extraction
	1,2-Dichloropropane	ug/L	5				UW,SW	Soil fumigant for nematode control, waste industrial solvent
	1,3-Dichloropropene	ug/L	0.5				UW,SW	Soil fumigant for nematode control
	Ethylbenzene	ug/L	700				UW,SW	Gasoline, insecticides, chemical manufacturing wastes. Evaporation and biodegradation is significant in water.
	Monochlorobenzene	ug/L	70 ^a				UW,SW	Waste solvent from metal degreasing processes, pesticide manufacturing. Moderate degradation rate in sediment.
	Styrene	ug/L	100				UW,SW	Plastics, rubber, resin, drug industries, leachate from landfills
	1,1,2,2-Tetrachloroethane	ug/L	1				UW,SW	Rubber solvent, insecticides, bleach, paint, varnish, rust remover, degreasing
	Tetrachloroethylene	ug/L	5				UW,SW	Industrial and dry cleaning solvent
	Toluene	ug/L	150 ^a				UW,SW	Gasoline additive, manufacturing and solvent operations
	1,2,4-Trichlorobenzene	ug/L	70				UW,SW	dyes, cleaners, lubricants. Mixes poorly in water, slow degradation rate
	1,1,1-Trichloroethane	ug/L	200				UW,SW	Adhesives, aerosols, textiles, paints, inks, metal degreasers
	1,1,2-Trichloroethane	ug/L	5				UW,SW	Solvent in rubber, other organic products, chemical production wastes
	Trichloroethylene	ug/L	5				UW,SW	Textiles, adhesives and metal degreasers
	Trichlorofluoromethane	ug/L	150				UW,SW	Industrial solvent and refrigerant, aerosol sprays
	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	1200				UW,SW	Dry cleaning solvent and refrigerant
	Vinyl Chloride	ug/L	0.5 ^a				UW,SW	Solvents, PVC pipe
	Xylenes (total)	ug/L	1750 ^a				UW,SW	Gasoline refining, paints, inks, detergents. Dominant removal process is volatilization, mobile in soil.
(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))								

Table 6-7. Lower American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
	Acrylamide	ug/L	TT (PAP)				UW,SW	Polymer used in water/wastewater treatment, adhesives, printing ink emulsion stabilizers, thickening agents for agricultural sprays. Does not bind well with soil, soluble in water.
✓	Alachlor	ug/L	2				UW,SW	Herbicide for corn, soybeans, other crops. Degrades readily, soluble in water
	Atrazine	ug/L	3				UW,SW	Herbicide for corn and non-cropland
✓	Bentazon	ug/L	18				UW,SW	Herbicide for peas, alfalfa, and other crops. Rapid degradation in soil and water, highly soluble in water, does not bind to or adsorb to soil particles.
	Benzo(a)pyrene	ug/L	0.2				UW,SW	Coal tar coatings, burning organic matter, volcanoes, fossil fuels
✓	Carbofuran	ug/L	18 ^a				UW,SW	Soil fumigant on corn, cotton and other vegetable crops. Soluble in water, Hard to degrade in water, mobile in soil, moderately degrades in soil.
✓	Chlordane	ug/L	0.1 ^a	<0.1	<0.1		UW,SW	Insecticide for termite control that is no longer distributed in the US. Not water soluble, rapidly binds to topsoil, slow degradation rate in soil and water.
✓	2,4,-D	ug/L	70	<0.1	<10		UW,SW	Herbicide on wheat, corn, rangelands, lawns; control broadleaf weeds. Degrades rapidly.
✓	Dalapon	ug/L	200				UW,SW	Herbicide on orchards, beans, coffee, lans, road/railways. Moves quickly through soil, highly soluble in water, degrades rapidly.
✓	Dibromochloropropane	ug/L	0.2				UW,SW	Soil fumigant for nematode control on soybeans, cotton, pineapple, orchards
	Di (2-ethylhexyl) Adipate	ug/L	400				UW,SW	Synthetic rubber, food packaging, cosmetics
	Di (2-ethylhexyl) Phthalate	ug/L	4 ^a				UW,SW	Plasticizer in PVC and other plastics
✓	Dinoseb	ug/L	7				UW,SW	Pesticide for orchards, vineyards, alfalfa, onions, almonds and other crops. Not soluble in water, degrades rapidly.
✓	Diquat	ug/L	20				UW,SW	Land/Aquatic weed herbicide
✓	Endothall	ug/L	100				UW,SW	Herbicide/defoliant/desiccant/algaecide on crops, land/aquatic weeds. Highly soluble in water, moves quickly through soil, degrades rapidly.
✓	Endrin	ug/L	2	<0.1	<0.1		UW,SW	Pesticide on insects, rodents, birds
	Epichlorohydrin	ug/L	TT (PAP)				UW,SW	Water treatment chemicals, waste epoxy resins, coatings
✓	Ethylene Dibromide	ug/L	0.05				UW,SW	Leaded gas additive, soil fumigant. Moves slowly through soil, soluble in water, degrades rapidly in water.
✓	Glyphosate	ug/L	700				UW,SW	Herbicide on grasses, weeds, brush. Adsorbs quickly to soil, moderate degradation rates in water.
✓	Heptachlor	ug/L	0.01 ^a	<0.01	<0.01		UW,SW	Insecticide for termites. Not water soluble, rapidly degrades in water.
	Heptachlor Epoxide	ug/L	0.01 ^a	<0.01	<0.01		UW,SW	Biodegradation of Heptachlor. Not water soluble
✓	Hexachlorobenzene	ug/L	1				UW,SW	Pesticide production waste by-product, wood preservative, fungicide. Not water soluble.
	Hexachlorocyclopentadiene	ug/L	50				UW,SW	Pesticide production intermediate
✓	Lindane	ug/L	0.2	<0.2	<0.2		UW,SW	Insecticide on cattle, lumber, gardens. Slightly soluble in water.
✓	Methoxychlor	ug/L	40	<10	<10		UW,SW	Insecticide for fruits, vegetables, alfalfa, livestock, pets. Insoluble in water, movement occurs through adsorption to soil particles in runoff.
✓	Molinate	ug/L	20				UW,SW	Herbicide. Highly soluble in water.
✓	Oxamyl (vydate)	ug/L	200				UW,SW	Insecticide on apples, potatoes, tomatoes. Mobile in soil, highly soluble in water, rapidly degrades in soil and water.
✓	Pentachlorophenol	ug/L	1				UW,SW	Wood preservatives, herbicide, cooling tower wastes. Moderately degrades
✓	Picloram	ug/L	500				UW,SW	Herbicide on broadleaf and woody plants, mobile in soil, soluble in water.
	PCBs	ug/L	0.5				UW,SW	Coolant oils from electrical transformers, plasticizers
✓	Simazine	ug/L	4				UW,SW	Herbicide on grass sod, crops, aquatic algae. Mobile in soil, low water solubility, moderate degradation rate in water.
✓	Thiobencarb	ug/L	70				UW,SW	Herbicide on grasses and broadleaf weeds which infest rice fields
✓	Toxaphene	ug/L	3	<1.0	<1.0		UW,SW	Insecticide/herbicide for cotton and soybeans
	2,3,7,8-TCDD (Dioxin)	ug/L	3.00E-05				UW,SW	Chemical production by-product (pulp and paper industry), herbicides

Table 6-7. Lower American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
✓	2,4,5-TP (Silvex)	ug/L	50	<1.0	<1.0		UW,SW	Herbicide on crops, right-of-way, golf courses
Unregulated Organic Chemicals (Section 64450, Table 64450-B)								
✓	Bromacil	ug/L	MO (if vulnerable)				UW,SW	Herbicide on noncrop areas, soil sterilant. Leaches readily through soil, slow degradation rate in soil, soluble in water, moderate degradation in water.
	Bromochloromethane	ug/L	MO (if vulnerable)				UW,SW	Fire extinguishing agent
	n-Butylbenzene	ug/L	MO (if vulnerable)				UW,SW	Resin/rubber additive, solvent in synthesis of insecticides. Insoluble in water.
	sec-Butylbenzene	ug/L	MO (if vulnerable)				UW,SW	pharmaceutical. Insoluble in water.
	tert-Butylbenzene	ug/L	MO (if vulnerable)				UW,SW	Used in organic synthesis, polymer linking agent. Insoluble in water
✓	Chlorothalonil	ug/L	MO (if vulnerable)				UW,SW	Fungicide (control fungus in nurseries). Not water soluble, moderate degradation rate.
✓	Diazinon	ug/L	MO (if vulnerable)				UW,SW	Insecticide for home, lawn, garden, pets, and flies. Not water soluble, low soil mobility, degrades slowly in soil.
✓	Dimethoate	ug/L	MO (if vulnerable)				UW,SW	Insecticide on alfalfa, apples, corn and other crops. Mobile in soil, highly soluble in water, rapidly degrades.
✓	Diuron	ug/L	MO (if vulnerable)				UW,SW	Herbicide for non crop areas such as industrial sites, railways, footpaths and pavements, farm buildings. Slightly soluble in water.
	Hexachlorobutadiene	ug/L	MO (if vulnerable)				UW,SW	Rubber solvent, synthetic rubber, heat transfer liquid, transformer liquid, hydraulic fluid
	Isopropylbenzene	ug/L	MO (if vulnerable)				UW,SW	Phenol (an intermediate chemical used to manufacture building materials and plastics) and acetone production. Not water soluble.
	p-Isopropyltoluene	ug/L	MO (if vulnerable)				UW,SW	Sulfite mills
	Naphthalene	ug/L	MO (if vulnerable)				UW,SW	Petroleum refining, coal tar distillation, pesticides, fungicides, dyes, detergents, and wetting agents
	n-Propylbenzene	ug/L	MO (if vulnerable)				UW,SW	Textile dyeing and printing, solvent, gasoline, diesel, incinerators. Very slightly soluble in water, volatile, degrades readily.
✓	Prometryn	ug/L	MO (if vulnerable)				UW,SW	Herbicide on carrots, corn, and other crops. Mobile in soil, moderately degrades in soil, degrades slowly in water.
	1,2,3-Trichlorobenzene	ug/L	MO (if vulnerable)				UW,SW	Insecticide, coolant in electrical installations and glass tempering, polyester dyeing, lubricants, solvent for high melting products
	1,3,4-Trichlorobenzene	ug/L	MO (if vulnerable)				UW,SW	Solvent in dyes, lubricants, cleaners, and dielectric fluids
	1,2,4-Trimethylbenzene	ug/L	MO (if vulnerable)				UW,SW	Gasoline and paint additive, slightly water soluble, does not bind well with soil.
	1,3,5-Trimethylbenzene	ug/L	MO (if vulnerable)				UW,SW	Paints, polymers. Not water soluble.
Unregulated Organic Chemicals (Section 64450, Table 64450-C)								
✓	Aldicarb	ug/L	3				UW,SW	Insecticide on cotton, potatoes, and other crops. Soluble and mobile in soil, soluble in water.
	Aldicarb Sulfone	ug/L	2				UW,SW	Biodegradation of aldicarb
	Aldicarb Sulfoxide	ug/L	4				UW,SW	Biodegradation of aldicarb
✓	Aldrin	ug/L	MO	<0.075	<0.075		UW,SW	Insecticide, fumigant
✓	Butachlor	ug/L	MO				UW,SW	Herbicide on weeds
✓	Carbaryl	ug/L	MO				UW,SW	Insecticide used in pet shampoos and for agriculture. Not water soluble, readily degrades in soil and water.
✓	Dicamba	ug/L	MO				UW,SW	Herbicide. Highly mobile in soil, Highly water soluble, degrades readily.
✓	Dieldrin	ug/L	MO	<0.02	<0.02		UW,SW	Insecticide, wood preservative, oxidation product of Aldrin
	3-Hydroxycarbofuran	ug/L	MO				UW,SW	Biodegradation of carbofuran
✓	Methomyl	ug/L	MO				UW,SW	Insecticide on corn, potatoes, and other crops. Highly soluble in water, degrades slowly in water.
✓	Metolachlor	ug/L	MO				UW,SW	Herbicide used in agriculture. Mobile in soil, water soluble, degrades slowly.
✓	Metribuzin	ug/L	MO				UW,SW	Herbicide used in agriculture. Water soluble, degrades rapidly in water.

Table 6-7. Lower American River - Treated Water Summary of Information Related to Potentially Waivable Title 22 Constituents

	Contaminant	Units	MCL	Minimum	Maximum	Average	Available Waiver Type	General Uses/ Occurrence and Environmental Persistence
√	Propachlor	ug/L	MO				UW,SW	Herbicide used in agriculture. Virtually no degradation in water.

^a - DHS MCL lower than EPA

^b - Action Level

^c - DHS MCL lower than EPA, EPA remanded in 1995

^d - Monitoring Waivers are Available for Results < 50% of the MCL

^e - Recommended/Upper/Short Term MCLs

√ - Indicates Which Constituents Have Use/Occurrence Information for American River Watershed

MW - Monitoring Waiver Potentially Available

UW - Use Waiver Potentially Available

SW - Susceptibility Waiver Potentially Available

CAEC - Consumer Acceptance and Economic Considerations Evaluated

VA - Vulnerability Assessment Required

TT - Treatment Technology

PAP - Polymer Addition Practices

MO - Monitoring Required Only

Data Provided by City of Sacramento (1993 - 97)

Table 6-8. Lower American River Ambient Monitoring Data for Regulated SOC and VOCs

Contaminant	Monitoring Station	Period of Record	Monitoring Program	Number of Samples	Detection Limit, Fg/L	Results, Fg/L
Benzo(a)pyrene	DP, ND, FD	92,93,94	SSWP	12	0.025– 0.05	1 detect: 2.7
Chlordane	DP, ND, FD	91	SSWP	3	0.05	No detects
2,4-D	DP, ND, FD	91	SSWP	3	0.1	No detects
Dalapon	DP, ND, FD	91	SSWP	3	0.5	No detects
Di (2-ethylhexyl)phthalate	DP, ND	93	SSWP	2	0.36	No detects
Dinoseb	DP, ND, FD	91	SSWP	3	0.01	No detects
Endrin	DP, ND, FD	90,91,92	SSWP	18	0.1	No detects
Hexachlorobenzene	DP, ND, FD	92,93,94	SSWP	12	0.12– 0.24	No detects
Lindane	DP, ND, FD	90,91,92	SSWP	21	0.05	No detects
Methoxychlor	DP, ND, FD	90,91	SSWP	15	0.2	No detects
PCBs	DP, ND, FD	90,91,92,93	SSWP	24	0.1–0.5	No detects
Toxaphene	DP, ND, FD	90,91,92	SSWP	21	0.5–1	No detects
2,4,5-TP	DP, ND, FD	91	SSWP	3	0.01	No detects
Diazinon	DP, ND, FD, JS, LN, WA	91,92, 94, 95, 96, 97	SSWP, RWQCB, USGS, AMP	76	0.002–1	7 detects: 0.13–0.74
Dimethoate	DP, ND, FD	91,92	SSWP	6	1	No detects
Aldrin	DP, ND, FD	90,91	SSWP	12	0.05	No detects
Dicamba	DP, ND, FD	91	SSWP	3	5	No detects
Disulfoton	DP, ND	94,95,96	USGS, AMP	28	0.017–0.1	No detects
Prometon	DP, ND	94,95,96	USGS, AMP	24	0.018– 0.1	No detects
Dieldrin	DP, ND, FD	90,91,92, 96	SSWP, USGS	23	0.001–0.1	No detects
Metolachlor	DP, ND	96	USGS	2	0.002	No detects
Alachlor	DP, ND	96	USGS	2	0.002	No detects
Metribuzin	DP, ND	96	USGS	2	0.004	No detects
Carbaryl	DP, ND	95, 96	USGS, AMP	6	0.003–0.14	No detects
Diuron	DP, ND	95,96	AMP	4	0.8	1 detect: 0.2
Methomyl	DP, ND	95,96	AMP	4	0.14	No detects
Propachlor	DP, ND	95,96	AMP	4	7	No detects
Carbofuran	DP, ND	96	USGS	2	0.003	No detects
Simazine	JS	96,97	USGS	21	-	2 detects: 0.007 and 0.032

Table 6-8. Continued

Contaminant	Monitoring Station	Period of Record	Monitoring Program	Number of Samples	Detection Limit, Fg/L	Results, Fg/L
Fonofos	DP, ND	96	AMP	2	0.003	No detects
Alpha BHC	DP, ND	96	AMP	2	0.002	No detects
P,P DDE	DP, ND	96	AMP	2	0.006	No detects
Lindane	DP, ND	96	AMP	2	0.004	No detects
Malathion	DP, ND	96	AMP	2	0.006	No detects
Parathion	DP, ND	96	AMP	2	0.004	No detects
Atrazine	DP, ND	96	AMP	2	0.005	No detects
Acetochlor	DP, ND	96	AMP	2	0.004	No detects
Terbacil	DP, ND	96	AMP	2	0.001	No detects
Methyl Parathion	DP, ND	96	AMP	2	0.002	No detects
EPTC	DP, ND	96	AMP	2	0.007	No detects
Molinate	DP, ND	96	AMP	2	0.004	No detects
Terbufos	DP, ND	96	AMP	2	0.013	No detects
DCPA	DP, ND	96	AMP	2	0.002	No detects
Thiobencarb	DP, ND	96	USGS	2	0.002	No detects
<u>Monitoring Stations</u>						
DP	=	Discovery Park				
ND	=	Nimbus Dam				
FD	=	Folsom Dam				
JS	=	J Street				
LN	=	Lake Natoma				
WA	=	Watt Avenue				
<u>Monitoring Programs</u>						
SSWP	=	Sacramento Stormwater Management Program				
RWQCB	=	Regional Water Quality Control Board				
USGS	=	U.S. Geological Survey				
AMP	=	Ambient Monitoring Program				

WATERSHED OCCURRENCE AND USE INFORMATION FOR SELECTED CONSTITUENTS

Information on specific use and occurrence in the American River watershed was compiled for arsenic, asbestos, cyanide, and pesticides.

Asbestos

Asbestos is a term applied to a group of six silicate minerals that readily separate into thin, strong fibers that are flexible, heat resistant, and chemically inert. The most common asbestos fibers are chrysotile, amphibole, and actinolite. Asbestos minerals occur in both serpentine and schist rocks that are formed through metamorphic processes. Serpentine and schist rock occur in the American River watershed in scattered outcrops. Schist rocks can be found in the area roughly bounded by the eastern reaches of Folsom Lake, Colfax, and Kyburz (1987 Geologic Map of the Sacramento Quadrangle).

Serpentine rocks occur throughout the foothills that are associated with the foothills fault zone. Asbestos fibers commonly form in the fractures in the serpentine rock created by slippage along faults and also are components of the unfractured rock. Asbestos does not occur in the foothills at concentrations to make mining profitable. In the early 1900s, some very limited mining of serpentine rocks was conducted in the foothills area of El Dorado County; however, the mining was not lucrative and was soon closed (Churchill, CDMG, pers. comm.). The 1993 ARWSS Report noted that two serpentine formations are known to outcrop in the North Fork basin: in the Green Valley area and near the Colfax-Iowa Hill Bridge. A March 1998 Sacramento Bee article described the potential hazard of new construction in the foothills area exposing previously covered serpentine veins. Air and dust testing in western El Dorado County, conducted by an industrial hygienist, found elevated levels of asbestos fibers near new construction.

Asbestos fibers are released through mechanical weathering. Asbestos fibers are basically chemically inert, and neither chemical weathering nor other chemical processes particularly act to degrade the fibers. Once physically released from the host rock, the fibers are transported by gravity and running water or in wind-blown dust. Thus, the principal period during which asbestos fibers will be transported into the stream system are in heavy rainfall or high wind. Of the asbestos fibers released by weathering and transported into the stream system, some proportion of fiber will be longer than 10 Fm while others will be shorter. Only asbestos fibers longer than 10 Fm are regulated in drinking water; these are not to exceed 7 million fibers per liter (MFL).

McGuire, in his evaluation of the relative risks of the Sacramento and American rivers as sources of drinking water supply, noted that most WTPs remove 99% or greater of all asbestos fibers. He concluded that asbestos was not significant in evaluating the health risk of either river. (McGuire, 1993.)

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Monitoring conducted by water agencies along the American River during the past 5 years shows asbestos detected only in Folsom Lake (the two detections were in March 1995 at the EID El Dorado Hills WTP, both at a level of 0.94 MFL, well below the MCL of 7 MFL). No asbestos was detected in the North Fork, South Fork, or the Lower American River. Asbestos was detected once in 1997 in treated water at the EID El Dorado Hills WTP (at 0.1883 MFL). For more detail, see the individual agency data tables in Chapter 4.

Arsenic

Mining is the principal means of exposure of arsenic to the environment within the American River watershed. Other sources and uses of arsenic include ore smelters, glass manufacturing, electronic manufacturing, and the long-banned use of arsenic in pesticides and defoliants—none of which are either present or significant in the outdoor environment of the watershed.

Mining of metal ore has been a California industry since the onset of the gold rush in 1849. The famed Mother Lode mining district lies in the foothills zone of the Sierra Nevada that transects the American River watershed. There are numerous inactive mines in the watershed, both lode and placer mines, as well as active mining activities that are mostly for gold in tertiary gravels (rather than of hard rock ore deposits) and are largely placer operations. Past mining in the watershed has included some limited recovery of chromium, copper, and silver as well as gold. Currently, no major active mines are in the watershed but rather a cumulation of small dredging operations (Croyle, RWQCB, pers. comm.). Only two active lode mines are shown in the most recent CDMG listing of active mines (which was current through 1995). The Tim Mine in El Dorado County and the Snowbird Mine in Placer County are both fairly small operations that may no longer be active. Mines can switch between active and inactive status depending on the market price of the metal being mined. Most active lode mining in the Sierra Nevada foothills has closed in the last 4–5 years (Churchill, CDMG, pers. comm.).

Drainage from inactive mines can originate from old underground workings (shaft and tunnel complexes), tailings (end material left over when the ores have been extracted from the rock), and waste rock (that contain unprocessed ore). Metal mining operations in the watershed have primarily recovered gold; some of the gold ore has been associated with arsenopyrite rock formations. Because arsenopyrite was an associated rock rather than the target ore, there are no detailed records or maps that describe the arsenopyrite formations (Croyle, RWQCB, pers. comm.).

Mine drainage from inactive mines associated with arsenopyrite rock is most likely a source of arsenic to the river system. High arsenic concentrations are not found in drainage from mining of tertiary gravels (Croyle, RWQCB, pers. comm.). The 1993 ARWSS Report identified a total of 2,100 mines in the watershed, of which only a percentage would be associated with arsenopyrite rock. Figures in Appendix B show the locations of mines in the watershed that are less than 1,000 feet from a watercourse. The 1993 ARWSS Report provided some detail on 16 of the 2,100 identified mines. Of those 16, four were noted

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as sources of arsenic: the Alhambra Mine and Darlings Mine in the South Fork basin, and the Cabin Mine Adits and Buckeye Mine in the Middle Fork basin.

RWQCB staff surveyed and identified eight mines in the Folsom Lake basin as part of their 1992 study on inactive mine drainage in the Sacramento Valley (Montoya, 1992). The report noted that no deleterious discharges were observed from the mines visited; however, no runoff samples were collected to confirm the lack of contamination. Two of the eight mines included arsenopyrite as one of the host rocks. No mines in the Upper American River watershed were surveyed as part of this study.

The Ambient Monitoring Program has collected samples from the Lower American River for analysis of total arsenic since December 1992. A summary of the Ambient Monitoring Program data is shown in **Table 6-9**.

**Table 6-9. Ambient Monitoring Program Lower American River
Total Arsenic Data, 1992-1997**

	Number of Samples	Range, Fg/L	Median, Fg/L
Folsom Dam	56	<1.0–8.5	<1.0
Nimbus Dam	84	<0.05–2.9	<1.0
Discovery Park	84	<0.05–1.23	<1.0

Monitoring conducted by water agencies along the American River during the past 5 years has detected virtually no arsenic anywhere along the river, with minimum detection levels ranging from 1 to 8 Fg/L. The data are well below the current MCL of 50 Fg/L, and most results are below the anticipated revised MCL of 2–20 Fg/L. For more detail, see the individual agency data tables in Chapter 4.

Cyanide

The primary source of cyanide to the environment within the American River watershed is from past mining operations. Cyanide is also used in electroplating, steel manufacturing, plastics manufacturing, and fertilizer manufacturing—none of which are either present or significant in the outdoor environment of the watershed.

Cyanide has been used in the past in the watershed to process crushed rock from lode mines. Dredging and placer mining operations do not use cyanide (Croyle, RWQCB, pers. comm.). The cyanide heap-leach process involves spraying heaped-up crushed rock with a cyanide solution and then collecting and processing the runoff that contains extracted metals. The cyanide is re-used in a closed recirculating system. The potential exposure to the environment is through the leaching process from waste rock piles that have not been completely cleaned of the cyanide. Because cyanide exposed to sunlight and oxygen

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will quickly degrade, environmental exposure would result only from rock piles that have failed; recently exposed inner, previously covered rock; or extremely heavy storms that may leach deeply into the inner recesses of undisturbed rock piles (Churchill, CDMG, pers. comm.).

In some areas of the Sierra Nevada, small “custom milling” operations use the cyanide heap-leach process to extract metals from old tailings. Tailings may be imported from other areas and re-processed at the milling site. These operations are more likely to be identified (and then regulated) on public lands, where government agency staff have ready access and may more readily notice them, than on private lands. On private lands, these operations may remain unknown to regulatory agency staff. No known custom milling operations are located in the American River watershed (Croyle, RWQCB, pers. comm.).

The Ambient Monitoring Program has collected samples from the American River for the analysis of cyanide since December 1992. All results for December 1992 through July 1996 were non-detect for cyanide (either <20 Fg/L or <2 Fg/L when the minimum detection limit was lowered).

Monitoring conducted by water agencies along the South Fork, North Fork, and Folsom Lake during the past 5 years has not detected cyanide anywhere along the river at detection limits ranging from 3 to 100 Fg/L, well below the MCL of 200 Fg/L. For more detail, see the individual agency data tables in Chapter 4.

Pesticides

Tables 6-10, 6-11, and 6-12 list all the potentially waivable Title 22 pesticides. **Table 6-10** shows the pesticides that have not been registered for use in California for several years. California law requires independent evaluation and registration of pesticides. DPR may reject pesticides that are approved and registered by the USEPA or may impose more restrictive use conditions. Pesticides that are no longer in use may be of concern in groundwater or in bed sediment but would not be expected to be present in a flowing stream. For practical purposes, the pesticides shown in Table 6-10 can be considered not used in the American River watershed and therefore not present in the American River source water.

Table 6-11 shows the usage of currently registered pesticides in the watershed. This table is based on reported use data from 1993 through 1995 that was obtained from DPR for all of Placer, El Dorado, and Sacramento counties. The reported use data include information on restricted pesticides and pesticides used by licensed operators, such as pest control businesses, but does not include home and garden use of over-the-counter pesticides. No information is readily available on home and garden use of pesticides. The reported use amounts shown in Table 6-11 are overestimates of the actual amount of reported use in the American River watershed. The western

Table 6-10. Pesticides No Longer Registered for Use in California

Pesticide	Last Active Registration in California
Aldrin	1987
Chlordane	1989
Dalapon	1986
1,2 Dibromo-3-chloropropane	~1977
Dieldrin	1986
Dinoseb	1989
Endrin	1990
Ethylene dibromide	1987
Heptachlor	1988
Hexachlorobenzene	1987
Picloram	1987
Toxaphene	1987
2,4,5-TP (Silvex)	1986

**Table 6-11. Registered Pesticides Currently Used
in the American River Watershed**

Pesticide	Pounds Applied Annually ^a			Use
	Placer County	El Dorado County	Sacramento County	
Atrazine	43	596	95	Herbicide: Christmas trees, forest trees, landscape maintenance, rights-of-way.
Bentazon	--	<1	13	Herbicide: grapes, landscape maintenance, orchards, rights-of-way.
Bromacil	62	7	637	Herbicide: landscape maintenance, orchards, rights-of-way, structural pest control.
Carbaryl (Sevin)	1,160	447	633	Insecticide: forests, landscape maintenance, orchards, rights-of-way, structural pest control.
Carbofuran (3-hydroxycarbofuran is a break-down product)	--	10	494	Pesticide: grapes, landscape maintenance.
Chlorothalonil	929	24	494	Fungicide: landscape maintenance, orchards, rights-of-way, structural pest control.
Diazinon	4,751	2,495	10,408	Insecticide: grapes, landscape maintenance, orchards, rights-of-way, structural pest control.
Dicamba	44	18	325	Herbicide: rights-of-way, structural pest control.
Dimethoate	32	6	12	Insecticide: landscape maintenance, orchards.
Diquat dibromide	106	159	4,934	Herbicide: aquatic weeds, landscape maintenance, orchards, rights-of-way, structural pest control.
Diuron	9,433	993	21,276	Herbicide: aquatic weeds, grapes, landscape maintenance, orchards, rights-of-way, structural pest control.
Endothall	32	465	73	Herbicide: landscape maintenance, rights-of-way.

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Table 6-11. Continued

Pesticide	Pounds Applied Annually ^a			Use
	Placer County	El Dorado County	Sacramento County	
Glyphosate (Round Up)	14,175	15,867	37,530	Herbicide: forests, landscape maintenance, orchards, rights-of-way, structural pest control.
Lindane	25	7	35	Insecticide: grapes, forests, landscape maintenance, orchards, rights-of-way, structural pest control.
Methomyl	8	1	--	Insecticide: grapes, landscape maintenance, orchards, rights-of-way, structural pest control.
Metolachlor	9	8	194	Herbicide: grapes, landscape maintenance, orchards, rights-of-way, structural pest control.
Oxamyl	1	<1	1	Insecticide: landscape maintenance, orchards, structural pest control.
Simazine	2,301	2,253	10,899	Herbicide: grapes, forests, landscape maintenance, rights-of-way, structural pest control.
2,4-D	1,913	4,185	3,191	Herbicide: grapes, forests, landscape maintenance, orchards, rights-of-way, structural pest control.
^a These quantities are for compounds containing the pesticide chemical. Thus, the actual pounds of the pesticide will be less than these numbers. Amounts are based on 1995 DPR reported use data, the most recent available year of record. Data for 1993 and 1994 were also reviewed to ensure that all pesticides used were included.				

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portion of Placer County (which is in the Bear River and Sacramento River watersheds), the southern portion of El Dorado County (which is in the Cosumnes River watershed), and much of Sacramento County (Sacramento River and Cosumnes River watersheds) are outside the American River watershed. Reporting data for areas smaller than counties, however, are not readily available. In addition, the quantities shown are for compounds containing the chemical as an active ingredient in the pesticide. Thus, the actual pounds of the pesticide chemical will be much less than these numbers. These numbers are used principally to show heavy-use versus light-use pesticides. As can be seen on Table 6-11, the most heavily used pesticides in the watershed are carbaryl, diazinon, diquat dibromide (Sacramento County only), diuron, glyphosate, simazine, and 2,4-D.

Pesticides are used in Placer County on apples, aquatic areas, barley, cherries, Christmas trees, forest trees, grapes, landscape maintenance, nurseries, peaches, pears, plums, prunes, rights-of-way, structural pest control, and walnuts. Pesticides used on crops particular to the western portion of Placer County (Bear and Sacramento river watersheds) were not included in Table 6-11, namely pesticides used on clover, corn, and rice. Pesticides are used in El Dorado County on apples, aquatic areas, cherries, Christmas trees, forest trees, grapes, landscape maintenance, nurseries, nectarines, peaches, pears, plums, public health control, rights-of-way, structural pest control, and walnuts. Since the American River watershed in Sacramento County is almost entirely urban, only Sacramento County pesticides with urban uses were included in the table. Urban pesticide uses include commercial/institutional uses, fumigation, landscape maintenance, nurseries, ornamental turf, public health control, rights-of-way, regulatory pest control, structural pest control, and vertebrate pest control.

In addition to the information on pesticide use obtained from DPR, information on PCWA's use of pesticides along its canals is presented in this section. The American River water diverted by PCWA is conveyed to the two WTPs via open canals. PCWA applies several herbicides for weed and brush control along the open canals. Herbicide products used by PCWA include Ureabor, Spike, Garlon, Round-Up, Karmex, and Predict. The herbicides are applied in accordance with product labels and California regulations and are applied using a gallon backpack in order to reduce the risk of drift or overspray. In addition, attention is paid to weather conditions (such as temperature and rainfall) and nothing is sprayed below the water line.

Table 6-12 lists the pesticides that are currently registered for use, but which, based on the review of the 1993, 1994, and 1995 DPR reported use database, are not used in the American River watershed.

Table 6-12. Pesticides Not Used in the American River Watershed^a

Pesticide
Alachlor
Aldicarb
Butachlor
Methoxychlor
Metribuzin
Molinate
Prometryn
Propachlor
Thiobencarb
^a Based on 1993, 1994, and 1995 DPR reported use data.

No participating agency monitoring has detected pesticides along the American River system. Very low levels of diazinon, diuron, and simazine have been detected in the Lower American River by other monitoring programs: the USGS NAWQA Monitoring Program, the Ambient Monitoring Program, RWQCB monitoring, and the Sacramento Stormwater Management Program. These pesticides, when detected, have been well below MCLs (see Table 6-8).

Chapter 7. Surface Water Treatment Rule Evaluations

The purpose of this chapter is to evaluate the WTPs that treat American River water for their compliance with existing drinking water regulations and to identify potential treatment concerns related to future drinking water regulations. For assistance with acronyms, the reader is referred to the list of abbreviations at the front of the report.

The existing and future drinking water regulations of concern are discussed in Chapter 3 and Appendix D. The major regulations requiring compliance include the following:

Existing Drinking Water Regulations

- Phases I, II, and V
- NPDWR - Radioactivity
- NPDWR - Trihalomethanes
- Surface Water Treatment Rule
- Total Coliform Rule
- Lead and Copper Rule
- Information Collection Rule

Future Drinking Water Regulations

- Arsenic
- Sulfate
- Radionuclides
- Radon
- Disinfectants/Disinfection By-Product Rule
- Enhanced Surface Water Treatment Rule
- Backwash Water Rule
- Drinking Water Candidate Contaminant List

Compliance with the existing and future drinking water regulations are evaluated for each agency, using the water quality and operations data collected from the various agencies. The water quality data have been summarized and presented in Chapter 4.

GIARDIA AND VIRUS REDUCTION REQUIREMENTS

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The SWTR requires all surface water suppliers to provide a minimum 3-log (99.9%) reduction of *Giardia* and a 4-log (99.99%) reduction of viruses. In source waters that are subjected to significant sewage and recreational use, it may be necessary to require higher levels of reduction.

In developing its guidance on level of treatment, the DHS has assumed a correlation between *Giardia* and viruses and total coliform densities. The State has determined that for source waters with total coliform densities less than 1,000 MPN/100 mL, the 3- and 4-log reduction for *Giardia* and viruses is satisfactory. If total coliform densities are greater than 1,000 MPN/100 mL but less than 10,000 MPN/100 mL, a 4- and 5-log reduction may be required for *Giardia* and viruses, respectively. If a water supplier disagrees with this requirement, the supplier can conduct monitoring and demonstrate more accurately the level of risk associated with the supply. The 1993 ARWSS Report concluded that 3- and 4-log removal/inactivation for *Giardia* and virus was sufficient, pending the collection of data on *Giardia* and viruses.

Based on the data collected over the past 5 years and presented in Chapter 4, the water agencies diverting from the North Fork, South Fork, and Folsom Lake continue to satisfy the total coliform level for which 3- and 4-log reduction of *Giardia* and viruses is satisfactory. Of more importance in determining the reduction requirements are the *Giardia* and virus data collected by SJWD from July 1997 through the present (12 monthly samples). These data have only presumptively detected *Giardia* on one occasion and have never confirmed a detection of *Giardia*. There have been two low-level detections of viruses. This low incidence indicates that only 3- and 4-log reduction of *Giardia* and viruses is required. All facilities for PCWA, EID, SJWD, FSP, Roseville, and Folsom currently meet the 3- and 4-log reduction requirements through a combination of physical removal and chemical inactivation.

Total coliform data for the Lower American River have been collected by ACWS and AWD during summer months and some winter months, by the City of Sacramento throughout the year, and by EBMUD for a limited six-month period. The available winter and summer data for ACWS and AWD show total coliform levels well below 1,000 MPN/100 mL most of the time. The limited data collected by EBMUD were collected manually from the river surface, not from an intake facility, and show total coliform levels well above 1,000 MPN/100 mL. The City of Sacramento has collected extensive coliform data over the past 5 years from the E.A. Fairbairn WTP. The winter average is 1,460 MPN/100 mL, and the summer average is 740 MPN/100 mL.

ACWS, AWD, the City of Sacramento, and CWD all have collected raw water samples for *Giardia*; and the City of Sacramento has collected raw water samples for viruses as well. Out of 90 samples, 19 have presumptively detected *Giardia*, with two confirmed detections. No viruses were detected along the Lower American River. The low number of detections indicate a low-level incidence of *Giardia* and viruses along the Lower American River.

The *Giardia* data presented in Chapter 4 appear to indicate that the correlation between *Giardia* and total coliform density is not consistent or reliable. For this reason, and since a substantial amount of real *Giardia*

and virus data are now available, it is prudent to evaluate the needed level of reduction required based on the low-level incidence of *Giardia* and viruses. Based on these data, 3- and 4-log reduction of *Giardia* and viruses should be required for agencies treating Lower American River water. All facilities for ACWS, CWD, AWD, and the City of Sacramento currently meet the 3- and 4-log reduction of *Giardia* and viruses requirements through a combination of physical removal and chemical inactivation.

REOPERATION OF FOLSOM DAM AND INSTALLATION OF THE TEMPERATURE CONTROL DEVICE

The operation of Folsom Reservoir has changed significantly in recent years. As a result of the floods of 1986, the Sacramento Area Flood Control Agency (SAFCA) in 1993 recommended that the U.S. Bureau of Reclamation plan to reoperate the reservoir in order to allow more flexible storage of flood flows from November through March, ranging from 400,000 to 670,000 acre-feet. The U.S. Bureau of Reclamation began operating Folsom Lake within this range in 1994 as an interim operating plan until a permanent flood protection plan is adopted. This interim operating plan still continues to date and exposes a large amount of shoreline and also passes a large amount of water through the reservoir during the wet period of the year. As is discussed later in this section, the reoperation may impact the raw water quality at downstream intakes.

Raw water supplied from Folsom Dam to Folsom, Roseville, SJWD, and FSP is diverted through a single outlet in the dam located at elevation 317 feet. This outlet location is typically within Folsom Reservoir's cold water pool between late spring and early fall (April through November). Consequently, diversion of water from this elevation reduces the cold water pool volume. This, in turn, reduces the amount of cold water available for releases into the Lower American River for benefit to the fishery resources. To optimize the use of the cold water pool, a temperature control device has been proposed to provide the four water purveyors at the dam with the ability to divert water from the reservoir at elevations above the cold water pool (above elevation 317 feet). This facility has not been authorized by the U.S. Congress, therefore no funds have yet been appropriated for design or construction. During final design, it may be determined that the temperature control device (TCD) facility will not impact the agencies' existing intake locations. In that event, there should be a far lesser impact to raw water quality.

Table 7-1 summarizes the expected impacts of the reoperation of Folsom Dam and the installation of the temperature control device.

For those agencies whose intakes are located upstream of Folsom Lake, such as PCWA or EID at Strawberry, the reoperation and the temperature control device will not impact the facilities. Also, since EID's El Dorado Hills WTP has its own intake in Folsom Lake, the installation of the temperature control device will not impact that facility.

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The reoperation of Folsom Lake will impact all agencies diverting from Folsom Lake or the Lower American River. It is not expected to impact EBMUD substantially, because it is expected that during high turbidity events, EBMUD will either not divert American River water or will deliver it to terminal storage reservoirs in the East Bay, rather than treating it directly. Therefore, EBMUD

Table 7-1. Impacts of Folsom Reoperation and Installation of the Temperature Control Device

Agency WTP	Folsom Reoperation	Temperature Control Device
El Dorado Irrigation District		
Strawberry WTP	None	None
El Dorado Hills WTP	Medium	None
Placer County Water Agency		
Foothill WTP	None	None
Sunset WTP	None	None
City of Roseville		
Roseville WTP	Medium	Medium
San Juan Water District		
Sidney N. Peterson WTP	Medium	Medium
City of Folsom		
Folsom WTP	Medium	Medium
Folsom State Prison		
FSP WTP	Medium	Medium
Arden Cordova Water Service		
Coloma WTP	High	Low
Carmichael Water District		
Ranney Collectors/WTP	High	Low
Arcade Water District		
Infiltration Wells/WTP	High	Low
City of Sacramento		
E.A. Fairbairn WTP	High	Low
EBMUD		
Lafayette WTP	Low	Low
Orinda WTP	Low	Low
Walnut Creek WTP	Low	Low
Upper San Leandro WTP	Low	Low
Sobrante WTP	Low	Low
Note: See text for explanation of terms none, low, medium, and high.		

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will have low impacts. Since the reoperation exposes greater shoreline, it is anticipated that increased levels of turbidity will be seen in the river water downstream of the dam. Therefore, higher impacts will be imposed on agencies diverting from the Lower American River. The agencies which divert water from Folsom Dam are currently afforded a level of protection from the reoperation impacts because of the deep intake facility. It is expected that the intake depth will alleviate turbidity levels slightly and cause only moderate reoperation impacts to these WTPs.

The temperature control device will impact the agencies using the Folsom Dam intake the greatest. This facility may reduce the depth of withdrawal for raw water. This decrease will provide warmer raw water during the spring, summer, and fall months. Also associated with the increase in temperature could be an increase in turbidity, TOC, coliforms, and MTBE. Each of these constituents can impact the treatment processes by challenging removal and disinfection efficiencies, however, the impact is expected to be only moderate. The agencies diverting from the Lower American River will also be impacted by the installation of the temperature control device but less significantly. The river water will be substantially cooler during the spring, summer, and fall months. This will cause a reduction in chemical reaction efficiencies and will probably require an increase in chemical usage for removal and disinfection, but this is expected to be a low-level impact.

Reservoirs can often be a source of taste and odor compounds and low lake levels often provide warmer water in the lake which can increase algae levels. Lake turnover can occur during the spring and the fall which can release hydrogen sulfide, iron, manganese, algae, and chemical compounds. Taste and odor episodes are typically caused by elevated levels of algae or odor-producing chemical compounds. There are a variety of algae which produce tastes or odors. There are two main chemical compounds which can be responsible for taste or odor: methylisobaneal (MIB) or geosmin. MIB is produced by algae and *actinomyces* (a filamentous bacteria). Geosmin is also produced by algae and *actinomyces*.

WATER TREATMENT PLANT EVALUATIONS

This section evaluates the individual WTPs.

Placer County Water Agency

PCWA operates two WTPs that may treat water diverted from the North/Middle Fork of the American River: Foothill WTP and Sunset WTP. Both of these plants are conventional WTPs. The Foothill WTP has a capacity of 27 MGD and services the Newcastle, Loomis, Rocklin, and Lincoln areas. The Sunset WTP has a capacity of 5 MGD, is blended with Foothill WTP water, and services the communities of Rocklin and Lincoln in western Placer County. Currently, PCWA diverts water from the American River on the North Fork, after its confluence with the Middle Fork, at the Auburn Dam site from a temporary pump station that is installed in early spring and dismantled in the fall. PCWA uses this source to meet peak

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summer demands and to serve as a main supply during the PG&E source down-times during planned maintenance.

The water diverted from the American River is pumped through the Ophir Tunnel, then pumped again up and into PG&E's South Canal. There, it is blended with water from the Yuba and Bear rivers. This blended water can then be provided directly to the Foothill WTP or transported, via open canals, to the Sunset WTP.

The Foothill WTP is a conventional WTP that consists of two distinct treatment trains. The older treatment train, built in 1979, has a capacity of 12 MGD under low-turbidity conditions, less than 30 NTU. The newer treatment train, built in 1990, has a capacity of 15 MGD and is operated preferentially in winter. The older 12-MGD train was designed as a conventional WTP with tube settlers in the sedimentation basins. The train has been classified as a direct filtration plant by DHS due to the size of the sedimentation basins. The sludge is manually removed from the settling basins and applied to sludge lagoons for drying. Four dual-media filters contain 17 inches of sand and 10 inches of anthracite with a gravel base. The filters are operated at 5 gpm/sf. There is no filter-to-waste facility in operation. The filter backwash water is recycled to a small settling basin and returned to the headworks at a constant rate. Each filter has a surface wash system. The settled water goal is <2 NTU, and the filtered water goal is <0.05 NTU. The newer 15-MGD train is a conventional WTP with flocculation and long horizontal sedimentation basins. The sedimentation basins include a mechanical chain and flight sludge removal system. The four dual-media filters have Leopold underdrains support gravel and air scour. The filtered water is treated with lime for pH control and chlorine prior to storage in the reservoirs (11 MG). This is where most of the disinfection CT credit is achieved. The plans for expansion to 55 MGD, total plant capacity, will probably include the addition of an ACTIFLOW flocculation/sedimentation unit and five additional filters. PCWA receives *Giardia* credit of 2.5-log reduction for physical removal and achieves 0.5-log credit for disinfection.

The Sunset WTP was designed in the 1960s as a temporary WTP. It is a simple treatment plant with a capacity of 5 MGD. The treatment consists of rapid mix, flocculation, sedimentation, and filtration. Alum is added for coagulation and mixed mechanically. The raw water is then prechlorinated after which a non-ionic polymer is added as a pretreatment aid. Horizontal flocculators are situated perpendicular to the flow. Because sludge is not mechanically removed in the sedimentation basins, the basins must be cleaned manually. Four dual-media filters each with surface wash contain 17 inches of sand and 10 inches of anthracite on support gravel and Leopold clay underdrains. The plant will be upgraded, and filter-to-waste capabilities will be installed. The filter backwash is recycled back to a settling basin, and the decant is recycled to the influent. Lime and chlorine are added to the treated water prior to its discharge to a 2.5-MG storage tank. The treated water is blended with treated water from Foothill WTP and services the community of Rocklin. This year, the WTP did not operate during winter since the Rocklin area could be serviced by the Foothill WTP. PCWA receives 2.5-log reduction for physical removal and achieves 0.5-log credit for disinfection.

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Since the influent water to the WTPs is a blend of American, Yuba, and Bear river water, the Title 22 compliance monitoring from the WTPs is not completely descriptive of the American River water source. PCWA has been performing grab sampling on raw American River water for a variety of constituents, including general water quality parameters, organics, inorganics, and microbial contaminants.

Existing Drinking Water Regulations Compliance

Tables 7-2 and 7-3 provide summaries of the major existing drinking water regulations of concern and PCWA's compliance status. PCWA is currently in compliance with all regulations at both WTPs.

Future Drinking Water Regulations Impacts

Tables 7-4 and 7-5 provide summaries of the major future drinking water regulations of concern and the potential impacts to PCWA. Since the American River source is low in TOC and the water is blended with Yuba and Bear river water that also is low in TOC, THM levels are maintained below the expected Stage 1 DBP Rule and near the probable Stage 2 DBP Rule levels, 80 Fg/L and 40 Fg/L, respectively. The new turbidity requirements of the ESWTR should be able to be met at both WTPs. Filter-to-waste capability may need to be installed at both WTPs. Currently, filter backwash water is treated when it is recycled. Depending on what the final regulation determines, the existing treatment facilities may require upgrading, or disposal options may need to be identified. MTBE is on the Drinking Water Contaminant Candidate List and may be a concern for treatment in the future. No data are available for the North Fork, but future monitoring will provide more information to determine whether any treatment modifications would be required.

El Dorado Irrigation District

EID operates two WTPs with direct intakes on the American River. EID operates the Strawberry WTP in the community of Strawberry in the upper South Fork basin and the El Dorado Hills WTP in the community of El Dorado Hills on Folsom Lake. The Strawberry WTP is a small membrane filtration plant, and the El Dorado Hills WTP is a conventional WTP.

The Strawberry WTP is a microfiltration plant with a design capacity of 100 gpm. The plant has an operating flow range of 80–125 gpm. It is operated at this capacity for approximately 6 hours per day in winter months and 10 hours per day in summer months. Water is not pretreated. The plant consists of 24 microfiltration modules and is monitored in Placerville with SCADA controls and alarms. The filtered water is chlorinated with sodium hypochlorite, the pH is adjusted with soda ash, and the water then is sent to the distribution system. There is a total of 0.25 MG of storage in the system. EID has been granted 3-log *Giardia* reduction and 0.5-log virus reduction for physical removal and achieves 0.5- and 3.5-log reduction from disinfection, respectively.

Table 7-2. Placer County Water Agency - Foothill WTP Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for treated source water, blended American River , Yuba River and Bear River. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for treated source water, blended American River , Yuba River and Bear River. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. All treated water turbidity requirements met.
Total Coliform Rule	1989	Microbial	necessary. No violations. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Not Applicable

Table 7-3. Placer County Water Agency - Sunset WTP Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for treated source water, blended American River , Yuba River and Bear River. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for treated source water, blended American River , Yuba River and Bear River. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. All treated water turbidity requirements met.
Total Coliform Rule	1989	Microbial	necessary. No violations. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Not Applicable

Table 7-4. Placer County Water Agency - Foothill WTP Future Drinking Water Regulations Impacts

Regulation	of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	regulation is set above 2 ug/L, no additional treatment required. If regulation is set below 2 mg/L.
Sulfate	2001 ^a	Sulfate	has been monitored in raw and treated water with no detection above 2 mg/L. If regulation is set, it is expected to be well above 2 mg/L. It is unlikely that
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and Stage II rule will be based on TCM results and more recent data. The probable 40/30 THM/HAA levels may be a problem depending on chlorination
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	removal of <i>Cryptosporidium</i> for conventional treatment. Already continuous monitoring of individual filter effluent for turbidity. May need to install filter-to-waste capacity. If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	upgraded and disposal options may be required if recycling is banned.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCL in Appendix E. Most organics are not monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not be detected at low levels in Folsom Lake and in urban runoff discharging to the
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Table 7-5. Placer County Water Agency - Sunset WTP Future Drinking Water Regulations Impacts

Regulation	of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	regulation is set above 2 ug/L, no additional treatment required. If regulation is set below 2 ug/L, no additional treatment required. If regulation is set below 2 ug/L, no additional treatment required. If regulation is set below 2 ug/L, no additional treatment required.
Sulfate	2001 ^a	Sulfate	mg/L. If regulation is set, it is expected to be well above 2 mg/L. It is unlikely that
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and probable 40/30 THM/HAA levels may be a problem depending on chlorination
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Will meet new turbidity requirements of 0.3/1.0 NTU. Will receive 2 log removal of <i>Cryptosporidium</i> for conventional treatment. Already continuous filter-to-waste capacity. If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	Existing treatment facilities for filter backwash water may need to be upgraded
Drinking Water Candidate Contaminant Lis	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Chapter 7. Surface Water Treatment Rule Evaluations

The El Dorado Hills WTP is a conventional WTP with a design capacity of 12 MGD. The plant is usually operated between 2 and 12 MGD, with an average winter flow of 2.5 MGD and an average summer flow of 6 MGD. The influent water is diverted from Folsom Lake where the South Fork of the American River enters the lake. The raw water is pumped up to the WTP. The raw water is pre-chlorinated for disinfection CT credit, to enhance treatment and to prevent growth in the treatment facilities. The pH is adjusted with soda ash to help with coagulation. Alum and polymer are both added for coagulation. The water is flocculated and clarified in upflow clarifiers. These clarifiers are backwashed with raw water approximately every 8 hours. Also, pressure switches in the clarifiers induce backwash if the pressure builds up in the clarifiers. The dual-media filters contain 18 inches of sand and 30 inches of anthracite. The filtration rate is 5 gpm/sf. The filters are backwashed based on headloss but are backwashed a minimum of once per week. The filters are backwashed at a rate of 20 gpm/sf. The filter and clarifier backwash water is returned to a large settling basin, and the decant is blended with the influent water. There are no filter-to-waste facilities. The filtered water is post-chlorinated with chlorine gas, and the pH is adjusted with zinc orthophosphate. Disinfection CT credit is achieved in the existing 0.5-MG storage tank. There is a total of 7 MG of storage in the system. EID receives 2-log reduction for physical removal and 1-log reduction for disinfection.

EID has been monitoring the raw and treated water for both the Strawberry WTP and the El Dorado Hills WTP for all the required Title 22 compliance constituents. EID has also monitored the raw water from Folsom Lake for MTBE.

Existing Drinking Water Regulations Compliance

Tables 7-6 and 7-7 provide summaries of the major existing drinking water regulations of concern and EID's compliance status. EID is currently in compliance with all regulations at both WTPs.

Future Drinking Water Regulations Impacts

Tables 7-8 and 7-9 provide summaries of the major future drinking water regulations of concern and the potential impacts to EID. Since the American River source is low in TOC, THM levels are maintained below the proposed Stage 1 and near the probable Stage 2 levels. This regulation would only impact EID at the El Dorado Hills WTP if the Stage 2 levels were set below 49 Fg/L, which is the current 5-year average. Both WTPs should be able to meet the new turbidity requirements of the ESWTR. Filter-to-waste capacity may need to be installed at the El Dorado Hills WTP. Currently, filter backwash water is treated when it is recycled at the El Dorado Hills WTP. Depending on what the final regulation requires, the existing treatment facilities may require upgrading or disposal options may need to be identified. MTBE is on the Drinking Water Contaminant Candidate List and may be a concern for the El Dorado Hills WTP in the future.

Table 7-6. El Dorado Irrigation District - Strawberry WTP Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated American River water. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for gross alpha and gross beta in raw and treated American River water. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. Treated water turbidity requirements met.
Total Coliform Rule	1989	Microbial	Monitored distribution system weekly; performed repeat samples as necessary. No violations. Continually maintains chlorine residual >0.2 mg/L in distribution
Lead and Copper Rule	1991	Corrosion By-Products	performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Not Applicable

Table 7-7. El Dorado Irrigation District - El Dorado Hills WTP Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated American River water. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for gross alpha and gross beta in raw and treated water. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. Treated water exceeded 5 NTU once in January 1995, otherwise requirements met.
Total Coliform Rule	1989	Microbial	Violations in April 1994 - 3 of 72 samples positive total coliform (7.1%). Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	Performed initial monitoring requirements (2 - 6 month periods) and performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Not Applicable

Table 7-8. El Dorado Irrigation District - Strawberry WTP Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	Has been monitored in 4 raw water samples with one detection at 1 ug/L. If regulation is set above 2 ug/L, no additional treatment required. If regulation is set below 2 ug/L, then additional monitoring and/or removal may be required.
Sulfate	2001 ^a	Sulfate	Has been monitored in raw and treated water with no detection above 2 mg/L. If regulation is set, it is expected to be well above 2 mg/L. It is unlikely that any additional treatment will be required for sulfate removal.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	Has been monitored in raw and treated water with detections ranging from ND to 81 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and microbial benchmarking not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels should not be a problem due to the use of membrane filtration for treatment.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Will be able to meet new turbidity requirements of 0.3/1.0 NTU. Already continuous monitoring of membrane filtrate for turbidity. May need to prove 2 log removal of <i>Cryptosporidium</i> . If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation. This is not a likely requirement with the use of membrane filtration for treatment.
Backwash Water Rule	2000	Microbial and Turbidity	Existing treatment facilities for filter backwash water may need to be upgraded and disposal options may be required if recycling is banned.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Table 7-9. El Dorado Irrigation District - El Dorado Hills WTP Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	Has been monitored in 5 raw water samples with one detection at 1.2 ug/L. If regulation is set above 2 ug/L, no additional treatment required. If regulation is set below 2 ug/L, then additional monitoring and/or removal may be required.
Sulfate	2001 ^a	Sulfate	Has been monitored in raw and treated water with no detection above 5 mg/L. If regulation is set, it is expected to be well above 5 mg/L. It is unlikely that any additional treatment will be required for sulfate removal.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	Has been monitored in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and microbial benchmarking not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels may be a problem depending on chlorination practices.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Will meet new turbidity requirements of 0.3/1.0 NTU. Will receive 2 log removal of <i>Cryptosporidium</i> for conventional treatment. Already continuous monitoring of individual filter effluent for turbidity. May need to install filter-to-waste capacity. If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	Existing treatment facilities for filter backwash water may need to be upgraded and disposal options may be required if recycling is banned.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard; current data is in compliance. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Chapter 7. Surface Water Treatment Rule Evaluations

Of the 13 MTBE samples collected from Folsom Lake prior to December 1997, only one resulted in a positive detection at 0.92 Fg/L. Future monitoring will provide more information to determine whether any treatment modifications are necessary.

Recent Watershed Changes and Their Impact to Treatment

The potential impact of Folsom Reservoir reoperation on EID at the El Dorado Hills WTP is higher turbidity, higher coliforms, and higher TOC levels. It is probable that the El Dorado Hills WTP would be able to satisfy all drinking water regulations during most November-through-March period. However, short-term (on the order of 7 days) treatment difficulties are to be expected during major storm events such as the January 1997 Pineapple Express. It is possible that the upflow clarification/filtration process would be overloaded at higher plant flows (above 50% of capacity) during extremely high turbidity periods (over 200 NTU).

In addition to acute treatment plant problems associated with high turbidity periods, reoperation of Folsom Reservoir could result in chronic water quality problems at the El Dorado Hills WTP intake location. Due to the reduction in lake level from November through March, the intake is more exposed to contaminants high in the water column such as turbidity, coliforms, MTBE, and TOC.

Folsom

Folsom operates the Folsom WTP, which is provided water from Folsom Lake. The Folsom WTP is a conventional WTP with a design capacity of 25 MGD and an operating range of 0–25 MGD. The average flow in winter is 10 MGD, and the average flow in summer is 24 MGD. There is an ongoing expansion of the WTP to 40 MGD.

The influent water, diverted from Folsom Lake at the Folsom Dam, is treated with chlorine for disinfection CT credit and with polyaluminum chloride (PAC) and polymer for coagulation. The chemicals are mixed using a pump injection located close to the inlet structure. The water is then flocculated in four three-stage basins with vertical shaft flocculators. The water is sedimented in four basins, with a surface loading rate of 1.25 gpm/sf. The solids are removed mechanically with chain and flight sludge removal equipment. The settled water is treated with a filter aid and then filtered in automatic backwash traveling bridge-type filters. These are mono-media filters with 16-18 inches of sand. The filtration rate is 2.5 gpm/sf. The backwashing is performed automatically, based on time or head loss. The filter backwash water is returned to the raw water lagoon to blend with the influent water. The filters have filter-to-waste capacity. Folsom will be installing three temporary dual media filters (sand and anthracite) with a total capacity of 6 MGD to meet summer demands. The filtered water is then chlorinated for CT credit and adjusted for pH with lime. The system has 19.5 MG of storage. Folsom receives *Giardia* credit of 2.5-log reduction for physical removal and 0.5-log credit for disinfection.

Chapter 7. Surface Water Treatment Rule Evaluations

Folsom has been monitoring the treated water for the Folsom WTP for all the required Title 22 compliance constituents.

Existing Drinking Water Regulations Compliance

Table 7-10 provides a summary of the major existing drinking water regulations of concern and Folsom's compliance status. Folsom is currently in compliance with all regulations.

Future Drinking Water Regulations Impacts

Table 7-11 provides a summary of the major future drinking water regulations of concern and the potential impacts to Folsom. Since the American River source is low in TOC, THM levels are maintained below the proposed Stage 1 and near the probable Stage 2 levels. Folsom should be able to meet the new turbidity requirements of the ESWTR. Currently, filter backwash water is recycled to the raw water lagoon. It may be determined that additional treatment facilities are required, or disposal options may need to be identified. MTBE is on the Drinking Water Contaminant Candidate List and may be a concern for treatment in the future. Of the 13 MTBE samples collected from Folsom Lake prior to December 1997, only one resulted in a positive detection at 0.92 Fg/L. Future monitoring will provide more information to determine whether any treatment modifications are required.

Recent Watershed Changes and Their Impact to Treatment

The potential impact of Folsom Reservoir reoperation on Folsom is higher turbidity, higher coliform levels and higher TOC levels. It is probable that Folsom's treatment facility would be able to satisfy all drinking water regulations during the November-through-March period. During the major storm event in January 1997, treatment difficulties were not experienced.

Raw water, supplied from Folsom Dam to Folsom, Roseville, SJWD, and FSP, is diverted through a single outlet in the dam located at elevation 317 feet. This outlet location is typically within Folsom Reservoir's cold water pool between late spring and early fall (April through November). Consequently, diversion of water from this elevation reduces the cold water pool volume. This, in turn, reduces the amount of cold water available for releases into the Lower American River for benefit to the fishery resources. To optimize the use of the cold water pool, a temperature control device has been proposed to provide the four water purveyors at the dam with the ability to divert water from the reservoir at elevations above the cold water pool (above elevation 317 feet). Raising the diversion location in the reservoir could impact the following raw water quality parameters: temperature, turbidity, coliforms levels, TOC (as a result of increased algae concentrations), and MTBE.

Table 7-10. City of Folsom Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for treated American River water. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for gross alpha, gross beta, strontium 90 and tritium in treated water. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. All treated water turbidity requirements met.
Total Coliform Rule	1989	Microbial	necessary. Violation in December 1996- 2 of 35 samples positive for total coliform. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	Performed initial monitoring requirements (2 - 6 month periods) and performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Not Applicable

Table 7-11. City of Folsom Future Drinking Water Regulations Impacts

Regulation	of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	If regulation is set above 2 ug/L, no additional treatment required. If regulation is set below 2 ug/L, then additional monitoring and/or removal may be required.
Sulfate	2001 ^a	Sulfate	mg/L. If regulation is set, it is expected to be well above 10 mg/L. It is unlikely that
Radionuclides	2000	Radionuclides	Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and probable 40/30 THM/HAA levels may be a problem depending on chlorination
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Already continuous monitoring of individual filter effluent for turbidity and filter-to-log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	May need to install treatment facilities for filter backwash water prior to return to raw water lagoon, unless lagoon meets treatment requirements. May need to identify disposal methods if recycling is banned.
Drinking Water Candidate Contaminant Lis	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not been detected at low levels in Folsom Lake and in urban runoff discharging to the
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Chapter 7. Surface Water Treatment Rule Evaluations

The specific impacts of the temperature control device on treatment costs and treatment plant efficiencies largely depend on the details of the design and the operational rules of the temperature control device itself. It is strongly recommended that the four water purveyors at Folsom Dam remain involved throughout the design, construction, and operational phases of the temperature control device project.

Roseville

Roseville operates the Roseville WTP, which treats water diverted from Folsom Lake at the Folsom Dam. The Roseville WTP has a design capacity of 48 MGD. The plant typically operates between 9 and 36 MGD. The average flow during winter is 10 MGD, and the average flow during summer is 30 MGD.

The Roseville WTP is a conventional WTP. The influent water is pre-chlorinated for disinfection CT credit. Alum and polymer are added for coagulation and are mixed hydraulically using the headloss at the inlet control valve. Recently, a chemical addition point was added at the flash mix so that lime can be added for pH control during high-turbidity, low-alkalinity storm events. A portable tank is located at the flash mix for the lime. The new treatment facilities will use caustic soda for pre-treatment.

Flocculation and sedimentation are achieved in three upflow clarifiers. The existing clarifiers are round basins where the water enters in the center, flows up through tube settlers, and exits over launders. The clarifiers have a suspended sludge blanket that is used to thicken and settle out the solids. The water flows up through the sludge blanket and then up through tube settlers. The tube settlers were added to the original basins to increase the capacity of the flocculation and sedimentation process. Operations staff monitor the blanket daily to ensure that the clarifiers are operating properly. The clarifier blowoff process removes sludge, which is sent to the sludge lagoons. The clarifiers are operated to achieve an effluent turbidity of less than 1-2 NTU. This can be difficult since the clarifiers do not respond well to changes in the flow pattern. Roseville currently has about 12 MG of storage through the entire system, which requires flow changes through the treatment plant to respond to variations in use throughout the day.

A polymer is added as a filter aid upstream of the filters. The six dual-media filters, containing 20 inches of anthracite, 10 inches of sand, and 12 inches of gravel, have a Leopold tile underdrain. The filters are operated with a filtration rate up to 4.5 gpm/sf. The filters have backwash with a surface wash and are backwashed on an auto sequence. The backwash is operated at a rate of 18.5 gpm/sf. The filter runs can be up to 100 hours. The filter backwash water is sent to the reclamation basins, where the water is settled and decant water is returned to the headworks. Filter-to-waste is currently employed at the treatment plant. The water is wasted to a pond located on the site with an off-site overflow. The filters have individual turbidimeters and a combined filter effluent turbidimeter. The filtered water is treated with lime for pH adjustment and with fluoride and chlorine for post-chlorination. Roseville receives *Giardia* credit of 2.5-log reduction for physical removal and 0.5-log credit for disinfection.

Chapter 7. Surface Water Treatment Rule Evaluations

Roseville has been monitoring the raw and treated water for the Roseville WTP for all required Title 22 compliance constituents.

Existing Drinking Water Regulations Compliance

Table 7-12 provides a summary of the major existing drinking water regulations of concern and Roseville's compliance status. Roseville is currently in compliance with all regulations.

Future Drinking Water Regulations Impacts

Table 7-13 provides a summary of the major future drinking water regulations of concern and the potential impacts to Roseville. Since the American River source is low in TOC, THM levels are maintained below the expected Stage 1 and near the probable Stage 2 levels. This regulation would probably not impact the WTP since the current 5-year average for THMs is 38 Fg/L, which is below the anticipated Stage 2 level. Roseville should be able to meet the new turbidity requirements of the ESWTR. Currently, filter backwash water is treated when it is recycled. Depending on what the final regulations require, the existing treatment facilities may require upgrading, or disposal options may need to be identified. MTBE is on the Drinking Water Contaminant Candidate List and may be a concern for treatment in the future. Of the 13 MTBE samples collected from Folsom Lake prior to December 1997, only one resulted in a positive detection at 0.92 Fg/L. Future monitoring will provide more information to determine whether any treatment modifications would be required.

Recent Watershed Changes and Their Impact to Treatment

The potential impact of Folsom Reservoir reoperation on Roseville is higher turbidity, higher coliform levels and higher TOC levels. It is probable that Roseville's treatment facility would be able to satisfy all drinking water regulations during the November-through-March period. However, short-term (on the order of 5 days) treatment difficulties are to be expected during major storm events such as the January 1997 Pineapple Express.

Raising the diversion location in the reservoir could impact the following raw water quality parameters: temperature, turbidity, coliform levels, TOC (as a result of increased algae concentrations), and MTBE. The specific impacts of the temperature control device on treatment costs and treatment plant efficiencies depend largely on the details of the design and the operational rules of the temperature control device itself. It is strongly recommended that the four water purveyors at Folsom Dam remain involved throughout the design, construction, and operational phases of the temperature control device project.

Table 7-12. City of Roseville Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated American River water. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for gross alpha in treated water. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. All treated water turbidity requirements met.
Total Coliform Rule	1989	Microbial	necessary. No violations. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	Performed initial monitoring requirements (2 - 6 month periods) and performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Not Applicable

Table 7-13. City of Roseville Future Drinking Water Regulations Impacts

Regulation	of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	If regulation is set above 3 ug/L, no additional treatment required. If regulation is
Sulfate	2001 ^a	Sulfate	mg/L. If regulation is set, it is expected to be well above 7 mg/L. It is unlikely that
Radionuclides	2000	Radionuclides	Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and Stage II rule will be based on TCR results and more recent data. The probable 40/30 THM/HAA levels may be a problem depending on chlorination
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Already continuous monitoring of individual filter effluent for turbidity and filter-to-log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	Existing treatment facilities for filter backwash water may need to be upgraded
Drinking Water Candidate Contaminant Lis	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Folsom State Prison

FSP operates a Microfloc two-stage filtration package plant with a design capacity of 4.0 MGD. The operating range is typically 1.2–2 MGD. The winter average flow is 1.3 MGD, and the summer average flow is 2 MGD. The plant is operated from 5:00 to 12:00 a.m.

The influent water, diverted from Folsom Lake at Folsom Dam, flows to a 30,000-gallon raw water wet well. The influent water is treated with chlorine for disinfection CT credit and with alum and polymer for coagulation. The water is then flocculated and clarified in an upflow clarifier. The clarifier is backwashed approximately every 8 hours. The water then flows into two tri-media filters, consisting of 10 inches of anthracite, 8 inches of sand, and 3 inches of garnet with a gravel base. The filters are backwashed once or twice a day, in conjunction with a clarifier backwash. The filter and clarifier backwash water is sent to the sludge lagoons, and the decant is recycled to the headworks. Filter-to-waste facilities have been installed. The filtered water is chlorinated for disinfection CT credit, and the pH is adjusted with lime. The system has 2.0 MG of storage. FSP receives *Giardia* credit for 2-log reduction for physical removal and achieves 1-log credit for disinfection.

FSP has been monitoring the treated water for all required Title 22 compliance constituents. FSP has also sampled the treated water several times for MTBE.

Existing Drinking Water Regulations Compliance

Table 7-14 provides a summary of the major existing drinking water regulations of concern and FSP's compliance status. FSP is currently in compliance with all regulations.

Future Drinking Water Regulations Impacts

Table 7-15 provides a summary of the major future drinking water regulations of concern and the potential impacts to FSP. Since the American River source is low in TOC, THM levels are maintained below the expected Stage 1 and near the probable Stage 2 levels. FSP should be able to meet the new turbidity requirements of the ESWTR. Currently, filter backwash water is settled before it is recycled. Depending on what the final regulations require, treatment facilities may need to be installed. The FSP is currently installing a by-pass line to dispose the decant to the sanitary sewer. MTBE is on the Drinking Water Contaminant Candidate List and may be a concern for treatment in the future. Of the 13 MTBE samples collected from Folsom Lake prior to December 1997, only one resulted in a positive detection at 0.92 Fg/L. Future monitoring will provide more information to determine whether any treatment modifications are required.

Table 7-14. Folsom State Prison Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for treated American River water. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for gross alpha and gross beta in treated water. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored annually in distribution system. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. All treated water turbidity requirements met.
Total Coliform Rule	1989	Microbial	necessary. Violation in August 1993- 2 of 16 samples positive for total coliform. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	Performed initial monitoring requirements (2 - 6 month periods) and performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Not Applicable

Table 7-15. Folsom State Prison Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	Has been monitored in 2 raw water samples with no detection above 1 ug/L. If regulation is set above 2 ug/L, no additional treatment required. If regulation is set below 2 ug/L, then additional monitoring and/or removal may be required.
Sulfate	2001 ^a	Sulfate	Has not been monitored in raw or treated water. Other agency monitoring indicates that it is unlikely that any additional treatment will be required for sulfate removal.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and microbial benchmarking not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels may be a problem depending on chlorination practices.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Will be able to meet new turbidity requirements of 0.3/1.0 NTU. Already continuous monitoring of individual filter effluent for turbidity and filter-to-waste. Will receive 2 log removal of <i>Cryptosporidium</i> . If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	Existing treatment facilities for filter backwash water may need to be upgraded and disposal options may be required if recycling is banned.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Chapter 7. Surface Water Treatment Rule Evaluations

Recent Watershed Changes and Their Impact to Treatment

The potential impact of Folsom Reservoir reoperation on FSP is higher turbidity, higher coliforms, and higher TOC levels. It is probable that the FSP treatment facility would be able to satisfy all drinking water regulations during most November-through-March period. However, short-term (on the order of 2 weeks) treatment difficulties are to be expected during major storm events such as the January 1997 Pineapple Express. It is possible that the two-stage filtration process would be overloaded at higher plant flows (above 50% of capacity) during extremely high-turbidity periods (over 200 NTU).

Raising the diversion location in the reservoir could impact the following raw water quality parameters: temperature, turbidity, coliform levels, TOC (as a result of increased algae concentrations), and MTBE. The specific impacts of the temperature control device on treatment costs and treatment plant efficiencies depend largely on details of the design and the operational rules of the temperature control device itself. It is strongly recommended that the four water purveyors at Folsom Dam remain involved throughout the design, construction, and operational phases of the temperature control device project.

San Juan Water District

SJWD operates the Sidney N. Peterson WTP which treats American River water diverted from Folsom Lake at the Folsom Dam. The Sidney N. Peterson WTP has a design capacity of 120 MGD. The WTP is typically operated between 20 and 120 MGD. The average winter flow is 30 MGD, and the average summer flow is 80 MGD.

The Sidney N. Peterson WTP is a conventional WTP. The influent water is pre-chlorinated for disinfection CT credit, and alum and polymer are added as coagulants. The coagulants are mixed using a vertical-shaft mechanical mixer in a small basin. The water is then flocculated using three-stage basins with horizontal shaft flocculators that are situated parallel to the flow. The sedimentation basins are half covered with tube settlers, which were installed to improve the settling characteristics of the basins. The settled solids are removed from the sedimentation basin using a vacuum-type system. A polymer is added as a filter aid, and the water is filtered through gravity-flow dual-media filters. The two filter basins are divided into 24 filters, and each filter has 10 cells. The filters are made of sand and anthracite with a gravel base on a porous-plate underdrain system. There are no filter-to-waste facilities. The filter backwash water is sedimented for a short amount of time in a small basin and then returned to the influent stream. The filtered water is post-chlorinated for disinfection CT credit, and the pH is adjusted with calcium hydroxide. There is 66.5 MG of storage in the distribution system. SJWD receives *Giardia* credit for 2.5-log reduction for physical removal and achieves 0.5-log credit for disinfection.

Chapter 7. Surface Water Treatment Rule Evaluations

SJWD has been monitoring the raw and treated water for the Sidney N. Peterson WTP for all required Title 22 compliance constituents. SJWD has also been performing monitoring in compliance with the Information Collection Rule. SJWD has collected data for raw and treated water levels of TOC, and raw water levels for *Giardia* and *Cryptosporidium*.

Existing Drinking Water Regulations Compliance

Table 7-16 provides a summary of the major existing drinking water regulations of concern and SJWD's compliance status. SJWD is currently in compliance with all regulations.

Future Drinking Water Regulations Impacts

Table 7-17 provides a summary of the major future drinking water regulations of concern and the potential impacts to SJWD. Since the American River source is low in TOC, THM levels are maintained below the expected Stage 1 and near the probable Stage 2 levels. This regulation would only impact the WTP if the Stage 2 levels were set below 34 Fg/L, which is the current 5-year average. SJWD should be able to meet the new turbidity requirements of the ESWTR. Filter-to-waste capacity may need to be installed. Currently, filter backwash water is settled for a short time prior to being recycled. Depending on what the final regulation determines, the existing facilities may require upgrading, or disposal options may need to be identified. MTBE is on the Drinking Water Contaminant Candidate List and may be a concern for treatment in the future. Of the 13 MTBE samples collected from Folsom Lake prior to December 1997, only one resulted in a positive detection at 0.92 Fg/L. Future monitoring will provide more information to determine whether any treatment modifications would be required.

Recent Watershed Changes and Their Impact to Treatment

The potential impact of Folsom Reservoir reoperation on SJWD is higher turbidity, higher coliform levels and higher TOC levels. It is probable that SJWD's treatment facility would be able to satisfy all drinking water regulations during the November-through-March period. However, short-term (on the order of 2 to 3 days) treatment difficulties are to be expected during major storm events such as the January 1997 Pineapple Express.

Raising the diversion location in the reservoir could impact the following raw water quality parameters: temperature, turbidity, coliform levels, TOC (as a result of increased algae concentrations), and MTBE. The specific impacts of the temperature control device on treatment costs and treatment plant efficiencies depend largely on details of the design and the operational rules of the temperature control device itself. It is strongly recommended that the four water purveyors at Folsom Dam remain involved throughout the design, construction, and operational phases of the temperature control device project.

Table 7-16. San Juan Water District Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated American River water. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for gross alpha, gross beta, strontium 90 and tritium in treated water. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. All treated water turbidity requirements met.
Total Coliform Rule	1989	Microbial	necessary. No violations. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Began monitoring in September 1996, will continue through December 1998.

Table 7-17. San Juan Water District Future Drinking Water Regulations Impacts

Regulation	of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	Has been monitored in multiple raw water samples with one detection at 19 ug/L. This result is not in agreement with all the other data collected on regulation is set below 5 ug/L, then additional monitoring and/or removal may be
Sulfate	2001 ^a	Sulfate	mg/L. If regulation is set, it is expected to be well above 10 mg/L. It is unlikely that
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and probable 40/30 THM/HAA levels may be a problem depending on chlorination
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	removal of <i>Cryptosporidium</i> for conventional treatment. Already continuous monitoring of individual filter effluent for turbidity. May need to install filter-to-waste capacity, although backwash cells are small and may meet intent of filter-to-waste. If required, additional log reduction of
Backwash Water Rule	2000	Microbial and Turbidity	Existing treatment facilities for filter backwash water may need to be upgraded
Drinking Water Candidate Contaminant Lis	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCL in Appendix E. Most organics are not monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to
^a Determination to Regulate			
^b Stage I/Stage II			
^c Interim/Long Term I/Long Term II			
^d Decision to Regulate - Every Five Years Subsequent			

Chapter 7. Surface Water Treatment Rule Evaluations

Arden Cordova Water Service

ACWS operates the Coloma WTP, which uses American River water diverted to the Folsom South Canal. The Coloma WTP is a direct filtration plant (the plant has been classified as direct filtration plant by the DHS due to the size of the sedimentation basins) that uses pressure filters. Groundwater is the primary water supply for the system, with surface water as a supplemental source during the high-demand period of summer months. Due to contamination of some of the local groundwater resources with perchlorate, ACWS will begin operating the Coloma WTP throughout the year.

The Coloma WTP has a plant capacity of 7 MGD. The plant is operated between 0 and 7 MGD, with an average flow of 4.5 MGD. American River water is diverted into the Folsom South Canal at Nimbus Dam. The water is diverted by ACWS from the Folsom South Canal approximately 3 miles downstream of Nimbus Dam. Once the water is diverted from the Folsom South Canal, it is treated with potassium permanganate to help prevent algal growth along the pipeline to the WTP. The water travels several thousand feet to the inlet of the WTP.

Cationic polymer is added to the water for coagulation and is hydraulically mixed under most flow conditions. Under low-flow conditions, mechanical mixers can be used. The water is flocculated in two parallel basins by horizontal paddles with a low mixing energy. The water then passes through small sedimentation basins. The solids have historically been removed manually from the basins when the WTP is off-line. A non-ionic polymer is added as a filter aid, and then the water passes through the dual media, rapid sand pressure filters. The seven filters contain 18 inches of anthracite, 12 inches of sand, 6 inches of pea gravel, and 18 inches of rock. The total filter area is 1,680 square feet (sf). The filters are operated at a filtration rate of 3 gallons per minute per square foot (gpm/sf). The filters are backwashed when the effluent turbidity exceeds 0.25 NTU or when the loss of flow is greater than the flow loss to the backwash cycle. The filters are backwashed at a flow not to exceed 15 gpm/sf. The filter backwash water is not recycled back to the influent water stream. After backwashing, the filtration rate is increased gradually. There is filter-to-waste capability. After filtration, the water is chlorinated. All CT credit is achieved after filtration. The water is treated with chlorine gas and then passes through three large clearwells, in series, with a total of 6 MG of storage. ACWS has been granted 2-log *Giardia* reduction for physical removal and achieves 1-log credit for disinfection.

ACWS has been monitoring the raw and treated water for the Coloma WTP for all required Title 22 compliance constituents. ACWS has also monitored the raw and treated water on multiple occasions for *Giardia* and *Cryptosporidium*.

Chapter 7. Surface Water Treatment Rule Evaluations

Existing Drinking Water Regulations Compliance

Table 7-18 provides a summary of the major existing drinking water regulations of concern and ACWS's compliance status. ACWS is currently in compliance with all regulations.

Future Drinking Water Regulations Impacts

Table 7-19 provides a summary of the major future drinking water regulations of concern and the potential impacts to ACWS. Since the American River source is low in TOC and it is blended with groundwater in the distribution system, THM levels are maintained below the expected Stage 1 and the probable Stage 2 levels. This regulation is not expected to impact ACWS. The new turbidity requirements of the ESWTR should be met during summer conditions. The WTP has not been operated in winter months previously and may need to be monitored for compliance. Currently, filter backwash water is not recycled, so there should be no impact to ACWS. MTBE and perchlorate are both on the Drinking Water Contaminant Candidate List and may be a concern for treatment in the future. Neither of these constituents have been detected in raw river water samples along the Lower American River, but future monitoring will provide more information to determine whether any treatment modifications are required.

Recent Watershed Changes and Their Impact to Treatment

The potential impact of Folsom Reservoir reoperation on ACWS is higher turbidity, higher coliform levels and higher TOC levels. It is probable that the ACWS treatment facility would be able to satisfy all drinking water regulations during most November-through-March period. However, short-term (on the order of 2 weeks) treatment difficulties are to be expected during major storm events such as the January 1997 Pineapple Express. It is possible that the "direct filtration" process would be overloaded at higher plant flows (above 50% capacity) during extremely high-turbidity periods (over 200 NTU).

The proposed temperature control device in Folsom Lake should not have a significant impact on the Lower American River water purveyors. The only expected water quality-related impact to the Lower American River purveyors is a decrease in raw water temperature between April and November. This decrease could increase chemical usage but should not have a significant impact on treatment plant performance.

Table 7-18. Arden Cordova Water Service Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated American River water. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Gross alpha monitored as required in raw American River water, no trigger man-made radioactivity monitoring. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system for blended American River and groundwater. No MCLs exceeded, THM<100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. All treated water turbidity requirements met.
Total Coliform Rule	1989	Microbial	necessary. Violation in August 1997 - 3 of 49 samples positive for total coliform (5.17%).
Lead and Copper Rule	1991	Corrosion By-Products	performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Not Applicable

Table 7-19. Arden Cordova Water Service Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	ACWS has no arsenic data. The City of Sacramento has raw and treated American River data - no detection above 5 ug/L. If the regulation is set above 5 ug/L, no additional treatment required. If the regulation is set below 5 ug/L, then additional monitoring and/or treatment may be required. Optimizing coagulation in conventional treatment helps with removal, else anion exchange activated alumina or reverse osmosis are effective treatment processes.
Sulfate	2001 ^a	Sulfate	ACWS has no sulfate data. The City of Sacramento has raw & treated water data - no detection above 10 mg/L. It is expected that regulation, if set, will be well above this. It is unlikely that additional treatment will be required.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and microbial benchmarking not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels should not be a problem due to distribution system blending with groundwater.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Will be able to meet new turbidity requirements of 0.3/1.0 NTU. Already continuous monitoring of individual filter effluent for turbidity and filter-to-waste. Will receive 2 log removal of <i>Cryptosporidium</i> . If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	Filter backwash water is not currently recycled, would only require treatment if decide to recycle backwash water. Otherwise, continue with disposal.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River. Perchlorate is a potential contaminant of concern due to local groundwater contamination but has not been detected in the American River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Carmichael Water District

CWD has both groundwater sources and surface water sources (four Ranney Collectors) for water supply. Historically, the surface water supply has been the primary supply and has provided about 70–75% of CWD's needs.

The surface water supply for CWD is from the American River using four Ranney Collectors. The collectors are located within the American River floodplain and adjacent to the streambed. They serve as intake and pump structures to provide naturally-filtered water to the distribution system.

The effluent from Ranney Collectors 1, 2, and 3 crosses the American River in a 33-inch diameter pipeline. This 33-inch-diameter pipeline splits into one 30-inch-diameter pipeline and one 14-inch-diameter pipeline at CWD's corporation yard on the north side of the river. It should be noted that the 14-inch-diameter pipeline is currently valved off from the Ranney Collector supply. This forces all the Ranney Collector water to flow into the 30-inch-diameter pipeline so that the water is provided with the chlorine contact time required by DHS prior to reaching the first customer. Currently, CWD adds chlorine on the south side of the river upstream of the 33-inch-diameter pipeline that crosses the river.

The effluent from Ranney Collector 4 is connected to the Sacramento County irrigation system via an 18-inch-diameter pipeline that traverses Ancil Hoffman Park. Water from Ranney Collector 4 is not of drinking water quality and is used solely for non-potable purposes at the Ancil Hoffman Park facility. CWD receives variable physical removal credit based on actual daily particle count data and achieves the remaining log reduction required through disinfection.

Existing Drinking Water Regulations Compliance

Table 7-20 provides a summary of the major existing drinking water regulations of concern and CWD's compliance status. CWD is currently in compliance with all regulations, except for those of the SWTR. The DHS has determined that the Ranney Collectors will require filtration and disinfection facilities. A Compliance Order has been issued to install these facilities. CWD has performed a treatment process evaluation and has selected membrane filtration.

Future Drinking Water Regulations Impacts

Table 7-21 provides a summary of the major future drinking water regulations of concern and the potential impacts to CWD. Since the American River source is low in TOC and it is blended with groundwater in the distribution system, THM levels are maintained below the expected Stage 1 and the probable Stage 2 levels. This regulation is not expected to impact CWD. During design of treatment facilities, CWD should ensure that the treatment requirements of the ESWTR and the Backwash Water Recycling Rule will

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be met. This may include membrane filter turbidity monitoring, filter backwash water treatment or disposal, and 2-log removal of *Cryptosporidium*.

Table 7-20. Carmichael Water District Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required in distribution system for blended American River and groundwater. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required in distribution system for blended American River and groundwater. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system for blended American River and groundwater. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Under Compliance Order from DHS. If continue to use American River source, need to install a filtration and disinfection facility. Microfiltration was selected, expected in Nov. 2000. Does not meet treated water turbidity requirements at all times.
Total Coliform Rule	1989	Microbial	Monitored distribution system weekly; performed repeat samples as necessary. Violations; Feb 1997 - 3 of 40 samples positive total coliform (6.1%) and Dec 1996 - 2 of 40 samples positive total coliform (14.2%).Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Not Applicable

Table 7-21. Carmichael Water District Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	CWD has no arsenic data. The City of Sacramento has raw and treated American River data - no detection above 5 ug/L. If the regulation is set above 5 ug/L, no additional treatment required. If the regulation is set below 5 ug/L, then additional monitoring and/or treatment may be required. Optimizing coagulation in conventional treatment helps with removal, else anion exchange activated alumina or reverse osmosis are effective treatment processes.
Sulfate	2001 ^a	Sulfate	CWD has no sulfate data. The City of Sacramento has raw & treated water data - no detection above 10 mg/L. It is expected that regulation, if set, will be well above this. It is unlikely that additional treatment will be required.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and microbial benchmarking not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels should not be a problem due to distribution system blending with groundwater and the use of membrane filtration for treatment.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Will need to ensure that new treatment facilities comply with more stringent <i>Giardia</i> and <i>Cryptosporidium</i> removals. Microfiltration should comply with new turbidity and filter-to-waste requirements. May need to prove 2 log removal of <i>Cryptosporidium</i> . This should be a relatively easy exercise due to the extensive data already available for membrane filtration removal levels. If required, additional log reduction would be needed through chemical inactivation. This is not a likely requirement with the use of membrane filtration for treatment.
Backwash Water Rule	2000	Microbial and Turbidity	New treatment facilities will comply with more stringent backwash water recycle requirements including treatment and disposal options.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored as part of Title 22 unregulated organics see DWCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River. Perchlorate is a potential contaminant of concern due to local groundwater contamination but has not been detected in the American River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

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MTBE and perchlorate are both on the Drinking Water Contaminant Candidate List and may be concerns for treatment in the future. Neither of these constituents have been detected in raw river water samples along the Lower American River, but future monitoring will provide more information to determine whether any treatment modifications would be required.

Recent Watershed Changes and Their Impact to Treatment

The potential impact of Folsom Reservoir reoperation on CWD is higher turbidity, higher coliform levels and higher TOC levels. It is probable that the proposed CWD treatment facility would be able to satisfy all drinking water regulations during all November-through-March period. However, short-term (on the order of 1 week) treatment difficulties are to be expected during major storm events such as the January 1997 Pineapple Express. The expected treatment difficulties for membrane filtration are increased backwash and chemical cleaning frequencies. Drinking water quality should not be compromised.

The proposed temperature control device in Folsom Lake should not have a significant impact on the Lower American River water purveyors. The only expected water quality-related impact to the Lower American River purveyors is a decrease in raw water temperature between April and November. This decrease could increase chemical usage but should not have a significant impact on treatment plant performance.

Arcade Water District

AWD owns and operates the American River Well Field located adjacent to the American River near Harrington Park at river mile 12.0. Groundwater is the primary water supply, with surface water as a supplemental source during the high-demand period of the summer months. The surface water from the American River, when in operation, is supplied only to the Town and Country service area.

AWD has operated the infiltration wells intermittently over the past 5 years. The wells have generally been operated only during the summer months to meet peak-demand scenarios. Of the 11 wells installed, AWD has operated only some of the wells at any point in time to meet supplemental demand requirements. In 1997, AWD rehabilitated several wells to increase capacity and to improve water quality. The well field has a design capacity of 10 MGD, but is usually operated between 0 and 2.4 MGD, with an average delivery of 1.0 MGD. The water is pumped from the wells to a common pipeline where it is chlorinated. The water is chlorinated using chlorine gas, with dosages ranging from 0 to 6 mg/L. Chlorine contact is achieved in a small tank and the pipeline prior to the first point of service. The chlorinated water from the American River is provided directly to retail customers and is not stored in the distribution system. AWD achieves all of its *Giardia*/virus reduction credits, 3 and 4 log logs, respectively, through disinfection.

AWD has monitored the water quality of the American River and the well water when the wells are in operation. The river has been monitored for coliform levels, temperature, pH, turbidity, *Giardia*,

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Cryptosporidium, microscopic particulate analysis, and particle counts. The well water has been monitored for coliform levels, temperature, pH, turbidity, *Giardia*, *Cryptosporidium*, microscopic particulate analysis, particle counts, and chlorine residual.

Existing Drinking Water Regulations Compliance

Table 7-22 provides a summary of the major existing drinking water regulations of concern and AWD's compliance status. AWD is currently in compliance with all regulations, except for those of the SWTR. The DHS has determined that the infiltration wells will require filtration and disinfection facilities. A Compliance Order has been issued to install these facilities. AWD has performed a treatment process evaluation and has selected two-stage (serial) filtration if this source of water is continued to be used.

Future Drinking Water Regulations Impacts

Table 7-23 provides a summary of the major future drinking water regulations of concern and the potential impacts to AWD. Since the American River source is low in TOC and it is blended with groundwater in the distribution system, THM levels are maintained below the expected Stage 1 and the probable Stage 2 levels. This regulation is not expected to impact AWD. When treatment facilities are designed, AWD should ensure that the treatment requirements of the ESWTR and the Backwash Water Recycling Rule will be met. This may include individual filter turbidity monitoring, filter-to-waste capability, filter backwash water treatment or disposal, and 2-log removal of *Cryptosporidium*. MTBE and perchlorate are both on the Drinking Water Candidate Contaminant List and may be concerns for treatment in the future. Neither of these constituents has been detected in raw river water samples along the Lower American River, but future monitoring will provide more information to determine whether any treatment modifications would be required.

Recent Watershed Changes and Their Impact to Treatment

The potential impact of Folsom Reservoir reoperation on AWD is higher turbidity, higher coliform levels and higher TOC levels. It is probable that the proposed AWD treatment facility would be able to satisfy all drinking water regulations during most November-through-March periods. However, short-term (on the order of 2 weeks) treatment difficulties are to be expected during major storm events such as the January 1997 Pineapple Express. It is possible that the two-stage filtration process would be overloaded at higher plant flows (above 50% capacity) during extremely high turbidity periods (over 200 NTU).

Table 7-22. Arcade Water District Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required in distribution system for blended American River and groundwater. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required in distribution system for blended American River and groundwater. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system for blended American River and groundwater. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	source, need to install a filtration and disinfection facility by July 1, 2001. Serial filtration has been selected. All treated water turbidity requirements are met.
Total Coliform Rule	1989	Microbial	necessary. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	performed follow-up monitoring as required. Results within action levels for lead and copper. Do not practice corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	American River source is not applicable. Groundwater source completed monitoring requirements.

Table 7-23. Arcade Water District Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	AWD has no arsenic data. The City of Sacramento has raw and treated American River data - no detection above 5 ug/L. If the regulation is set above 5 ug/L, no additional treatment required. If the regulation is set below 5 ug/L, then additional monitoring and/or treatment may be required. Optimizing coagulation in conventional treatment helps with removal, else anion exchange activated alumina or reverse osmosis are effective treatment processes.
Sulfate	2001 ^a	Sulfate	AWD has no sulfate data. The City of Sacramento has raw and treated American River data - no detection above 10 mg/L. It is expected that regulation, if set, will be well above this. Additional treatment is unlikely to be required.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and microbial benchmarking not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels should not be a problem due to distribution system blending with groundwater.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Need to ensure that new treatment facilities comply with more stringent <i>Giardia</i> and <i>Cryptosporidium</i> removals. Treatment should comply with new turbidity, monitoring and filter-to-waste requirements. May need to prove 2 log removal of <i>Cryptosporidium</i> , depending on treatment process selection. If required, additional log reduction for <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	Will need to ensure that new treatment facilities comply with more stringent backwash water recycle requirements including treatment or disposal options.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored as part of Title 22 unregulated organics see DWCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. Aluminum may be a concern in treated water. California already has a primary (1.0 mg/L) and a secondary (0.2 mg/L) standard. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since detected at low levels in Folsom Lake and in urban runoff discharging to the River. Perchlorate is a potential contaminant of concern due to local groundwater contamination but has not been detected in the American River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

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The proposed temperature control device in Folsom Lake should not have a significant impact on the Lower American River water purveyors. The only expected water quality-related impact to the Lower American River purveyors is a decrease in raw water temperature between April and November. This decrease could increase chemical usage but should not have a significant impact on treatment plant performance.

City of Sacramento

The City of Sacramento operates the E.A. Fairbairn WTP, which treats American River water diverted from the Lower American River at river mile 7.75. The E.A. Fairbairn WTP has a design capacity of 100 MGD. The WTP is typically operated between 30 and 100 MGD. The average winter flow is 37 MGD, and the average summer flow is 48 MGD.

The E.A. Fairbairn WTP is a conventional WTP. The influent water is pre-chlorinated for disinfection CT credit. Alum is added as a coagulant and is mixed using pump injection. The water is then flocculated in three-stage basins with horizontal flocculators. The surface loading rate on the sedimentation basins is 1.24 gpm/sf. The sedimentation basins have mechanical chain and flight sludge removal systems in the first half of the basins, and the second half is cleaned manually. A polymer is then added as a filter aid. The sedimented water is applied to eight gravity-flow tri-media filters. The filters are made of 12 inches of anthracite, 10 inches of sand, and 2 inches of garnet with a gravel base on a concrete teepee underdrain. The filters are operated at a rate of 5.7 gpm/sf, at 100 MGD. The filters are backwashed when the headloss exceeds 6 feet. The filters are backwashed at a rate of 18 gpm/sf. Currently, there are no filter-to-waste facilities. All filter backwash water is returned directly to the influent stream. After filtration, the water is chlorinated for disinfection CT credit and the pH is adjusted with calcium hydroxide. A clearwell at the WTP has 20 MG of storage. The distribution system has an additional 16 MG. The City of Sacramento receives 2.5-log *Giardia* reduction credit for physical removal and 0.5-log credit for disinfection.

The City of Sacramento has been monitoring the raw and treated water for the E.A. Fairbairn WTP for all required Title 22 compliance constituents. The City of Sacramento has also been performing monitoring in compliance with the Information Collection Rule. The City of Sacramento has collected data for raw and treated water levels of TOC, and raw water levels for *Giardia*, *Cryptosporidium*, and viruses.

Existing Drinking Water Regulations Compliance

Table 7-24 provides a summary of the major existing drinking water regulations of concern and the City of Sacramento's compliance status. The City of Sacramento is currently in compliance with all regulations.

Table 7-24. City of Sacramento Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated American River water. No MCLs exceeded.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for gross alpha, gross beta, strontium 90 and tritium in treated water. No MCLs exceeded.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system. No MCLs exceeded, THMs <100 ug/L.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. All treated water turbidity requirements met.
Total Coliform Rule	1989	Microbial	necessary. No violations. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control.
Information Collection Rule	1996	Microbial and D/DBPs	Began monitoring in September 1996, will continue through December 1998.

Future Drinking Water Regulations Impacts

Table 7-25 provides a summary of the major future drinking water regulations of concern and the potential impacts to the City of Sacramento. Since the American River source is low in TOC, THM levels are maintained below the expected Stage 1 and near the probable Stage 2 levels. This regulation would only impact the WTP if the Stage 2 levels were set below 46 Fg/L, which is the current 5-year average. The new turbidity requirements of the ESWTR should be met. Filter-to-waste capacity may need to be installed. Currently, no treatment is provided to backwash water prior to return to the headworks. Treatment facilities may need to be designed and installed, or disposal options may need to be identified. MTBE and perchlorate are both on the Drinking Water Contaminant Candidate List and may be concerns for treatment in the future. Neither of these constituents has been detected in raw river water samples along the Lower American River, but future monitoring will provide more information to determine whether any treatment modifications would be required.

Recent Watershed Changes and Their Impact to Treatment

The potential impacts of Folsom Reservoir reoperation on the City of Sacramento are higher turbidity, higher coliform levels, and higher TOC levels. It is probable that the City of Sacramento's treatment facility would be able to satisfy all drinking water regulations during the November-through-March period. However, short-term (on the order of 2–3 days) treatment difficulties are to be expected during major storm events such as the January 1997 Pineapple Express.

The proposed temperature control device in Folsom Lake should not have a significant impact on the Lower American River water purveyors. The only expected water quality-related impact to the Lower American River purveyors is a decrease in raw water temperature between April and November. This decrease could increase chemical usage but should not have a significant impact on treatment plant performance.

Table 7-25. City of Sacramento Future Drinking Water Regulations Impacts

Regulation	of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	ug/L. If regulation is set above 5 ug/L, no additional treatment required. If regulation is set below 5 ug/L, then additional monitoring and/or removal may be
Sulfate	2001 ^a	Sulfate	mg/L. If regulation is set, it is expected to be well above 10 mg/L. It is unlikely that
Radionuclides	2000	Radionuclides	No available data for raw or treated water for Radium 226 and 228. Uranium is already regulated by the DHS and it has not been detected in the American
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not required. THMs <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not required. THMs <64 ug/L, therefore disinfection profiling and Stage II rule will be based on test results and more recent data. The probable 40/30 THM/HAA levels may be a problem depending on chlorination
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	removal of <i>Cryptosporidium</i> for conventional treatment. Already continuous monitoring of individual filter effluent for turbidity. May need to install filter-to-waste capacity. If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	Will need to install backwash water treatment facilities if required by regulations. Will need to identify disposal options if recycling is banned.
Drinking Water Candidate Contaminant Lis	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

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East Bay Municipal Utility District

EBMUD does not currently divert or treat any American River water. When EBMUD begins to divert water from the American River to supplement its Mokelumne River supply, the water will be transported to the Bay Area via the Folsom South Canal and the Mokelumne Aqueducts. The water will be blended in the aqueducts with water from Pardee Reservoir, which is chlorinated and pH adjusted in the Mokelumne Aqueducts.

EBMUD has recently (July 1997) instituted a monitoring program to evaluate the raw water quality of the American River at three locations and along the Folsom South Canal at three locations. EBMUD is collecting information regarding microbiological constituents, potential taste and odor constituents, DBP precursors, and general water quality parameters.

The water may then be delivered via the Mokelumne aqueducts to any of three East Bay WTPs including Lafayette WTP, Orinda WTP, and Walnut Creek WTP. Each of these treatment plants are in-line WTPs. The water may also be delivered to terminal storage facilities (Briones, San Pablo, and/or the Upper San Leandro Reservoirs) in the East Bay and then treated at either the Upper San Leandro WTP or the Sobrante WTP, which are conventional WTPs. In the event the in-line filtration plants are unable to adequately treat American River water, EBMUD may exercise one of several options:

- (1) not take American River water,
- (2) blend American and Mokelumne river water, or
- (3) store American River water in its terminal reservoirs which receive full conventional treatment.

The Lafayette WTP is an in-line WTP with a plant capacity of 35 MGD. The plant was built in 1953 and expanded in 1960. The plant is usually operated between 8 and 35 MGD, with an average flow of 15 MGD. The plant operates 24 hours a day, 7 days a week from April through November. The influent water is treated with sodium hypochlorite for disinfection credit and calcium hydroxide for pH adjustment to assist in coagulation. Aluminum sulfate (alum) and a polymer are added as coagulants and are hydromixed with a high-mixing energy using water jets. The coagulated water is immediately applied to gravity-flow, rapid-sand filters. The filters have 24 inches of sand and 1–4 inches of anthracite, with a 26-inch gravel base. The filtration rate is 3 gpm/sf. The filters are backwashed at a rate of 28 inches of rise per minute when there is 6 feet of headloss, a 72-hour filter run, or effluent turbidity is greater than 0.1 NTU. The backwash water is settled and the supernatant goes back into the aqueducts to be treated at the Orinda WTP. Filter-to-waste facilities have been installed. After filtration, the water is post-chlorinated with sodium hypochlorite, fluoridated with hydrofluorosilic acid, and pH-adjusted with sodium hydroxide. EBMUD has been granted 2.7-log reduction credit of *Giardia* for physical removal and achieves 0.5-log credit for disinfection.

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The Orinda WTP is an in-line WTP with a capacity of 175 MGD. The plant was built in 1935 and expanded in 1948 and 1961. Other process improvements have been made from 1986 to 1996. The plant is usually operated between 80 and 175 MGD, with an average flow of 96 MGD. The influent water is treated with sodium hypochlorite for disinfection credit and calcium hydroxide for pH adjustment to assist in coagulation. Alum and a polymer are added as coagulants and are hydromixed with a high-mixing energy using water jets. The coagulated water is immediately applied to dual-media gravity flow filters. The filters have 12 inches of sand and 24 inches of anthracite supported by a proprietary IMS cap to the filter underdrain system. The filtration rate is 6 gpm/sf. The filters are backwashed every 24–72 hours, depending on headloss. The filters are backwashed for 3.5 minutes at 6 gpm/sf and then for 4 minutes at 18 gpm/sf. The backwash water is dechlorinated and settled prior to discharge to San Pablo Creek. Filter-to-waste facilities have been installed. After filtration, the water is post-chlorinated with sodium hypochlorite, fluoridated with hydrofluorosilic acid, and pH-adjusted with calcium hydroxide. EBMUD has been granted 2.7-log reduction credit of *Giardia* for physical removal and achieves 0.5-log credit for disinfection.

The Walnut Creek WTP is an in-line WTP with a capacity of 80 MGD. The plant was built in 1966. The plant is usually operated between 10 and 60 MGD, with an average flow of 25 MGD in winter and 47 MGD in summer. The influent water is treated with sodium hypochlorite for disinfection credit and calcium hydroxide for pH adjustment to assist in coagulation. PAC and a polymer are added as coagulants and are mixed with mechanical mixers at three energy levels. The coagulated water is immediately applied to dual-media, gravity-flow filters. The filters have 15 inches of sand and 18 inches of anthracite, with a 17-inch gravel base. The filtration rate is 6 gpm/sf. The filters are backwashed at a rate of 25 inches of rise per minute when the headloss is 6 feet, the filter run approaches 72 hours, or the effluent turbidity is greater than 0.1 NTU. The backwash water is settled and the supernatant is pumped back to the Aqueducts for treatment at either the Lafayette WTP or the Orinda WTP. The settled sludge is sent to a wastewater treatment facility. Filter-to-waste facilities have been installed. After filtration, the water is post-chlorinated with sodium hypochlorite, fluoridated with hydrofluorosilic acid, and pH-adjusted with calcium hydroxide. EBMUD has been granted 2.7-log *Giardia* reduction credit for physical removal and achieves 0.5-log credit for disinfection.

The Upper San Leandro WTP is a conventional WTP with a capacity of 65 MGD. The plant is usually operated between 10 and 55 MGD, with an average flow of 20 MGD. The influent water is treated with sodium hypochlorite for disinfection credit. Alum and polymer are added as coagulants and are mixed with a water jet. The water is flocculated in four-stage basins, with horizontal paddle wheels at variable mixing energies. The water is allowed to settle in large basins at a maximum loading rate of 1.6 gpm/sf. The sludge is removed from the basins using a Trac-Vac sludge vacuum system. The water is then applied to 16 gravity, dual-media filters. The filters have 7 inches of GAC, 19 inches of sand, and 16 inches of gravel on various underdrain systems (Leopold, EggCrate, or Wheeler Bottoms). The filtration rate is 3.8 gpm/sf. The filters are backwashed either when the headloss is 8 feet, the filter run approaches 120 hours, or the effluent turbidity exceeds 0.1 NTU. The filters are backwashed at a rate of 32 inches of rise per minute.

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The backwash water is settled prior to being returned to the headworks. After filtration, the water is post-chloraminated, fluoridated, and pH-adjusted. EBMUD has been granted 2.5-log reduction credit for *Giardia* for physical removal and achieves 0.5-log credit for disinfection.

The Sobrante WTP is a conventional WTP with a capacity of 60 MGD. The plant is usually operated between 10 and 60 MGD, with an average flow of 27 MGD. The influent water is treated with sodium hypochlorite for disinfection credit. Alum and polymer are added as coagulants and are mixed with a water jet. The water is flocculated in four-stage basins, with horizontal paddle wheels at variable mixing energies. The water is sedimented in large basins at a maximum loading rate of 2.1 gpm/sf. The sludge is removed from the basins using a Trac-Vac sludge vacuum system. The water is then applied to four gravity, dual-media filters. The filters have 8 inches of GAC, 22 inches of sand, and 16 inches of gravel on Wheeler Bottoms. The filtration rate is 4.5 gpm/sf. The filters are backwashed either when the headloss is 8 feet, the filter run approaches 120 hours, or the effluent turbidity exceeds 0.1 NTU. The filters are backwashed at a rate of 32 inches of rise per minute. The backwash water is settled prior to being returned to the headworks. After filtration, the water is post-chloraminated, fluoridated, and pH-adjusted. EBMUD has been granted 2.5-log reduction credit for *Giardia* for physical removal and achieves 0.5-log credit for disinfection.

Existing Drinking Water Regulations Compliance

Tables 7-26 through 7-30 provide summaries of the major existing drinking water regulations of concern and EBMUD's compliance status. EBMUD is currently in compliance at all three WTPs with all regulations for treatment of the current source water from the Mokelumne River system. It is expected that the WTPs may require slight modifications to treat the American River source and meet all existing drinking water regulations.

Future Drinking Water Regulations Impacts

Tables 7-31 through 7-35 provide summaries of the major future drinking water regulations of concern and the potential impacts to EBMUD. Since the American River source is low in TOC, THM levels are expected to occur at levels below the expected Stage 1 and the probable Stage 2 levels. The THM levels may be influenced by the pre-chlorination procedures implemented during transport to the East Bay and the blending with local service waters. The impact of this regulation on EBMUD cannot be determined at this time due to the uncertainty in pre-treatment and blending. The new turbidity requirements of the ESWTR should be met with slight modifications to the treatment process. EBMUD may also need to prove that physical treatment processes provide

Table 7-26. EBMUD - Lafayette WTP Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system - no data for American River source. No MCLs exceeded, THM<100 ug/L. American River source will depend on pre-treatment practices.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. Not treating American River source water.
Total Coliform Rule	1989	Microbial	necessary. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	Performed initial monitoring requirements (2 - 6 month periods) and performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control. Not applicable for American River source.
Information Collection Rule	1996	Microbial and D/DBPs	Began monitoring in September 1996, will continue through December 1998 - not required for American River source.

Table 7-27. EBMUD-Orinda WTP Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system - no data for American River source. No MCLs exceeded, THM<100 ug/L. American River source will depend on pre-treatment practices.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. Not treating American River source water.
Total Coliform Rule	1989	Microbial	necessary. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	Performed initial monitoring requirements (2 - 6 month periods) and performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control. Not applicable for American River source.
Information Collection Rule	1996	Microbial and D/DBPs	Began monitoring in September 1996, will continue through December 1998 - not required for American River source.

Table 7-28. EBMUD - Walnut Creek WTP Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system - no data for American River source. No MCLs exceeded, THM<100 ug/L. American River source will depend on pre-treatment practices.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. Not treating American River source water.
Total Coliform Rule	1989	Microbial	Monitored distribution system weekly; performed repeat samples as necessary. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	Performed initial monitoring requirements (2 - 6 month periods) and performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control. Not applicable for American River source.
Information Collection Rule	1996	Microbial and D/DBPs	Began monitoring in September 1996, will continue through December 1998 - not required for American River source.

Table 7-29. EBMUD - Upper San Leandro WTP Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system - no data for American River source. No MCLs exceeded, THM<100 ug/L. American River source will depend on pre-treatment practices.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. Not treating American River source water.
Total Coliform Rule	1989	Microbial	Monitored distribution system weekly; performed repeat samples as necessary. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	Performed initial monitoring requirements (2 - 6 month periods) and performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control. Not applicable for American River source.
Information Collection Rule	1996	Microbial and D/DBPs	Began monitoring in September 1996, will continue through December 1998 - not required for American River source.

Table 7-30. EBMUD - Sobrante WTP Existing Drinking Water Regulations Compliance

Regulation	Date of Promulgation	Targeted Compounds	Compliance Status
Phase I, II, and V	1987,1991,1992	Organics - VOCs, IOCs, SOCs	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Radioactivity	1976	Radionuclides	Monitored as required for raw and treated source water - no data for American River source. No MCLs exceeded. American River source not expected to exceed MCLs.
NPDWR-Trihalomethanes	1979	Disinfection By-Products	Monitored quarterly in distribution system - no data for American River source. No MCLs exceeded, THM<100 ug/L. American River source will depend on pre-treatment practices.
Surface Water Treatment Rule	1989	Microbial and Turbidity	Filtration and disinfection facilities have been installed to meet the 3/4 log removal for <i>Giardia</i> /virus. All operating, monitoring and reporting requirements are met. Not treating American River source water.
Total Coliform Rule	1989	Microbial	Monitored distribution system weekly; performed repeat samples as necessary. Continually maintains chlorine residual >0.2 mg/L in distribution system.
Lead and Copper Rule	1991	Corrosion By-Products	Performed initial monitoring requirements (2 - 6 month periods) and performed follow-up monitoring as required. Results within action levels for lead and copper. Practices corrosion control. Not applicable for American River source.
Information Collection Rule	1996	Microbial and D/DBPs	Began monitoring in September 1996, will continue through December 1998 - not required for American River source.

Table 7-31. EBMUD - Lafayette WTP Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	EBMUD has no American River data. The City of Sacramento has raw & treated American River data - no detection above 5 ug/L. If the regulation is set above 5 ug/L, no additional treatment will be required. If the regulation is set below 5 ug/L, then additional monitoring and/or treatment may be required. Optimizing coagulation in conventional treatment helps with removal, else anion exchange activated alumina or reverse osmosis are effective treatment processes.
Sulfate	2001 ^a	Sulfate	EBMUD has no American River data. The City of Sacramento has raw & treated water data with no detection above 10 mg/L. It is expected that the regulation, if set, will be well above this. Additional treatment is unlikely to be required.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for American River. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not expected to be required. THMs expected <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not expected to be required. THMs may be <64 ug/L, if so disinfection profiling and microbial benchmarking will not be not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels may be a concern depending on raw water chlorination practices.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Should be able to meet new turbidity requirements of 0.3/1.0 NTU. Already continuous monitoring of individual filter effluent for turbidity and filter-to-waste. May need to prove 2 log <i>Cryptosporidium</i> removal. If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	Lafayette WTP influent water has treated backwash water from Walnut Creek WTP. The filter backwash water is treated and then pumped to the headworks of the Orinda WTP. Disposal method may need to be investigated.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River. Perchlorate is a potential contaminant of concern due to local groundwater contamination but has not been detected in the American River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Table 7-32. EBMUD-Orinda WTP Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	EBMUD has no American River data. The City of Sacramento has raw & treated American River data - no detection above 5 ug/L. If the regulation is set above 5 ug/L, no additional treatment will be required. If the regulation is set below 5 ug/L, then additional monitoring and/or treatment may be required. Optimizing coagulation in conventional treatment helps with removal, else anion exchange activated alumina or reverse osmosis are effective treatment processes.
Sulfate	2001 ^a	Sulfate	No available American River data. The City of Sacramento has raw & treated water data with no detection above 10 mg/L. It is expected that the regulation, if set, will be well above this. It is unlikely that additional treatment will be required.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for American River. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not expected to be required. THMs expected <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not expected to be required. THMs may be <64 ug/L, if so disinfection profiling and microbial benchmarking will not be not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels may be a concern depending on the raw water chlorination practices.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Should be able to meet new turbidity requirements of 0.3/1.0 NTU. Already continuous monitoring of individual filter effluent for turbidity and filter-to-waste. May need to prove 2 log <i>Cryptosporidium</i> removal. If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	Orinda WTP influent has treated backwash water from Lafayette and Walnut Creek WTPs. The filter backwash water is dechlorinated and discharged to San Pablo Creek.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River. Perchlorate is a potential contaminant of concern due to local groundwater contamination but has not been detected in the American River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Table 7-33. EBMUD - Walnut Creek WTP Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	EBMUD has no American River data. The City of Sacramento has raw & treated American River data - no detection above 5 ug/L. If the regulation is set above 5 ug/L, no additional treatment will be required. If the regulation is set below 5 ug/L, then additional monitoring and/or treatment may be required. Optimizing coagulation in conventional treatment helps with removal, else anion exchange activated alumina or reverse osmosis are effective treatment processes.
Sulfate	2001 ^a	Sulfate	No available American River data. The City of Sacramento has raw & treated water data with no detection above 10 mg/L. It is expected that the regulation, if set, will be well above this. It is unlikely that additional treatment will be required.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for American River. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC <2.0 mg/L, therefore enhanced coagulation not expected to be required. THMs expected <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not expected to be required. THMs may be <64 ug/L, if so disinfection profiling and microbial benchmarking will not be not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels may be a concern depending on raw water chlorination practices.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Should be able to meet new turbidity requirements of 0.3/1.0 NTU. Already continuous monitoring of individual filter effluent for turbidity and filter-to-waste. May need to prove 2 log <i>Cryptosporidium</i> removal. If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	The filter backwash water is already treated prior to recycling to the headworks of either Lafayette WTP or Orinda WTP. Disposal method may need to be identified.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River. Perchlorate is a potential contaminant of concern due to local groundwater contamination but has not been detected in the American River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Table 7-34. EBMUD - Upper San Leandro WTP Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	EBMUD has no American River data. The City of Sacramento has raw & treated American River data - no detection above 5 ug/L. If the regulation is set above 5 ug/L, no additional treatment will be required. If the regulation is set below 5 ug/L, then additional monitoring and/or treatment may be required. Optimizing coagulation in conventional treatment helps with removal, else anion exchange activated alumina or reverse osmosis are effective treatment processes.
Sulfate	2001 ^a	Sulfate	No available American River data. The City of Sacramento has raw & treated water data with no detection above 10 mg/L. It is expected that the regulation, if set, will be well above this. It is unlikely that additional treatment will be required.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for American River. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC >4.0 mg/L, therefore enhanced coagulation is expected to be required. THMs expected <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not expected to be required. THMs may be <64 ug/L, if so disinfection profiling and microbial benchmarking will not be not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels may be a concern depending on raw water chlorination practices.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Should be able to meet new turbidity requirements of 0.3/1.0 NTU. Already continuous monitoring of individual filter effluent for turbidity and filter-to-waste. If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	The filter backwash water is already treated prior to recycling to the headworks. Disposal method may need to be identified.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River. Perchlorate is a potential contaminant of concern due to local groundwater contamination but has not been detected in the American River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

Table 7-35. EBMUD - Sobrante WTP Future Drinking Water Regulations Impacts

Regulation	Expected Date of Promulgation	Targeted Compounds	Potential Impacts
Arsenic	2001	Arsenic	EBMUD has no American River data. The City of Sacramento has raw & treated American River data - no detection above 5 ug/L. If the regulation is set above 5 ug/L, no additional treatment will be required. If the regulation is set below 5 ug/L, then additional monitoring and/or treatment may be required. Optimizing coagulation in conventional treatment helps with removal, else anion exchange activated alumina or reverse osmosis are effective treatment processes.
Sulfate	2001 ^a	Sulfate	No available American River data. The City of Sacramento has raw & treated water data with no detection above 10 mg/L. It is expected that the regulation, if set, will be well above this. It is unlikely that additional treatment will be required.
Radionuclides	2000	Radionuclides	No available data for raw or treated water for American River. Uranium is already regulated by the DHS and it has not been detected in the American River. It is unlikely that these constituents will be present at high levels.
Radon	2000	Radon	No available data for raw or treated American River water. EID has monitored El Dorado Hills WTP in raw and treated water with detections ranging from ND to 110 pCi/L. These are lower than proposed 300 pCi/L regulation. It is unlikely that additional treatment will be required, but this is pending current radon risk assessment.
Disinfectant/Disinfection By-Product Rule	1998/2002 ^b	D/DBPs	TOC >4.0 mg/L, therefore enhanced coagulation is expected to be required. THMs expected <80 ug/L and HAAs expected <60 ug/L, therefore alternative disinfection procedures not expected to be required. THMs may be <64 ug/L, if so disinfection profiling and microbial benchmarking will not be not required. Stage II Rule will be based on ICR results and more health data. The probable 40/30 THM/HAA levels may be a concern depending on raw water chlorination practices.
Enhanced Surface Water Treatment Rule	1998/2000/2002 ^c	Microbial and Turbidity	Should be able to meet new turbidity requirements of 0.3/1.0 NTU. Already continuous monitoring of individual filter effluent for turbidity and filter-to-waste. If required, additional log reduction of <i>Cryptosporidium</i> would be needed through chemical inactivation.
Backwash Water Rule	2000	Microbial and Turbidity	The filter backwash water is already treated prior to recycling to the headworks. Disposal method may need to be identified.
Drinking Water Candidate Contaminant List	2001 ^d	Organic and Microbial	Several constituents already monitored by other agencies as part of Title 22 unregulated organics see DWCCCL in Appendix E. Most organics are not detected in the watershed. None of the microbial constituents have been monitored. Aluminum may be concern in treated water. California already has primary (1.0 mg/L) and secondary (0.2 mg/L) standard, current data is in compliance. This is not a high priority constituent and will probably not be regulated soon. MTBE is a potential contaminant of concern since it has been detected at low levels in Folsom Lake and in urban runoff discharging to the River. Perchlorate is a potential contaminant of concern due to local groundwater contamination but has not been detected in the American River.
^a Determination to Regulate ^b Stage I/Stage II ^c Interim/Long Term I/Long Term II ^d Decision to Regulate - Every Five Years Subsequent			

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2-log removal of *Cryptosporidium* to be granted credit, for the in-line treatment plants. Currently, filter backwash water is treated when it is recycled, and in some cases it is not recycled. Depending on what the final backwash water regulation requires, the existing treatment facilities may require upgrading, or disposal options may need to be determined where they are not already implemented. MTBE and perchlorate are both on the Drinking Water Contaminant Candidate List and may be concerns for treatment in the future. Neither of these constituents has been detected in raw river water samples along the Lower American River, but future monitoring will provide more information to determine whether any treatment modifications is required.

Recent Watershed Changes and Their Impact to Treatment

The potential impacts of Folsom Reservoir reoperation on EBMUD are higher turbidity, higher coliform levels, and higher TOC levels. It is uncertain that EBMUD's in-line treatment facilities would be able to reliably satisfy all drinking water regulations during many November-through-March periods if American River water was directly fed into the East Bay plants. However, during major storm events such as the January 1997 Pineapple Express, EBMUD could either interrupt American River deliveries during such periods or divert American River water into terminal EBMUD reservoirs.

The proposed temperature control device in Folsom Lake should not have a significant impact on the Lower American River water purveyors. The only expected water quality-related impact to the Lower American River purveyors is a decrease in raw water temperature between April and November. This decrease could increase chemical usage but should not have a significant impact on treatment plant performance.

DISCUSSION AND RECOMMENDATIONS

Based on the previous discussions for the individual agencies, the following specific and general issues, either treatment- or compliance-related, are of most concern to the water agencies.

- All water agencies that divert and treat American River water must comply with the SWTR and obtain 3-log reduction of *Giardia* and 4-log reduction of viruses through physical removal or chemical inactivation.
- All water agencies have met turbidity removal requirements, except during extreme storms such as the January 1997 Pineapple Express.
- AWD and CWD need to install filtration and disinfection facilities to comply with the SWTR. (In AWD's case, only if this source of water is continued to be used.)

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- Arsenic, sulfate, radionuclides, and radon regulations are not expected to impact current treatment practices.
- All water agencies may need to install backwash water treatment facilities, if not already installed, to reduce the turbidity of the recycled wash water as part of the ESWTR.
- All water agencies may need to install filter-to-waste capabilities, if not already installed, to minimize the potential for a "break-through" of microbial contaminants as part of the ESWTR.
- All water agencies may need to monitor for new, revised, or additional unregulated constituents in accordance with the Unregulated Contaminant Monitoring from the Drinking Water Candidate Contaminant List.
- Some water agencies may need to prove physical removal of *Cryptosporidium* to obtain 2-log reduction credit as part of the ESWTR. Also, agencies may need to obtain additional log reduction of *Cryptosporidium* through chemical inactivation if required by future regulations. Agencies may choose to provide physical and hydraulic space for later installation of ozone facilities, if required.
- Another area of major concern is related to changes in the reoperation of Folsom Dam for increased flood control and the anticipated installation of a temperature control device to release colder water for downstream fisheries. These operational changes will impact each agency in an individual way as discussed previously. The general level of the impact, related to operation of the water treatment process, can be classified by the amount of disturbance the changes may cause to the treatment facilities.
- The reoperation of Folsom Dam will not impact the water quality or treatment of the facilities in the upper watershed, including PCWA and EID at the Strawberry WTP. The reoperation may moderately impact the water quality, such as turbidity and coliforms, and, in turn, the treatment processes for facilities diverting from Folsom Lake. The reoperation is expected to have the greatest impact on Lower American River diverters, with the exception of EBMUD which is not expected to directly treat American River water during periods of high turbidity. The other diverters will need to optimize treatment to increase removal and disinfection efficiencies.
- The installation of a temperature control device will not impact the water quality or treatment of the facilities in the upper watershed, including PCWA and EID. This facility will most greatly impact the agencies diverting from Folsom Dam by potentially increasing temperature, coliforms, turbidity, TOC, and MTBE. All of these will require optimization of current treatment processes and may require installation of new treatment technologies. The temperature control device would also impact Lower American River diverters by reducing water temperatures which could lead to an increase in chemical usage.

Chapter 7. Surface Water Treatment Rule Evaluations

In conclusion, each of the water treatment facilities along the American River currently is, or soon will be, in compliance with all existing drinking water regulations. As discussed above, several treatment or monitoring issues are related to anticipated drinking water regulations that may impact any or all of the water agencies.

Recommendations are as follows:

1. The agencies should optimize their WTP performance. Optimization would include:
 - monitor source water quality;
 - regular inspection and maintenance of equipment;
 - set internal process water turbidity goals throughout the treatment plant;
 - optimize coagulant type, dose, and conditions;
 - monitor sedimentation loading rates and short circuiting;
 - monitor filter loading rates, backwash procedures, and filter media; and
 - optimize disinfection for effectiveness in achieving inactivation requirements without producing excess DBPs.
2. The four water agencies that divert water at Folsom Dam should remain involved throughout the design, construction, and operational phases of the temperature control device project.
3. Provide space at new or expanded WTPs to allow for potential installation of alternative facilities to meet future regulatory requirements such as the potential need for:
 - backwash water treatment facilities
 - filter-to-waste capabilities
 - potential ozone treatment facilities
4. Continue to monitor distribution system DBPs and disinfection practices to ensure that future anticipated DBP standards are not exceeded. Stage 2 DBP standards may demand changes in disinfectants or disinfection procedures.

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Source water protection, according to AWWA's Statement of Principles, is to manage water resources in a manner consistent with the protection and enhancement of source waters for current and future supplies of drinking water. AWWA further states that to be successful, source water protection effort must account for local conditions, diverse interests and uses of the water supply; requires commitment; and is a long-term process. For assistance with acronyms, the reader is referred to the list of abbreviations at the front of the report.

When developing a source water protection program, it is necessary to be pragmatic in the development of recommendations. Generally, in order for recommendations to be implemented, they must be clearly identified, have overall support, improve the source water quality or treatment operations, and be able to be funded as necessary. Some additional considerations influencing pragmatic recommendations in the American River watershed are described below.

- The American River water agencies, although sharing the same source water, are a diverse group with different water quality and treatment concerns, depending on where they divert water in the river system, their particular treatment facilities, varying resource capabilities, and different local constituencies. Many of the agencies have prioritized issues other than source water protection since the water quality is generally excellent and limited control or influence is possible. PCWA does not currently have a permanent intake facility and has prioritized its design and construction. EID has uncovered treated water reservoirs and has prioritized covering these facilities. All the agencies diverting water from Folsom Dam are concerned with the reoperation of Folsom Lake and its impact on their source water quality. ACWS is primarily supplied by groundwater and has concerns about contamination from nearby industries. CWD and AWD are under compliance orders to meet the requirements of the existing SWTR. The City of Sacramento not only diverts drinking water but also discharges urban runoff to the Lower American River and relies on the operating of Folsom Dam for flood control and, therefore, must balance these potentially competing interests. EBMUD and the City of Sacramento (along with the County of Sacramento) are focusing on the development of future water diversions, conveyance, and treatment facilities through the Joint Project.
- The source water quality is generally excellent; also, it is difficult to point to any recommended watershed management activity that will result in a demonstrable measurable reduction in treated water concentrations. This, of course, is partly a result of the difficulty in accurately measuring microbiological constituents in the water and also is affected by the amount of data that are generally needed to conclusively demonstrate cause-and-effect relationships. So watershed management recommendations must rely heavily on basic sanitary engineering principles in addition to whatever data are available.
- The water agencies have no direct authority in the watershed (except for the City of Sacramento and the City of Folsom, which together with the County of Sacramento and the City of Galt, implements

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urban runoff control measures). Watershed management recommendations, therefore, are mostly limited to recommendations that (1) collect monitoring data or other information needed to better understand a contaminant source or (2) influence the activities of other agencies and/or public behavior.

In this chapter, background information is summarized for which agencies have pertinent authority in the watershed, the 1993 ARWSS Report watershed management recommendations are summarized, information is provided on related efforts that have progressed since the 1993 Report, and then the 1998 Update watershed management recommendations are discussed.

THE 1993 ARWSS REPORT RECOMMENDATIONS

The 1993 ARWSS Report contained several recommendations regarding activities to improve control of sources of microbiological constituents to the river system. The recommendations were developed during a workshop with the 1993 ARWSS study participating agencies. The process for developing the recommendations was as follows:

- A list was developed of sources of microbiological constituents (no other constituents were considered).
- The study participants cast votes in order to establish overall priorities. Contaminant sources were prioritized by the participating agencies as follows: (1) recreation, (2) septic tanks, (3) wild animals, (4) grazing animals, (5) wastewater discharges, (6) storm runoff, and (7) natural discharges.
- Brainstorming was then conducted on each source, resulting in a list of potential control measures.
- The control measures were then categorized as public education activities or policy changes.
- A separate list of possible BMPs was also put together.
- A sub-selection of activities was then made that constituted the list of recommendations.

Implementation of the recommendations largely depended on formation of a “Watershed Coalition,” which would consist of the participating agencies and have as its purpose, the selection of some of the recommendations for implementation. Key recommendations included:

- initiation of a public education campaign,
- creation of a research program to conduct monitoring,
- coordination with counties on septic system issues,

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- coordination with the RWQCB on wastewater issues, and
- initiation of an emergency response program to deal with spills.

For more detail on the previous watershed management recommendations, the reader is referred to the 1993 ARWSS Report.

WATERSHED MANAGEMENT EFFORTS BETWEEN 1993 AND 1998

Activities of the participating agencies and related efforts (the CRMP, the Sacramento River Watershed Program, and CALFED) are discussed in this section.

Activities of the Participating Agencies

The watershed coalition that was recommended in the 1993 ARWSS Report was not formed, and the various actions that were to be performed by the coalition were largely left undone. Several agencies have, however, performed work related to the previous report recommendations, and watershed coalition type activities have been initiated.

PCWA is a participant in the American River CRMP, discussed later in this section. The American River CRMP seeks to promote forest health and to protect water quality through activities related primarily to timber harvesting and fire management.

EID staff have attempted to promote stakeholder group formation mostly through the local Community Services District, although these efforts have not so far been successful.

The City of Sacramento has extensive education programs for the purposes of protecting water quality in the American and Sacramento River watersheds. Comprehensive public participation and community outreach programs and proactive media relations campaigns include pollution prevention, winter tips, water conservation, and stormwater management. Identification of the sources of City of Sacramento's water supply is a constant theme in the City of Sacramento's drinking water education and public awareness programs. In addition, the City of Sacramento is an active participant in the Sacramento Area Water Works Association (SAWWA), a collaborative agency of 32 water agencies focusing on issues such as backflow programs, well testing, education/certification, and water conservation. The City of Sacramento's public education programs have included information on the source of the City's water supplies; drinking water regulations; *Cryptosporidium*; and pollution prevention for urban runoff, including proper disposal of pet wastes. Specific efforts have included distribution of information to customers through utility bill inserts, a community grant program, poster contest, radio and TV campaigns, multi-ethnic outreach, participation in community events, sponsorship of citizen monitoring, educational workshops, school projects, participation in the annual Creek Week events, storm drain stenciling, and education programs at the Sacramento and Folsom zoos. Currently, a new watershed education effort is planned to be

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conducted jointly with the County of Sacramento and the Sacramento Regional County Sanitation District.

In implementing recommendations from the 1995 SRWSS Report, the City of Sacramento has conducted several activities pertinent to the American River as well, as follows.

- The City of Sacramento is developing a public education campaign targeted to boaters and users of the Sacramento and American rivers that encourages the use of restrooms and pumpout facilities and discourages dumping of sewage from houseboats.
- The City is tracking Dr. Rob Atwill's research on grazing animals and sponsored workshops on microbiological issues in the river system and on urban runoff.
- The City has also arranged for direct notification of the E.A. Fairbairn WTP from both wastewater agencies and CUPAs with jurisdiction for spills that could enter the river system downstream of Folsom Dam.

The City of Sacramento is also an active participant in the Sacramento River Watershed Program (discussed later in this section) and in 1997, assisted the Sacramento River Watershed Program in sponsoring a workshop on drinking water issues. The City of Sacramento also is participating in the CALFED process (see discussion later in this section).

Seven of the 11 participating agencies (AWD, ACWD, CWD, Folsom, Roseville, the City of Sacramento, SJWD) participate in SAWWA, which has funded public education on water issues in the area. SAWWA's public education campaign has included promotional materials, community events, media relations, a partnership with the Sacramento Bee, and development of school curriculum supplements. Mr. Leaky, the SAWWA mascot, promotes messages both to conserve and protect Sacramento area water.

The Water Forum, which was formed in 1993, represents water districts, cities, counties, and business and environmental groups in Sacramento, Placer, and El Dorado counties in an interest-based process to estimate water demands for the three counties into the 21st century and then develop a plan for managing the local water resources in order to ensure that the demand will be met. Overall objectives of the Water Forum are to:

- provide reliable and safe water supply through 2030; and
- preserve fishery, wildlife, and recreational values along the Lower American River.

Expectant signatories of the Forum Agreement include 7 of the 11 agencies participating in this sanitary survey: ACWS, CWD, Folsom, Roseville, Sacramento, SJWD, and PCWA. AWD, EBMUD, and EID also participated in the Water Forum process but may not be signatories to the agreement.

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The Memorandum of Understanding for this forum, signed by participating agencies, includes an element to support a Water Forum Successor Effort. The Successor Effort is expected to focus on preserving the environmental and aesthetic values of the Lower American River. For the City of Sacramento, the County of Sacramento, and EBMUD, the agreement specifies that, in conjunction with other American River diverters, these agencies will develop an effective, mutually acceptable American River watershed and water quality protection and enhancement program.

American River Coordinated Resources Management Plan

The American River CRMP effort is an affiliation of interest groups; landowners; and local, state, and federal agencies with objectives to improve forest health, protect water quality, and preserve the overall condition of the American River watershed in Placer County. Participating agencies include, but are not limited to CDF, Placer County Resource Conservation District and Natural Resources, PCWA, DFG, USFS, Bureau of Land Management, Placer County Air Pollution Control District, Placer County Environmental Health Department, UCD Cooperative Extension, State Department of Parks and Recreation, the RWQCB, and several environmental interest groups. The group signed a Memorandum of Understanding in 1996 and has since outlined specific objectives, conducted planning, coordinated existing efforts, begun monitoring, begun public education, defined desired projects, and sought funding for demonstration projects through CALFED grants.

Specific objectives of the CRMP include:

- better fuel management and fuel reduction,
- public education,
- reducing the risk of erosion and sedimentation by preventing depletion of ground cover,
- preventing discharge of pollutants,
- preventing depletion of old-growth tree stands,
- optimizing native freshwater species, and
- creating and sustaining diverse habitat and wildlife diversity.

This year, the CRMP submitted and was awarded a CALFED grant proposal for a demonstration project to reduce fuel loading. The project involves establishing 66 miles of fuel breaks, reducing fuel on 2,478 acres, and inspecting for fuel conditions at 5,300 housing units. A monitoring component is included.

The American River CRMP is currently focused on Placer County and is focused on establishing itself more fully. In time, once the CRMP is better established, the CRMP may seek to include El Dorado County interest groups and thus include the South Fork of the American River. From the point of view of the American River water utilities, the American River CRMP, by seeking to manage wildfire conditions and promote forest health, will address some controllable aspects of erosion, and therefore potential contaminants, in the upper watershed.

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Sacramento River Watershed Program

In recent years, strategic planning by the SWRCB and the RWQCB has determined that RWQCB actions should be guided by consideration of water quality-related impacts within the context of the watershed. RWQCBs will address pollution problems (particularly nonpoint source problems) through supporting, sponsoring, and facilitating water quality management on a watershed scale, in partnership with local stakeholders.

The Sacramento River Watershed Program is one of the first efforts to implement the watershed management approach to pollution problems. The Sacramento River Watershed Program is an effort to bring together stakeholders in the Sacramento River basin to share information and resources, to collaboratively address water quality-related issues, and to establish a long-term monitoring program. The watershed program was launched by the Sacramento Regional County Sanitation District using USEPA grant funds. The grant funds are for the Sacramento River Toxic Pollutant Control Program, which aims to bring the river and its tributaries into compliance with receiving water quality standards for the protection of all beneficial uses such as aquatic life as well as drinking water. The Sacramento River Watershed Program is wider in scope than the Sacramento River Toxic Pollutant Control Program, intending to address all water quality issues that stakeholders believe to be important. Sacramento River Watershed Program committees include monitoring, toxics, biological and habitat assessment, public outreach and education, funding, coordination, and the Sacramento River Toxic Pollutant Control Program grants.

To date, much effort has been spent on developing relationships among stakeholders and planning. A monitoring program for the Sacramento River basin has been developed and was initiated in 1998. Selection and implementation of BMPs to address water quality problems is still some years away. The inclusion of drinking water issues in the Sacramento River Watershed Program is a result of participation by several drinking water utilities, including the City of Sacramento and several utilities downstream of the Delta. The Sacramento River Watershed Program is a stakeholder-driven process, requiring stakeholder participation to ensure that particular problems and points of view are represented.

The Monitoring Committee has now finalized the Sacramento River Watershed Program Monitoring Program. The Sacramento River Watershed Program Monitoring Program includes several constituents of interest to drinking water utilities, such as turbidity, alkalinity, TOC, DOC, *Giardia* and *Cryptosporidium*, and total and fecal coliform levels. The first phase of monitoring, however, will focus on the main stem of the Sacramento River. Although the first phase of monitoring includes two monitoring stations on the American River, at J Street and at Discovery Park, these sites will be focused on toxicity testing and bioassessment monitoring rather than drinking water parameters.

The Education Committee has produced two videos. One video on the Sacramento River Watershed Program aired on PBS; the other was an amalgam of TV news clips from the 1997 State of the Watershed Conference. In addition, the Education Committee hired a consulting firm to prepare a Strategic

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Communications Plan. The Strategic Communications Plan describes objectives, strategic goals, tactical options, intrinsic obstacles, and implementation steps for education on Sacramento River watershed issues.

The Sacramento River Watershed Program is still a young effort and has spent much of its formation period building relationships. However, it has momentum, it has funding, and it is facilitated by the RWQCB, which is the agency with regulatory authority for many of the watershed contaminant sources of interest to the American River water agencies.

CALFED Bay-Delta Program

The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. The CALFED Bay-Delta Program was formed in 1995, following the December 1994 Bay-Delta Accord, and is managed by an inter-disciplinary, inter-agency staff team that is assisted by experts from state and federal agencies and consulting firms.

The California Urban Water Agencies (CUWA) participates in the CALFED Program both directly and through the Ag-Urban Policy Group, a forum of urban and agricultural users that provides input to the CALFED planning process, attempting to develop consensus on a CALFED solution. The City of Sacramento is a member of CUWA. Other water agencies and organizations also participate directly through membership on various committees and through the public review process.

At this point, the CALFED Program is completing development of its problem assessment and alternative solutions. Three alternatives have been identified that provide different conveyance options for selected long-term solutions to the problems of the Bay-Delta Estuary. A preferred alternative will be selected by the end of 1998. In addition to the development of alternative solutions, six programs common to all the alternatives have been formed that deal with issues needing to be addressed regardless of the final selected alternative. These six common programs include ecosystem restoration, water quality, levee system integrity, water use efficiency, water transfers, and watershed management.

The watershed management common program seeks primarily to reduce such stressors in the watershed as damaging land use practices, excessive runoff and erosion, and weak levee structures and to enhance instream flow patterns, water quality, integrated resource planning, and watershed restoration. The watershed management common program will seek to coordinate and foster communication between various locally-implemented watershed management programs and to assist in coordinating local watershed funds that will be used in conjunction with CALFED funds. To qualify for CALFED funds, local watershed efforts must establish clear linkage to correcting problems of the Bay-Delta Estuary and species dependent on the estuary.

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CALFED is an intense planning and advisory effort on a fast track; the program has no regulatory authority of its own. The primary benefit to the American River water agencies is that, as a result of CALFED, more attention and more funds are becoming available for nonpoint source problems in Delta tributary systems. The CALFED focus is Delta problems; funds will be available for upstream projects that promise to assist in solving Delta problems. In addition to providing funding for the solution of water quality problems that affect the Delta, CALFED is in the process of establishing a Comprehensive Monitoring Assessment and Research Program. This program is currently under development to identify the monitoring and research needs for CALFED-related projects and activities. This program, which may be managed by the USGS, would seek to coordinate with other monitoring programs in the Delta and Delta tributaries, such as the Sacramento River Watershed Program.

1998 UPDATE WATERSHED MANAGEMENT RECOMMENDATIONS

There are clear benefits to the TC in continuing to function as a group after the 1998 Update Report is completed.

- Several watershed contaminant sources concerns are common to all the participating agencies.
- Information sharing is of interest to all the agencies, even in areas where agencies have differing levels of concern. Information sharing about the watershed on a regular basis should result in less time required for scoping and conduct of future sanitary survey updates.
- The agencies, as a group, have more collective influence than as individuals.
- The agencies collectively have more resources to achieve watershed protection and improve or protect source water quality.

The TC considered several options for continuing the group, including a stand-alone group, a sub-set of another organization such as SAWWA, continuing the group for information sharing only, or continuing the group for joint implementation of recommendations of mutual interest. The TC also considered the option of not continuing the group.

The general consensus is to continue as a stand-alone group, meeting regularly for the purposes of information sharing and potentially for the purpose of joint implementation of recommendations of mutual interest. Since there is a disparity in resources and in the level of importance of some of the watershed contaminant sources and issues, each agency may participate in the group at a different level of involvement. The City of Sacramento and EBMUD (also the County of Sacramento) are required to participate in a watershed enhancement effort as part of the potential Joint Project, and the continued group should be able to serve that purpose. It is recommended that the continued group be limited to American River surface water diverters and focus on water quality protection and watershed enhancement. The TC has agreed

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that other current diverters and potential future diverters that did not participate in the 1998 Update (Georgetown Divide Public Utility District and the County of Sacramento) should be invited to join.

Information sharing may include information on individual implementation of recommendations, new information on contaminant sources, information on drinking water regulations, and/or other areas of mutual interest that pertain to the source water quality of the American River.

Joint implementation of the recommendations may begin with a high priority recommendation(s) of mutual interest, such as the recommendation to ensure that all the agencies will receive notification in the event of a hazardous material spill.

After a period of about 1 year, the group may wish to re-assess the value of continuing. If it is decided to continue the group, the group may wish to formalize its arrangement. This could include developing a workplan for implementing recommendations, investigating grant opportunities, and/or developing funding for the group.

The City of Sacramento agreed to coordinate the first meeting in 1999; thereafter, other agencies will share responsibility for coordinating the meetings.

The watershed management recommendations are shown in **Table 8-1**. Also shown in Table 8-1 are the agencies to which the recommendations are applicable and a classification of the recommendations as high, medium, and low priority. The recommendations are consistent with the near-intake zone concepts included in this 1998 Update. The recommendations were developed to maximize existing efforts. Additionally the list of recommendations was developed to be as pragmatic and specific as possible. For example, recommendations are not made to develop policy statements about MTBE. MTBE is a state-wide issue and is being addressed by most of the participating agencies on a policy level, independent of information arising from this study.

Table 8-1. List of Watershed Management Recommendations

[illegible]

Table 8-1. Continued

Recommendation	P C W A	E ID	C S P F	City of Fol- som	City of Rose- ville	S J W D	A C W S	C W D	A W D	City of Sac	EB MU D
MEDIUM PRIORITY											
3. Conduct coliform monitoring upstream and downstream of Strawberry to better identify whether a measurable upstream to downstream increase of coliform levels occurs as the river passes through the community of Strawberry. EID already collects the downstream data at the Strawberry WTP intake. If the results indicate an increase (implicating septic system leakage), the continued group may wish to apply for grant funding to conduct a more comprehensive study and/or meet and confer with El Dorado County and Placer County Departments of Environmental Management regarding increased inspection of existing septic systems and public education on septic system maintenance. Because these county departments have considerable resource issues that would make increased inspection and education difficult for them to implement, data indicating real effects in the river system are needed before resources could be expected to be allocated to this contaminant source.		T									
4. Coordinate the Folsom lake agencies to monitor raw water in Folsom Lake at a higher frequency for MTBE. Monthly monitoring supplemented by event-based monitoring (such as during times of high recreational use) could better determine the occurrence of MTBE in the lake and any seasonal trends.		T	T	T	T	T					
5. Meet and confer with the RWQCB and DFG regarding the fish hatcheries to discuss their monitoring program, develop a better understanding of their activities, and request that the hatcheries conduct a limited amount of discharge/river monitoring for coliform levels and TOC. If coliform levels are high, the appropriateness of conducting pathogen monitoring should be considered.								T	T	T	T
6. Meet and confer with the RWQCB and Aerojet regarding concerns with potential future additional discharges from Aerojet into the American River system.							T	T	T	T	T
7. Meet and confer with the County of Sacramento regarding potential improvements in sanitation facilities along the American River Parkway, including the adequacy of the number of toilet facilities and their maintenance, the potential for posting information on restroom locations, and the potential for more resources to be applied toward these facilities.								T	T	T	T

Table 8-1. Continued

Recommendation	P C W A	E ID	C S P F	City of Fol- som	City of Rose- ville	S J W D	A C W S	C W D	A W D	City of Sac	EB MU D
8. The City of Sacramento to share information with the continued Technical Committee on work in progress on the Sacramento Stormwater Management Program including: (1) work on coliform issues (2) tracking of Caltrans' work on both pathogens and MTBE, (3) pertinent sections of the Coordinated Monitoring Program Reports, and (4) pertinent sections of the upcoming 1998/1999 comprehensive annual monitoring report. Sacramento should also share information with the continued group on work in progress to implement recommendations of the Sacramento River Watershed Sanitary Survey, including: (1) tracking ongoing research into wild animal and livestock pathogen occurrence, (2) developing and implementing the City's public education campaign on recreation, and (3) analysis of Sacramento urban runoff for UV₂₅₄.										T	
LOW PRIORITY											
9. Meet and confer with RWQCB staff on small community wastewater system issues in the watershed and on efforts by the cities of Placerville and Colfax to improve their wastewater systems.	T	T	T	T	T	T	T	T	T	T	T
10. Begin the process of encouraging expansion into El Dorado County of the American River CRMP by helping to bring information on the CRMP's accomplishments to potential stakeholder groups in El Dorado County. This could be done by helping to connect speakers from the American River CRMP with interested organizations in El Dorado County.		T									

Chapter 9. Findings and Recommendations

This chapter contains a discussion of the principal findings of the study and a comprehensive list of recommendations. For assistance with acronyms, the reader is referred to the list of abbreviations at the front of the report.

SUMMARY OF PRINCIPAL FINDINGS

This summary is presented in three sections: (1) water quality findings, (2) contaminant source findings, and (3) findings on treatment plant issues. The summary is focused on principal findings; for more comprehensive details, the reader is referred to the last section of Chapter 4 (“Evaluation of Selected Parameters”), the discussion sections in Chapter 5 at the end of each contaminant source section and the last section in Chapter 7 (“Discussion and Recommendations”).

Summary of Water Quality Findings

The source water quality along the entire American River is generally excellent. All drinking water MCLs are met in the treated water. Also, concentrations of constituents that are trigger levels for additional treatment (i.e., *Giardia*, viruses, and TOC) are, or appear to be, below the current trigger levels.

There is a substantial amount of coliform data. The evaluation of the coliform data showed that high coliform levels are frequently associated with storms, although high levels can also be seen during dry weather. There is a clear trend of increasing concentrations from upstream to downstream, with the largest increase along the Lower American River. Water diverted from the upper watershed or Folsom Lake almost never has total coliform levels greater than 1,000 MPN/100 mL. The 1,000 MPN/100 mL density is the guidance level, which in the absence of direct data on *Giardia* and viruses, has been used by the DHS in evaluating the level of treatment for *Giardia* and virus removal for a WTP. Water diverted from the Lower American River has coliform levels greater than 1,000 MPN/100 mL about 15–25% of the time usually during the rain season. The most likely sources of the increased coliform levels along the Lower American River are urban runoff discharges and recreational use along the river. The American River fish hatcheries may also be contributing to coliform levels along the Lower American River.

As a result of numerous research projects, it is becoming increasingly clear in the water industry that coliform bacteria are not good indicators of *Giardia*, viruses or *Cryptosporidium*. Direct monitoring for these constituents, with increasingly reliable methods, is important in evaluating their presence. Nevertheless, until then, the coliform bacteria data should continue to be seriously regarded and evaluated as one of several imperfect tools used in our attempt to understand the overall quality of source water.

A substantial amount of *Giardia* and *Cryptosporidium* data and a limited amount of virus data have been collected over the last 5 years. Detections have been uncommon; however, since there are limitations

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associated with the analytical methodology, this may indicate only that these pathogens are present at low levels. The monitoring has not shown any correlation between pathogen levels and either coliform or turbidity.

As follow up to the ICR, the USEPA will be conducting a voluntary sampling program for pathogens in surface water. The USEPA will be collecting 12 monthly water samples from 47 utilities around the United States for analysis of *Cryptosporidium*, and potential *Giardia*, by the new USEPA Method 1622. This method analyzes for pathogens using a combination of filtration, immunomagnetic separation, and immunofluorescence assay, and is expected to provide higher recovery rates than the IFA method alone. The City of Sacramento has volunteered to participate as part of the study. Raw samples from E.A. Fairbairn WTP will be submitted beginning November 1998 and continue through October 1999.

Turbidity in the river reaches of the system correlates very well with flow. In general, turbidity levels in the source water exceed 10 NTU less than 10% of the time and exceed 100 NTU less than 1% of the time.

TOC levels average 1.5 mg/L. A limited amount of SUVA data, collected along the Lower American River shows an average of 3.3 m-L/mg, indicating that the organic material present is humic in nature and will contribute to DBP formation. Each agency has varying levels of THMs due to variable treatment processes and distribution system configurations.

MTBE has been monitored regularly in Folsom Lake and irregularly along the Lower American River. It has been detected once, in Folsom Lake, at a concentration of 0.92 Fg/L.

Perchlorate has been monitored a few times on the Lower American River by the DHS. It was not found at a detection limit of 4 Fg/L.

In addition to the water quality information described above, information was collected from other ambient monitoring programs, all on the Lower American River. Data from these other monitoring programs have included monitoring for pesticides at ultra-low detection limits (i.e., nanograms per liter), arsenic (also at low detection limits), and MTBE. Few pesticides have been detected. Three exceptions—diazinon, diuron, and simazine—have been occasionally detected, well below drinking water levels of concern. The average arsenic concentration in the Lower American River is about 0.35 Fg/L. MTBE has not been detected in the Lower American River.

Summary of Watershed Contaminant Sources and Management Activities

Identification and evaluation of contaminant sources in the watershed is based on several tools available for understanding overall source water quality (along with coliform water quality data, pathogen water quality data, and basic sanitary engineering principles). In assessing pathogen contaminant sources, it is important to appreciate that this is an active area of research. For example, 5 years ago, cattle were often

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the main concern as sources of *Giardia* and *Cryptosporidium*, and peremptory decisions were made in some watersheds to ban cattle altogether. Today, we understand that infection epidemics occur only in calves and have a more sophisticated (though still evolving) appreciation of potential BMPs such as buffer strip effectiveness, manure management, and controlling the calving season in relation to the rain season. Today, rodents have come to the fore as a major concern, but our understanding of pathogen occurrence in rodents and their role in infecting domestic species is currently very limited.

Most pathogenic material in the watershed may be transported into the river system during storm events. The following is a summary of our present understanding of potentially significant pathogen contaminant sources in the American River watershed.

- Fecal waste from wild animals, livestock, and pets, whether in undeveloped or urban areas, can be transported to the river during storms. There is less concern with these sources during the dry season, especially in undeveloped areas. There is virtually no runoff during the dry season; in addition, heat and dry conditions (i.e., desiccation) are important inactivation factors for protozoa. Pathogen occurrence in wild animal species is an active area of research. Research into pathogen occurrence in livestock is also an active area, especially in California, as the UCD Veterinary Medicine and Research Teaching Center and UCD Cooperative Extension seek to better define the occurrence of pathogens among different livestock species and identify effective BMPs that are practical and implementable by the livestock industries. It is expected that a great deal more will be known on these subjects at the time of the next watershed sanitary survey update and perhaps BMPs targeting pathogens in cattle will have been incorporated into the Rangeland Water Quality Management Plan.

In urban areas, a wild and domestic animal population contributes fecal matter to land surface. The impervious nature of an urban area results in more rapid and thorough transport of contaminants than in undeveloped areas. Pathogens in Sacramento area urban runoff are being addressed by the Sacramento Stormwater Management Program. The Sacramento Stormwater Management Program is currently in the process of better assessing the degree of the problem and is collecting information on potential control measures. The major data collection effort underway on pathogen occurrence in urban runoff is being conducted by Caltrans in the San Diego area; this effort is being closely watched by the Sacramento Stormwater Permittees.

- Untreated human wastewater inputs into this watershed are very limited but are more likely to occur during storms. The Colfax and Placerville wastewater treatment plants have capacity problems due to high flows during storms. Also, some of the small non-discharging community wastewater systems have had spills during major storms.

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There are also several dry weather sources of potentially significant pathogen contamination.

- Data suggest that urban runoff, as described above, probably contains some level of fecal/pathogen contamination. In urban areas, heat and dry conditions also prevail during the dry season, but a continual dry-weather flow from outdoor water use may carry some fecal waste. Urban runoff is being investigated and addressed, as described previously.
- Septic systems are of concern because of the large number of septic systems in the upper watershed—somewhere in the order of 27,000 to 35,000 total (with many close to the South Fork)—also, due to a lack of resources there is little assurance that they are properly maintained once installed. For septic systems, additional data would be needed in order to move forward from the suspicion that they may be a problem. If monitoring data from a small study indicates a water quality problem, it may be possible to obtain grant funding for a larger study. If the larger study confirms water quality concerns, the information can be used to discuss resource re-allocation for septic system maintenance and inspections. If initial monitoring data do not indicate water quality concerns, additional attention may not be needed.
- Recreation is the other major potential source of pathogens in this watershed during dry weather. Recreational use of the American River system involves an estimated 8 million visitor-days per year. Improper sanitary practices during body-contact recreation and handling of waste on boats may contribute pathogens directly to the river system. The Eastside Reservoir modeling work by MWD suggests that recreational users can be a significant source of pathogens and points out that children may contribute a disproportionate share. The San Francisco Estuary Project work suggests that improper disposal of waste from boats is not uncommon. Coliform bacteria monitoring efforts at Camanche Reservoir and Modesto Reservoir have shown correlations between high coliform levels and high recreational use. The EBMUD Lower American River coliform monitoring, to date, has not shown this correlation. Water agencies that own or have a high degree of control of their reservoirs typically limit recreational use. The entire American River system, however, is a multi-use system, with recreation being one of the key benefits to the surrounding population. Public education is the only apparent means within the purview of the water agencies to affect change in this area.

Exposed soil can contribute to elevated turbidity levels in the river system and can be caused by timber harvesting, fires, landslides, and over-grazing. Forest health, including timber harvesting and fires, in part of the upper watershed (Placer County) is beginning to be addressed through the American River CRMP. The 1998 Clean Water Action Plan contains several action items related to forest health, erosion, and grazing on fewer lands; what actions may actually be taken as a result of this plan remain to be seen. The Rangeland Water Quality Management Plan's seminar system principally focuses on erosion control, although these seminars have not yet been given in the American River watershed.

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Recreation and boating are both sources of MTBE. MTBE is being addressed at a policy level through state legislation, the adoption of an MTBE policy statement by ACWA, and various other activities. If MTBE is banned or its use is severely curtailed as a result of these efforts, it will rapidly become a low-priority issue in surface waters. If not, it will remain a potential problem; more monitoring data would be needed to evaluate the extent of the problem on the American River system.

In general, industries pose little risk to the drinking water quality of the river system. This is in large part due to the relatively low level of industrialization in the watershed. Industries that do discharge to the river system are regulated by the RWQCB through effluent discharge limitations, with a history of compliance with the permit limits. The only industry of potential concern is the Aerojet facility. Although effluent discharge limits for Aerojet's discharges to the Lower American River system are developed to be protective of all the beneficial uses of the river based on current knowledge and analytical capabilities, there is a history of finding previously unknown constituents of concern to drinking water (i.e., perchlorate and NDMA) in Aerojet's treated groundwater once analytical method detection limits are lowered sufficiently. In addition, a concern exists over future disposal options for the potentially very large volume of water that may eventually be generated by groundwater extraction and treatment at the facility; i.e., the potential for additional discharges to the American River and/or the Folsom South Canal.

Finally, the potential for spills of hazardous materials due to traffic accidents, railroad accidents, and pipeline spills is of concern. The agencies need timely notification in order to respond properly at the WTP. There is currently no assurance that the agencies will receive prompt notification, except for PCWA and Sacramento. PCWA has obtained agreement to receive direct notification from Placer County. The City of Sacramento has agreements to receive direct notification from Placer County, Sacramento County, the City of Sacramento, and wastewater treatment collection facilities downstream of Folsom Lake.

Summary of Water Treatment Plant Evaluations

The 1993 ARWSS Report concluded that 3- to 4-log removal for *Giardia* and viruses was sufficient, pending the collection of data on *Giardia* and viruses. The *Giardia* and virus data collected over the past 5 years show few detections of *Giardia* and viruses, suggesting that the incidence of these pathogens in the source water is low. Although these data are inexact, based on the limitations of the analytical method, they support the conclusion from the 1993 Report that 3- to 4-log removal is the appropriate level of treatment for American River water agencies.

The coliform data show that agencies diverting water from the upper watershed and Folsom Lake rarely see total coliform levels greater than 1,000 MPN/100 mL, while agencies on the Lower American River may see coliform levels greater than 1,000 MPN/100 mL from 15 to 25% of the time usually during the rain season. It is increasingly clear that coliform bacteria are not good indicators of *Giardia*, viruses, or *Cryptosporidium*. Nevertheless, until more reliable methods are developed to accurately determine the presence of these pathogens, the coliform bacteria data should continue to be evaluated as an indicator of

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the source water quality. The Lower American River water agencies, in particular, should optimize treatment during storms and periods of high recreation as well as support a public education campaign targeted to recreational users of the river.

Currently all the agencies are in compliance with all existing regulations, except for AWD and CWD which are under compliance orders for the SWTR. Both AWD and CWD are responding to the compliance orders.

All agencies experienced some level of difficulty during the January 1997 Pineapple Express storm. Similar difficulties can be expected when similar climatic conditions recur and cause short-term turbidity spikes. The reoperation of Folsom Dam for increased flood control results in additional exposure of shoreline and also passes a large volume of water through the reservoir during the wet years. During the rain season, this is likely to accentuate turbidity spikes during major storms and cause short-term treatment difficulties.

Installation and operation of a temperature control device to provide the four Folsom Dam water diverters with water from the reservoir at elevations above the cold water pool, could result in increased temperature, turbidity, coliform levels, TOC, and MTBE in the raw water. The specific impacts depend on the details of the design and operational rules of the temperature control device, which are still being developed.

Future treatment issues include the potential need to install backwash water treatment facilities and filter-to-waste capabilities, the potential change in disinfection requirements and procedures due to the proposed Stage 2 Rule, the potential need to monitor for constituents in accordance with the Drinking Water Candidate Contaminant List, and the potential need to prove physical removal of *Cryptosporidium* in order to obtain 2-log removal credit.

LIST OF RECOMMENDATIONS

The list of recommendations developed to protect and improve source water quality and maintain treated water quality is shown in **Table 9-1**, along with the agency(ies) to which the recommendation applies. More detail on the recommendations is provided in the text of this section.

1. Optimize treatment processes particularly during storms and high recreational use periods. Although the *Giardia* and virus data indicate a generally low incidence of *Giardia* and viruses, these are inexact data. Based on our current level of knowledge, risk is probably increased during storms and periods of high recreational use. The consequences of an outbreak are potentially quite severe in terms of public health, public trust, and cost. Treatment optimization is the most protective action that the agencies can take to reduce risk during all times of operation.

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2. When pathogen analytical methods become substantially more exact, the water agencies may consider collecting additional pathogen data, particularly along the Lower American River where the high coliform levels indicate poorer overall water quality. The City of Sacramento has volunteered to participate in a 12-month USEPA sampling program to evaluate the efficiency of new EPA Method 1622 for analyzing *Cryptosporidium*, and potentially *Giardia*. If accepted for the study, then additional pathogen data will be collected.
3. For the four water agencies that divert water at Folsom Dam, remain involved throughout the design, construction, and operational phases of the temperature control device project.
4. Ensure that spill notification procedures are in place so that each agency can be assured it will receive timely notification in the event of a hazardous material spill into the river system. Several options include:
 - Identifying a single lead agency to be contacted by the LAA/CUPAs. This lead agency would then directly contact all other agencies that may be impacted.
 - Developing a water agency chain notification system. This system would involve inter-notification among agencies without a lead agency responsibility.
 - Clarify through additional discussions that notification through the RWQCB and DHS is a reliable process and that notification will come through DHS.
 - Each agency obtaining direct notification from each applicable LAA/CUPAs.

It is recommended that the selected option be for the continued group to send a single letter to each LAA/CUPA, requesting individual agency notification to the contacts shown in Appendix G in the event of a spill. If the LAA/CUPAs are unwilling to provide notification to each individual agency, the agencies can consider establishing a lead agency to receive notification and establish their own notification tree.

5. Develop and implement a public education campaign targeted to encourage responsible recreational use of the river system. For example, the campaign could promote signage or other media describing the proper methods of sewage disposal that could be posted at the park entries and in other service-type areas. Implementation of this recommendation will require funding resources.

The City of Sacramento is currently in the process of developing public education materials on responsible sanitation practices for boaters. Perhaps this campaign could be expanded to include more of the American River watershed. Or perhaps the SAWWA Education Subcommittee would

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be the right vehicle for an area-wide public education campaign on the impact of recreation on water quality.

6. Water agencies that plan to expand their WTPs should provide space for new facilities that would address potentially more stringent regulations in the future, such as ozone contactors or CT tanks.
7. Continue to monitor distribution system DBPs and disinfection practices to ensure future DBP water quality standards are not exceeded. Although most agencies' distribution system DBPs are well below the proposed Stage 1 MCLs, many are close to, if not exceeding, the expected Stage 2 MCLs. It will be necessary to understand the physical and chemical factors influencing the distribution system DBPs so that treatment may be altered or optimized to comply with future regulations.
8. Conduct coliform monitoring upstream and downstream of the community of Strawberry to better indicate whether there is a measurable upstream to downstream increase of coliform as the river passes through Strawberry. EID already collects midstream data at the Strawberry WTP intake. If the results indicate an increase (implicating septic system leakage), the continued group may wish to apply for grant funding to conduct a more comprehensive study and/or meet and confer with El Dorado County and Placer County Departments of Environmental Management regarding increased inspection of existing septic systems and public education on septic system maintenance. Because these County departments have considerable resource issues that would make increased inspection and education difficult to implement, data showing real effects in the river system are needed before resources could be expected to be allocated to this contaminant source.
9. Monitor raw water in Folsom Lake for MTBE at a higher frequency (unless MTBE use is discontinued in California). Monthly monitoring supplemented by event-based monitoring (such as during times of high recreational use) could better determine the occurrence of MTBE in the lake and any trends.
10. Meet and confer with the RWQCB and DFG regarding the fish hatcheries to discuss their monitoring program, develop a better understanding of their activities, and request that the hatcheries conduct a limited amount of discharge/river monitoring for coliform levels and TOC.
11. Meet and confer with the RWQCB and Aerojet regarding concerns with potential future additional discharges from Aerojet into the American River system.
12. Meet and confer with the County of Sacramento regarding sanitation along the American River Parkway, including the adequacy of the number of toilet facilities and their maintenance, the potential for posting information on restroom locations, and the potential for more resources to be applied toward these facilities.

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13. The City of Sacramento to share information with the continued group on work in progress on the Sacramento Stormwater Management Program, including:

(1) work on coliform/pathogen issues, (2) tracking of Caltrans' work on both pathogens and MTBE, (3) pertinent sections of Coordinated Monitoring Program Reports, and (4) pertinent sections of the upcoming 1998/1998 comprehensive annual monitoring report.

The City of Sacramento to also share information with the continued group on work in progress to implement recommendations of the Sacramento River Watershed Sanitary Survey, including:

- (1) tracking ongoing research into wild animal and livestock pathogen occurrence and
- (2) development and implementation of the City's public education campaign on river recreation.
- (3) analysis of Sacramento urban runoff for UV₂₅₄.

14. Meet and confer with RWQCB staff on small community wastewater system issues in the watershed and on efforts by the cities of Placerville and Colfax to improve their wastewater systems.
15. Begin the process of encouraging expansion into El Dorado County of the American River CRMP by helping to bring information on the CRMP's accomplishments to potential stakeholder groups in El Dorado County. This could be done by helping to connect speakers from the American River CRMP with interested organizations in El Dorado County.

Table 9-1. List of Recommendations

RECOMMENDATION	P C W A	E I D	F S P	City of Fol- som	City of Rose- ville	S J W D	A C W S	C W D	A W D	City of Sac	EB M U D
HIGH PRIORITY											
1. Optimize treatment during storms and other critical periods such as high recreational use times.	T	T	T	T	T	T	T	T	T	T	T
2. When pathogen analytical methods become substantially more exact, the water agencies may consider collecting additional pathogen data.	T	T	T	T	T	T	T	T	T	T	T
3. The four water agencies that divert water at Folsom Dam should remain involved throughout the design, construction, and operational phases of the temperature control device project.			T	T	T	T					
4. Ensure that spill notification procedures are in place so that each agency can be assured it will receive timely notification in the event of a hazardous material spill into the river system.	T	T	T	T	T	T	T	T	T	T	T
5. Develop and implement a public education campaign targeted to responsible recreational use of the river system.	T	T	T	T	T	T	T	T	T	T	T
MEDIUM PRIORITY											
6. Provide planning and space at new or expanded WTPs to allow for potential installation of alternative facilities to meet future regulatory requirements.	T	T	T	T	T	T	T	T	T	T	T
7. Continue to monitor distribution system DBPs and disinfection practices to ensure that future anticipated DBP standards are not exceeded.											
8. Conduct coliform monitoring upstream and downstream of Strawberry to better identify the potential effects of septic systems.		T									
9. Coordinate the Folsom Lake agencies to monitor raw water in Folsom Lake for MTBE at a higher frequency.		T	T	T	T	T					

Table 9-1. Continued

[illegible]

Appendix A: Internet Sites

American River Watershed Sanitary Survey Web Sites

Site Name	Site/Agency Description	Site Address
California Data Exchange Center (CDEC) Department of Water Resources	Provides historic and real time snowpack, satellite images, river/tide forecast, hydrologic data (i.e. reservoir, precipitation, river stages, and flows).	http://cdec.water.ca.gov/
California Department of Fish and Game	Provides spill information through the Office of Spill Prevention and Response (OSPR)	http://www.dfg.ca.gov/
California Department of Water Resources	Manages California water resources. Provides river forecast and reservoir information. Provides links the State Water Project, CDEC, CERES, CALFED Bay-Delta, and other programs.	http://www.dwr.water.ca.gov/
California Environmental Protection Agency (Cal EPA)	Regulatory agency provides a list of California program reports, permit information, and access to the Office of Environmental Health Hazard Assessment (OEHHA).	http://www.calepa.cahwnet.gov/
California State Water Resources Control Board	Monitors the state water quality. Provides news, forms/permits, underground tanks, watershed/nonpoint source, and other information.	http://www.swrcb.ca.gov/
Central Valley Regional Water Quality Control Board	Preserves and enhances the water quality of the Central Valley Region. Provides board meeting agendas and minutes, documents, and other information.	http://www.swrcb.ca.gov/~rwqcb5/cover1.html
Department of Pesticide Regulation	Regulators of pesticide sales and use to protect public health and the environment. Provides fact sheets, regulations planning, and other information.	http://www.cdpr.ca.gov/
Know Your Watershed	Access to the National Watershed Newsletter, Focus, National Watershed Library, state leaders, and other information is available.	http://www.ctic.purdue.edu/cgi-bin/kyw.exe

American River Watershed Sanitary Survey Web Sites

Site Name	Site/Agency Description	Site Address
National Pesticide Telecommunications Network	A search engine for pesticide characteristics and general information.	http://ace.orst.edu/info/nptn/index.html
National Weather Service (NWS) Office of Hydrology	Primary link between the National Weather Service Headquarters and the hydrologic field service programs. Current and historical flood and water supply outlooks are available.	http://www.nws.noaa.gov/oh/
Nonpoint Education for Municipal Officials (NEMO)	Seeks to educate local officials about the effects of land use practices on water quality.	http://www.canr.uconn.edu/ces/nemo.index.html
Office of Emergency Services	Access the "Hazardous Materials" page to investigate hazardous material spills within the California Hazardous Material Incident Report (CHIMR), regulations and other information	http://www.oes.ca.gov/
River Network	Access to watershed protection issues, publications, and other information.	http://www.rivernetwork.org/
The Watershed Management Council	Dedicated to the art and science of watershed management, includes conference information and newsletters.	http://glinda.cnrs.humboldt.edu/wmchome
U.S. Bureau of Reclamation	Manages, develops, and protects water resources. Access to publications, general information, features, facilities, programs are available on this site.	http://www.usbr.gov/main/
U.S. Department of Agriculture (USDA)	Provides agriculture news and information	http://www.usda.gov/

American River Watershed Sanitary Survey Web Sites

Site Name	Site/Agency Description	Site Address
U.S. Environmental Protection Agency: Office of Water-The Office of Science and Technology	Standards, criteria, advisories, guidelines, limitations and standard guidelines for water quality. Provides watershed ecological risk assessment case studies, analytical methods, drinking water advisory and other information.	http://www.epa.gov/owow/
U.S. Environmental Protection Agency: Office of Wetlands, Oceans, and Watersheds	Conservation/restoration and other internet search. Provides access to wetlands, Adopt your Watershed, American Heritage Rivers, and other information is available on this web site.	http://www.epa.gov/owow/
U.S. Environmental Protection Agency: Catalog of Federal Funding Sources for Watershed Protection	Provides access to funding fact sheets, type of projects funded and eligibility.	http://www.epa.gov/owow/watershed/wacademy/fund.html
U.S. Geological Survey	Provides access to historic and real time hydrologic data (i.e. gage station flow, reservoir, precipitation, snowpack, satellite images, river/tide forecast data) acid rain and GIS information.	http://waterdata.usgs.gov/
Watershed Information Technical System (WITS)	Single-point access to a wide variety of data for watershed planning, management, restoration, monitoring and regulations.	http://ceres.ca.gov/watershed/
Watershed Projects Inventory (WPI)	Most current list of watershed programs and projects	http://endeavor.des.ucdavis.edu/WPI/

Appendix B: Table of Contents and Watershed Figures Reproduced from the 1993 ARWSS Report

Note: Legends and References on these figures refer to the 1993 ARWSS Report.

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Appendix C: Agency Surveys

American River Watershed Sanitary Survey Update Report Agency Survey Response Summary

What water treatment difficulties have you experienced during the study period, January 1993 - December 1997, for the American River water supply? (i.e. contaminants, storm events, natural disasters)

Arcade Water District:

The District utilizes eight infiltration wells to produce surface water from the American River. A submersible pump in each of these wells is used to discharge water into a common transmission main. There are three additional wells which have never been put in service. The infiltration wells are shallow wells producing water from an estimated five acres of surface area in contact with the American River. Treatment consists of natural filtration (water passes through the natural sands and gravels of the river bed) followed by chlorine disinfection.

The District has experienced the following treatment difficulties:

- Submergence of wells and transmission main when river flows exceed 8,000 cfs (DHS does not allow the District to operate any wells when they are submerged). The District's American River Wells and related facilities also sustained significant damage during the flooding that occurred in January 1997.
- Total/fecal coliforms. Total coliforms have been detected in water produced from Wells A, C, and L. These specific wells were rehabilitated in 1996-97. Although this rehabilitation effort improved the pumping capacity from these wells, it also appears to have changed the natural filtration characteristics which resulted in occasional positive tests for total coliforms. Both total and fecal coliforms have been detected in water produced from Well D and DHS will not allow this wells to be operated until the source of contamination has been found and eliminated.
- High Turbidity. Monitoring equipment will automatically shut down the well(s) if the turbidity in the water from all operating wells is 0.50 NTU or greater (this usually occurs when system demands are high).
- Low chlorine residual. Monitoring equipment will automatically shut down the well(s) if the chlorine level in the combined discharge drops to 3.0 ppm or lower.
- High chlorine residual. Due to the high chlorine dosages required by DHS in allowing the District to operate these wells (chlorination set point is 4.0 ppm), some water quality complaints (taste and odor) have been received from customers that obtain water from the American River Wells.

Arden Cordova Water Service:

The Coloma Treatment Plant has historically been operated during the months of May through October. During these times there has not been any significant event that has caused, or had the potential of causing, water treatment difficulties.

Carmichael Water District:

El Dorado Irrigation District:

Survey Response Summary

Power outages, increased turbidities, difficulty in accessing WTP at Strawberry when landslides, etc. block Highway 50.

Folsom State Prison:

During the flooding occurring during January 1997, raw water from Folsom Dam reached 400 NTU and shut down our ability to produce treated water. It was not until February 1997 when the NTU levels dropped to a point where we could go back to full production.

City of Folsom:

We experience high turbidity in the raw water due to winter storms with above normal runoff. In January 1997, turbidity was very high. However, water was still treatable with the chemicals being used.

Placer County Water Agency:

- Storm Event - May 1996
- Storm Events - January 1, 2, 19, 20, 1997
- Annual high water turbidity debris, sand

City of Roseville:

January 1997 - High turbidity of 770 NTU. Storm related.

San Juan Water District:

- High turbidities during intense winter storms.
- Taste and odor (Geosmin).
- Warm water issues due to very low lake levels.
- Algae growth issues due to very low lake levels.

City of Sacramento:

Storm turbidity, low alkalinity.

What were the specific contaminants or water characteristics that contributed to water treatment difficulties?

Arcade Water District:

Total/fecal coliforms, high turbidity, and low/high chlorine residual.

Arden Cordova Water Service:

N/A

Carmichael Water District:

El Dorado Irrigation District:

Increased turbidities at EDH.

Folsom State Prison:

Turbidity, cold water.

City of Folsom:

High turbidity - silt in water. Taste and odor from organics in water from runoff.

Placer County Water Agency:

Turbidity, silt, and debris.

City of Roseville:

Low alkalinity. Reduces effectiveness of the coagulation process.

San Juan Water District:

City of Sacramento:

High turbidity, low alkalinity.

Were these water treatment difficulties short term or persistent?

Arcade Water District:

When the wells are in operation, the noted water treatment difficulties are generally short term in nature.

Total/fecal coliforms - persistent in some wells (conditions can change from year to year due to changes in the river bed resulting from flood flows); short term in others.

Turbidity - short term (typically flow sensitive).

Chlorine Residual - low residual is a short term situation (typically flow sensitive); high residual is a persistent situation due to the treatment requirements dictated by DHS in allowing the operation of these wells.

Arden Cordova Water Service:

N/A

Carmichael Water District:

El Dorado Irrigation District:

Short term.

Folsom State Prison:

Short term.

City of Folsom:

These difficulties were short term (3 weeks).

Placer County Water Agency:

Short term.

City of Roseville:

Short term during spring runoff months.

San Juan Water District:

Short term.

City of Sacramento:

Some short term, some long term (=>2 months).

How did you address these water treatment difficulties in the treatment process?

Arcade Water District:

If fecal coliforms were found to be present in water produced by a specific well, DHS would not allow operation of that particular well until the source of contamination could be located and eliminated. Well D has been taken off line for that reason.

When total coliforms were detected in the water produced from a specific well, DHS would allow continued operation only if total coliforms were absent for three consecutive monitoring days. In 1997, Wells A and L had to be taken off-line because this requirement could not be met.

When the turbidity level exceeded 0.50 NTU any operating well(s) would automatically shut down until the turbidity level went below 0.30 NTU. High turbidity events were usually addressed by reducing the number of wells in operation (or changing the combination of wells in operation). Another option was to throttle the well pump discharge valves to reduce the pumping capacity (and, therefore, reduce the turbidity).

When the chlorine residual dropped below 3.0 ppm, the well(s) would automatically shut down until the chlorine residual could be increased to 3.5 ppm. This situation is typically caused by rapid increases in system demand. To address this situation, the chlorination system is allowed to automatically adjust the chlorine dosage to meet the increased demand.

Arden Cordova Water Service:

N/A

Carmichael Water District:

El Dorado Irrigation District:

Increased backflushing rate.

Folsom State Prison:

Had to wait until Inf NTU was around 150 then switched from using alum and a cat flocc to pro pac 9800 and zetaflocc. Then lowered the plant flow of raw water and split the flow between two micro flocc units instead of one. Ran plant 24 hours a day instead of 19 hours.

City of Folsom:

The existing process and chemicals worked very well.

Placer County Water Agency:

Did not use source during events.

City of Roseville:

Brought in portable lime slurry to adjust pH and boost alkalinity. This has been replaced with a permanent tank structure.

San Juan Water District:

- Geosmin: Able to increase CL_2 free residual and seemed to oxidize contaminant.
- High NTU: Fortunately in winter with low demands, slowed process and increased frequency of backwash and lots of jar tests.
- Warm Water: Just had to deal with customer complaints hoping Folsom Lake would fill and lower temperature.
- Algae: Raised CL_2 and optimized pre-treatment.

City of Sacramento:

Lime.

Do you believe you will have difficulty in meeting the proposed Stage 1 DBP Rule (THM<80ug/L, HAA<60ug/L) based on current treatment processes?

Arcade Water District:

Based on the results of past water quality testing, the District does not anticipate any difficulty in meeting the proposed THM standard. The highest concentration of total Trihalomethanes (TTHM) from the District's American River in the past eight years is 11 µg/L. There is not past data available on HAA concentrations from the American River Wells.

Arden Cordova Water Service:

It is anticipated that the Coloma Treatment Plant will meet both Phase I and Phase II of the DBP without modifying treatment processes. (See enclosed THM summary.)

Carmichael Water District:

El Dorado Irrigation District:

No.

Folsom State Prison:

Do not know.

City of Folsom:

Not at present.

Placer County Water Agency:

No.

City of Roseville:

No. The 1993 through 1997 THM's averaged 39 µg/L, with a maximum of 70 µg/L and a minimum of 19 µg/L.

San Juan Water District:

No.

City of Sacramento:

No.

Do you plan any new or expanded water treatment facilities, new or expanded intake facilities or a change in treatment or intake? If so, please describe. Is this expansion designed to meet any future regulatory requirements?

Arcade Water District:

The State Department of Health Services (DOHS) has issued the District a compliance order for the surface water supply from the American River infiltration wells "because the District was not in compliance with the Surface Water Filtration and Disinfection Regulation, Title 22, Chapter 17, California Code Regulations by June 29, 1993." The regulations require treatment to provide 99.9% (3-log) reduction of *Giardia* cysts and 99.9% (4-log) reduction of viruses through filtration and disinfection. The District is planning the construction of new water treatment facilities to comply with the Surface Water Treatment Rule (SWTR). It is anticipated that the capacity of these treatment facilities will be 10 mgd (the District is still negotiating future surface water diversions among local stakeholder organizations as part of the ongoing Water Forum planning process).

The compliance order requires operation of engineered filtration and disinfection facilities by July 1, 1999, although a time extension has been requested from DHS. In May 1997, Kennedy/Jenks Consultants completed an "American River Wells Treatment Process Evaluation Report" which selected contact clarification-filtration (Serial Filtration) as the preferred water treatment process for the District's future water treatment facilities.

Arden Cordova Water Service:

The following improvements are either under construction or currently installed and will be utilized during the 1998 seasonal operation:

- a) Potassium permanganate feed system has been added at the raw water intake.
- b) A coagulant aid polymer feed system is being installed.
- c) Sodium Hydroxide will be utilized for pH control.
- d) Feasibility of increased filtration rate is currently being reviewed.
- e) Filter backwash water will be recycled at a rate not to exceed 10% of total plant flow.
- f) Advanced automation is being installed.

Carmichael Water District:

El Dorado Irrigation District:

The EDH plant will be expanded before it approaches 10,000 svs. connections. It is currently at 6,680. Planning to begin in 2 years or so.

Folsom State Prison:

Yes, add a stream and current controller, pre-treatment basin and particle counters.

City of Folsom:

Yes. We will be expanding the plant from 25 mgd to 40 mgd over the next 2 years and replacing a portion of the intake pipeline with a 60-inch pipeline.

Placer County Water Agency:

American River pump station - Current facility is 50 cfs temporary (summer only). We are negotiating with Bureau of Reclamation to replace with permanent 100 cfs facility (expandable to 200 cfs).

Foothill Water Treatment Plant - Planning phased project to optimize (add Actiflow process) and expand plant (see attached copy of draft pre-design report) as well as install parallel raw water delivery pipe from existing South Canal Pump Station to Plant.

Sunset Water Treatment Plant - Planning \$1.5 million worth of improvements for next two years including filter to waste system, washwater clarification basins, standby power, and chemical feed system improvements (see attached April 96 Expansion Feasibility Study Executive Summary - Note: Only mandatory compliance directives as identified in the study are planned at this time).

City of Roseville:

Yes. New expanded facilities are in design stage with Montgomery Watson. Also, Boyle recently completed raw water lines design for additional 60" feed. Folsom Dam pumping plant has been expanded to increase pumping capacity in the low lake times.

San Juan Water District:

A possible plant expansion looms on the horizon, designed to meet future customer demands.

City of Sacramento:

Yes. Plant and intake in predesign to expand to 160 mgd.

Are you involved in any watershed management efforts such as public education, participation in a stakeholder's group or other activities?

Arcade Water District:

Although not directly a watershed management effort, the District has been an active participant in the Regional Water Forum planning process. The Water Forum is a group of business and agricultural leaders, environmental interests, neighborhood representatives, taxpayer advocates, and water purveyors that came together in 1993 to develop a regional plan. The purpose of the plan is to secure a safe and reliable water supply well into the future while at the same time protecting the lower American River. Specific elements of the Water Forum process include reducing diversion impacts on the lower American River in drier years, developing an improved pattern of fishery flow releases from Folsom Reservoir, and providing habitat management for the lower American River.

Arcade is also a member of the Sacramento Metropolitan Water Authority (SMWA), a joint powers authority involved in water activities of significance throughout the Sacramento Valley. These include devising a strategy to ensure development of surface water resources for future needs.

Arden Cordova Water Service:

Carmichael Water District:

El Dorado Irrigation District:

We have tried some participation in stakeholder's group formation - mostly through the local CSD. So far there is not enough conviction or available time among stakeholders to make this a go.

Folsom State Prison:

No.

City of Folsom:

The City participates in the Water Forum and the Sacramento Metropolitan Water Authority (SMWA).

Placer County Water Agency:

We participate in the Sacramento Water Forum.

City of Roseville:

No.

San Juan Water District:

Not to my knowledge.

City of Sacramento:

Yes. Public involvement and education continues to be a priority of the Department of Utilities, to garner local support for water, sewer, drainage and flood control projects and services. Specific to water management, our comprehensive public participation and community outreach programs and pro-active media relations plans include:

- Indoor and outdoor water use programs, implementation of statewide Best Management Practices (BMPs), and the development of a 5-year strategy Urban Water Conservation Plan is the focus of water management. The City is linked with a number of organizations such as the Sacramento Area Water Works Association (SAWWA), Sacramento Water Forum, California Urban Water Conservation Council (CUWCC), Association of California Water Agencies (ACWA) and California Municipal Utility Association (CMUA).
- Currently, plans to develop a public education campaign targeted to the boaters and users of Sacramento waterways is underway. The primary emphasis is to deter dumping of sewage from houseboats into the rivers, encourage use of land-side restroom facilities, heighten awareness of water quality issues facing the Sacramento and American Rivers and rally vital support to preserve the natural beauty of these two rivers.

The City of Sacramento, Department of Utilities actively participates as a stakeholder in the Sacramento River Watershed Program. Staff resources also include a significant role in planning and organizing a workshop on drinking water issues held in Sacramento in May 1997.

The City of Sacramento, Department of Utilities has been tracking research into grazing animals and their contribution of pathogens to the Sacramento River system as well as the implementation of grazing management practices in the Sacramento River watershed. We are planning an informal workshop on pathogen sources in the Sacramento River watershed with Dr. Robert Atwill of UC Davis Tulare Extension, one of the principal researchers in California on this topic. The agencies participating in the American River Watershed Sanitary Survey Update report will be invited to the workshop to promote sharing of knowledge on these types of watershed issues.

American River Watershed Sanitary Survey Update

WATER SYSTEM:		
Utility Name		Placer County Water Agency
Service Area		Placer County
Number Customers - Retail / Wholesale		
PWSID No.		CA3110025
SOURCE:		
Name		North Fork American River
Entitlement and Amount		
INTAKE:		
Location and Description		Pump Station near Ophir Tunnel in Auburn
Intake Protection Facilities		Fish Screens
WTP:		
Name		Foothill WTP
Type of Treatment		Conventional WTP
State Approved Plant Capacity (MGD)		27 MGD
Capacity Flow Range (MGD)		0 - 27 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	8 MGD
	Summer (Apr-Sep)	25 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	General Parameters, Organics
	Treated Water	None for 100% American River
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine
pH Adjustment	Chemical and Dose	
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Alum-Flocculation, PAC-Taste and Odor
Rapid Mix	Volume Basin	
	Type of Mixing	Mechanical
	Mixing Energy (G)	
Flocculation	No. of Basins	4
	Volume Basin	
	Type of Flocculators	Horizontal Shaft
	Mixing Energy	
Sedimentation	No. of Basins	4
	Volume Basin	
	Surface Load Rate	
	Method of Sludge Removal	Chain and Flight, Manual
Chemical Addition	Chemical, Purpose & Dose	Polymer-Floc Aid
Filtration	No. of Filters	8
	Type of Filter	Dual media
	Filter Box Volume	
	Underdrain Type	Leopold
	Media: Type, Depth, Area	Sand, anthracite (10" / 17")
	Filtration Rate	5 gpm / sf
	Backwash: Criteria, Rate	
	Filter -to-Waste Facilities	No
Washwater Treatment	Volume Basin	Negligible
	Chemical and Dose	
Post-Chlorination	Chemical and Dose	Chlorine
Fluoridation	Chemical and Dose	NA
pH Adjustment	Chemical and Dose	Lime
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG) / Area(AC))	21 MG
Open Surface Storage	(Volume(MG) / Area(AC))	0
Floating Covers	(Volume(MG) / Area(AC))	0
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg / L)	
WTP:		

American River Watershed Sanitary Survey Update

Name		Sunset WTP
Type of Treatment		Conventional WTP
State Approved Plant Capacity (MGD)		5 MGD
Capacity Flow Range (MGD)		0 - 5 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	NA
	Summer (Apr-Sep)	5 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	General Parameters, Organics
	Treated Water	None for 100% American River Water
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine
pH Adjustment	Chemical and Dose	
Grit Basin	Volume Basin	
Chemical Addition	Chemical, Purpose & Dose	alum and Polymer-Flocculation, PAC-Taste and Odor
Rapid Mix	Volume Basin	
	Type of Mixing	Mechanical
	Mixing Energy (G)	
Flocculation	No. of Basins	2
	Volume Basin	
	Type of Flocculators	Vertical Shaft
	Mixing Energy	
Sedimentation	No. of Basins	2
	Volume Basin	
	Surface Load Rate	
	Method of Sludge Removal	Manual
Chemical Addition	Chemical, Purpose & Dose	
Filtration	No. of Filters	4
	Type of Filter	Dual media
	Filter Box Volume	
	Underdrain Type	
	Media: Type, Depth, Area	Sand, anthracite (10" / 17")
	Filtration Rate	
	Backwash: Criteria, Rate	
	Filter -to-Waste Facilities	No
Washwater Treatment	Volume Basin	Negligible
	Chemical and Dose	
Post-Chlorination	Chemical and Dose	Chlorine
Fluoridation	Chemical and Dose	
pH Adjustment	Chemical and Dose	Lime
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG) / Area(AC))	21 MG
Open Surface Storage	(Volume(MG) / Area(AC))	0
Floating Covers	(Volume(MG) / Area(AC))	0
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg / L)	
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	Dave Zuccaro
	Other WTP's	
	City / County / State / Federal	

American River Watershed Sanitary Survey Update

WATER SYSTEM:		
Utility Name		El Dorado Irrigation District
Service Area		El Dorado County
Number Customers - Retail / Wholesale		
PWSID No.		CA0910001
SOURCE:		
Name		Folsom Reservoir
Entitlement and Amount		24,500 AF / YR - Folsom Reservoir (Water Entitlement and Contracts - PG&E and USBR)
INTAKE:		
Location and Description		Intake at Folsom Reservoir
Intake Protection Facilities		Fish Screens
WTP:		
Name		El Dorado Hills WTP
Type of Treatment		Conventional WTP
State Approved Plant Capacity (MGD)		12 MGD
Capacity Flow Range (MGD)		2 - 12 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	2 - 3 MGD
	Summer (Apr-Sep)	3 - 9.6 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Title 22
	Treated Water	Title 22
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Cl2 - 2 mg / L
pH Adjustment	Chemical and Dose	Soda Ash 1 - 3 mg / L
Grit Basin	Volume Basin	
Chemical Addition	Chemical, Purpose & Dose	Alum / Polymer - 5.0 mg / L / 1.0 mg / L
Rapid Mix	Volume Basin	Upflow Clarifiers
	Type of Mixing	
	Mixing Energy (G)	
Flocculation	No. of Basins	
	Volume Basin	
	Type of Flocculators	
	Mixing Energy	
Sedimentation	No. of Basins	
	Volume Basin	
	Surface Load Rate	
	Method of Sludge Removal	
Chemical Addition	Chemical, Purpose & Dose	
Filtration	No. of Filters	4
	Type of Filter	Dual Media
	Filter Box Volume	1480 sf total filter area
	Underdrain Type	
	Media: Type, Depth, Area	Anthracite (30") and sand (18")
	Filtration Rate	5 gpm / sf
	Backwash: Criteria, Rate	20 gpm / sf
	Filter -to-Waste Facilities	yes
Washwater Treatment	Volume Basin	150,000 gallons
	Chemical and Dose	
Post-Chlorination	Chemical and Dose	chlorine
Fluoridation	Chemical and Dose	
pH Adjustment	Chemical and Dose	soda ash 2 - 4 mg / L
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG) / Area(AC))	7 MGD
Open Surface Storage	(Volume(MG) / Area(AC))	0
Floating Covers	(Volume(MG) / Area(AC))	0
Disinfection Booster Stations	Number	0
	Range Cl2 Dosing (mg / L)	

American River Watershed Sanitary Survey Update

SOURCE:		
Name		South Fork American River
Entitlement and Amount		15,080 AF/YR - South Fork American River
INTAKE:		
Location and Description		South Fork American at Strawberry
Intake Protection Facilities		Fish Screens
WTP:		
Name		Strawberry WTP
Type of Treatment		Conventional WTP
State Approved Plant Capacity (MGD)		
Capacity Flow Range (MGD)		
Average Daily Flow (MGD)	Winter (Oct-Mar)	100 gpm (6hrs / day)
	Summer (Apr-Sep)	100 gpm (10hrs / day)
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Title 22
	Treated Water	Title 22
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Membrane Filtration Plant
pH Adjustment	Chemical and Dose	
Grit Basin	Volume Basin	
Chemical Addition	Chemical, Purpose & Dose	
Rapid Mix	Volume Basin	
	Type of Mixing	
	Mixing Energy (G)	
Flocculation	No. of Basins	
	Volume Basin	
	Type of Flocculators	
	Mixing Energy	
Sedimentation	No. of Basins	
	Volume Basin	
	Surface Load Rate	
	Method of Sludge Removal	
Chemical Addition	Chemical, Purpose & Dose	
Filtration	No. of Filters	
	Type of Filter	Membrane
	Filter Box Volume	
	Underdrain Type	
	Media: Type, Depth, Area	
	Filtration Rate	100 gpm
	Backwash: Criteria, Rate	Every 40 minutes for 3 minutes
	Filter -to-Waste Facilities	
Washwater Treatment	Volume Basin	
	Chemical and Dose	
Post-Chlorination	Chemical and Dose	Cl2 - 1.4 mg / L
Fluoridation	Chemical and Dose	
pH Adjustment	Chemical and Dose	Soda Ash - 0.5 mg / L
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG) / Area(AC))	0.25 MG
Open Surface Storage	(Volume(MG) / Area(AC))	0
Floating Covers	(Volume(MG) / Area(AC))	0
Disinfection Booster Stations	Number	0
	Range Cl2 Dosing (mg / L)	0
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	Daryl Noel

American River Watershed Sanitary Survey Update

	Other WTP's	
	City / County / State / Federal	

American River Watershed Sanitary Survey Update

WATER SYSTEM:		
Utility Name		City of Folsom
Service Area		Folsom
Number Customers - Retail / Wholesale		10,000 Retail
PWSID No.		CA 3410014
SOURCE:		
Name		Folsom Reservoir
Entitlement and Amount		27,000 AF/YR (Water Rights - Co-Tenancy Agreement with ACWS), 7,000 AF/YR (Pending PL 101-514)
INTAKE:		
Location and Description		Shared Diversion Facilities at Folsom Dam
Intake Protection Facilities		Fish Screens
WTP:		
Name		Folsom Water Treatment Plant
Type of Treatment		Conventional WTP
State Approved Plant Capacity (MGD)		25 MGD
Capacity Flow Range (MGD)		0 - 25 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	10 MGD
	Summer (Apr-Sep)	24 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Title 22
	Treated Water	Title 22
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine Gas (mg/L)
pH Adjustment	Chemical and Dose	Lime
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Alum - Coagulant (mg/L), Polymer-Coagulant (mg/L)
Rapid Mix	Volume Basin	
	Type of Mixing	Pump Injection
	Mixing Energy (G)	750 (1/s)
Flocculation	No. of Basins	4 (3 stages)
	Volume Basin	528,500 Gallons
	Type of Flocculators	Mechanical - Vertical
	Mixing Energy	80,50 (1/s)
Sedimentation	No. of Basins	4
	Volume Basin	1,374,000 Gallons
	Surface Load Rate	1.25 gpm / sf
	Method of Sludge Removal	Mechanical
Chemical Addition	Chemical, Purpose & Dose	Polymer - Filter Aid (mg/L)
Filtration	No. of Filters	4
	Type of Filter	Gravity Sand
	Filter Box Volume	
	Underdrain Type	
	Media: Type, Depth, Area	16" sand, gravel 1760 sf / filter
	Filtration Rate	2.5 gpm / sf
	Backwash: Criteria, Rate	Automatic
	Filter -to-Waste Facilities	Yes
Washwater Treatment	Volume Basin	
	Chemical and Dose	
Post-Chlorination	Chemical and Dose	Chlorine Gas (mg/L)
Fluoridation	Chemical and Dose	NA
pH Adjustment	Chemical and Dose	Lime (mg/L)
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG)/Area(AC))	Steel Tanks: 19.5 MG

American River Watershed Sanitary Survey Update

Open Surface Storage	(Volume(MG) / Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG) / Area(AC))	0 MG / 0 AC
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg / L)	
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	Alex Custodio
	Other WTP's	
	City / County / State / Federal	

American River Watershed Sanitary Survey Update

WATER SYSTEM:		
Utility Name		City of Roseville
Service Area		Roseville
Number Customers - Retail/Wholesale		22,000/0
PWSID No.		CA3110008
SOURCE:		
Name		Folsom Reservoir
Entitlement and Amount		62,000 AF/YR (Contracts - USBR and PCWA)
INTAKE:		
Location and Description		Shared Diversion Facilities at Folsom Dam
Intake Protection Facilities		Fish Screens
WTP:		
Name		Roseville WTP
Type of Treatment		Conventional WTP
State Approved Plant Capacity (MGD)		48 MGD
Operating Flow Range (MGD)		9 - 36 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	10 MGD
	Summer (Apr-Sep)	30 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Title 22
	Treated Water	Title 22
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine (0.2 mg/L)
pH Adjustment	Chemical and Dose	NA
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Alum-Coagulant (10-14 mg/L), Polymer-Coagulant (0.5 mg/L)
Rapid Mix	Volume Basin	NA
	Type of Mixing	Headloss at Inlet Control Valve
	Mixing Energy (G)	Unknown, Variable
Flocculation	No. of Basins	Reactor Chambers in Clarifier
	Volume Basin	NA
	Type of Flocculators	Turbine
	Mixing Energy	
Sedimentation	No. of Basins	3 (Upflow Circular Clarifiers)
	Volume Basin	
	Surface Load Rate	2 gpm / sf
	Method of Sludge Removal	Rotating Rake
Chemical Addition	Chemical, Purpose & Dose	
Filtration	No. of Filters	6
	Type of Filter	Gravity Dual Media
	Filter Box Volume	
	Underdrain Type	Tile
	Media: Type, Depth, Area	1152 sf / filter
	Filtration Rate	4.5 gpm / sf
	Backwash: Criteria, Rate	18.5 gpm / sf
	Filter -to-Waste Facilities	Yes
Washwater Treatment	Volume Basin	2 Sedimentation Basins (340,000 gallons)
	Chemical and Dose	
Post-Chlorination	Chemical and Dose	Chlorine (mg/L)
Fluoridation	Chemical and Dose	Hydrofluosilic Acid (0.8 mg/L)
pH Adjustment	Chemical and Dose	Calcium Hydroxide (mg/L)
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG)/ Area(AC))	12 MG

American River Watershed Sanitary Survey Update

Open Surface Storage	(Volume(MG) / Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG) / Area(AC))	0 MG / 0 AC
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg / L)	
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	Alex Custodio
	Other WTP's	SJWD, PCWA
	City / County / State / Federal	

American River Watershed Sanitary Survey Update

WATER SYSTEM:		
Utility Name		Folsom State Prison
Service Area		Folsom Prison
Number Customers - Retail / Wholesale		
PWSID No.		CA3410032
SOURCE:		
Name		Folsom Reservoir
Entitlement and Amount		4,000 AF / YR
INTAKE:		
Location and Description		Shared Diversion Facilities at Folsom Dam
Intake Protection Facilities		Fish Screens
WTP:		
Name		
Type of Treatment		Package Filtration Plant
State Approved Plant Capacity (MGD)		4 MGD
Capacity Flow Range (MGD)		0 - 4 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	1.3 MGD
	Summer (Apr-Sep)	3.5 MGD
Hours of Operation		5 AM - 12 AM
Water Quality Parameters Monitored	Raw Water	Turbidity, Temperature, pH, Coliform
	Treated Water	Turbidity, Temperature, pH, Coliform
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine (1 mg / L)
pH Adjustment	Chemical and Dose	Lime
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Polymer, Flocc Aid
Rapid Mix	Volume Basin	NA
	Type of Mixing	NA
	Mixing Energy (G)	NA
Flocculation	No. of Basins	NA
	Volume Basin	NA
	Type of Flocculators	NA
	Mixing Energy	NA
Sedimentation	No. of Basins	2
	Volume Basin	Upflow Clarifier
	Surface Load Rate	
	Method of Sludge Removal	
Chemical Addition	Chemical, Purpose & Dose	Polymer, Filter Aid
Filtration	No. of Filters	2
	Type of Filter	Trimedia - Sand, Anthracite, Garnet
	Filter Box Volume	480 CF
	Underdrain Type	
	Media: Type, Depth, Area	Sand, Anthracite, Garnet (4'), 480 sf
	Filtration Rate	
	Backwash: Criteria, Rate	
	Filter -to-Waste Facilities	Yes
Washwater Treatment	Volume Basin	
	Chemical and Dose	
Post-Chlorination	Chemical and Dose	Chlorine (1 mg / L)
Fluoridation	Chemical and Dose	NA
pH Adjustment	Chemical and Dose	Lime
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG) / Area(AC))	2 MG
Open Surface Storage	(Volume(MG) / Area(AC))	0 / 0
Floating Covers	(Volume(MG) / Area(AC))	0 / 0
Disinfection Booster Stations	Number	0

American River Watershed Sanitary Survey Update

	Range Cl2 Dosing (mg /L)	0
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		NA
Notification	DHS	Daryl Noel
	Other WTP's	NA
	City / County / State / Federal	NA

American River Watershed Sanitary Survey Update

WATER SYSTEM:		
Utility Name		San Juan Water District
Service Area		Citrus Heights, Fair Oaks, Folsom, Granite Bay, Orangevale
Number Customers - Retail / Wholesale		21,000 - Retail / 125,426 - Wholesale
PWSID No.		CA 3410021
SOURCE:		
Name		Folsom Reservoir
Entitlement and Amount		69,200 AF/YR (Water Rights and Contracts - USBR and PCWA)
INTAKE:		
Location and Description		Shared Diversion Facilities at Folsom Dam
Intake Protection Facilities		Fish Screens
WTP:		
Name		Sidney N. Peterson WTP
Type of Treatment		Conventional WTP
State Approved Plant Capacity (MGD)		120 MGD
Capacity Flow Range (MGD)		20-120 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	30 MGD
	Summer (Apr-Sep)	80 MGD
Hours of Operation		24 hours
Water Quality Parameters Monitored	Raw Water	Title 22, ICR, MTBE
	Treated Water	Title 22, ICR
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine Gas (1.5 mg /L)
pH Adjustment	Chemical and Dose	NA
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Alum-Coagulant (10 mg /L), Polymer-Coagulant (0.1 mg /L)
Rapid Mix	Volume Basin	56,818 gallons
	Type of Mixing	Mechanical
	Mixing Energy (G)	300 (1 /s)
Flocculation	No. of Basins	2 - (3 stages)
	Volume Basin	1.435 MG
	Type of Flocculators	Mechanical - Horizontal
	Mixing Energy	75,55,20 (1 /s)
Sedimentation	No. of Basins	2
	Volume Basin	3.555 MG
	Surface Load Rate	
	Method of Sludge Removal	Vacuum
Chemical Addition	Chemical, Purpose & Dose	Polymer-Filter Aid (0.1 mg /L)
Filtration	No. of Filters	
	Type of Filter	Gravity Dual Media
	Filter Box Volume	1.5 MG
	Underdrain Type	
	Media: Type, Depth, Area	Sand- inches, Anthracite- inches, Gravel- inches 15,360 sf total
	Filtration Rate	
	Backwash: Criteria,Rate	
	Filter -to-Waste Facilities	NO
Washwater Treatment	Volume Basin	Sedimentation Basin, MG
	Chemical and Dose	NA
Post-Chlorination	Chemical and Dose	Chlorine Gas (0.5 -1.0mg /L)
Fluoridation	Chemical and Dose	NA
pH Adjustment	Chemical and Dose	Calcium Hydroxide (8.75 mg /L)
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG) / Area(AC))	66.5 MG / 14 AC

American River Watershed Sanitary Survey Update

Open Surface Storage	(Volume(MG) / Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG) / Area(AC))	60 MG / 12 AC
Disinfection Booster Stations	Number	0
	Range Cl2 Dosing (mg / L)	0
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	Dave Zacaro
	Other WTP's	
	City / County / State / Federal	

American River Watershed Sanitary Survey Update

WATER SYSTEM:		
Utility Name		Arden Cordova Water Service
Service Area		Rancho Cordova
Number Customers - Retail / Wholesale		
PWSID No.		CA3410003
SOURCE:		
Name		Folsom South Canal / American River Diversion
Entitlement and Amount		32,000 AF/YR (Water Rights - Co-Tenancy Agreement with City of Folsom)
INTAKE:		
Location and Description		Intake Facilities on Folsom South Canal
Intake Protection Facilities		Fish Screens
WTP:		
Name		Coloma WTP
Type of Treatment		Direct WTP (Conventional only under low flow conditions)
State Approved Plant Capacity (MGD)		7 MGD
Capacity Flow Range (MGD)		0 - 7
Average Daily Flow (MGD)	Winter (Oct-Mar)	Not Operating
	Summer (Apr-Sep)	4.5 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Title 22
	Treated Water	Title 22
UNIT PROCESSES:		
Pre-Treatment	Chemical and Dose	Potassium Permanganate
pH Adjustment	Chemical and Dose	
Grit Basin	Volume Basin	
Chemical Addition	Chemical, Purpose & Dose	Cationic Polymer-Coagulant (3-4 mg/L)
Rapid Mix	Volume Basin	
	Type of Mixing	Hydraulic (Mixers under low flow conditions)
	Mixing Energy (G)	
Flocculation	No. of Basins	2
	Volume Basin	83,769 gallons (total)
	Type of Flocculators	Horizontal paddle
	Mixing Energy	Low
Sedimentation	No. of Basins	2
	Volume Basin	295,243 gallons (total)
	Surface Load Rate	Basin 1 - 0.86 gpm /sf, Basin 2 - 1.18 gpm /sf
	Method of Sludge Removal	Manual
Chemical Addition	Chemical, Purpose & Dose	Nonionic Polymer-Filter Aid (0.5 - 2 mg/L)
Filtration	No. of Filters	7
	Type of Filter	Dual Media Rapid Sand Pressure Filters Constant Rate Control
	Filter Box Volume	100,000 gallons
	Underdrain Type	Pipe with Laterals
	Media: Type, Depth, Area	Anthracite (18"), Sand (12"), Pea Gravel (6"), Rock (18") Total Area = 1680 sf
	Filtration Rate	3 gpm /sf
	Backwash: Criteria, Rate	Turbidity >0.25; 15 gpm /sf
	Filter -to-Waste Facilities	Yes
Washwater Treatment	Volume Basin	
	Chemical and Dose	
Post-Chlorination	Chemical and Dose	Chlorine Gas (1-3 mg/L)
Fluoridation	Chemical and Dose	
pH Adjustment	Chemical and Dose	
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG)/ Area(AC))	

American River Watershed Sanitary Survey Update

Open Surface Storage	(Volume(MG)/ Area(AC))	
Floating Covers	(Volume(MG)/ Area(AC))	
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg /L)	
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	Dave Lancaster
	Other WTP's	
	City / County / State / Federal	

American River Watershed Sanitary Survey Update

WATER SYSTEM:		
Utility Name		Arcade Water District
Service Area		Town and Country / County of Sacramento
Number Customers- Retail / Wholesale		71,000 - Retail
PWSID No.		CA3410001
SOURCE:		
Name		Lower American River
Entitlement and Amount		26,064 AF / YR (Water Entitlement and Contract- City of Sacramento)
INTAKE:		
Location and Description		American River Well System at Harrington Park in Sacramento
Intake Protection Facilities		NA
WTP:		
Name		American River Well Field
Type of Treatment		Infiltration Wells with Chlorination
Original Design Capacity (MGD)		10 MGD
Current Capacity Flow Range (MGD)		0 - 2.4 MGD
Average Daily Flow (MGD)	Winter (Nov-Mar)	Off-Line
	Summer (Apr-Oct)	1.0 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Coliforms, Temperature, pH, turbidity, <i>Giardia</i> , <i>Cryptosporidium</i> , MPA, Particle Counts
	Treated Water	Coliforms, Temperature, pH, turbidity, <i>Giardia</i> , <i>Cryptosporidium</i> , MPA, Particle Counts, Chlorine Residual
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	NA
pH Adjustment	Chemical and Dose	NA
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	NA
Rapid Mix	Volume Basin	NA
	Type of Mixing	NA
	Mixing Energy (G)	NA
Flocculation	No. of Basins	NA
	Volume Basin	NA
	Type of Flocculators	NA
	Mixing Energy	NA
Sedimentation	No. of Basins	NA
	Volume Basin	NA
	Surface Load Rate	NA
	Method of Sludge Removal	NA
Chemical Addition	Chemical, Purpose & Dose	NA
Filtration	No. of Filters	NA
	Type of Filter	NA
	Filter Box Volume	NA
	Underdrain Type	NA
	Media: Type, Depth, Area	NA
	Filtration Rate	NA
	Backwash: Criteria,Rate	NA
	Filter -to-Waste Facilities	NA
Washwater Treatment	Volume Basin	NA
	Chemical and Dose	NA
Post-Chlorination	Chemical and Dose	Chlorine Gas (0 - 6 mg / L)
Fluoridation	Chemical and Dose	NA
pH Adjustment	Chemical and Dose	NA
DISTRIBUTION SYSTEM:		

American River Watershed Sanitary Survey Update

Covered Storage	(Volume(MG)/ Area(AC))	0 MG / 0 AC
Open Surface Storage	(Volume(MG)/ Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG)/ Area(AC))	0 MG / 0 AC
Disinfection Booster Stations	Number	0
	Range Cl2 Dosing (mg /L)	NA
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		Regular During Operating Season
Notification	DHS	Dave Lancaster
	Other WTP's	NA
	City / County / State / Federal	NA

American River Watershed Sanitary Survey Update

WATER SYSTEM:		
Utility Name		Carmichael Water District
Service Area		Carmichael
Number Customers - Retail / Wholesale		38,500 Population / Retail
PWSID No.		CA3410004
SOURCE:		
Name		Lower American River
Entitlement and Amount		32,600 AF/YR (Water Rights)
INTAKE:		
Location and Description		Ranney Collectors at Rossmoor Bar
Intake Protection Facilities		Ranney Collector Subsurface Laterals
WTP:		
Name		NA
Type of Treatment		Ranney Collectors with Chlorination
State Approved Plant Capacity (MGD)		NA
Capacity Flow Range (MGD)		0 - 22 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	Off-Line
	Summer (Apr-Sep)	10 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Title 22, <i>Giardia</i> , <i>Cryptosporidium</i>
	Treated Water	Title 22
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	NA
pH Adjustment	Chemical and Dose	NA
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	NA
Rapid Mix	Volume Basin	NA
	Type of Mixing	NA
	Mixing Energy (G)	NA
Flocculation	No. of Basins	NA
	Volume Basin	NA
	Type of Flocculators	NA
	Mixing Energy	NA
Sedimentation	No. of Basins	NA
	Volume Basin	NA
	Surface Load Rate	NA
	Method of Sludge Removal	NA
Chemical Addition	Chemical, Purpose & Dose	NA
Filtration	No. of Filters	NA
	Type of Filter	NA
	Filter Box Volume	NA
	Underdrain Type	NA
	Media: Type, Depth, Area	NA
	Filtration Rate	NA
	Backwash: Criteria,Rate	NA
	Filter -to-Waste Facilities	NA
Washwater Treatment	Volume Basin	NA
	Chemical and Dose	NA
Post-Chlorination	Chemical and Dose	Chlorine Gas (0-6 mg/L)
Fluoridation	Chemical and Dose	NA
pH Adjustment	Chemical and Dose	Caustic Soda (2-5 mg/L)
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG)/ Area(AC))	4 MG / 1 AC
Open Surface Storage	(Volume(MG)/ Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG)/ Area(AC))	0 MG / 0 AC

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Disinfection Booster Stations	Number	0
	Range Cl2 Dosing (mg/L)	NA
EMERGENCY RESPONSE TO WATERSHED DISASTERS:		
Inspection / Surveillance		
Notification	DHS	
	Other WTP's	
	City / County / State / Federal	

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WATER SYSTEM:		
Utility Name		City of Sacramento
Service Area		Sacramento
Number Customers - Retail/Wholesale		164,873 - Retail
PWSID No.		CA 3410020
SOURCE:		
Name		Lower American River
Entitlement and Amount		225,000 AF/YR (Water Rights and Contracts - USBR)
INTAKE:		
Location and Description		Pier Style Intake Structure near Howe Avenue
Intake Protection Facilities		Fish Screens
WTP:		
Name		E. A. Fairbairn WTP
Type of Treatment		Conventional WTP
State Approved Plant Capacity (MGD)		100 MGD
Capacity Flow Range (MGD)		30-100 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	37 MGD
	Summer (Apr-Sep)	48 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Title 22, ICR
	Treated Water	Title 22, ICR
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine Gas (1.5-2.5 mg/L)
pH Adjustment	Chemical and Dose	NA
Grit Basin	Volume Basin	0.292 MG
Chemical Addition	Chemical, Purpose & Dose	Alum-Coagulant (9.5 mg/L)
Rapid Mix	Volume Basin	650 gallons
	Type of Mixing	Pump Injection
	Mixing Energy (G)	750 (1/s)
Flocculation	No. of Basins	2 (3 stages)
	Volume Basin	1.5 MG
	Type of Flocculators	Mechanical - Horizontal
	Mixing Energy	20,20,20 (1/s)
Sedimentation	No. of Basins	2
	Volume Basin	6.074 MG
	Surface Load Rate	1.24 gpm/sf
	Method of Sludge Removal	Chain and Flight, Manual Removal
Chemical Addition	Chemical, Purpose & Dose	Polymer-Filter Aid (0.03 mg/L)
Filtration	No. of Filters	8
	Type of Filter	Gravity Tri Media
	Filter Box Volume	0.33 MG
	Underdrain Type	Concrete Teepee
	Media: Type, Depth, Area	Anthracite- 12 inches, Sand 10 inches, Garnet- 2 inches, Gravel- inches 1742 sf / filter
	Filtration Rate	5.7 gpm/sf @ 100MGD
	Backwash: Criteria,Rate	Turbidity, headloss, hours 18 gpm/sf
	Filter -to-Waste Facilities	NO
Washwater Treatment	Volume Basin	NA
	Chemical and Dose	NA
Post-Chlorination	Chemical and Dose	Chlorine Gas (0.2-0.5 mg/L)
Flouridation	Chemical and Dose	NA
pH Adjustment	Chemical and Dose	Calcium Oxide (7.5 mg/L)
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG)/ Area(AC))	36 MG /

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Open Surface Storage	(Volume(MG) / Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG) / Area(AC))	0 MG / 0 AC
Disinfection Booster Stations	Number	1
	Range Cl2 Dosing (mg / L)	0.4 - 0.6 mg / L
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	Dave Lancaster
	Other WTP's	
	City / County / State / Federal	

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WATER SYSTEM:		
Utility Name		East Bay Municipal Utility District
Service Area		San Francisco East Bay Area
Number Customers - Retail / Wholesale		
PWSID No.		CA01-0005
SOURCE:		
Name		Lower American River
Entitlement and Amount		150,000 AF/YR (Contract - USBR)
INTAKE:		
Location and Description		Undetermined
Intake Protection Facilities		Fish Screens
WTP:		
Name		Lafayette
Type of Treatment		In-Line Filtration
State Approved Plant Capacity (MGD)		35 MGD
Capacity Flow Range (MGD)		8 - 35 MGD
Average Daily Flow (MGD)	Winter (Nov - Apr)	Not Operating
	Summer (May - Oct)	15 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Mokelumne Source Only
	Treated Water	Mokelumne Source Only
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine
pH Adjustment	Chemical and Dose	Calcium Hydroxide
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Sodium Hypochlorite-Disinfectant(0.5-1.0mg /L), Alum Coagulant(1.2-3.5mg /L), Polymer-Coagulant(1.2-3.2mg /L)
Rapid Mix	Volume Basin	NA
	Type of Mixing	Hydromixing (Water Jet)
	Mixing Energy (G)	942-1015 (1/ s)
Flocculation	No. of Basins	NA
	Volume Basin	NA
	Type of Flocculators	NA
	Mixing Energy	NA
Sedimentation	No. of Basins	NA
	Volume Basin	NA
	Surface Load Rate	NA
	Method of Sludge Removal	NA
Chemical Addition	Chemical, Purpose & Dose	NA
Filtration	No. of Filters	8
	Type of Filter	Gravity Rapid Sand
	Filter Box Volume	0.7 MG
	Underdrain Type	#1-4: Red Brass Pipe, #5-8: Wheeler Bottom
	Media: Type, Depth, Area	Sand-24 inches, Anthracite-1-4 inches, Gravel-26 inches #1-4:1200sf, #5-8:1240 sf
	Filtration Rate	3 gpm / sf
	Backwash: Criteria,Rate	6' headloss, 72 hr run, >0.10 NTU, 28"rise/ min.
	Filter -to-Waste Facilities	Yes
Washwater Treatment	Volume Basin	Equalization Basin 200,000 gallons
	Chemical and Dose	Polymer-Treatment Aid(0.03-0.4mg /L)
Post-Chlorination	Chemical and Dose	Sodium Hypochlorite (0.5-1.5 mg /L)
Flouridation	Chemical and Dose	Hydrofluorosilic Acid (0.7-1.2 mg /L)
pH Adjustment	Chemical and Dose	Sodium Hydroxide (2.0-5.0 mg /L)
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG)/ Area(AC))	
Open Surface Storage	(Volume(MG)/ Area(AC))	0 MG / 0 AC

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Floating Covers	(Volume(MG)/ Area(AC))	0 MG / 0 AC
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg/L)	
WTP:		
Name		Orinda
Type of Treatment		In-Line Filtration
State Approved Plant Capacity (MGD)		175 MGD
Capacity Flow Range (MGD)		80 - 175 MGD
Average Daily Flow (MGD)	Winter (Oct-Mar)	96 MGD
	Summer (Apr-Sep)	95 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Mokelumne Source Only
	Treated Water	Mokelumne Source Only
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine
pH Adjustment	Chemical and Dose	Calcium Hydroxide
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Sodium Hypochlorite-Disinfectant(0.45-0.75mg/L), Alum-Coagulant(1.2-3.6mg/L), Polymer-Coagulant(1.2-5.0mg/L)
Rapid Mix	Volume Basin	NA
	Type of Mixing	Hydromixing (Water Jet)
	Mixing Energy (G)	NA
Flocculation	No. of Basins	NA
	Volume Basin	NA
	Type of Flocculators	NA
	Mixing Energy	NA
Sedimentation	No. of Basins	NA
	Volume Basin	NA
	Surface Load Rate	NA
	Method of Sludge Removal	NA
Chemical Addition	Chemical, Purpose & Dose	NA
Filtration	No. of Filters	20
	Type of Filter	Gravity Dual Media
	Filter Box Volume	1.6 MG
	Underdrain Type	Leopold-Plastic Block Underdrain
	Media: Type, Depth, Area	Sand-12 inches, Anthracite-24 inches, IMS Cap 1220 sf
	Filtration Rate	6 gpm / sf
	Backwash: Criteria,Rate	24-72 hours, 3.5 minutes @6gpm / sf then 4 minutes @18 gpm / sf
	Filter -to-Waste Facilities	Yes
Washwater Treatment	Volume Basin	Settling Basin - 3.0 MG
	Chemical and Dose	Sulfur dioxide-dechlorination (0.09-0.35 mg/L)
Post-Chlorination	Chemical and Dose	Sodium Hypochlorite (0.3-0.6 mg/L)
Flouridation	Chemical and Dose	Hydrofluorosilic Acid (0.7-1.2 mg/L)
pH Adjustment	Chemical and Dose	Calcium Hydroxide (2.0-5.0 mg/L)
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG)/ Area(AC))	
Open Surface Storage	(Volume(MG)/ Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG)/ Area(AC))	0 MG / 0 AC
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg/L)	
WTP:		
Name		Walnut Creek
Type of Treatment		In-Line Filtration
State Approved Plant Capacity (MGD)		80 MGD
Capacity Flow Range (MGD)		10 - 60 MGD

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Average Daily Flow (MGD)	Winter (Oct-Mar)	25 MGD
	Summer (Apr-Sep)	47 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Mokelumne Source Only
	Treated Water	Mokelumne Source Only
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine
pH Adjustment	Chemical and Dose	Calcium Hydroxide
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Sodium Hypochlorite-Disinfectant(0.45-0.6mg / L), PAC Coagulant(1.2-10.0mg / L), Polymer-Coagulant(0.5-3.0mg / L)
Rapid Mix	Volume Basin	NA
	Type of Mixing	Mechanical Mixer
	Mixing Energy (G)	66, 187, 344 (1/ s)
Flocculation	No. of Basins	NA
	Volume Basin	NA
	Type of Flocculators	NA
	Mixing Energy	NA
Sedimentation	No. of Basins	NA
	Volume Basin	NA
	Surface Load Rate	NA
	Method of Sludge Removal	NA
Chemical Addition	Chemical, Purpose & Dose	NA
Filtration	No. of Filters	4
	Type of Filter	Gravity Dual Media
	Filter Box Volume	0.97 MG
	Underdrain Type	Wheeler Bottom
	Media: Type, Depth, Area	Sand-15 inches, Anthracite-18 inches,Gravel-17 inches 2304 sf
	Filtration Rate	6 gpm / sf
	Backwash: Criteria,Rate	6'head loss, 72 hour run, >0.1 NTU 25" rise / min
	Filter -to-Waste Facilities	Yes
Washwater Treatment	Volume Basin	Settling Basin - 1.0 MG
	Chemical and Dose	Polymer-Treatment Aid(0.05-0.5mg / L)
Post-Chlorination	Chemical and Dose	Sodium Hypochlorite (0.45-0.75 mg / L)
Flouridation	Chemical and Dose	Hydrofluorosilic Acid (0.7-1.2 mg / L)
pH Adjustment	Chemical and Dose	Calcium Hydroxide (2.5 - 5.0 mg / L)
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG) / Area(AC))	
Open Surface Storage	(Volume(MG) / Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG) / Area(AC))	0 MG / 0 AC
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg / L)	
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	
	Other WTP's	
	City / County / State / Federal	
WTP:		
Name		Upper San Leandro
Type of Treatment		Conventional
State Approved Plant Capacity (MGD)		65 MGD

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Capacity Flow Range (MGD)		0 - 55 MGD
Average Daily Flow (MGD)		20 MGD
Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	Upper San Leandro Reservoir / Mokelumne Blend
	Treated Water	Upper San Leandro Reservoir / Mokelumne Blend
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine
pH Adjustment	Chemical and Dose	Caustic Soda
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Sodium Hypochlorite-Disinfectant, Alum-Coagulant, Polymer-Coagulant and treatment aid
Rapid Mix	Volume Basin	NA
	Type of Mixing	Hydromixing (Water Jet)
	Mixing Energy (G)	NA
Flocculation	No. of Basins	2 - 4 stage basins
	Volume Basin	0.92 MG
	Type of Flocculators	Horizontal paddle - variable speed
	Mixing Energy	56/30/12/9 G
Sedimentation	No. of Basins	2
	Volume Basin	3.6 MG
	Surface Load Rate	1.6 gpm / sf
	Method of Sludge Removal	Trac-Vac System
Chemical Addition	Chemical, Purpose & Dose	NA
Filtration	No. of Filters	16
	Type of Filter	Gravity Dual Media
	Filter Box Volume	NA
	Underdrain Type	(1) Leopold, (5) Egg Crate, and (10) Wheeler Bottom Sand-19 inches, GAC-7 inches, Gravel-16 inches
	Media: Type, Depth, Area	1200 / 1250 sf
	Filtration Rate	3.8 gpm / sf
	Backwash: Criteria, Rate	8' head loss, 120 hour run, >0.1 NTU 32" rise / min
	Filter -to-Waste Facilities	Yes
Washwater Treatment	Volume Basin	Settling Basin - 0.4 MG
	Chemical and Dose	NA
Post-Chlorination	Chemical and Dose	Chloramination
Flouridation	Chemical and Dose	Hydrofluorosilic Acid
pH Adjustment	Chemical and Dose	Caustic Soda
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG) / Area(AC))	
Open Surface Storage	(Volume(MG) / Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG) / Area(AC))	0 MG / 0 AC
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg / L)	
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	
	Other WTP's	
	City / County / State / Federal	
WTP:		
Name		Sobrante
Type of Treatment		Conventional
State Approved Plant Capacity (MGD)		60 MGD
Capacity Flow Range (MGD)		0 - 60 MGD
Average Daily Flow (MGD)		27 MGD

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Hours of Operation		0 or 24 hours
Water Quality Parameters Monitored	Raw Water	San Pablo Reservoir / Mokelumne Blend
	Treated Water	San Pablo Reservoir / Mokelumne Blend
UNIT PROCESSES:		
Pre-Chlorination	Chemical and Dose	Chlorine
pH Adjustment	Chemical and Dose	Caustic Soda
Grit Basin	Volume Basin	NA
Chemical Addition	Chemical, Purpose & Dose	Sodium Hypochlorite-Disinfectant, Alum -Coagulant, Polymer-Coagulant and treatment aid
Rapid Mix	Volume Basin	NA
	Type of Mixing	Polyjet (water jet)
	Mixing Energy (G)	NA
Flocculation	No. of Basins	2 - 4 stage basins
	Volume Basin	1.068 MG
	Type of Flocculators	Paddle Wheel
	Mixing Energy	49 / 29 / 7 / 11 G
Sedimentation	No. of Basins	2
	Volume Basin	3.2 MG
	Surface Load Rate	2.1 gpm / sf
	Method of Sludge Removal	Trac-Vac System
Chemical Addition	Chemical, Purpose & Dose	NA
Filtration	No. of Filters	4
	Type of Filter	Gravity Dual Media
	Filter Box Volume	1.1 MG
	Underdrain Type	Wheeler Bottom
	Media: Type, Depth, Area	Sand-22 inches, GAC-8 inches, Gravel-16 inches 2304 sf
	Filtration Rate	4.5 gpm / sf
	Backwash: Criteria, Rate	8' head loss, 120 hour run, >0.1 NTU 32" rise / min
	Filter -to-Waste Facilities	Yes
Washwater Treatment	Volume Basin	Settling Basin - 1.0 MG
	Chemical and Dose	NA
Post-Chlorination	Chemical and Dose	Chloramination
Flouridation	Chemical and Dose	Hydrofluorosilic Acid
pH Adjustment	Chemical and Dose	Caustic Soda
DISTRIBUTION SYSTEM:		
Covered Storage	(Volume(MG) / Area(AC))	
Open Surface Storage	(Volume(MG) / Area(AC))	0 MG / 0 AC
Floating Covers	(Volume(MG) / Area(AC))	0 MG / 0 AC
Disinfection Booster Stations	Number	
	Range Cl2 Dosing (mg / L)	
EMERGENCY RESPONSE TO WATERSHED DISASTERS		
Inspection / Surveillance		
Notification	DHS	
	Other WTP's	
	City / County / State / Federal	

Appendix D: Drinking Water Quality Regulations

BACKGROUND

The Safe Drinking Water Act (SDWA) was enacted by the United States Congress and signed into law by the President in 1974. Through the SDWA, the federal government gave the United States Environmental Protection Agency (EPA) the authority to set standards for contaminants in drinking water supplies in the United States. The EPA was required to establish primary regulations for the control of contaminants that affect public health and secondary regulations for compounds that affect the taste or aesthetics of drinking water. The SDWA required the EPA to establish interim regulations and then establish revised final regulations following a review of occurrence and toxicological data.

In 1975 the first series of National Interim Primary Drinking Water Regulations (NIPDWR) were established. However, progress in establishing new regulations for contaminants in drinking water in response to the SDWA was slow. As a result, extensive Amendments to the SDWA were signed into law in 1986.

The 1986 Amendments to the SDWA identified a list of 83 contaminants to be regulated by the EPA. The Amendments also included a strict schedule for promulgation of regulations for the listed contaminants. For each contaminant, the EPA was required to establish a maximum contaminant level (MCL) or a treatment technique (TT) to limit the level of these compounds in drinking waters. EPA was also required to recommend a Best Available Technology (BAT) for removal of each contaminant during treatment. The 1986 Amendments required the EPA to regulate the 83 contaminants within 3 years of promulgation and 25 additional contaminants every three years thereafter.

The first step taken by the EPA to establish MCLs is to determine a maximum contaminant level goal (MCLG) for the target compound. The MCLG represents the concentration at which no known or anticipated adverse health effects occur, including an adequate margin of safety. MCLGs are established without consideration of analytical, treatability or economic issues. The MCLs are then set as close to the MCLG as is technically and economically feasible. In some cases, EPA has regulated contaminants by establishing a TT in lieu of an MCL.

The SDWA was reauthorized in August 1996. Again, substantial Amendments were passed to radically revise the law. The Amendments were developed to provide more flexibility, more state responsibility and more cooperative approaches. The law changes the standard setting procedure for drinking water and establishes a State Revolving Loan Fund (SRLF) to help public water systems to improve their facilities and ensure compliance with drinking water regulations.

The 1996 Amendments eliminated the requirement to establish 25 standards every three years. On February 6, 1998, the EPA developed a list of chemical and microbial contaminants for possible future regulation. The list of candidate contaminants is shown in **Table 1**. These contaminants are known to occur in public water systems and may require regulation. Within 5 years of enactment of the 1996 Amendments (and every 5 years thereafter) the EPA will select five contaminants from the list and determine to regulate. Many of these constituents need additional occurrence data and will probably be required monitoring under the Unregulated Contaminant Monitoring Regulation. The regulations will be determined based on risk assessment and cost-benefit considerations and on minimizing overall risk. Regulations must be based on best available, peer reviewed science and data from best available methods.

Once a contaminant is determined to need regulation, the standard shall be promulgated within 18 months of the determination. The standard will take effect three years later. For each new regulation, the EPA is required to identify affordable technologies that will achieve compliance for small systems.

Under the provisions of the SDWA, the California Department of Health Services (DHS) has the primary enforcement responsibility (referred to as “primacy”). The Health and Safety Code of the California Administrative Code establishes DHS authority and stipulates drinking water quality and monitoring standards. To maintain primacy a state’s drinking water regulations can be no less stringent than the federal standards (a state’s regulations can be more stringent).

CURRENT REGULATIONS

The most significant recent regulations finalized are shown below in **Table 2**.

Table 2
Current Federal Regulations

Regulation	Targeted Contaminants
NIPDWR ^a	Health Contaminants
Phase I Standards	VOCs
Phase II Standards	VOCs, SOCs and IOCs
Phase V Standards	VOCs, SOCs and IOCs
NPDWR-Radioactivity	Radionuclides
NPDWR-THM Regulation	Trihalomethanes
Surface Water Treatment Rule	Microbiological and Turbidity
Total Coliform Rule	Microbiological
Lead and Copper Rule	Corrosion By-Products
Information Collection Rule	Microbiological and D / DBP

Table 1
Drinking Water Candidate Contaminant List

Chemical Contaminants	
1,1,2,2-tetrachloroethane	Disulfoton ^a
1,2,4-trimethylbenzene	Diuron ^a
1,1-dichloroethane	EPTC (s-ethyl-dipropylthiocarbamate) ^a
1,1-dichloropropene ^b	Fonofos ^{a,b}
1,2-diphenylhydrazine ^{a,b}	Hexachlorobutadiene
1,3-dichloropropane ^b	p-isopropyltoluene
1,3-dichloropropene (telone or 1,3-D)	Linuron ^a
2,4,6-trichlorophenol ^{a,b}	Manganese
2,2-dichloro-propane	Methyl bromide ^b
2,4-dichlorophenol ^{a,b}	Methyl-tert-butyl-ether (MTBE) ^{a,b}
2,4-dinitrophenol ^{a,b}	Metolachlor
2,4-dinitrotoluene ^a	Metribuzin
2,6-dinitrotoluene ^a	Molinate ^a
2-methyl-phenol (o-cresol) ^{a,b}	Naphthalene
Acetochlor ^{a,b}	Nitrobenzene ^a
Alachlor ESA (a degradation product of alachlor) ^{a,b}	Organotins
Aldrin	Perchlorate ^{a,b}
Aluminum ^b	Prometon ^a
Boron	RDX ^{a,b}
Bromobenzene	Sodium ^b
DCPA mono-acid degradate ^{a,b}	Sulfate
DCPA di-acid degradate ^{a,b}	Terbacil ^a
DDE ^a	Terbufos ^a
Diazinon ^a	Triazines and degradation products
Dieldrin	Vanadium
Microbiological Contaminants	
Acanthamoeba	
Adenoviruses ^{a,b}	
Aeromonas hydrophila ^{a,b}	
Caliciviruses ^{a,b}	
Coxsackieviruses ^{a,b}	
Cyanobacteria ^{a,b}	
Echoviruses ^{a,b}	
Helicobacter pylori ^{a,b}	
Microsporidia (Enterocytozoon & Septata) ^{a,b}	
Mycobacterium avium intracellulare complex (MAC) ^b	

^a Additional Occurrence Data Required Prior to Regulatory Determination, May Be Monitored in Unregulated Contaminant Monitoring Regulation

^b Additional Health, Treatment or Analytical Method Research Required Prior to Regulatory Determination

Table 3 contains a summary of each of the contaminants currently regulated in drinking water by both the EPA and the DHS. The table identifies the Federal Regulation and the MCL or the TT associated with each of the contaminants listed in the Table. The State of California is required to adopt State regulations that meet or exceed the Federal regulations. To date, DHS has established regulations for several drinking water contaminants that are not currently regulated by the Federal EPA. The State has also established MCLs for several contaminants at levels below the Federal MCLs.

The following is a general discussion of the requirements of each of the regulations (identified above in **Table 2**).

NIPDWR

Prior to the establishment of the EPA, the US Public Health Service had established 22 drinking water standards. These standards were adopted by the EPA as National Interim Primary Drinking Water Regulations (NIPDWR) by the SDWA. These contaminants have been updated or replaced by subsequent regulations.

Phase I Regulations

The Phase I Regulations were finalized in July 1987 and compliance for large utilities was required by January 1989. The Phase I Regulations included MCLs for eight VOCs and required utilities to collect quarterly samples from each source water supply for one year. After one year, utilities could qualify for reduced monitoring based on the first year monitoring results (one sample every three years). The Phase I Regulations also included monitoring requirements for unregulated contaminants. All systems were required to monitor for a minimum of 34 unregulated volatile organic contaminants; 2 additional contaminants if the system is determined vulnerable; and 15 additional contaminants at the State's discretion.

Phase II Regulations

The Phase II Regulations were proposed in May 1989 and finalized in July 1991. Monitoring under the Phase II Regulations was required to begin in January 1993. The Phase II Regulations established MCLs for 38 contaminants (7 IOCs, 10 VOCs, and 19 SOCs, plus nitrate, nitrite, and total nitrate and nitrite) and TT requirements for two additional treatment additives (polymers). In order to simplify the increasing number of monitoring requirements, the Standardized Monitoring Framework (SMF) was developed. The SMF is based on a 9 year cycle divided into three, three-year monitoring periods. Under the new monitoring schedule, initial monitoring, baseline monitoring, reduced monitoring, and increased monitoring requirements were established.

Table 3
Summary of Contaminants
Currently Regulated by EPA and DHS

Classification	Contaminant	Regulation	MCL (mg/L)
Inorganics (Section 64432)			
	Aluminum	DHS	1
	Antimony	Phase V	0.006
	Arsenic	NPDWR	0.05
	Barium	DHS/Phase II	1.0/2.0
	Beryllium	Phase V	0.004
	Boron	DHS	1.0**
	Cadmium	Phase II	0.005
	Chromium	DHS/Phase II	0.05/0.1
	Copper	LCR	1.3**
	Cyanide	Phase V	0.2
	Fluoride	DHS/NPDWR	2.0/4.0
	Lead	LCR	0.015**
	Mercury	Phase II	0.002
	Nickel	Phase V	0.1****
	Perchlorate	DHS	0.018**
	Selenium	Phase II	0.05
	Thalium	Phase V	0.002
Nitrate, Nitrite (Section 64432.1)			
	Nitrate	Phase II	10 as N (45 as NO3)
	Nitrite	Phase II	1 as N
Asbestos (Section 64432.2)			
	Asbestos	Phase II	7 MFL (>10um)
Secondary Standards (Section 64449, Table 64449-A)			
	Aluminum	DHS	0.2
	Color	DHS	15 Units
	Copper	LCR	1
	Corrosivity	DHS	non-corrosive
	Foaming Agents	DHS	0.5
	Iron	DHS	0.3
	Manganese	DHS	0.05
	Odor-Threshold	DHS	3 Units
	Silver	DHS	0.1
	Thiobencarb	DHS	0.001
	Turbidity	SWTR	0.5/5 NTU
	Zinc	DHS	5

Table 3
Summary of Contaminants
Currently Regulated by EPA and DHS

Classification	Contaminant	Regulation	MCL (mg/L)
Secondary Standards (Section 64449, Table 64449-B)			
	Total Dissolved Solids	DHS	500/1,000/1,500***
	Specific Conductance	DHS	900/1,600/2,200***
	Chloride	DHS	250/500/600***
	Sulfate	DHS	250/500/600***
General Mineral (Section 64449 (c) (2))			
	Bicarbonate	DHS	MO
	Carbonate	DHS	MO
	Hydroxide	DHS	MO
	Alkalinity	DHS	MO
	pH	DHS	MO
	Calcium	DHS	MO
	Magnesium	DHS	MO
	Sodium	DHS	MO
	Hardness	DHS	MO
(Volatile) Organic Chemicals (Section 64444, Table 64444-A (a))			
	Benzene	DHS/Phase I	0.001/0.005
	Carbon Tetrachloride	DHS/Phase I	0.0005/0.005
	o-Dichlorobenzene	Phase II	0.6
	p-Dichlorobenzene	DHS/Phase I	0.005/0.0785
	1,1-Dichloroethane	DHS	0.005
	1,2-Dichloroethane	DHS/Phase I	0.0005/0.005
	1,1-Dichloroethylene	DHS/Phase I	0.006/0.007
	cis-1,2-Dichloroethylene	DHS/Phase II	0.006/0.1
	trans-1,2-Dichloroethylene	DHS/Phase II	0.010/0.1
	Dichloromethane (Methylene chloride)	Phase V	0.005
	1,2-Dichloropropane	Phase II	0.005
	1,3-Dichloropropene	DHS	0.0005
	Ethylbenzene	Phase II	0.7
	Monochlorobenzene	DHS/Phase II	0.07/0.1
	Styrene	Phase II	0.1
	1,1,2,2-Tetrachloroethane	DHS	0.001
	Tetrachloroethylene	Phase II	0.005
	Toluene	DHS/Phase II	0.15/1.0
	1,2,4-Trichlorobenzene	Phase V	0.07
	1,1,1-Trichloroethane	Phase I	0.2
	1,1,2-Trichloroethane	Phase V	0.005
	Trichloroethylene	Phase I	0.005
	Trichlorofluoromethane	DHS	0.15
	1,1,2-Trichloro-1,2,2-Trifluoroethane	DHS	1.2
	Vinyl Chloride	DHS/Phase I	0.0005/0.002
	Xylenes (total)	DHS/Phase II	1.75/10
(Non-Volatile Synthetic) Organic Chemicals (Section 64444, Table 64444-A (b))			
	Acrylamide	Phase II	TT (PAP)
	Alachlor	Phase II	0.002
	Atrazine	Phase II	0.003
	Bentazon	DHS	0.018
	Benzo(a)pyrene	Phase V	0.0002
	Carbofuran	DHS/Phase II	0.018/0.04

Table 3
Summary of Contaminants
Currently Regulated by EPA and DHS

Classification	Contaminant	Regulation	MCL (mg/L)
	Chlordane	DHS/Phase II	0.0001/0.002
	2,4,-D	Phase II	0.07
	Dalapon	Phase V	0.2
	Dibromochloropropane	Phase II	0.0002
	Di (2-ethylhexyl) Adipate	Phase V	0.4
	Di (2-ethylhexyl) Phthalate	DHS/Phase V	0.004/0.006
	Dinoseb	Phase V	0.007
	Diquat	Phase V	0.02
	Endothall	Phase V	0.1
	Endrin	Phase V	0.002
	Epichlorohydrin	Phase II	TT (PAP)
	Ethylene Dibromide	Phase II	0.00005
	Glyphosate	Phase V	0.7
	Heptachlor	DHS/Phase II	0.00001/0.0004
	Heptachlor Epoxide	DHS/Phase II	0.00001/0.0002
	Hexachlorobenzene	Phase V	0.001
	Hexachlorocyclopentadiene	Phase V	0.05
	Lindane	Phase II	0.0002
	Methoxychlor	Phase II	0.04
	Molinate	DHS	0.02
	Oxamyl (vydate)	Phase V	0.2
	Pentachlorophenol	Phase II	0.001
	Picloram	Phase V	0.5
	PCBs	Phase II	0.0005
	Simazine	Phase V	0.004
	Thiobencarb	DHS	0.07
	Toxaphene	Phase II	0.003
	2,3,7,8-TCDD (Dioxin)	Phase V	3.00E-08
	2,4,5-TP (Silvex)	Phase II	0.05
Unregulated (Volatile) Organic Chemicals (Section 64450, Table 64450-A)			
	Bromobenzene	Phase I	MO
	Bromodichloromethane	Phase I	MO
	Bromoform	Phase I	MO
	Bromomethane	Phase I	MO
	Chlorodibromomethane	Phase I	MO
Unregulated (Volatile) Organic Chemicals (Section 64450, Table 64450-A) Cont'd			
	Chloroethane	Phase I	MO
	Chloroform	Phase I	MO
	Chloromethane	Phase I	MO
	o-Chlorotolulene	DHS	0.045**
	p-Chlorotoluene	DHS	0.045**
	Dibromomethane	Phase I	MO
	o-Dichlorobenzene	DHS	0.013**
	m-Dichlorobenzene	DHS	0.013**
	Dichlorodifluoromethane	DHS	1.0**
	1,3-Dichloropropane	Phase I	MO
	2,2-Dichloropropane	Phase I	MO
	1,1-Dichloropropene	Phase I	MO
	1,1,1,2-Tetrachloroethane	Phase I	MO
	1,2,3-Trichloropropane	Phase I	MO

Table 3
Summary of Contaminants
Currently Regulated by EPA and DHS

Classification	Contaminant	Regulation	MCL (mg/L)
Unregulated Organic Chemicals (Section 64450, Table 64450-B)	Bromacil	DHS	MO (if vulnerable)
	Bromochloromethane	DHS	MO (if vulnerable)
	n-Butylbenzene	DHS	0.045**
	sec-Butylbenzene	DHS	MO (if vulnerable)
	tert-Butylbenzene	DHS	MO (if vulnerable)
	Chlorothalonil	DHS	MO (if vulnerable)
	Diazinon	DHS	0.014**
	Dimethoate	DHS	0.14**
	Diuron	DHS	MO (if vulnerable)
	Hexachlorobutadiene	DHS	MO (if vulnerable)
	Isopropylbenzene	DHS	MO (if vulnerable)
	p-Isopropyltoluene	DHS	MO (if vulnerable)
	Naphthalene	DHS	MO (if vulnerable)
	n-Propylbenzene	DHS	MO (if vulnerable)
	Prometryn	DHS	MO (if vulnerable)
	1,2,3-Trichlorobenzene	DHS	MO (if vulnerable)
	1,2,4-Trimethylbenzene	DHS	MO (if vulnerable)
	1,3,5-Trimethylbenzene	DHS	MO (if vulnerable)
Unregulated Organic Chemicals (Section 64450, Table 64450-C)	Aldicarb	Phase II	0.003 (0.01**)
	Aldicarb Sulfone	Phase II	0.002
	Aldicarb Sulfoxide	Phase II	0.004
	Aldrin	Phase II	0.00005**
	Butachlor	Phase II	MO
	Carbaryl	Phase II	0.06**
Unregulated Organic Chemicals (Section 64450, Table 64450-C) Cont'd	Dicamba	Phase II	MO
	Dieldrin	Phase II	0.00005**
	3-Hydroxycarbofuran	Phase II	MO
	Methomyl	Phase II	MO
	Metolachlor	Phase II	MO
	Metribuzin	Phase II	MO
	Propachlor	Phase II	MO
Additional Organics with Action Levels	Baygon	DHS	0.09**
	a-Benzenhexachloride	DHS	0.0007**
	b-Benzenhexachloride	DHS	0.0003**
	Captan	DHS	0.35**
	Chloropicrin	DHS	0.05**
	2,4-Dimethylphenol	DHS	0.4**
	Diphenamide	DHS	0.04**
	Ethion	DHS	0.035**
	Formaldehyde	DHS	0.03**
	Isopropyl N carbamate	DHS	0.35**
	Malathion	DHS	0.16**
	Methyl isobutyl ketone	DHS	0.04**
	Methyl parathion	DHS	0.03**

Table 3
Summary of Contaminants
Currently Regulated by EPA and DHS

Classification	Contaminant	Regulation	MCL (mg/L)
	Methyl tertiary butyl ether	DHS	0.035**
	Parathion	DHS	0.03**
	Pentachloronitrobenzene	DHS	0.0009**
	Phenol	DHS	0.005**
	Trithion	DHS	0.007**
Natural Radioactivity (Section 64441)			
	Gross Alpha Particle Activity	NPDWR	15 pCi/L
	Radium 226 & 228	NPDWR	5 pCi/L
	Uranium	DHS	20 pCi/L
Man-Made Radioactivity (Section 64443)			
	Tritium	DHS	20,000 pCi/L
	Strontium-90	DHS	8 pCi/L
	Gross Beta Particle Activity	NPDWR	50 pCi/L
Disinfection By-Products			
	Total Trihalomethanes (Chloroform, Bromoform, Chlorodibromomethane, Bromodichloromethane)	NPDWR	0.1
Microbial			
	Giardia Lamblia	SWTR	TT(3-log Reduction)
	Heterotrophic Plate Counts	SWTR	TT(<500/mL)
	Legionella	SWTR	TT
	Viruses	SWTR	TT(4-Log Reduction)
	Disinfectant Residual	SWTR	TT(0.2)
	Fecal Coliform	TCR	TT
	E. Coli	TCR	TT(<5% mo. samples pos.)
	Total Coliform	TCR	TT(<5% mo. samples pos.)

TT - Treatment Technology

PAP - Polymer Addition Practices

MO - Monitored Only

* - DHS MCL lower than EPA

** - Action Level

*** - Recommended/Upper/Short Term MCLs

**** - DHS MCL lower than EPA, EPA remanded in 1995

Phase V Regulations

The Phase V Regulations were proposed in July 1990 and finalized in July 1992. The SMF was incorporated into the Phase V Regulations with the first compliance period for large utilities beginning January 1994. Phase V established regulations for 23 contaminants including 22 from the original list of 83 included in the 1986 SDWA Amendments (originally included a proposal for sulfate that was not included in the final Phase V regulations). The 23 Phase V contaminants include 5 inorganic contaminants (IOCs), 3 volatile organic contaminants (VOCs), and 15 synthetic organic contaminants (SOCs). The MCL for nickel, 0.1 mg/L, was remanded in February 1995 by the US Court of Appeals for the District of Columbia Circuit. The EPA is required to reconsider the nickel MCLG and the MCL, but no action has been taken yet.

Radioactivity

Regulations for radionuclides were first established under the National Interim Primary Drinking Water Regulations in 1976. As shown in **Table 3**, EPA established MCLs for three radiological contaminants including radium-226 & -228, gross alpha activity, and beta & photon emitters. Additionally, DHS established MCLs for tritium, strontium and uranium.

THM Regulation

The THM Regulation was promulgated in 1979 by the EPA and applies to all public water systems serving populations greater than 10,000 that apply a disinfectant. Large sized utilities were required to begin monitoring for TTHMs in November 1980. The regulation established an MCL of 100 µg/L for total trihalomethanes (TTHMs) in the distribution system. [Total trihalomethanes include the summation of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.] Systems must collect a minimum of four distribution system samples per treatment plant on a quarterly basis. Compliance with the MCL is based on a running annual average of the four quarterly monitoring periods.

Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) was promulgated in June 1989 and large utilities were required to be in compliance with the Rule by June 1993. The SWTR was promulgated to control the levels of turbidity, *Giardia lamblia*, viruses, *Legionella*, and heterotrophic plate count bacteria in U.S. drinking waters. These five contaminants were included on the list of 83 contaminants to be regulated by the EPA according to the 1986 SDWA Amendments.

The California SWTR requires all utilities utilizing a surface water supply or a ground water supply under the influence of a surface water supply, to provide adequate disinfection and under most conditions, to provide filtration. [Exemptions from filtration of surface water supplies are provided in rare occasions where the source water supply meets extremely rigid requirements for water quality and the utility possesses control of the watershed.]

General Requirements. The SWTR includes the following general requirements in order to minimize human exposure to microbial contaminants in drinking water.

1. Utilities are required to achieve at least 99.9 percent removal and/or inactivation of *Giardia lamblia* cysts (3-log removal) and a minimum 99.99 percent removal and/or inactivation of viruses (4-log removal). The required level of removal/inactivation must occur between the point where the raw water ceases to be influenced by surface water runoff to the point at which the first customer is served.
2. The disinfectant residual entering the distribution system must not fall below 0.2 mg/L for more than 4 hours during any 24 hour period.
3. A disinfectant residual must be detectable in 95 percent of distribution system samples. An HPC concentration of less than 500 colonies/mL can serve as a detectable residual if no residual is measured.
4. Each utility must perform a watershed sanitary survey at least every five years, according to California regulations.

Additional Requirements for filtered supplies:

1. "The turbidity of the filtered water shall be equal to or less than 0.5 NTU in 95 percent of the measurements taken each month..."
2. "The turbidity of the filtered water . . . shall not exceed 5.0 NTU at any time."
3. "For those suppliers using a grab sampling monitoring program the turbidity level of the filtered water shall not exceed 1.0 NTU in more than two samples taken consecutively while the plant is in operation. For those suppliers using a continuous monitoring program, the turbidity level of the filtered water shall not exceed 1.0 NTU for more than eight consecutive hours while the plant is in operation."

Additional Requirements for unfiltered supplies:

1. Source water fecal coliform concentrations must be less than 20 per 100 mL or total coliform levels must be below 100 per 100 mL (based on 5 samples per week for a six month period).
2. Source water turbidity levels must be less than 5 NTU prior to the point of first disinfectant application.
3. A redundant disinfection system must be installed
4. The utility must initiate a Watershed Control Program.
5. There must not be any known evidence of a water borne disease outbreak due to a lack of appropriate treatment.
6. The utility must remain in compliance with the Total Coliform Rule and THM regulations.

Removal Credit. The level of removal credit given a utility for both *Giardia lamblia* and viruses is determined by the type of treatment process used. For a conventional water treatment plant the SWTR provides a 2.5-log removal credit for *Giardia lamblia* and a 2.0-log removal credit for viruses. These credits are only provided to filtration plants that comply with the various operational criteria and performance standards included in the SWTR.

The operational criteria described in the SWTR for conventional treatment plants include the following:

General

1. All treatment plants regulated under the SWTR shall be operated by properly certified operators.

Filtration

2. The filtration rate shall not exceed 3 gpm/sf for single media filters and 6 gpm/sf for deep bed, dual or mixed media filters under gravity flow conditions. (Higher rates may be approved if a demonstration study is conducted.)

3. Filtration rates must be increased gradually following backwashing or other interruptions to filtration.
4. Following backwashing or any other interruption of an individual filter, the filtered water turbidity shall not exceed:
 - i. 2.0 NTU
 - ii. 1.0 NTU in at least 90 percent of interruption events in any one year period.
 - iii. 0.5 NTU after 4 hours of operation following the interruption.
5. Coagulation and flocculation unit processes shall be in use during all periods of plant operation. The effectiveness of these processes shall be demonstrated by proving either 1) a minimum 80 percent removal of turbidity through the filters of the monthly average raw water turbidity level or 2) jar testing, pilot testing or similar testing that demonstrates that optimum coagulation is being achieved.
6. Turbidity levels from each individual filter unit shall be monitored either continuously or with an approved grab sampling program. Individual filters that do not meet the required criteria shall be taken out of service and not returned to service until the filter can demonstrate compliance.

Disinfection

7. Sufficient disinfectant chemicals to provide continuous operation shall be maintained as a reserve or demonstrated to be available. (Ozone generation facilities must either have a back-up generation system or an alternate disinfection system available.)
8. An emergency plan must be developed which ensures that inadequately disinfected water does not enter the distribution system.

Operations

9. An operations plan must be submitted for review and approval to the DHS. The plan must include a description of various methods in which the optimal water quality from the treatment processes shall be achieved including CT.

Records

10. Treatment plants must maintain operation records regarding all issues of compliance with the SWTR.

Disinfection Credit. Disinfection during conventional treatment (assuming all operational criteria and performance standards are met and the plant receives 2.5 log credit for physical removal of *Giardia* and 2 log credit for physical removal of viruses), must achieve 0.5-log inactivation of *Giardia lamblia* and 2.0-log inactivation of viruses. To determine the inactivation of *Giardia lamblia* and viruses achieved at a treatment plant, the SWTR established the concept of CT. CT is the product of the concentration of disinfectant remaining at the end of a treatment process (“C” in mg/L) and the contact time in which 10 percent of the water passes through the treatment process (“T” or “T₁₀” in minutes). The contact time in which 10 percent of the water travels through a unit process can be conservatively estimated from DHS guidelines or more accurately determined by conducting a tracer study. The EPA Guidance Manual to the SWTR includes tables that identify the log removal of both *Giardia lamblia* and viruses achieved for a calculated CT value based on the type of disinfectant, the water temperature, and pH. [The reader is referred to the EPA SWTR Guidance Manual Section 3.2 “Disinfection Criteria”, Appendix C “Determination of Disinfectant Contact Time” and Appendix E “Inactivations Achieved By Various Disinfectants” for further details on the concept of “CT”.]

Monitoring Requirements. There are 4 primary monitoring requirements included in the SWTR. These requirements include the following:

1. Turbidity must be measured at least every four hours or by continuous monitoring at the combined filter effluent.
2. Turbidity must be measured in the raw water daily.
3. The disinfectant residual must be monitored continuously at the entry point to the distribution system.
4. The disinfectant residual must be recorded in the distribution system at the same locations and at the same time as coliform monitoring samples.

Additional monitoring for unfiltered supplies include:

1. A minimum of five coliform samples per week must be collected prior to disinfection.

Reporting Requirements. Each utility must report to DHS within 24 hours whenever:

1. Combined filtered (or raw water in unfiltered supply) turbidity level rises above 5.0 NTU .
2. More than 2 consecutive combined filtered turbidity levels are above 1.0 NTU or if turbidity levels are above 1.0 NTU for 8 hours for continuous monitoring.
3. Chlorine residual entering the distribution system at any time falls below 0.2 mg/L.
4. An event occurs which may affect the ability of the plant to produce safe, potable water.

Each utility must prepare a monthly report for submittal to DHS that includes the following information:

1. Turbidity monitoring data.
2. Distribution system residual monitoring data (and HPC data if collected).
3. Lowest chlorine residual leaving plant each day and any data when residual is <0.2 mg/L entering the distribution system.
4. Written explanation of the cause of any violation of a performance standard.
5. Summary of consumer water quality complaints and reports of gastrointestinal illness.

Total Coliform Rule

The Total Coliform Rule (TCR) was promulgated by the EPA in June 1989 with compliance required eighteen months after promulgation (January 1991). The State of California promulgated the Total Coliform Rule in January 1992 and the Rule went into effect on May 1, 1992. Under the TCR, utilities must submit a monitoring plan to the DHS for approval. The plan must provide for representative sampling of the distribution system (including all pressure zones and reservoir areas), describe any sample rotations proposed and include a statement that the sample collector has been trained. The total number of samples and frequency of sampling required is dependent on the population served by the utility. For all but the smallest utilities, weekly sampling is required. If any sample is coliform-positive, two actions must be taken within 24 hours of notification of the positive result:

1. A set of repeat samples must be collected. The location of the repeat samples must include the tap that tested positive, and one upstream and downstream location, both of which must be within five service connections of the positive

sample location. If one or more of the repeat samples tests positive for the presence of coliforms, an additional set of repeat samples must be taken. This process continues until all of the samples are total coliform-negative or an MCL has been violated.

2. The sample must be analyzed for the presence of fecal coliform or *E. Coli*.

The previous coliform standard was a density based standard. This was replaced by a presence/absence regulation. There are three potential scenarios in which an MCL is violated. These scenarios consist of the following:

1. For utilities that analyze less than 40 samples per month, no more than 1 monthly sample may be coliform-positive (this includes repeat samples). If more than 1 monthly sample is coliform-positive than an MCL has been violated. For >40 samples per month collected, an MCL has been violated if more than 5.0% are positive.
2. Utilities are in violation of an MCL if an original sample is fecal coliform / *E. Coli*-positive and any repeat sample is total, fecal, or *E. Coli*-positive.
3. Utilities are in violation of an MCL if an original sample is total coliform-positive and any repeat sample is fecal coliform / *E. Coli*-positive.

Furthermore, there are two conditions that results in a “Significant Rise in Bacterial Count” classification. This condition is not considered a violation of an MCL; however it does require notification to DHS. The two conditions which result in this classification are listed below:

1. An initial sample that is total coliform-positive is determined to be either fecal coliform or *E. Coli*-positive, as well.
2. At least two repeat samples are total coliform-positive but neither sample is fecal coliform or *E. Coli*-positive.

Best Available Technology. The TCR includes a list of four preventative measures a utility can institute to minimize the presence of coliforms in the distribution system. These four items include the following:

1. Ensure proper well protection.
2. Maintain of a minimum 0.2 mg/L disinfectant residual through the entire distribution system.
3. Institute a distribution system maintenance program including:

- appropriate pipe replacement and repair procedures,
 - flushing program,
 - proper operation and maintenance of distribution system reservoirs, and
 - maintenance of a positive water pressure throughout system.
4. Provide adequate filtration and disinfection treatment processes.

Lead and Copper Rule

The Lead and Copper Rule (LCR) was promulgated by the EPA on June 7, 1991. The objective of the LCR is to minimize the corrosion of lead and copper-containing plumbing materials in public water systems (PWS) by requiring utilities to optimize treatment for corrosion control. The LCR establishes “action levels” in lieu of MCLs for regulating the levels of both lead and copper in drinking water. The action level for lead was established at 0.015 mg/L while the action level for copper was set at 1.3 mg/L. An action level is exceeded when greater than 10 percent of samples collected from the sampling pool contain lead levels above 0.015 mg/L or copper levels above 1.3 mg/L. Unlike an MCL, a utility is not out of compliance with the LCR when an action level is exceeded. Exceedance of an action level requires a utility to take additional steps to reduce lead and copper corrosion in the distribution system. There is a California state secondary standard, of 1.0 mg/L, for copper.

In April of 1996, EPA proposed changes to the LCR to streamline implementation and reduce the reporting requirements. The revisions include requiring monitoring for public water systems with optimized corrosion control, which was inadvertently left out of the original LCR. The revisions also include changing the definition of the word “control” in the LCR to only require public water systems to replace lines that it owns or has authority to replace to protect the water quality. There are numerous modifications proposed to the system reporting requirements to minimize the reporting burden. These changes have not yet been finalized.

Information Collection Rule

The Information Collection Rule (ICR) was proposed in the Federal Register in February 1994 and the final rule was promulgated in May 1996. As the title suggests, the ICR will require a significant amount of data collection and monitoring targeted at utilities utilizing surface water, serving greater than 100,000 people and utilities utilizing groundwater, serving greater than 50,000 people.

The purpose of the ICR is to collect occurrence and treatment information to allow for evaluation of upcoming microbial and chemical regulations. The ICR includes requirements for the analysis of both microbial and chemical parameters, such as

Giardia, *Cryptosporidium*, viruses, general water quality parameters, and DBPs and precursors, as well as the performance of treatability monitoring for total organic carbon (TOC) which may lead to bench- and/or pilot-scale evaluations of TOC removal technologies. Sampling will be required on either a monthly or quarterly basis depending on the particular parameter. The treatability monitoring for TOC began in September 1996 and continued for 12 months. Systems serving over 100,000 people began their 18-month monitoring programs in July 1997. The 18 month monitoring program involves collection and analysis of raw, process and treated water samples.

Under the ICR utilities serving populations greater than 100,000 with surface water, or utilities serving populations greater than 50,000 with groundwater, may be required to perform a bench-or pilot-scale study of an advanced organics removal technology. Exemptions from performance of the bench- or pilot-scale study are anticipated for systems that meet one or more of the following criteria:

- Systems utilizing surface water supplies serving over 100,000 people with raw water TOC levels less than 4.0 mg/L (based on a 12 month average).
- Systems utilizing ground water supplies serving over 50,000 people with treated water TOC levels less than 2.0 mg/L (based on a 12 month average).
- Systems that use chlorine for primary and secondary disinfection and produce THMs and Haloacetic Acids (HAAs) less than 40 µg/L and 30 µg/L, respectively.

The data results from this Rule will be used to finalize regulations for the Enhanced Surface Water Treatment Rule and the Stage II Disinfection/Disinfectant By-Product Rule.

ANTICIPATED REGULATIONS

The EPA is developing new regulations needed to maintain compliance with the SDWA and its Amendments. The major anticipated regulations are shown in **Table 4**.

Table 4
Anticipated Federal Regulations

Anticipated Regulation	Targeted Contaminants	Status
Arsenic	Arsenic	Proposed - January 1, 2000 Final - January 1, 2001
Sulfate	Sulfate	August 6, 2001
Radionuclides	Radionuclides	Final - January 1, 2001
Radon	Radon	Proposed - August 6, 1999 Final - August 6, 2000

Stage I and II D/DBPs	Disinfectants Disinfection By-Products	Stage I - November 1998 Stage II - May 2002
Interim, Long Term 1 (LT 1) and Long Term 2 (LT 2) ESWTR	Microbial	Final Interim - Nov 1998 Final LT 1 - November 2000 Final LT 2 - May 2002
Backwash Water Recycling	Microbial	August 6, 2000

Arsenic Regulation

The current MCL for arsenic is 50 µg/L; however, recent epidemiological studies suggest that the health risks associated with arsenic ingestion may be more significant than previously estimated. The 1996 Amendments to the SDWA require the EPA to propose a regulation for arsenic by January 1, 2000 and adopt a final regulation within one year, by January 1, 2001. Previously, arsenic has been regulated based on its association with skin cancer. The EPA is evaluating information as to whether arsenic may be associated with internal cancers. The 1996 Amendments have also provided time and money for additional health effects research for low-level arsenic exposure. The EPA prepared a comprehensive study plan for the health effects research in February 1997. The Amendments authorize \$2.5 million per year for four years for these studies. The EPA has begun meeting with stakeholders to establish a dialogue regarding the arsenic regulation.

Sulfate Regulation

The 1996 Amendments to the SDWA require the EPA to complete a joint project with the Center for Disease Control and Prevention by February 6, 1999 that will establish a reliable dose-response relationship regarding the adverse public health effects of sulfate in drinking water. The EPA must consider sulfate for regulation within the next five years, by August 6, 2001. If a regulation is established, it must include public notification and options for the provision of alternative water supplies to be provided to at-risk populations. However, the EPA can determine that a regulation for sulfate is not required.

Radon Regulation

In 1991, the EPA proposed an MCL of 300 pCi/L for radon. That standard was never finalized. The 1996 Amendments to the SDWA require the EPA to withdraw its proposed rule for radon and propose and promulgate a new regulation for radon. The EPA must contract with the National Academy of Sciences to issue a cost-benefit analysis and risk assessment on the effects of radon in drinking water. The EPA must

publish for public comment a risk reduction and cost analysis for a potential radon standard by February 6, 1999 and then propose a regulation by August 6, 1999. A final regulation must be published by August 6, 2000.

Under the 1996 Amendments, the EPA must promulgate an “alternative MCL” for radon and publish guidelines for multimedia mitigation measures if the MCL for radon is more stringent than necessary to reduce drinking water’s contribution to radon in indoor air to a concentration equal to the national average outdoor air concentration. A public water system would be allowed to comply with the “alternative MCL” provided a program of mitigation measures is in place by the state or the public water system.

Disinfectants/Disinfection By-Products Rule

The Disinfectants/Disinfection By-Products (D/DBP) Rule was published for public comment in the Federal Register in July 1994. The 1996 Amendments to the SDWA require the Stage I and II Rules to be published in accordance with the schedule outlined in the Information Collection Rule (allowing for any delays). This would mean promulgation of the Stage I Rule in November 1998.

The Amendments require the EPA to develop a strategy for research for development of the Enhanced Surface Water Treatment Rule and the D/DBP Rule. This plan was completed in February, 1997. The Amendments allow the additional health effects data to be used in determining the Rule, but do not allow the use of the new health risk reduction and cost considerations. The main objectives of the anticipated Disinfectants/Disinfection By-Products (D/DBP) Rule include minimizing the formation of DBPs, minimizing the applied dose of disinfectant, and minimizing the level of total organic carbon (TOC) present at the point(s) of disinfection.

The D/DBP Rule proposed in 1994 originally included three items:

1. Establish MCLs

Total Trihalomethanes (TTHMs)	80 µg / L
Haloacetic Acids (HAAs)	60 µg / L
Bromate	10 µg / L
Chlorite	1000 µg / L

2. Establish Maximum Residual Disinfectant Limits (MRDLs)

Chlorine	4.0 mg / L
Chloramines	4.0 mg / L as total chlorine
Chlorine Dioxide	0.8 mg / L

3. Require Enhanced Coagulation

The EPA has determined that DBP-precursor materials should be regulated in lieu of regulating unidentified DBPs. TOC serves as a surrogate for precursor material, and therefore requirements for TOC removal have been proposed under the anticipated D/DBP Rule. In order to minimize the level of TOC present at the point(s) of disinfection, the new D/DBP Rule will likely require the installation of “enhanced coagulation” at all conventional water treatment plants. Performance criteria for TOC removal based on raw water TOC levels and alkalinity have been proposed to serve as a definition of enhanced coagulation.

A Notice of Data Availability (NODA) was published by the EPA on November 3, 1997 for public comment on the proposed Stage I D/DBP Rule and the Interim ESWTR.

The NODA for the Stage I D/DBP Rule determined that Stage I MCLs of 80/60/10 ug/L for THMs/HAA5/Bromate should be implemented. It was also determined that enhanced coagulation will be implemented and should be determined by the levels of TOC and specific ultraviolet absorbance (SUVA) in the source water. SUVA is an indicator of the humic content of water and is defined as the level of UV254 (1/m) divided by the dissolved organic carbon (DOC) (mg/L). If SUVA values are lower than 3 L/mg-m, then the water is considered primarily non-humic material. There will only be minor modifications to the 3 x 3 matrix for determining enhanced coagulation requirements, in order to reduce TOC levels, as shown below. The SUVA measurements will be used as an additional criteria to determine if enhanced coagulation is required. For raw water SUVA levels lower than 2.0 L/mg-m, enhanced coagulation has been shown to be not effective in reducing DBP precursors and it will not be required.

Source Water TOC (mg/L)	Source Water Alkalinity (mg/L)		
	0-60	60-120	>120
>2.0-4.0	35%	25%	15%
4.0-8.0	45%	35%	25%
>8.0	50%	40%	30%

Predisinfection credit will be allowed for all treatment plants. Disinfection profiling and microbial benchmarking will most likely be required of water utilities which exceed TTHM levels of 64 ug/L (80% MCL) and HAA5 levels of 48 ug/L (80% MCL). Disinfection profiling is the characterization of a system’s disinfection practice over a period of time. Using chlorine residual concentration, disinfection contact time, temperature, and pH, the daily log inactivation for *Giardia* and viruses can be calculated. Monthly average log inactivations will be calculated from the daily values

to determine the calendar month with the lowest inactivation levels. This month will be considered the critical period and will be used to identify the microbial benchmark for the minimum current disinfection practice. This will be used to ensure that no significant increase in microbial risk will occur due to revisions in disinfection practices to meet the D/DBP Rule requirements. The State's will review these profiles as part of sanitary surveys for the applicable utilities. The EPA is to develop guidance for developing and evaluating disinfection profiles and determining the significance of disinfection revisions.

If THM, HAA and bromate levels cannot be reduced to meet the proposed regulations, additional or alternative treatment may be required. Enhanced coagulation can be implemented to reduce DBP precursor levels. Also, alternative chemical disinfection may be used, such as ozone or a series of oxidants.

The Stage II D/DBP Rule is expected to be promulgated within 4 years after the Stage I Rule. The findings from the ICR will be used to develop appropriate regulations. It has been proposed previously that the Rule may include MCLs of 40/30 ug/L for THMs/HAAAs, respectively.

Enhanced Surface Water Treatment Rule

The Enhanced SWTR (ESWTR) was published in the Federal Register for public comment in July 1994. The 1996 Amendments to the SDWA require the ESWTR to be published in accordance with the schedule outlined in the Information Collection Rule (allowing any delays). This would mean promulgation of an Interim Rule in November 1998.

The Amendments require the EPA to develop a strategy for research for development of the ESWTR and the D/DBP Rule. This plan was completed in February, 1997. The Amendments allow the additional health effects data to be used in determining the Rule, but do not allow the use of the new health risk reduction and cost considerations. The main objectives of the anticipated ESWTR are to expand the scope of the SWTR to include *Cryptosporidium* and to prevent an increase in microbial risk while utilities come into compliance with the Stage I D/DBP Rule.

A Notice of Data Availability (NODA) was published by the EPA on November 3, 1997 for public comment on the proposed Stage I D/DBP Rule and the Interim ESWTR.

The NODA for the IESWTR includes revising the turbidity performance criteria to 0.3 NTU in 95% of measurements and never to exceed 1 NTU. The NODA also proposes continuous monitoring of individual filter effluent turbidity. It is proposed to set an MCLG of 0 for *Cryptosporidium* and require 2 log (99%) removal. Conventional treatment, direct filtration, slow sand filtration, and diatomaceous earth filtration will

all receive 2 log (99%) credit for removal if the treatment plant is meeting the turbidity performance standards. The NODA focuses on defining a risk-based “multi-barrier approach”, including source water protection, physical removal and inactivation, to prevent any increase in microbial contamination for the Long Term ESWTR.

If turbidity levels do not meet the proposed levels, improved or additional treatment may be required. Turbidity may be reduced by optimizing physical removal processes such as coagulation, sedimentation and filtration. Utilities may be required to alter treatment process flow to improve treatment removal levels. Also, additional treatment processes, such as physical removal, may be required for utilities not currently implementing them.

The Final ESWTR is expected to be promulgated within 4 years after the Interim Rule. The findings from the ICR will be used to develop appropriate regulations or correct existing regulations.

Backwash Water Recycling Regulation

The EPA must publish a regulation for recycling filter backwash water within a treatment plant. This regulation must be promulgated by August 6, 2000 and it is not anticipated to be addressed in the Enhanced Surface Water Treatment Rule. The EPA may choose to ban recycling of backwash water, require treatment of backwash water before returning it to the treatment process or require filter-to-waste facilities to allow the first filtered water to be wasted or reclaimed. Treatment requirements may include physical removal, such as equalization, sedimentation and filtration, or chemical treatment, such as chlorine or ozone. The ICR data will be used to evaluate existing conditions and water quality issues to help determine the final regulatory requirements.

OTHER ISSUES

***Cryptosporidium* Action Plan**

In 1996, the California Legislature passed SB 1307 which required the DHS to “comprehensively enact” the *Cryptosporidium* Action Plan (Plan). The Plan was developed by the California DHS in April 1995 and was intended to assist utilities with comprehensive compliance with the State’s existing SWTR. No new requirements are proposed, the Plan only clarifies the existing requirements to help utilities optimize treatment processes to ensure maximum removal of *Cryptosporidium* oocysts and reduce the risk of waterborne illness. This plan is intended for large utilities with over 1,000 service connections.

The Plan addresses six aspects of existing requirements for utilities that can be performed to optimize water assessment and treatment to improve drinking water quality.

1. Watershed Sanitary Survey (WSS) - A utility must perform a WSS for each water source every five years.
2. Data Collection - The State will be collecting and evaluating available ICR data to help provide guidance on treatment process optimization.
3. Alternative Treatment Technologies - The State will perform a comprehensive review during the first year of operation of an alternative treatment technology to evaluate compliance with turbidity and microbial requirements.
4. Operations Plan/Optimized Treatment - The State is recommending an effluent turbidity goal of 0.1 NTU. Each utility shall operate the treatment plant to optimize treatment and maximize turbidity removal. Each utility shall prepare an Operations Plan for Treatment Optimization that may include inspections, quick responses, operation at appropriate loading rates, turbidity goals as identified in **Table 5**, individual filter turbidity monitoring, optimized filter operations, and optimized filter backwash systems.

Table 5
***Cryptosporidium* Action Plan Turbidity Goals**

	Optimization Goals
Sedimentation / Clarification Basin Effluent	1 to 2 NTU
Combined Filter Effluent	0.1 NTU
Reclaimed Backwash Water Effluent	Less than 2.0 NTU
After Filter Backwash / Filter-to-Waste	Less than 0.3 NTU

5. Reliable Removal Treatment Process - A utility shall optimize removal for all conditions at all times and provide for reliability, alarms, and quick repairs or replacements. Utilities may continuously monitor turbidity of the plant effluent.
6. Informing the Public - A utility may want to notify customers when physical removal of pathogens is not provided for in treatment or when desired effluent turbidity goals cannot be achieved. A utility may also list the proposed remediation.

Urgent Threats

The 1996 Amendments to the SDWA authorize the EPA to skip the selection process for contaminant review and establish interim regulations to address urgent health threats. The EPA has three years to complete the selection process analysis and two more years to repromulgate the regulation.

Effective Date of Regulations

Compliance with regulations is required three years after promulgation (previously compliance was required 18 months after promulgation). The deadline can be extended for up to two years for all systems by the EPA in the regulation or for specific public water systems by the state if it is determined that additional time is needed for the capital improvements required.

Source Water Assessment and Protection

The 1996 Amendments to the SDWA established a new source water quality assessment program. The Source Water Assessment Program (SWAP) will be implemented to delineate drinking water source protection areas, conduct contaminant source inventories and conduct analyses of the susceptibility of the delineated areas to contamination. In August 1997 the EPA published guidance for primacy States to carry out SWAPs within the State's boundary. The States must now submit their program to EPA by February 6, 1999. Monitoring relief may be developed from the results of the assessment program, as discussed below.

The 1996 Amendments also established a new coordinated and comprehensive protection of groundwater resources program within a state. The EPA published guidelines for these programs in August 1997 and will continue annually hereafter.

Alternative Monitoring Guidelines

The 1996 Amendments to the SDWA required the EPA to develop guidelines for Primacy States for alternative monitoring to replace the permanent monitoring relief program. These guidelines were finalized in August 1997. A State can allow a water system to implement the alternative monitoring if the State has an approved SWAP, as described above, and the State has completed an assessment of the specific water system.

The alternative monitoring is available on a contaminant-by-contaminant basis for the constituents shown in **Table 6**. Alternative monitoring is not available for microbiological constituents, disinfectants/ disinfection by-products, and corrosion by-

products. Alternative monitoring can be offered as a monitoring waiver, surrogate sampling or reduced nitrate monitoring. The water system must show that the contaminant is not present in the drinking water supply or, if present, it is detected consistently below the MCL.

Methyl Tertiary Butyl Ether

The USEPA issued a health advisory for methyl tertiary butyl ether (MTBE) in drinking water in January 1998. This advisory is a non-regulatory document and not a mandatory standard for action. The health advisory provides guidance to prevent taste and odor problems. The advisory level is a range from 20 to 40 ug/L. This range is based on limited direct information on adverse human health effects. As additional data become available, USEPA will publish a revised health advisory. MTBE is on the USEPA's draft contaminant list and may be regulated in the future.

The DHS has had an interim action level for MTBE of 35 ug/L in place since 1991 to protect against adverse health effects. In February 1997, DHS included MTBE as an unregulated chemical for which monitoring is required, to be incorporated into the drinking water system's existing monitoring program.

Table 6
Chronic Chemical Contaminants for Alternative Monitoring

Inorganic Chemicals	Synthetic Organic Chemicals (Cont'd)
Antimony	Heptachlor
Arsenic	Hexachlorocyclopentadiene
Asbestos	Hexachlorobenzene
Barium	Lindane
Beryllium	Methoxychlor
Cadmium	Oxamyl (Vydate)
Chromium	Pentachlorophenol
Cyanide	Picloram
Fluoride	Polychlorinated biphenyls
Mercury	Simazine
Nickel	Toxaphene
Nitrate	
Selenium	Volatile Organic Chemicals
Thallium	1,1-Dichloroethylene
	1,1,2-Trichloroethane
Synthetic Organic Chemicals	1,1,1-Trichloroethane
2,4-D (Formula 40 Weeder 64)	1,2,4-Trichlorobenzene
2,3,4,8-TCDD (Dioxin)	1,2-Dichloropropane
2,4,5-TP (Silvex)	1,2-Dichloroethane
Alachlor (Lasso)	Benzene
Atrazine	Carbon tetrachloride
Benzo[a]pyrene	cis-1,2-Dichloroethylene
Carbofuran	Dichloromethane
Chlordane	Ethylbenzene
Dalapon	Monochlorobenzene
Di(2-ethylhexyl)adipate	o-Dichlorobenzene
Di(2-ethylhexyl)phthalate	p-Dichlorobenzene
Dibromochloropropane	Styrene
Dinoseb	Tetrachloroethylene
Diquat	Toluene
Endothall	trans-1,2-Dichloroethylene
Endrin	Trichloroethylene
Ethylene dibromide	Vinyl chloride
Glyphosate	Xylenes
Heptachlor epoxide	

The DHS is proceeding with adopting secondary and primary MCLs for MTBE. In order to address the aesthetic qualities of drinking water, DHS is to adopt a secondary standard for MTBE by July 1998. This will be an enforceable secondary standard. DHS will propose the regulation for public comment in early 1998. DHS will be using the emergency regulation procedures to set a 5 ug/L secondary standard. Public review and comment will follow. A primary MCL will be developed based on health risk assessment, technical feasibility of meeting an MCL and cost of compliance. The proposed regulation will be released for public comment in early 1999 and a final adopted by July 1999. California EPA has developed a proposed Public Health Goal (PHG) for MTBE in drinking water of 14 ug/L. This was calculated using the USEPA's proposed cancer risk assessment guidelines to a protection level of one fatality per million people exposed. This is a non-enforceable level. It is expected that the DHS will reduce it's action level from 35 to 14 ug/L upon finalization of the PHG.

Ammonium Perchlorate

Ammonium perchlorate (perchlorate) is a strong oxidant whose primary use is in solid-fuel rocket motors, fireworks and explosives devices. Perchlorate is very stable when dissolved in water. Perchlorate has been detected in groundwater in eastern Sacramento County. It has also been detected in the Colorado River in Southern California and Nevada, most likely from the perchlorate manufacturing facilities in the Las Vegas area.

The DHS has established a provisional "action level" of 18 ug/L, based on health effects data. DHS recommends that utilities near facilities that use or may have used perchlorate consider voluntary monitoring of their source water. Perchlorate primarily affects human health by interfering with the thyroid gland's ability to produce hormones, which can affect normal growth and development. Perchlorate may also cause chronic effects to the hematopoietic system.

Perchlorate has been placed on the Drinking Water Candidate Contaminant List by the EPA for possible future regulation. The EPA is waiting for additional chronic health effects data before developing a primary or secondary standard. The California Legislature has two active bills related to perchlorate. Senate Bill 1033 would require DHS to adopt a primary drinking water standard for perchlorate by January 1, 2000 and to report on the extent of contamination in California. When promulgating a primary standard, DHS would also be responsible for identifying a BAT for treatment. Assembly Bill 2392 would appropriate money for DHS to conduct a study on the effects of perchlorate contamination on existing and potential drinking water supplies. The study would assess occurrence data, identify health concerns, identify treatment technologies, and recommend research to develop cost effective technologies to reduce perchlorate levels. This Bill is dependent on the passing of Senate Bill 1033.

Appendix E: Water Quality Tables and Graphs

Drinking Water Contaminant Candidate List Monitoring

Drinking Water Contaminant Candidate List

Please Indicate For Which, If Any, Constituents You Have Monitored and Provide the Analytical Results

Constituent	Monitored Raw Water?	Monitored Treated Water?	Results
Chemical Constituents:			
1,1,2,2-tetrachloroethane			
1,2,4-trimethylbenzene			
1,1-dichloroethane			
1,1-dichloropropene			
1,2-diphenylhydrazine			
1,3-dichloropropane			
1,3-dichloropropene (telone or 1,3-D)			
2,4,6-trichlorophenol			
2,2-dichloro-propane			
2,4-dichlorophenol			
2,4-dinitrophenol			
2,4-dinitrotoluene			
2,6-dinitrotoluene			
2,6-di-tert-butyl-p-benzoquinone (DTBB)			
2-methyl-Phenol (o-cresol)			
Acetochlor			
Acetone			
Alachlor ESA (a degradation product of alachlor)			
Aldicarbs*			
Aldrin			
Aluminum			
Atrazine-desethyl (a degradation product of triazines)			
Boron			
Bromobenzene			
Cyanazine			
p-Cymene (p-isopropyltoluene)			
DCPA mono-acid degradate			
DCPA di-acid degradate			
DDE			
Diazinon			
Dieldrin			
Diemethoate			
Disulfoton			
Diuron			

Drinking Water Contaminant Candidate List

Please Indicate For Which, If Any, Constituents You Have Monitored and Provide the Analytical Results

Constituent	Monitored Raw Water?	Monitored Treated Water?	Results
EPTC (s-ethyl-dipropylthiocarbamate)			
Fonofos			
Hexachlorobutadiene			
Isopropylbenzene (cumene)			
Linuron			
Manganese			
Methyl bromide			
Methyl-tert-butyl-ether (MTBE)			
Metolachlor			
Metribuzin			
Molinate			
Naphthalene			
Nickel*			
Nitrobenzene			
Organotins			
Prometon			
RDX			
Rhodamine WT			
Sodium			
Sulfate*			
Terbacil			
Terbufos			
Vanadium			
Zinc			
Microbiological Contaminants:			
Acanthamoeba			
Adenoviruses			
Aeromonas hydrophila			
Caliciviruses			
Coxsackieviruses			
Cyclospora cayetanensis			
Echoviruses			
Helicobacter pylori			
Hepatitis A virus			
Microsporidia (Enterocytozoon & Septata)			
Mycobacterium avium intracellulare (MAC)			
Toxoplasma gondii			

Drinking Water Contaminant Candidate List

Constituent	Site 22 Monitor	AWD	ACWS	CWD	EID		CSPF	Folsom	PCWA	Roseville	SJWD	Sacramento
					EDHWP	SWTP						
Chemical Constituents:												
1,1-Dichloroethane	Table 64444-A	Raw-ND	Raw-ND Treated-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
1,1-Dichloropropene	Table 64450-A	Raw-ND	Raw-ND Treated-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
1,1,2,2-Tetrachloroethane	Table 64444-A	Raw-ND	Raw-ND Treated-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
1,2-Diphenylhydrazine					Raw-ND Treated-ND	Raw-ND Treated-ND						
1,2,4-Trimethylbenzene	Table 64450-B	Raw-ND	Raw-ND Treated-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
1,3-Dichloropropane	Table 64450-A	Raw-ND	Raw-ND Treated-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
1,3-Dichloropropene (telone or 1,3-D)	Table 64444-A	Raw-ND	Raw-ND Treated-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
2-Methyl-phenol (o-cresol)												
2,2-Dichloropropane	Table 64450-A	Raw-ND	Raw-ND Treated-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
2,4-Dichlorophenol					Raw-ND Treated-ND	Raw-ND Treated-ND						
2,4-Dinitrophenol					Raw-ND Treated-ND	Raw-ND Treated-ND						
2,4-Dinitrotoluene					Raw-ND Treated-ND	Raw-ND Treated-ND						
2,4,6-Trichlorophenol					Raw-ND Treated-ND	Raw-ND Treated-ND						
2,6-Dinitrotoluene					Raw-ND Treated-ND	Raw-ND Treated-ND						
Acetochlor												
Alachlor ESA (a degradation product of alachlor)	Table 64444-B		Raw-ND					Treated-ND	Raw-ND		Treated-ND	
Aldrin	Table 64450-C		Raw-ND		Raw-ND Treated-ND	Raw-ND Treated-ND			Raw-ND			Raw - ND Treated - ND
Aluminum	Table 64449-A	Raw-50 ug/L	Raw- 300ug/L Treated-		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-30ug/L	Treated-5 ug/L	Raw-75ug/L	Raw-90ug/L Treated- 15ug/L	Raw-87ug/L Treated- 58ug/L	Raw-55ug/L Treated-58ug/L
Boron					Raw-ND Treated-ND	Raw-ND Treated-ND						
Bromobenzene	Table 64450-A	Raw-ND	Raw-ND Treated-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
DCPA mono-acid degradate					Raw-ND Treated-ND	Raw-ND Treated-ND						
DCPA di-acid degradate					Raw-ND Treated-ND	Raw-ND Treated-ND						
DDE					Raw-ND Treated-ND	Raw-ND Treated-ND						Raw - ND Treated - ND
Diazinon	Table 64450-B		Raw-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND			Treated-ND	

Drinking Water Contaminant Candidate List

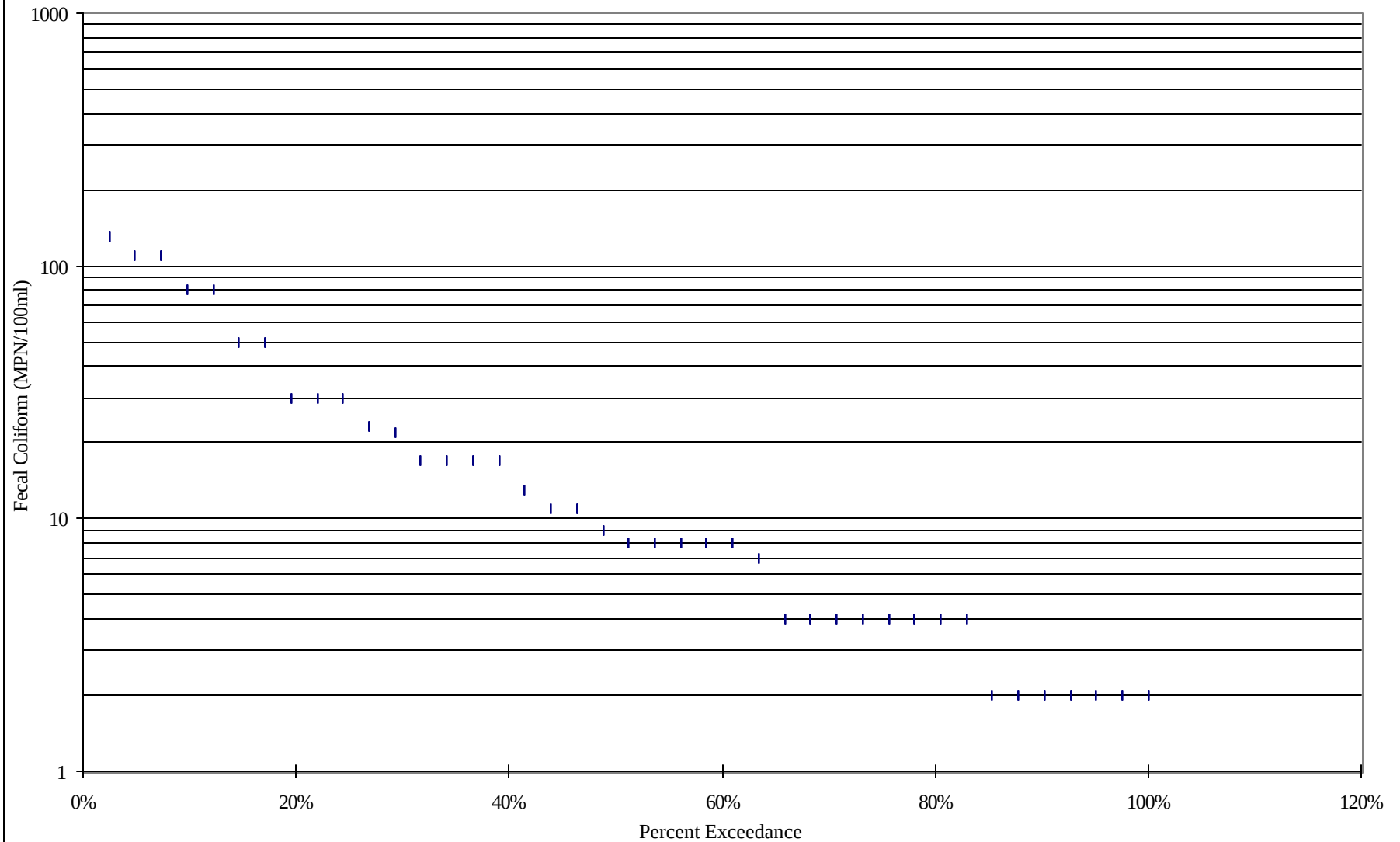
Constituent	Site 22 Monitoring	AWD	ACWS	CWD	EID		CSPF	Folsom	PCWA	Roseville	SJWD	Sacramento
Dieldrin	Table 64450-C		Raw-ND		Raw-ND Treated-ND	Raw-ND Treated-ND						Raw - ND Treated - ND
Disulfoton					Raw-ND Treated-ND	Raw-ND Treated-ND						
Diuron	Table 64450-B		Raw-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND					
EPTC (s-ethyl-dipropylthiocarbamate)												
Fonofos												
Hexachlorobutadiene	Table 64450-B	Raw-ND	Raw-ND Treated-ND		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
p-Isopropyltoluene	Table 64450-B				Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND	Raw - ND
Linuron												
Manganese	Table 64449-A	Raw - 10 ug/L	Raw-22ug/L Treated-30ug/L		Raw-ND Treated-ND	Raw-ND Treated-ND	Treated-ND	Treated-10ug/L	Raw-15ug/L	Raw-30ug/L Treated-15ug/L	Raw-27ug/L Treated-11ug/L	Raw - ND/Trace Treated - ND/Trace
Methyl tert butyl ether (MTBE)	DHS Optional		Raw-ND		Raw- <1.0ug/L			Treated-ND		Treated-ND	Raw-ND Treated-ND	Raw - ND
Methyl bromide (bromomethane)	Table 64450-A		Raw-ND Treated-ND				Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw-ND
Metolachlor	Table 64450-C		Raw-ND					Treated-ND				
Metribuzin	Table 64450-C		Raw-ND									
Molinate	Table 64444-B		Raw-ND					Treated-ND			Treated-ND	
Naphthalene	Table 64450-B	Raw-ND	Raw-ND Treated-ND				Treated-ND	Treated-ND	Raw-ND	Raw-ND Treated-ND	Raw-ND Treated-ND	Raw - ND
Nitrobenzene												
Organotins												
Perchlorate	DHS Optional											
Prometon												
RDX (cyclotrimethylene trinitramine)												
Sodium (Guidance)	Table 64449-C	Raw-2.9 mg/L	Raw-2.5mg/L Treated-11mg/L		Raw Treated	Raw Treated		Treated-2.6mg/L	Raw-2.9mg/L	Raw-1.6mg/L Treated-	Raw-2.2mg/L Treated-	Raw-2.7mg/L Treated-2.6mg/L
Sulfate	Table 64449-B	Raw-1.5 mg/L	Raw-2.7mg/L Treated-4.4mg/L		Raw Treated-2.5mg/L	Raw Treated-1.2mg/L		Treated-5.5mg/L	Raw-1.8mg/L	Raw-1.6mg/L Treated-	Raw-1.8mg/L Treated-	Raw-2.3mg/L Treated-7.2mg/L
Terbacil												
Terbufos												
Triazines and degradation products												
Vanadium												
Microbiological Contaminants:												
<i>Acanthamoeba</i>												
(Guidance for contact lens)												
Adenoviruses												
<i>Aeromonas hydrophila</i>												
Cyanobacteria and other freshwater algae												
Caliciviruses												

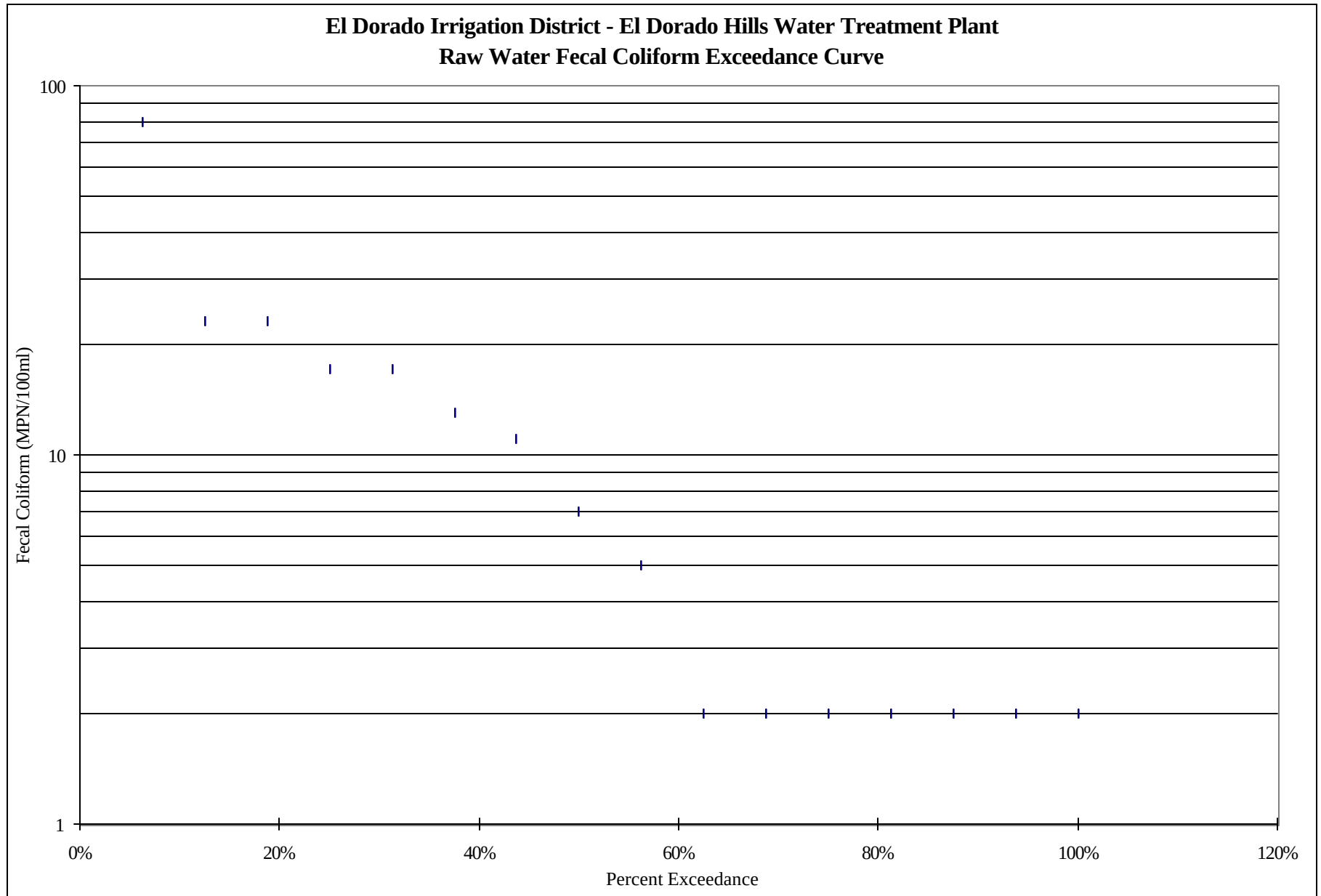
Drinking Water Contaminant Candidate List

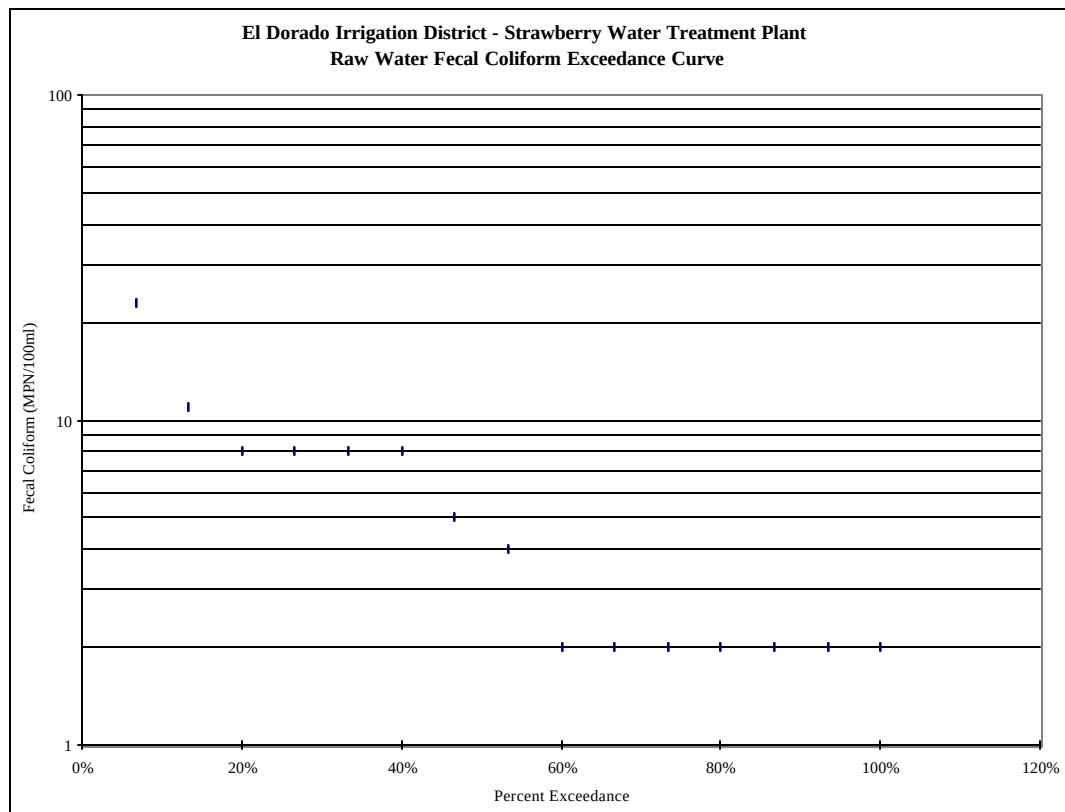
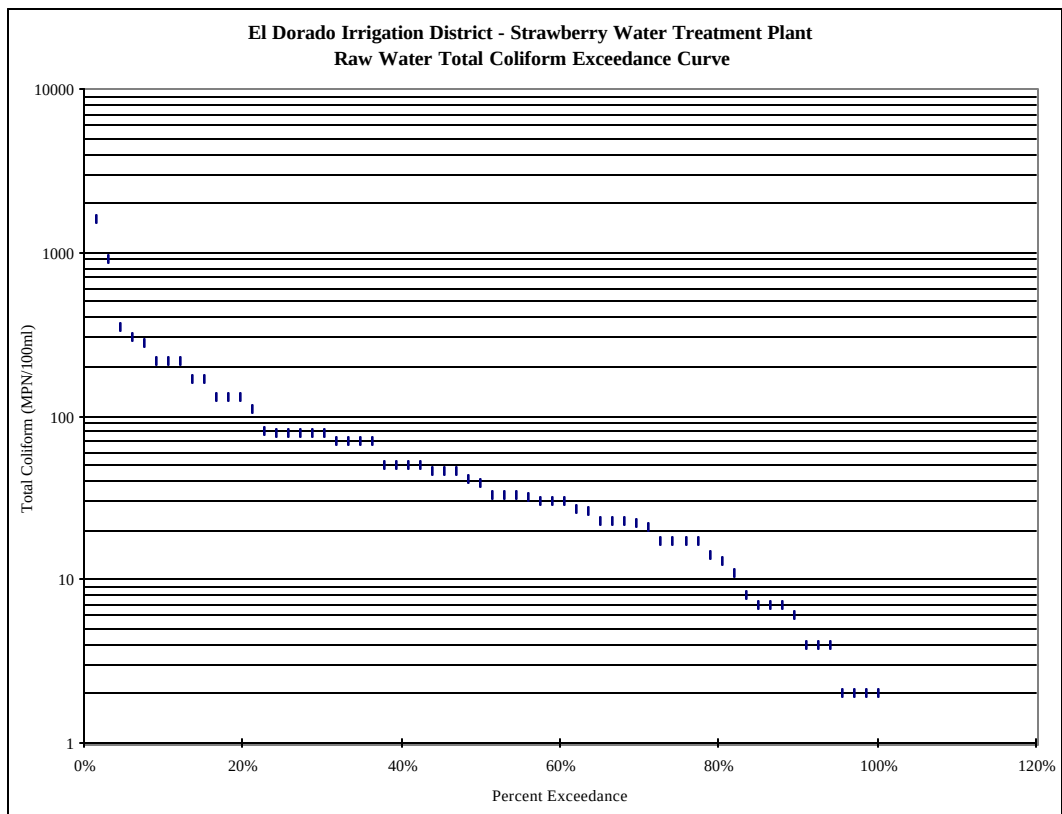
Constituent	itle 22 Monitori	AWD	ACWS	CWD	EID		CSPF	Folsom	PCWA	Roseville	SJWD	Sacramento
Coxsackieviruses												
Echoviruses												
<i>Helicobacter pylori</i>												
<i>Microsporidia</i> (Enterocytozoon & Septata)												
<i>Mycobacterium avium</i> <i>intracellulare</i> (MAC)												

Coliform Exceedance Curves

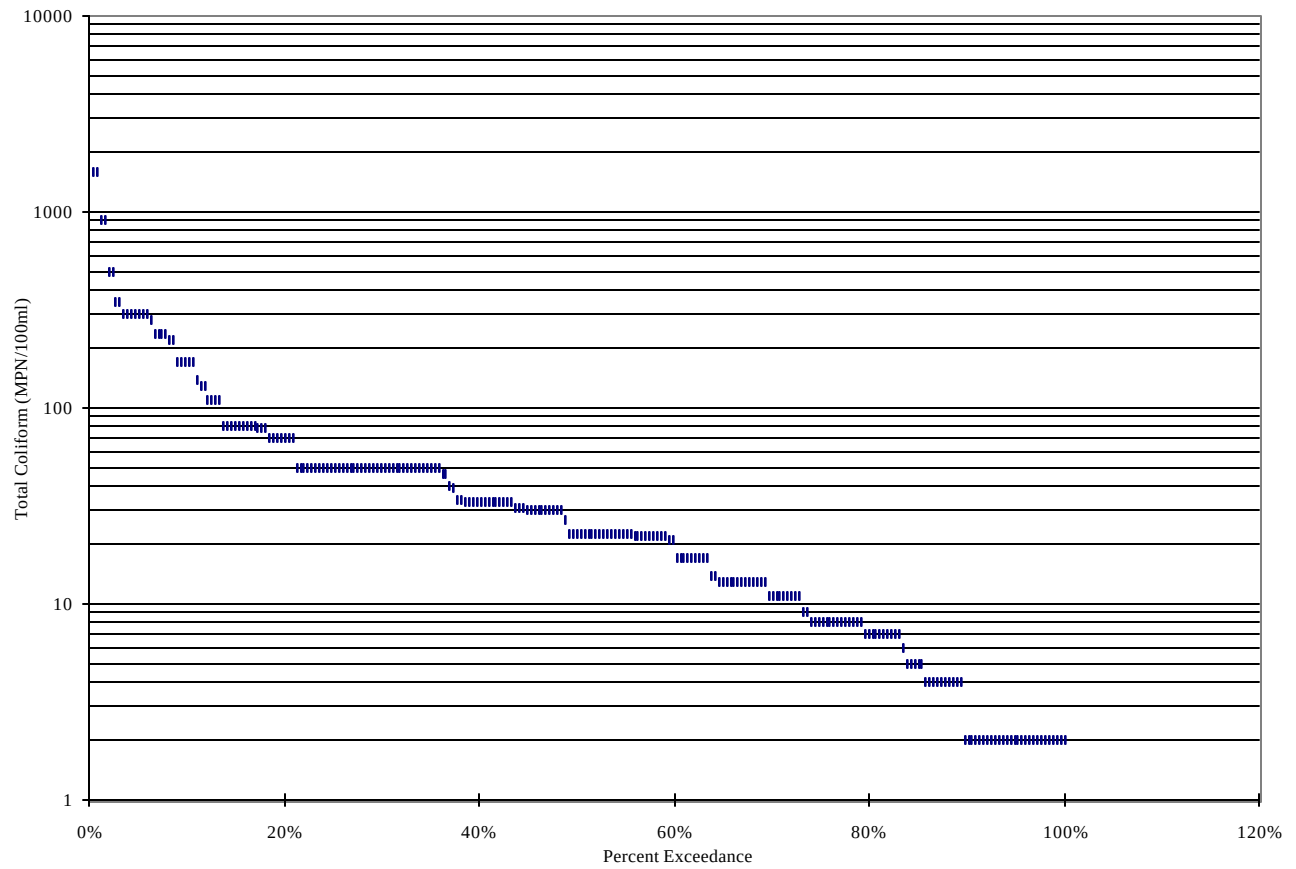
Placer County Water Agency **Raw Water Fecal Coliform Exceedance Curve**

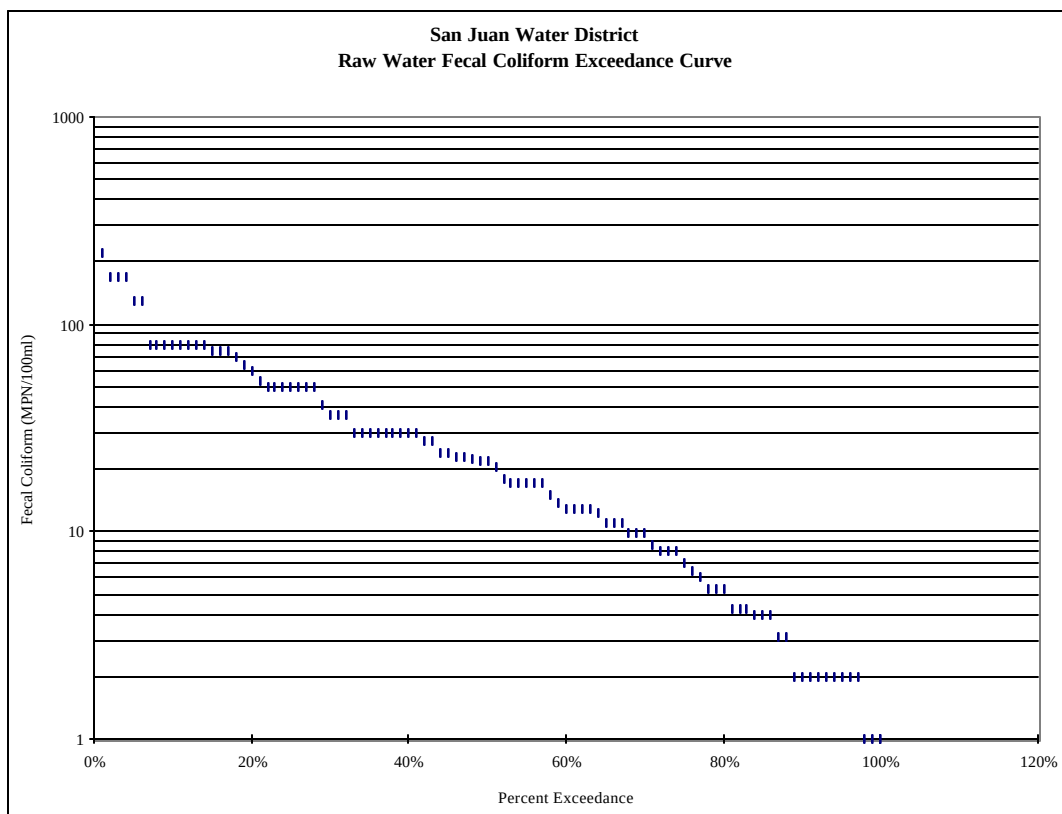
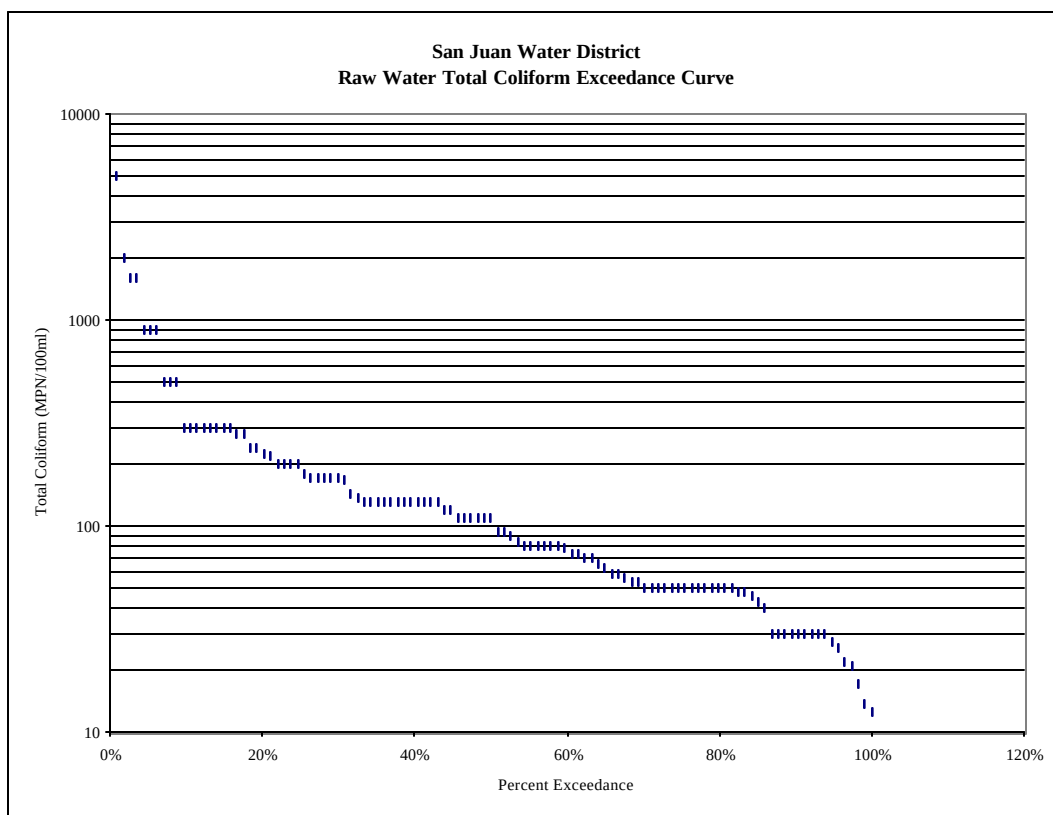




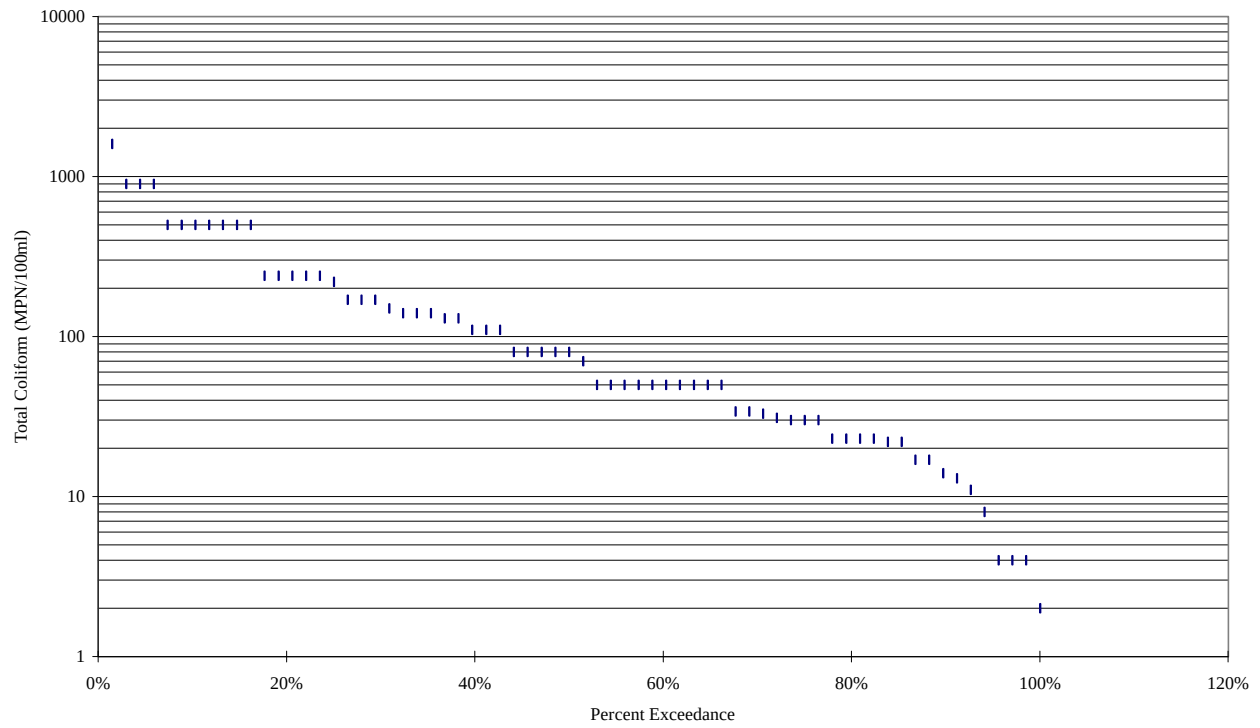


City of Roseville
Raw Water Total Coliform Exceedance Curve

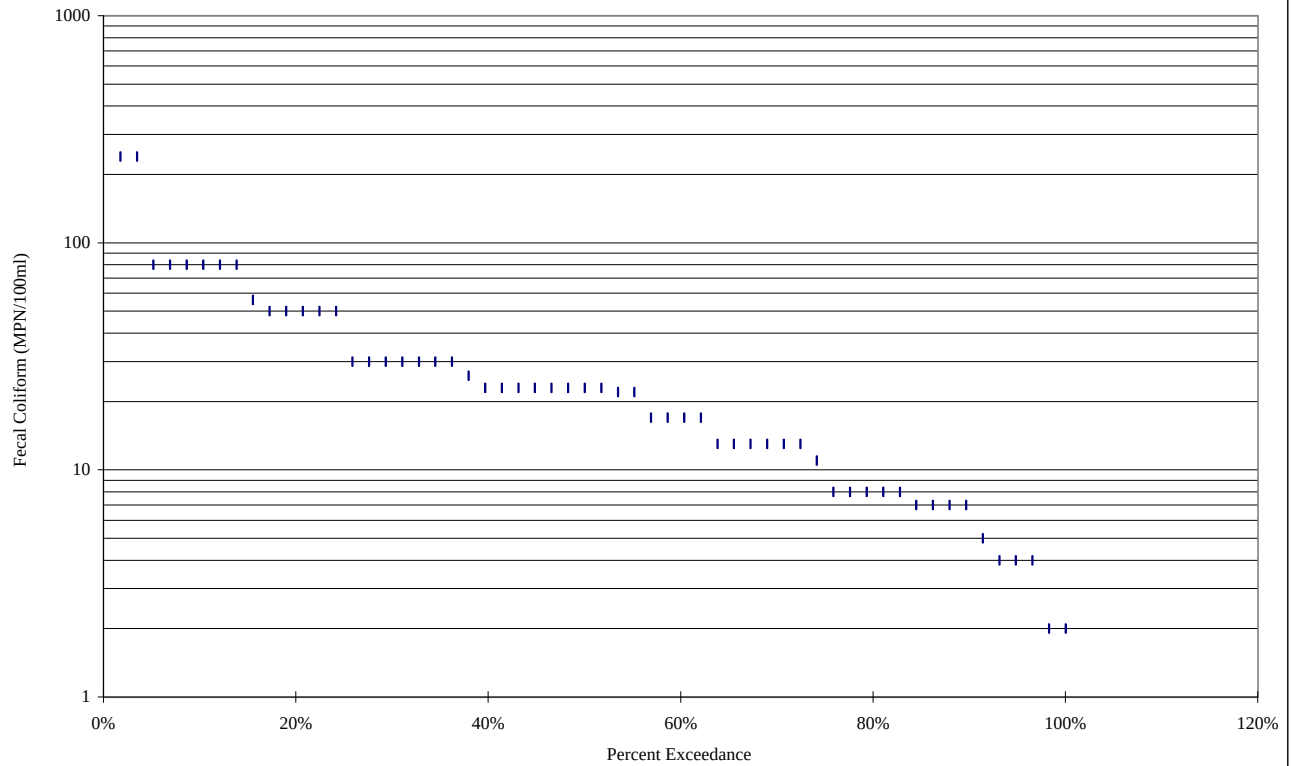


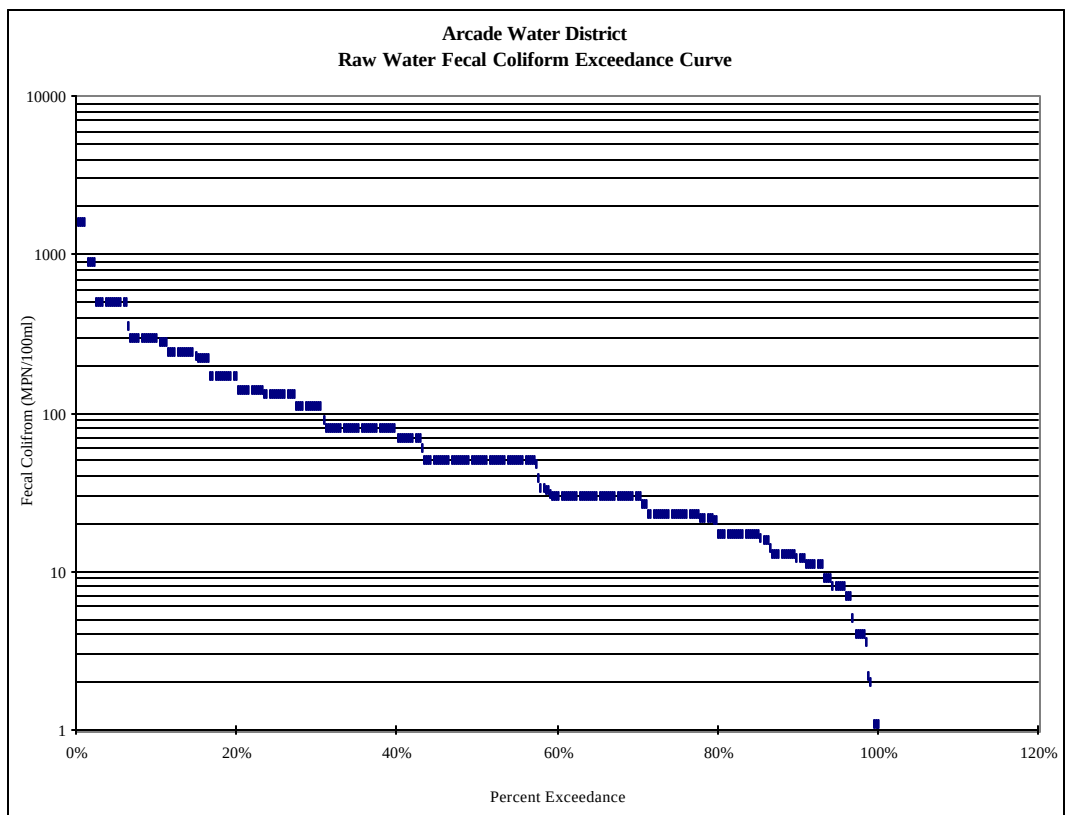
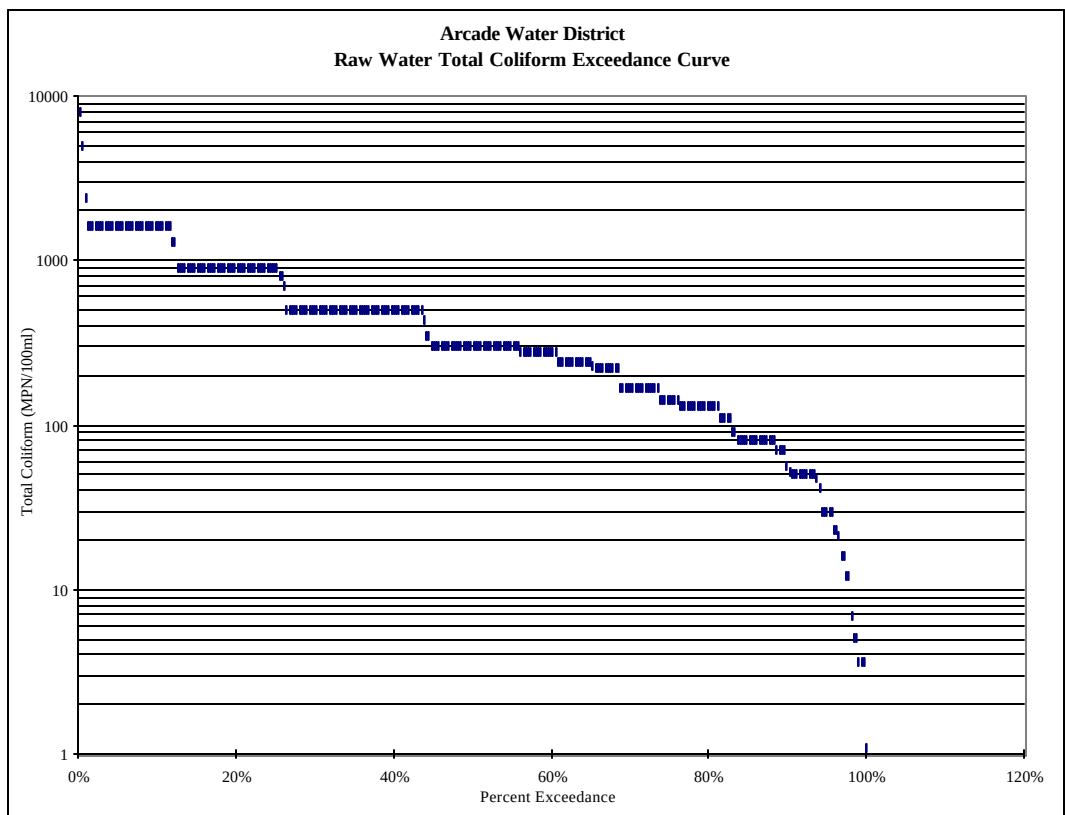


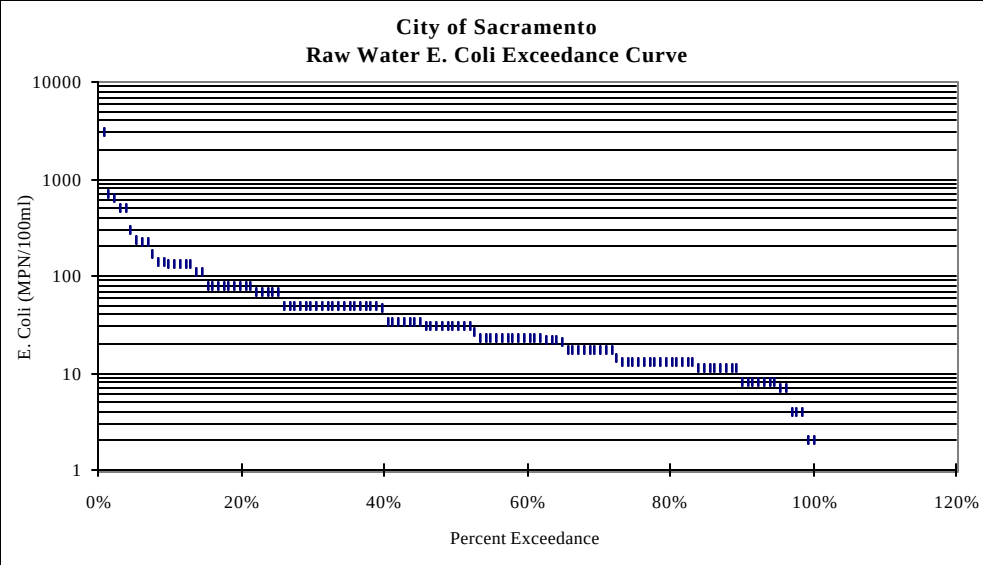
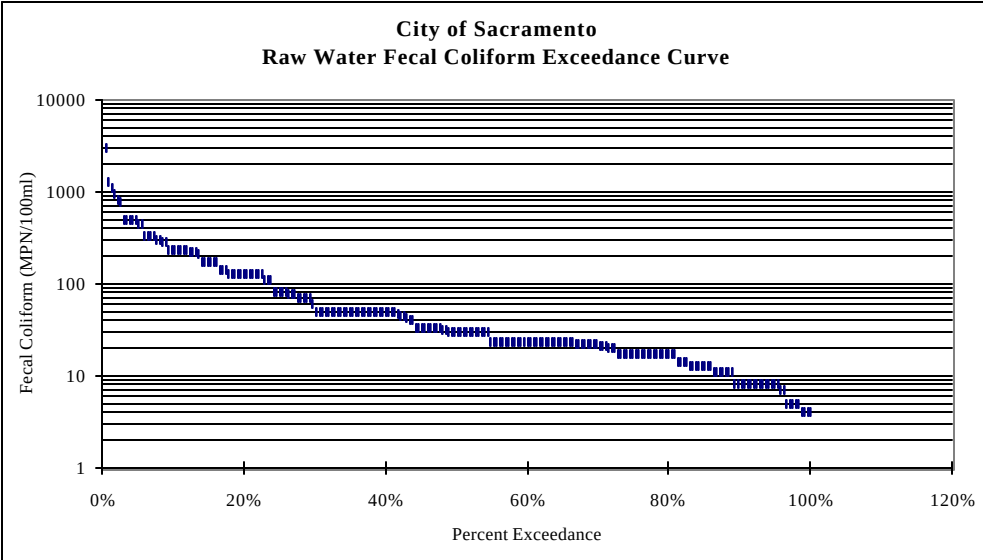
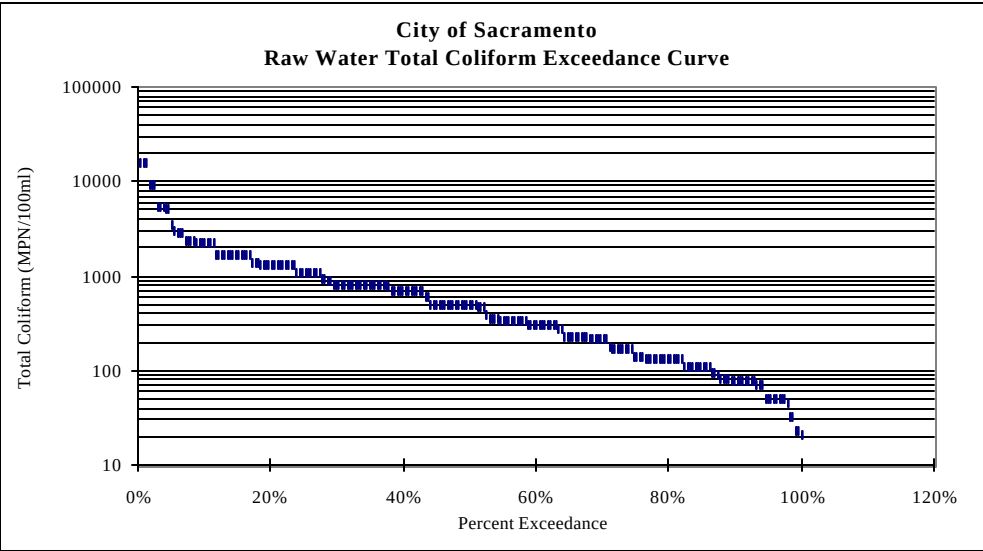
Arden Cordova Water Service Raw Water Total Coliform Exceedance Curve

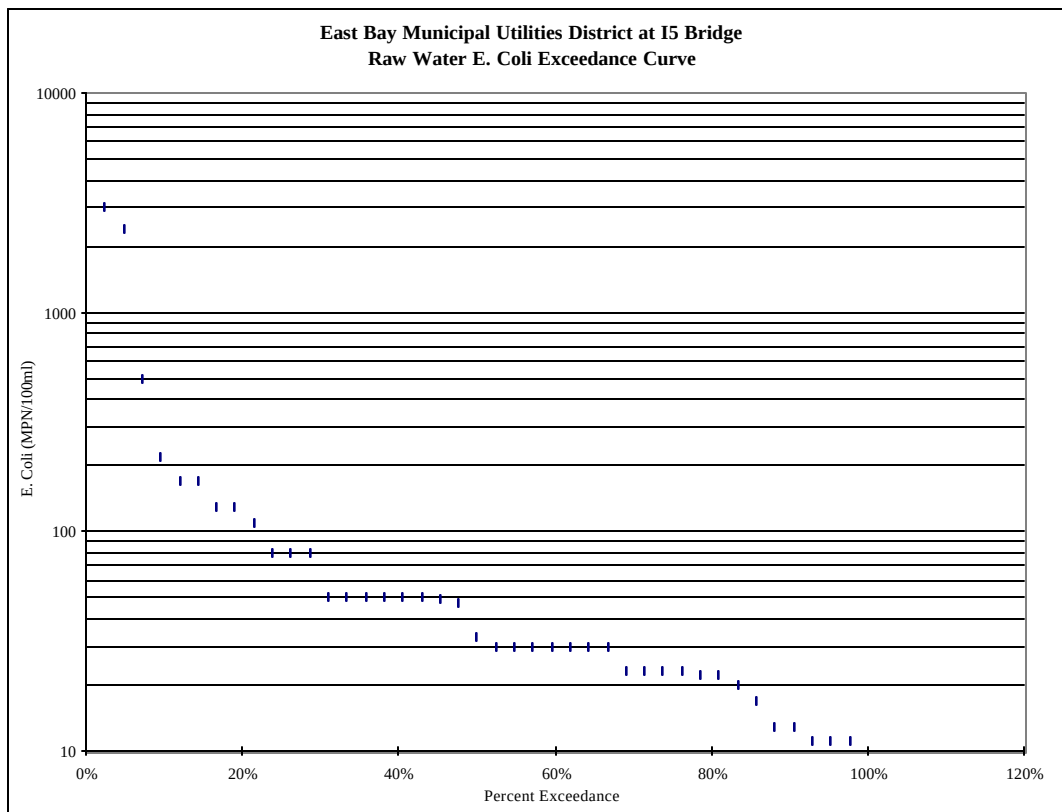
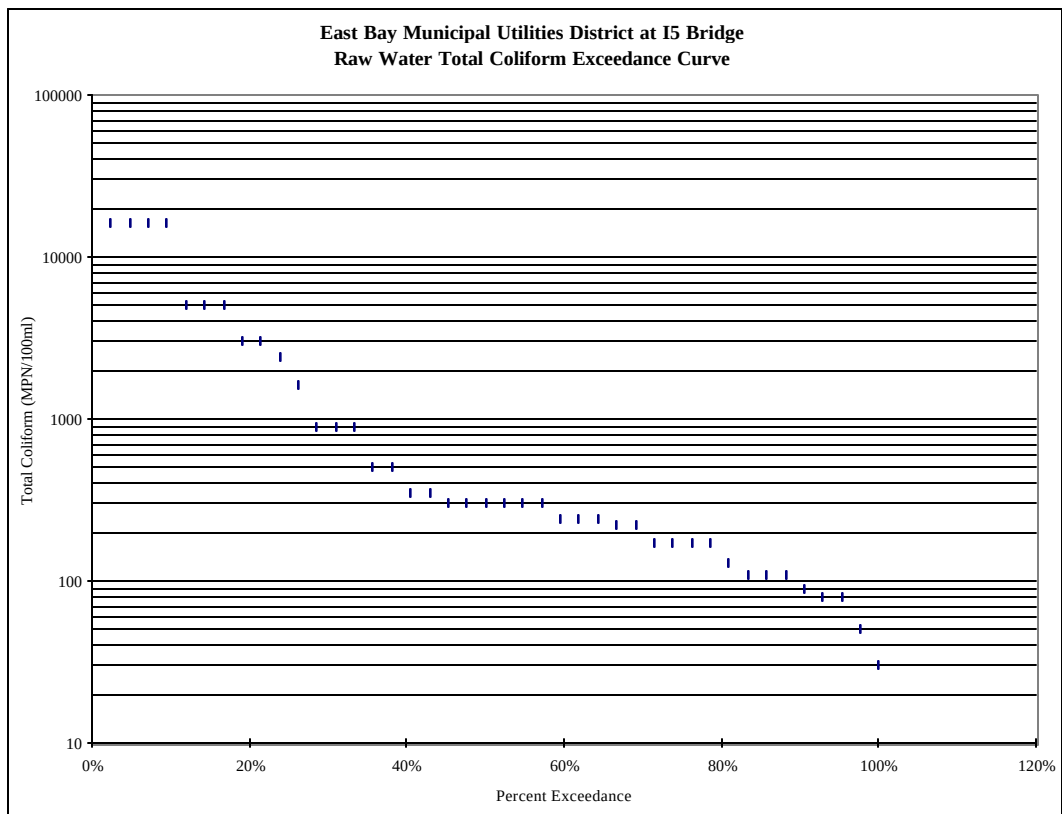


Arden Cordova Water Service Raw Water Fecal Coliform Exceedance Curve



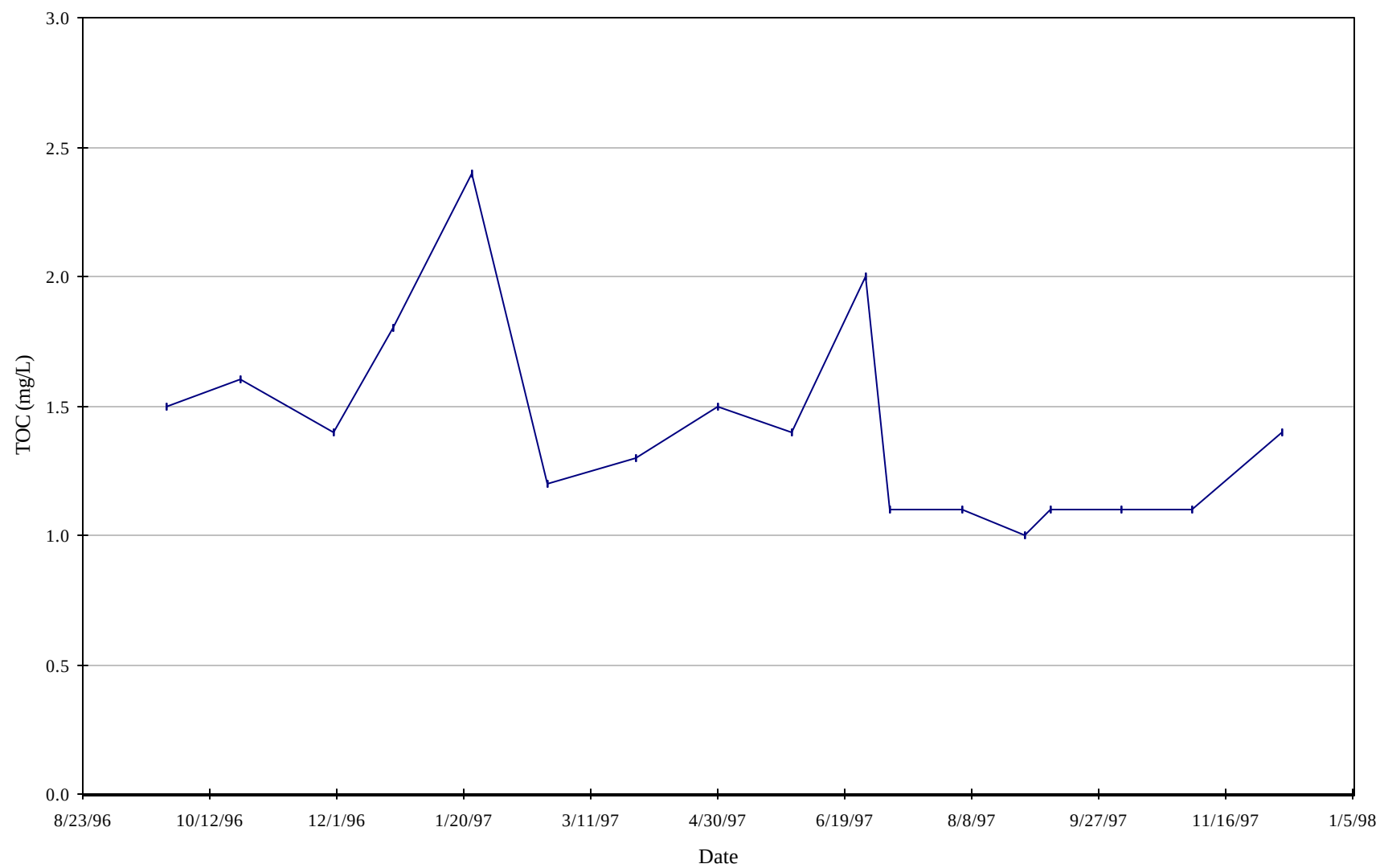






Total Organic Carbon Data

Historical TOC at S.N. Peterson WTP on the American River



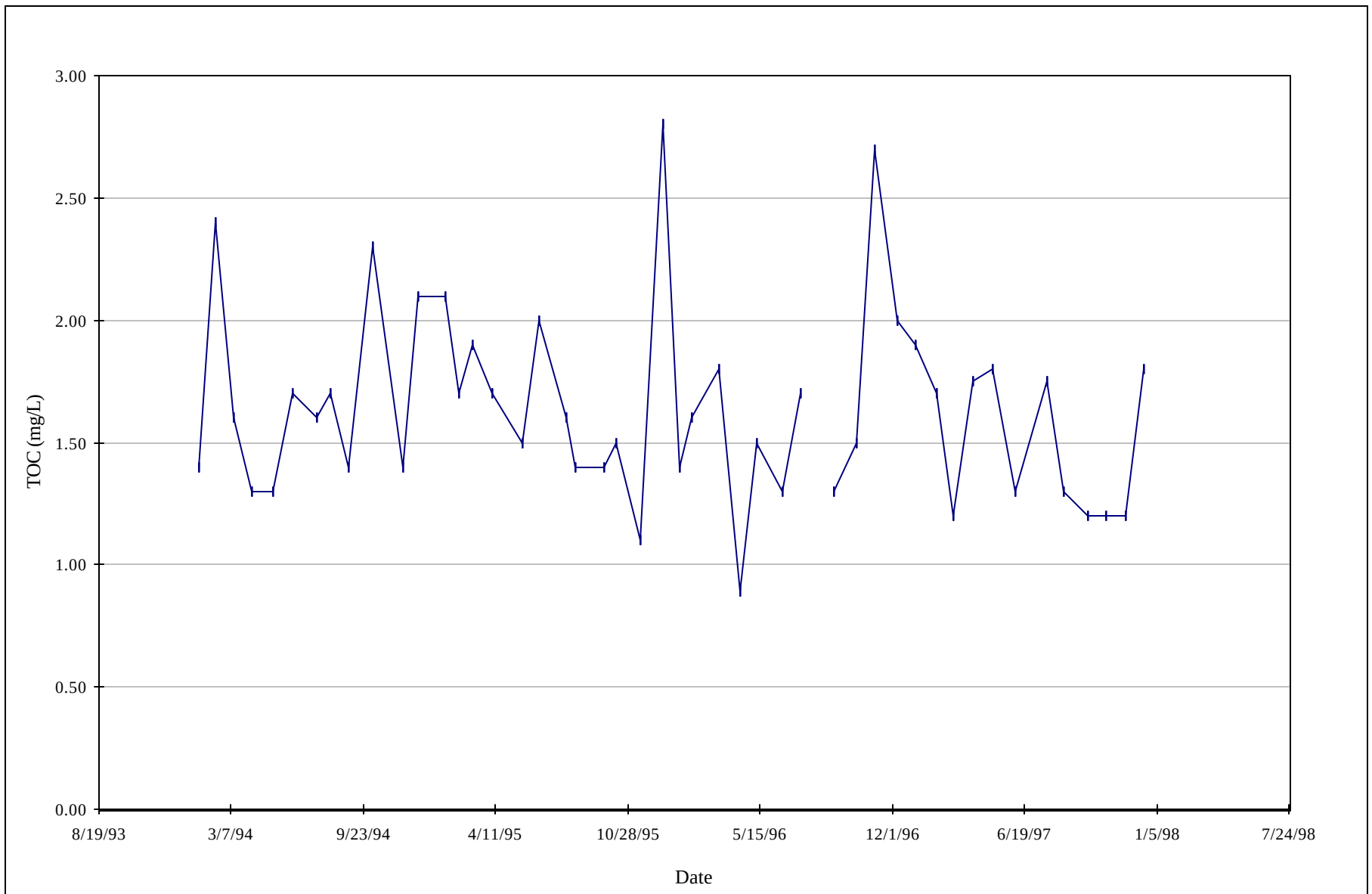
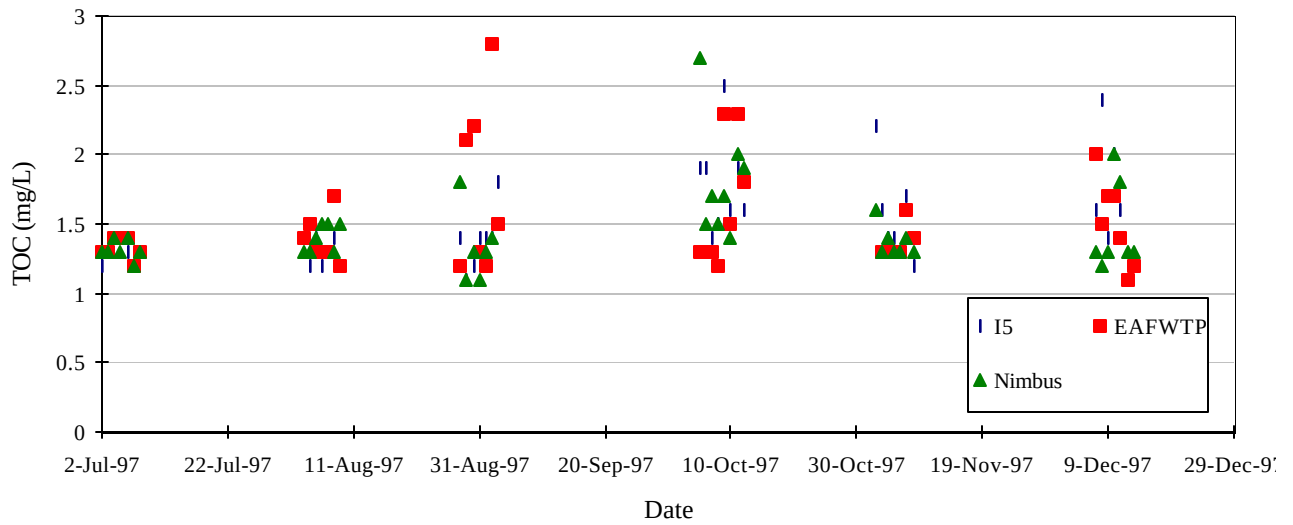


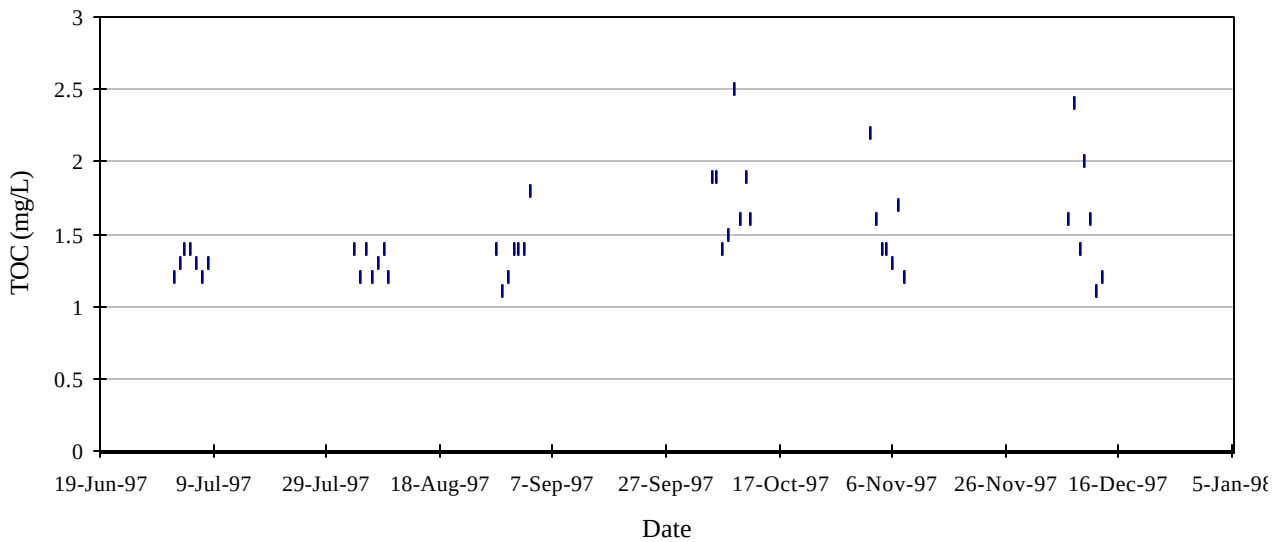
Figure __. Historical TOC at E.A. Fairbairn WTP on the American River

EBMUD

EBMUD Raw Water TOC Data on the American River



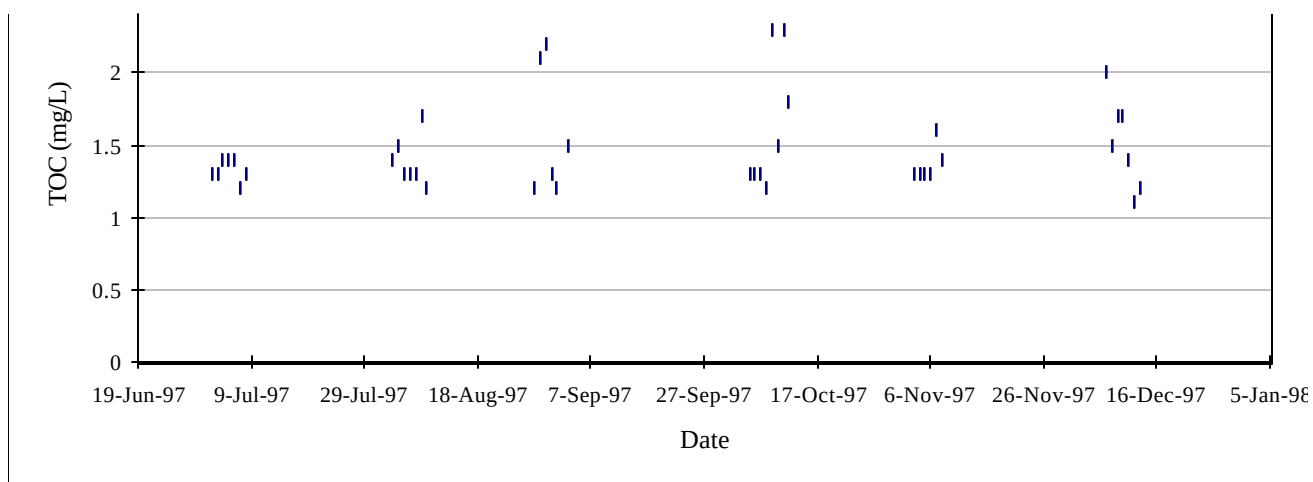
EBMUD TOC Data at I5 on the American River



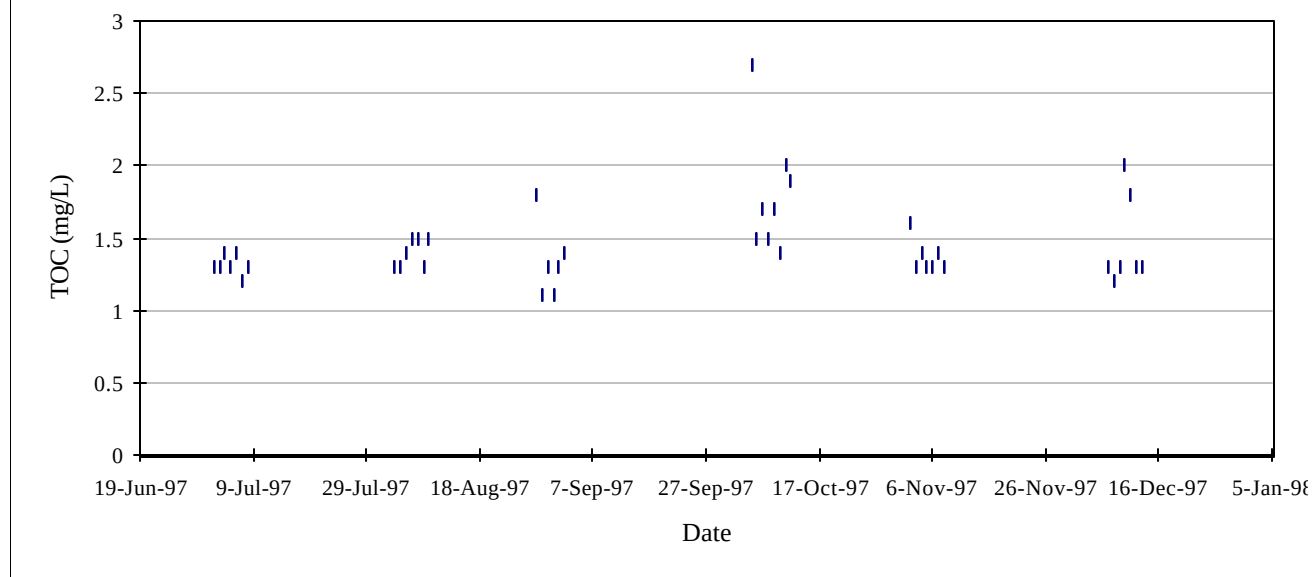
EBMUD TOC Data at E.A.Fairbairn WTP on the American River



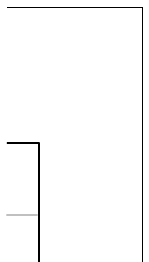
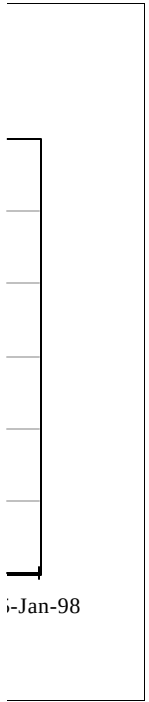
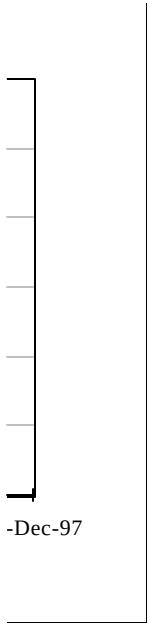
EBMUD

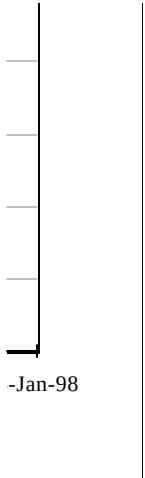


EBMUD TOC Data at Nimbus on the American River







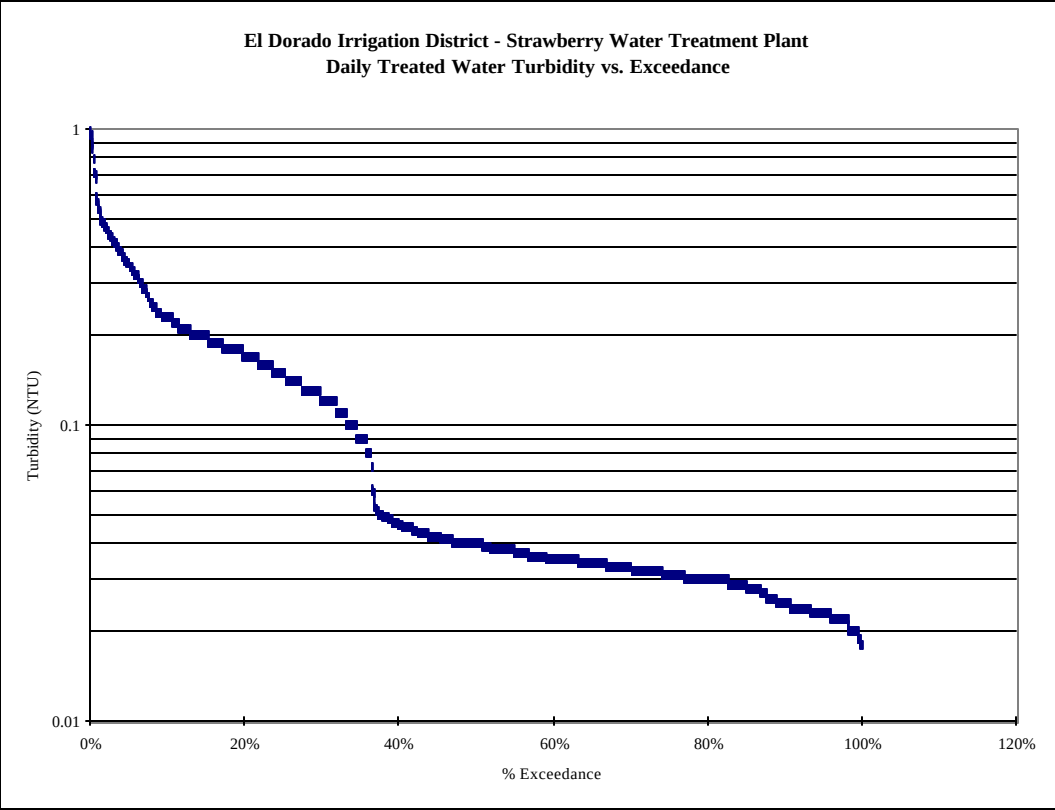
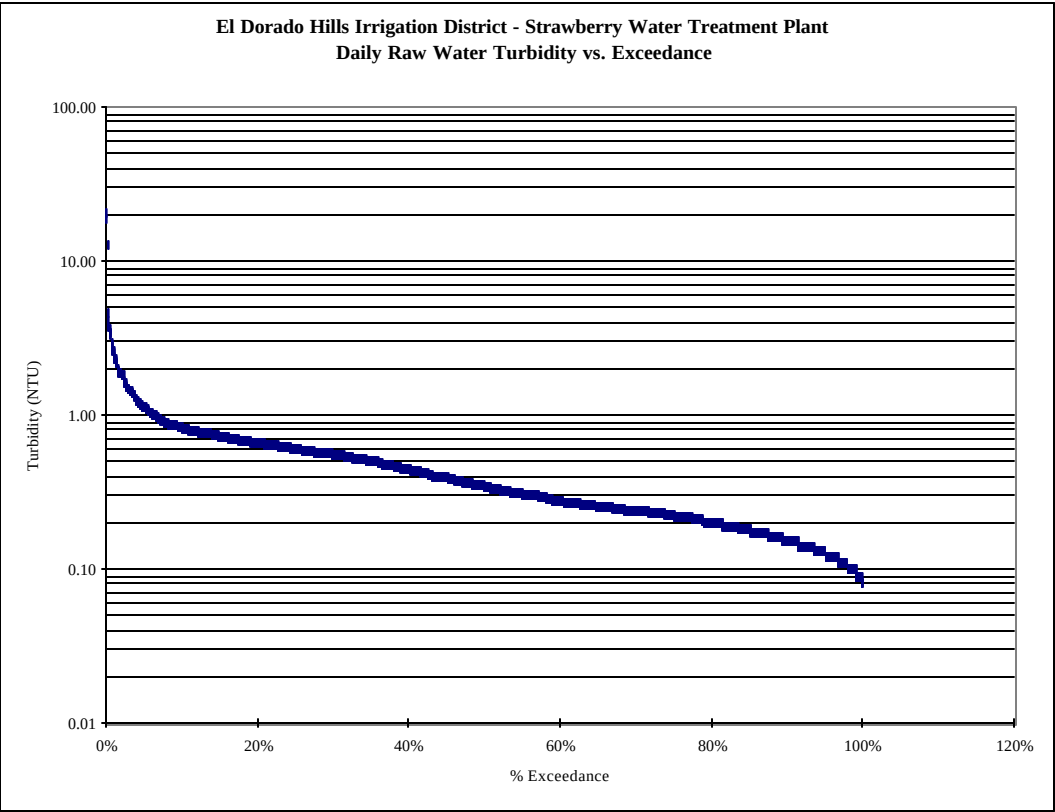


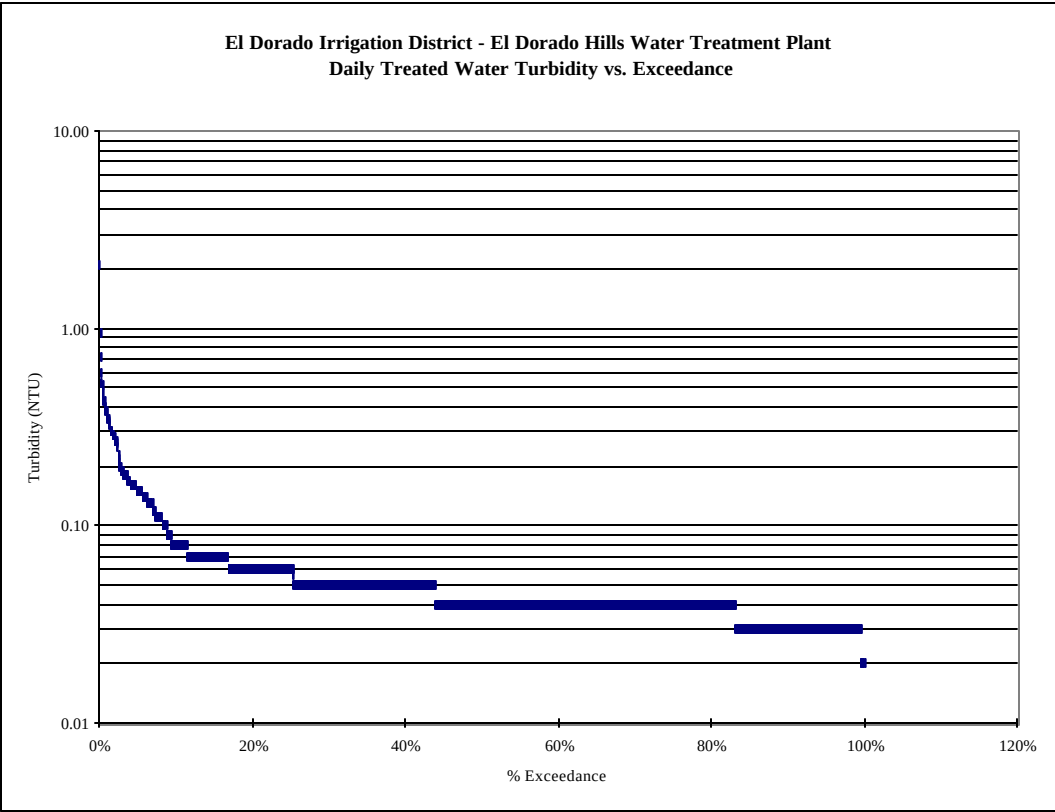
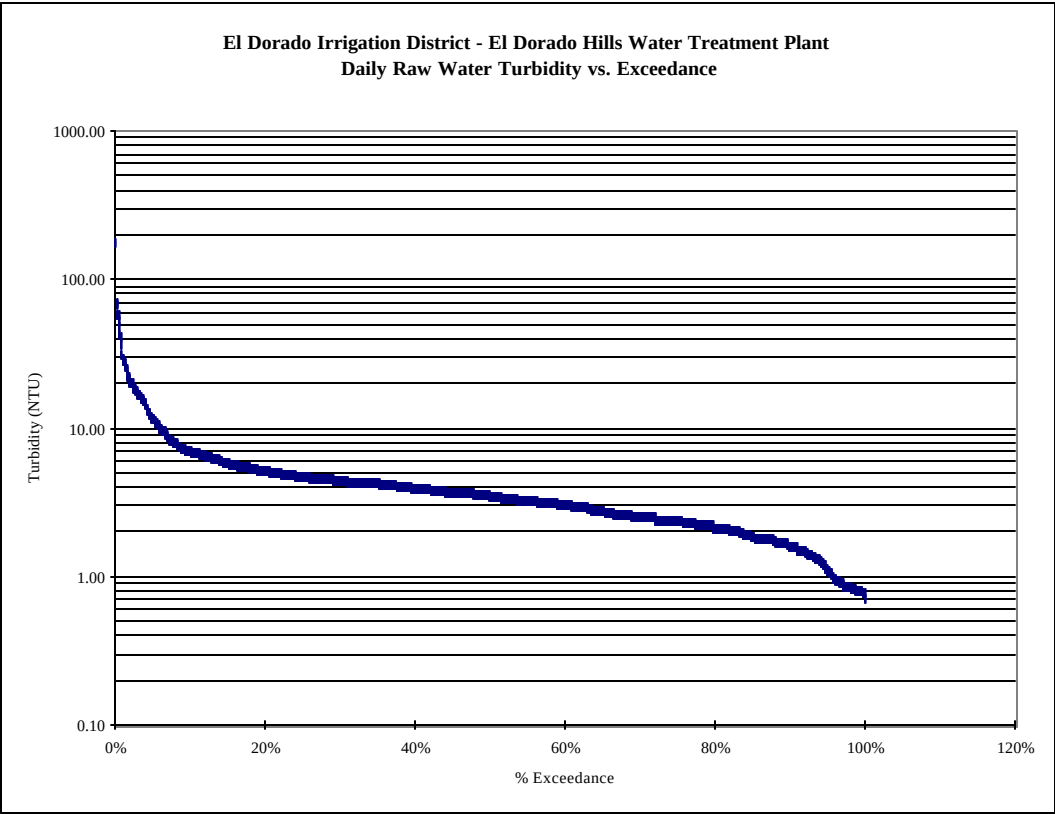
SUVA Data

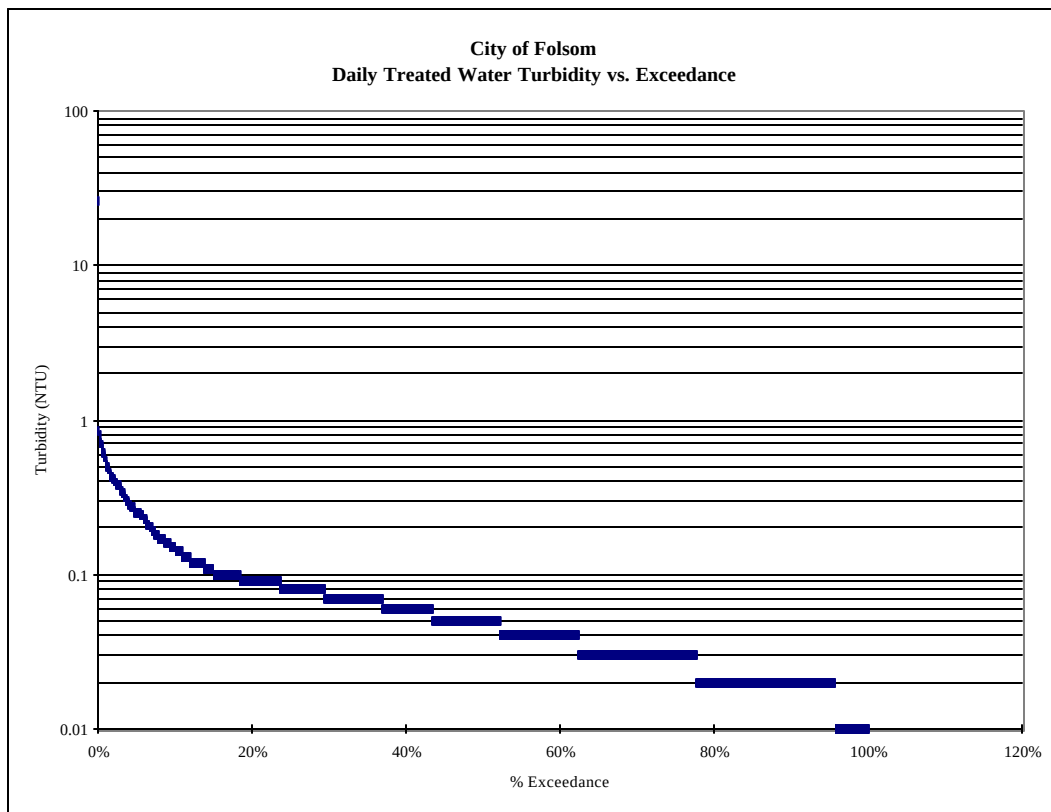
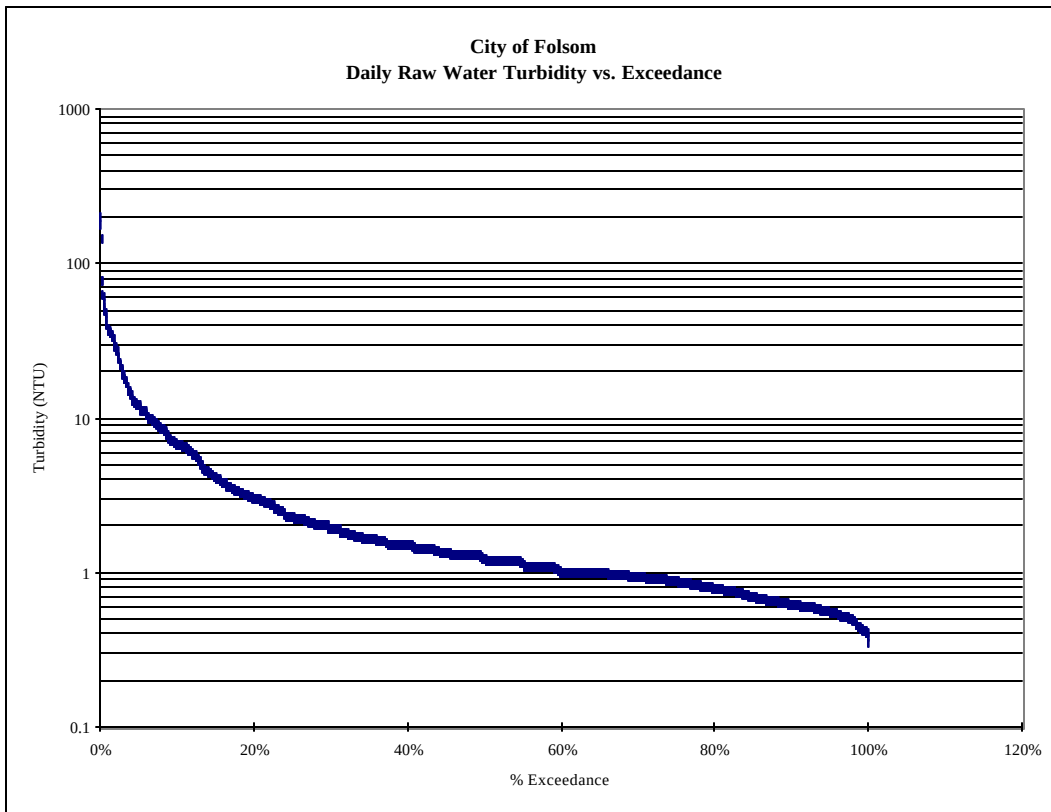
EBMUD DOC/UV/SUVA Data for Raw Water on the American River

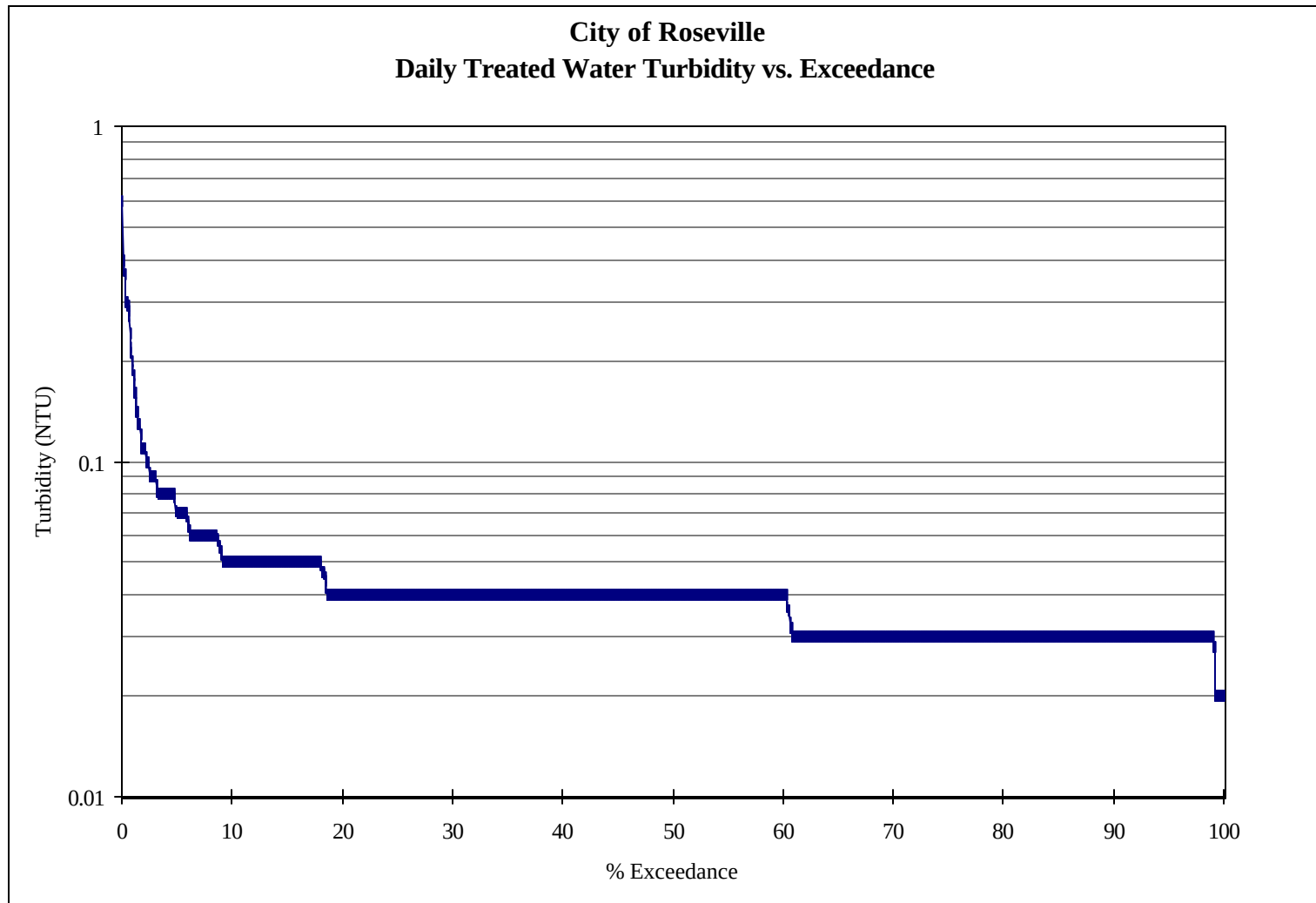
Date Sample	UV	DISSOLVED	SPECIFIC UV	UV	DISSOLVED	SPECIFIC UV	UV	DISSOLVED	SPECIFIC UV
	ABSORBANC E @254 at I5	ORGANIC CARBON at I5	ABSORBANC E at I5	ABSORBANCE @254 at EAFWTP	ORGANIC CARBON at EAFWTP	ABSORBANCE at EAFWTP	ABSORBANC E @254 at Nimbus	ORGANIC CARBON at Nimbus	ABSORBANC E at Nimbus
Collected	l/cm	mg/L	m-L/mg	l/cm	mg/L	m-L/mg	l/cm	mg/L	m-L/mg
2-Jul-97	0.04	0.96	4.167	0.039	1.2	3.250	0.044	1	4.4
3-Jul-97	0.041	1.1	3.727	0.04	1	4.000	0.041	1	4.100
4-Jul-97	0.041	1.1	3.727	0.04	1	4.000	0.04	1	4.000
5-Jul-97	0.042	1.1	3.818	0.041	1.1	3.727	0.039	1.1	3.545
6-Jul-97	0.041	1.1	3.727	0.04	1.2	3.333	0.038	1.2	3.167
7-Jul-97	0.034	1.1	3.091	0.04	1	4.000	0.039	1	3.900
8-Jul-97	0.041	1.1	3.727	0.041	1.3	3.154	0.038	1.1	3.455
3-Aug-97	0.039	1.1	3.545	0.038	1.1	3.455	0.036	1.1	3.273
4-Aug-97	0.041	0.99	4.141	0.04	1	4.000	0.038	1.1	3.455
5-Aug-97	0.03	1.3	2.308	0.027	1.2	2.250	0.026	1.4	1.857
6-Aug-97	0.027	1.2	2.250	0.027	1.2	2.250	0.028	1.3	2.154
7-Aug-97	0.028	1.2	2.333	0.028	1.2	2.333	0.024	1.3	1.846
8-Aug-97	0.037	1.3	2.846	0.036	1.2	3.000	0.033	1.2	2.750
9-Aug-97	0.038	1.3	2.923	0.035	1.2	2.917	0.034	1.4	2.429
28-Aug-97	0.034	1	3.400	0.033	1.1	3.000	0.033	1.2	2.750
29-Aug-97	0.035	1	3.500	0.039	1.1	3.545	0.036	1	3.600
30-Aug-97	0.034	1	3.400	0.036	1	3.600	0.033	1	3.300
31-Aug-97	0.037	1.1	3.364	0.038	1.1	3.455	0.034	1.1	3.091
1-Sep-97	0.037	1.4	2.643	0.035	0.99	3.535	0.037	0.99	3.737
2-Sep-97	0.037	1.1	3.364	0.048	1.4	3.429	0.037	1.4	2.643
3-Sep-97	0.046	1	4.600	0.036	1.1	3.273	0.038	0.99	3.838
5-Oct-97	0.038	1.1	3.455	0.036	1.1	3.273	0.038	1.3	2.923
6-Oct-97	0.038	1.1	3.455	0.035	1.1	3.182	0.04	1.1	3.636
7-Oct-97	0.037	1.1	3.364	0.035	1.1	3.182	0.037	1.1	3.364
8-Oct-97	0.036	1.1	3.273	0.035	1	3.500	0.037	1.1	3.364
9-Oct-97	0.068	1.7	4.000	0.063	1.5	4.200	0.035	1.1	3.182
10-Oct-97	0.047	1.2	3.917	0.035	1.1	3.182	0.037	1.2	3.083
11-Oct-97	0.038	1.3	2.923	0.04	1.2	3.333	0.038	1.2	3.167
12-Oct-97	0.039	1.2	3.250	0.036	1.1	3.273	0.038	1.3	2.923
2-Nov-97	0.03	1.1	2.727	0.038	1.2	3.167	0.032	1.4	2.286
3-Nov-97	0.025	1.1	2.273	0.025	1.1	2.273	0.031	1.1	2.818
4-Nov-97	0.032	1.2	2.667	0.032	1.2	2.667	0.032	1.2	2.667
5-Nov-97	0.034	1.2	2.833	0.033	1.2	2.750	0.034	1.3	2.615
6-Nov-97	0.033	1.2	2.750	0.033	1.2	2.750	0.035	1.2	2.917
7-Nov-97	0.014	1.2	1.167	0.012	1.3	0.923	0.015	1.3	1.154
8-Nov-97	0.013	1.3	1.000	0.014	1.3	1.077	0.014	1.1	1.273
7-Dec-97	0.041			0.058	1.5	3.867	0.034	1.2	2.833
8-Dec-97	0.12	2.2	5.455	0.048	1.2	4.000	0.084	1.1	7.636
9-Dec-97	0.044	1.2	3.667	0.13	1.6	8.125	0.086	1.1	7.818
10-Dec-97	0.1	1.6	6.250	0.064	1.3	4.923	0.12	1.5	8.000
11-Dec-97	0.054	1.3	4.154	0.039	1.2	3.250	0.099	1.5	6.600
12-Dec-97	0.037	1.1	3.364	0.035	1.1	3.182	0.072	1.3	5.538
13-Dec-97	0.037	1	3.700	0.039	1.1	3.545	0.069	1.3	5.308
Average	0.04	1.19	3.386	0.04	1.17	3.358	0.04	1.18	3.544
Median	0.04	1.10	3.364	0.04	1.20	3.000	0.04	1.20	3.083
Minimum	0.01	0.96	1.354	0.01	0.99	1.212	0.01	0.99	1.414
Maximum	0.12	2.20	5.455	0.13	1.60	8.125	0.12	1.50	8.000
95th Percentile	0.07	1.59	4.189	0.06	1.49	4.195	0.09	1.40	6.129

Turbidity Exceedance Curves

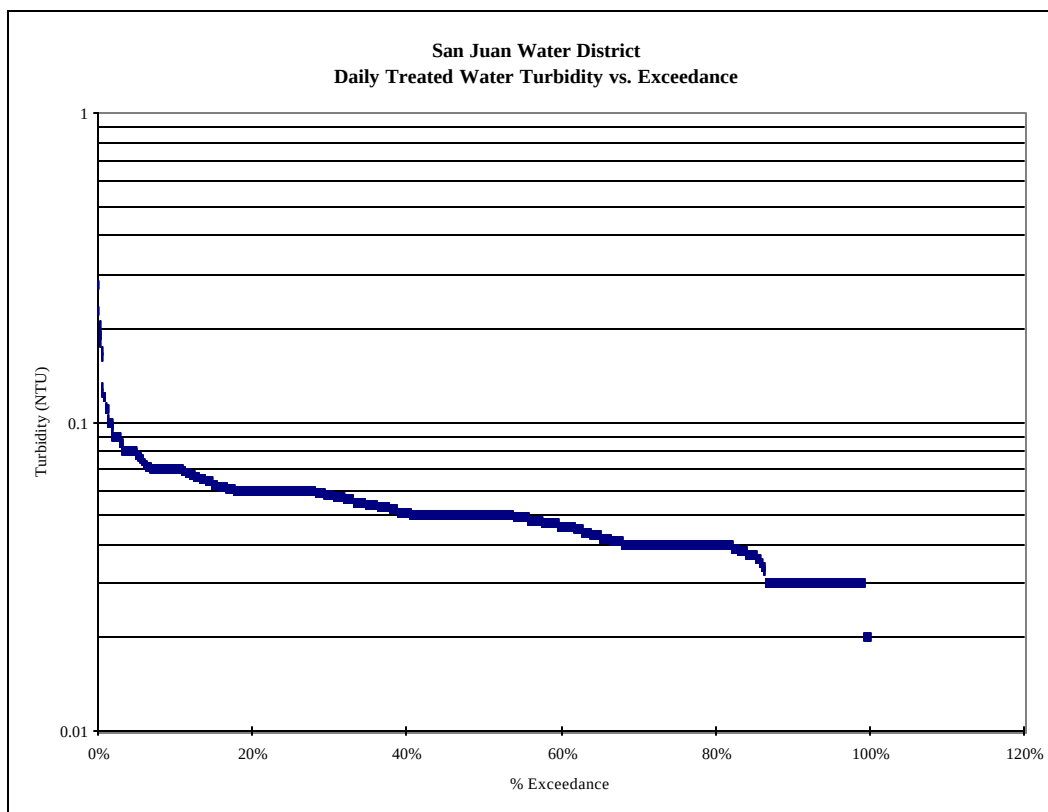
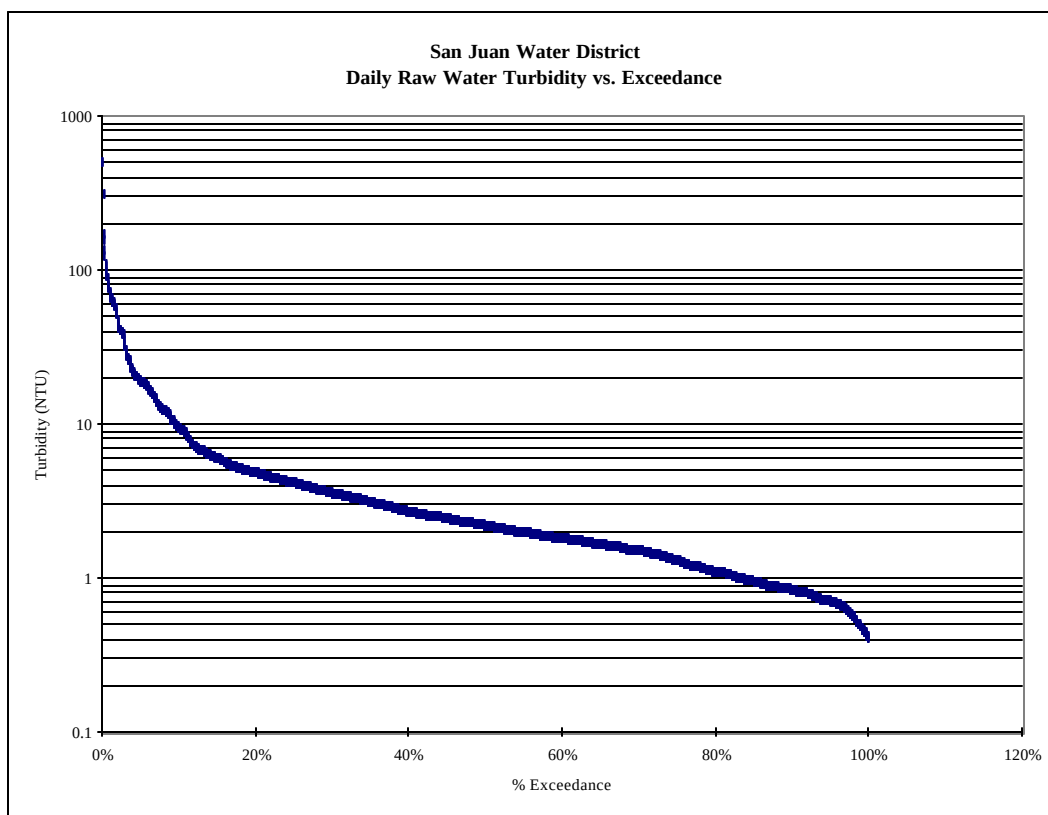


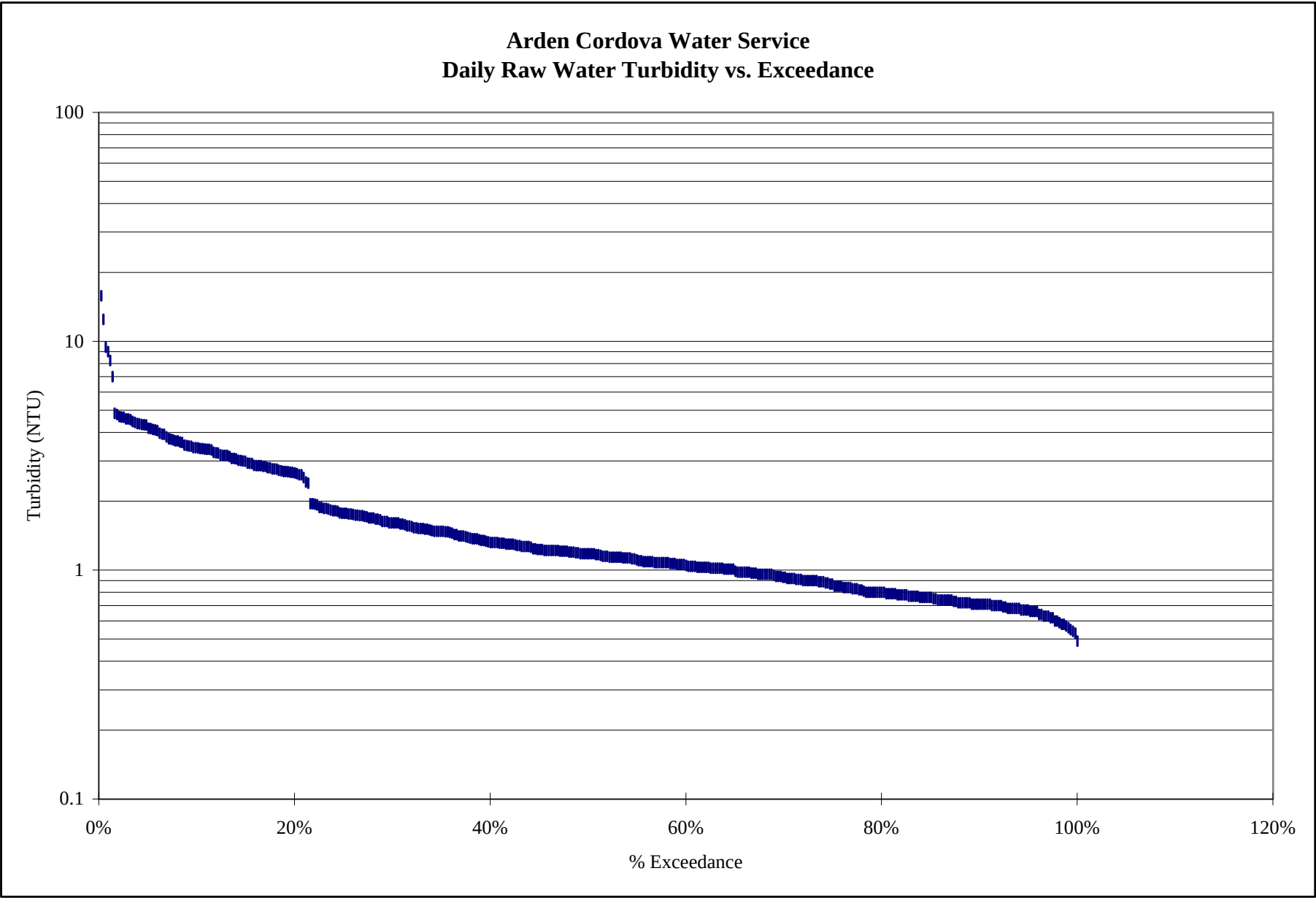




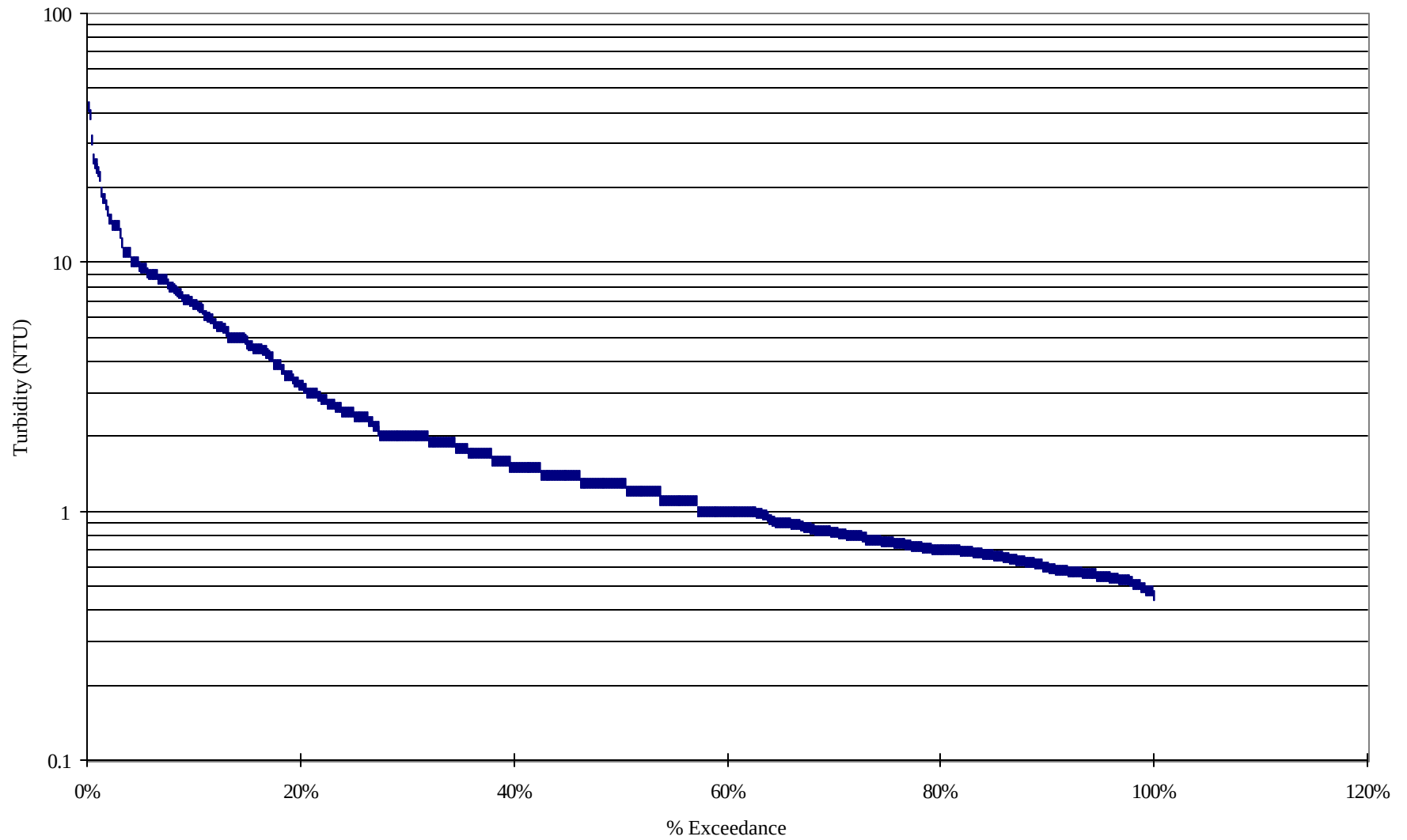


Source: City of Roseville daily turbidity monitoring (1993-1997)

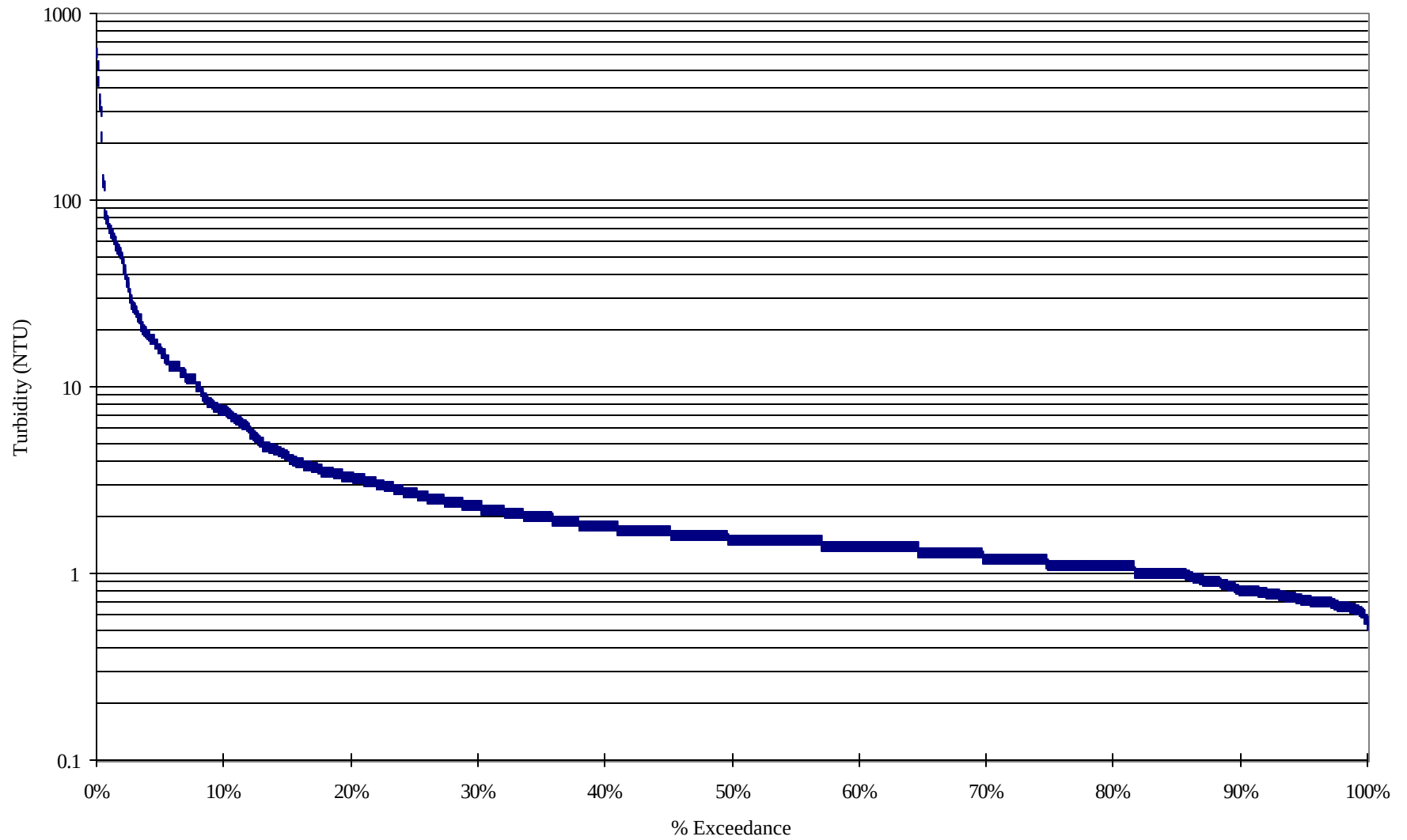




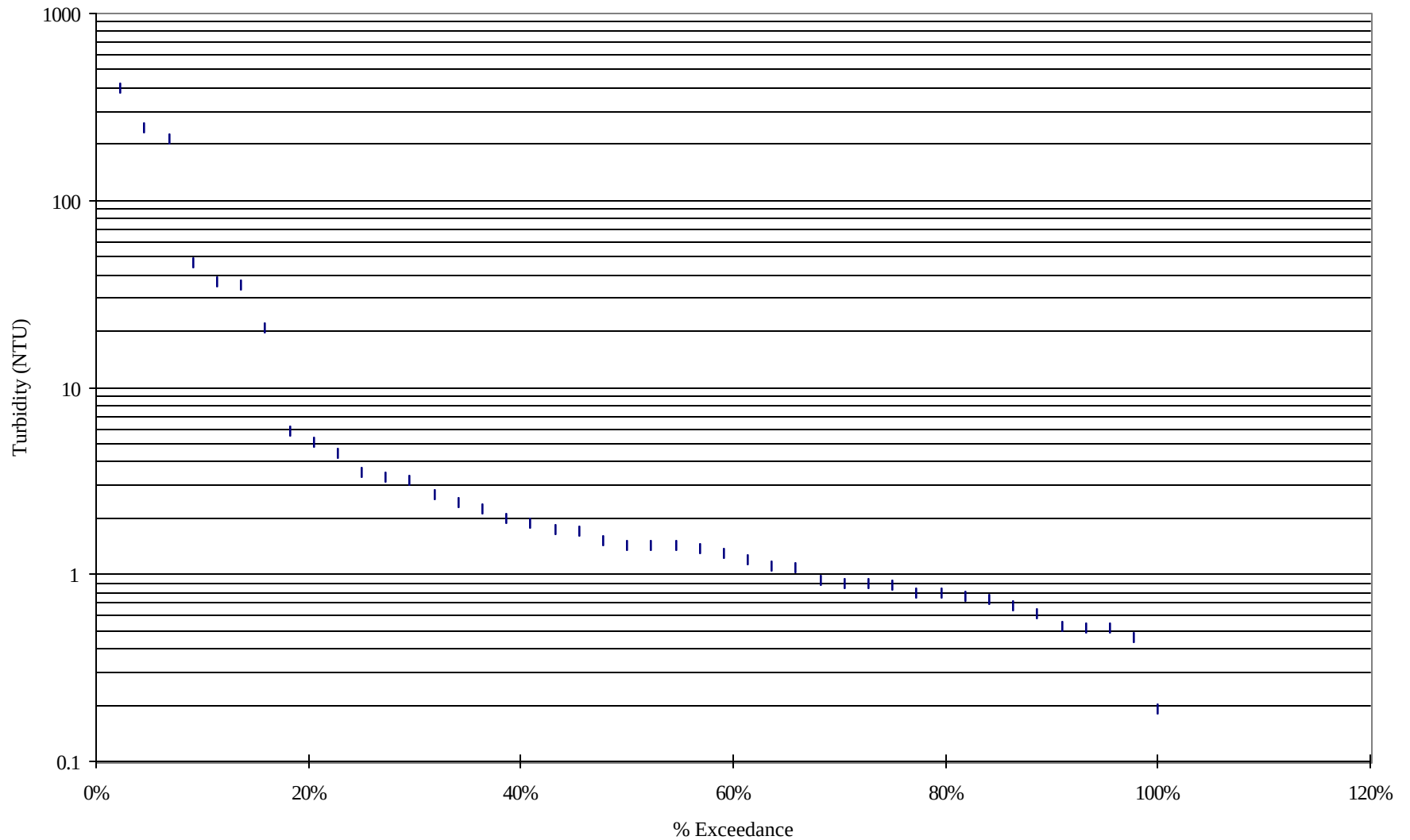
**Carmichael Water District
Daily Raw Water Turbidity vs. Exceedance**



City of Sacramento
Daily Raw Water Turbidity vs. Exceedance



**Placer County Water Agency
Monthly Raw Water Turbidity vs. Exceedance**



RWQCB Monitoring Data

**Sacramento River Watershed Program
American River at Discovery Park**

Sample Date	Field Temp (°C)	Field pH	Field EC (mmhos)	Lab pH	Lab EC (mmhos)	Lab DO (mg/l)	Total Hardness (mg/l)	Calcium Hardness (mg/l)	Alkalinity (mg/l)	TSS (mg/l)
8/20/96 to 8/22/96				7.56	40	7.9	30	18	26	5.38
9/22/96 to 9/24/96				8.26	49	8.3	20	12	20	<5.0
11/18/96	14.1	7.22	42	7.51	50	8.1	30.8	16	26	<5.0
1/19/97 to 1/21/97	8.3	7.21	30	7.49	97	9.4	20	12	24	33.7
2/21/97	9	7.67	33	7.63	80	8.3	28	16	25	13.52
3/1/97	9.4	7.5	36	7.5	52	8.6	24	14	24	<5.0
4/1/97	19.9	6.94	50	7.84	53	8.3	20	16	18	<5.0
5/1/97	19.4	8.2	45	7.82	71	8.6	32	12	28	<5.0
6/1/97	22.3	7.48	136	8.05	51	8.5	20	16	24	
7/1/97	21.1	7.8	40	7.69	60	8.1	16	12	23	<5.0
10/2/97	21	7.53	48	7.72	45	8.2	28	20	30	
10/17/97	18	7.52	49	7.61	45	8.6	20	12	24	
10/31/97	17	7.76	61	7.97	55	8.1	28		28	
11/18/97	15	8.33	43	7.43	50	8.1	20		24	
12/2/97	13.5	7.91	45	7.64	58	8.5	60		34	
12/15/97	11.1	8.14	65	7.64	69	8.3	64		36	
Average	15.65	7.66	51.64	7.71	57.81	8.37	28.80	14.67	25.88	17.53
Median	16.00	7.60	45.00	7.64	52.50	8.30	26.00	15.00	24.50	13.52
Minimum	8.30	6.94	30.00	7.43	40.00	7.90	16.00	12.00	18.00	5.38
Maximum	22.30	8.33	136.00	8.26	97.00	9.40	64.00	20.00	36.00	33.70
95th %	21.52	8.25	89.85	8.10	84.25	8.80	61.00	18.90	34.50	31.68

In May 1997, Chlorpyrifos <50 ng/l and Diazinon <30 ng/l.

EBMUD Coliform Data

EBMUD Weekend Coliform Data
Lower American River at Nimbus

Date Sample	Day of Week	TOTAL COLIFORMS	E COLI
Collected		MPN/100 mL	MPN/100 mL
2-Jul-97	Wednesday	240	17
3-Jul-97	Thursday	170	50
4-Jul-97	Friday	900	13
5-Jul-97	Saturday	49	33
6-Jul-97	Sunday	5000	2
7-Jul-97	Monday	130	17
8-Jul-97	Tuesday	17	13
3-Aug-97	Sunday	240	2
4-Aug-97	Monday	30	4
5-Aug-97	Tuesday	32	7
6-Aug-97	Wednesday	50	8
7-Aug-97	Thursday	2	2
8-Aug-97	Friday	80	11
9-Aug-97	Saturday	5000	80
29-Aug-97	Friday	30	30
30-Aug-97	Saturday	220	140
31-Aug-97	Sunday	300	170
1-Sep-97	Monday	170	170
2-Sep-97	Tuesday	3500	30
3-Sep-97	Wednesday	300	13
5-Oct-97	Sunday	500	22
6-Oct-97	Monday	3000	110
7-Oct-97	Tuesday	240	80
8-Oct-97	Wednesday	240	130
9-Oct-97	Thursday	16000	230
10-Oct-97	Friday	50	30
11-Oct-97	Saturday	50	22
12-Oct-97	Sunday	30	30
2-Nov-97	Sunday	50	21
3-Nov-97	Monday	30	30
4-Nov-97	Tuesday	11	4
5-Nov-97	Wednesday	50	50
6-Nov-97	Thursday	110	50
7-Nov-97	Friday	30	23
8-Nov-97	Saturday	27	27
7-Dec-97	Sunday	23	4
8-Dec-97	Monday	30	13
9-Dec-97	Tuesday	170	170
10-Dec-97	Wednesday	800	130
11-Dec-97	Thursday	220	8
12-Dec-97	Friday	300	30
13-Dec-97	Saturday	80	23
Average		916.69	48.79
Median		120.00	25.00
Minimum		2.00	2.00
Maximum		16000.00	230.00
95th Percentile		4925.00	170.00

EBMUD Weekend Coliform Data
Lower American River at E.A. Fairbairn WTP

Date Sample	Day of Week	TOTAL COLIFORMS	E COLI
Collected		MPN/100 mL	MPN/100 mL
2-Jul-97	Wednesday	130	30
3-Jul-97	Thursday	22	4
4-Jul-97	Friday	300	130
5-Jul-97	Saturday	56	34
6-Jul-97	Sunday	240	130
7-Jul-97	Monday	300	22
8-Jul-97	Tuesday	1100	20
3-Aug-97	Sunday	16000	2
4-Aug-97	Monday	500	50
5-Aug-97	Tuesday	500	23
6-Aug-97	Wednesday	300	30
7-Aug-97	Thursday	90	23
8-Aug-97	Friday	300	110
9-Aug-97	Saturday	110	80
29-Aug-97	Friday	50	23
30-Aug-97	Saturday	16000	110
31-Aug-97	Sunday	1600	17
1-Sep-97	Monday	500	33
2-Sep-97	Tuesday	5000	26
3-Sep-97	Wednesday	500	80
5-Oct-97	Sunday	300	11
6-Oct-97	Monday	140	4
7-Oct-97	Tuesday	240	30
8-Oct-97	Wednesday	240	30
9-Oct-97	Thursday	16000	3000
10-Oct-97	Friday	3000	130
11-Oct-97	Saturday	1600	80
12-Oct-97	Sunday	70	17
2-Nov-97	Sunday	170	11
3-Nov-97	Monday	50	17
4-Nov-97	Tuesday	23	23
5-Nov-97	Wednesday	300	17
6-Nov-97	Thursday	90	11
7-Nov-97	Friday	7	2
8-Nov-97	Saturday	90	8
7-Dec-97	Sunday	2400	1600
8-Dec-97	Monday	900	80
9-Dec-97	Tuesday	500	500
10-Dec-97	Wednesday	500	90
11-Dec-97	Thursday	140	90
12-Dec-97	Friday	13	11
13-Dec-97	Saturday	170	26
Average		1679.55	161.07
Median		300.00	28.00
Minimum		7.00	2.00
Maximum		16000.00	3000.00
95th Percentile		15450.00	481.50

EBMUD Weekend Coliform Data
Lower American River at I5

Date Sample	Day of Week	TOTAL COLIFORMS	E COLI
Collected		MPN/100 mL	MPN/100 mL
2-Jul-97	Wednesday	300	50
3-Jul-97	Thursday	350	49
4-Jul-97	Friday	300	23
5-Jul-97	Saturday	350	33
6-Jul-97	Sunday	170	30
7-Jul-97	Monday	110	30
8-Jul-97	Tuesday	300	30
3-Aug-97	Sunday	5000	80
4-Aug-97	Monday	80	50
5-Aug-97	Tuesday	5000	80
6-Aug-97	Wednesday	220	47
7-Aug-97	Thursday	240	30
8-Aug-97	Friday	110	22
9-Aug-97	Saturday	300	110
29-Aug-97	Friday	110	13
30-Aug-97	Saturday	170	30
31-Aug-97	Sunday	16000	50
1-Sep-97	Monday	3000	23
2-Sep-97	Tuesday	80	30
3-Sep-97	Wednesday	16000	220
5-Oct-97	Sunday	900	50
6-Oct-97	Monday	240	22
7-Oct-97	Tuesday	90	20
8-Oct-97	Wednesday	900	30
9-Oct-97	Thursday	16000	2400
10-Oct-97	Friday	3000	80
11-Oct-97	Saturday	300	11
12-Oct-97	Sunday	900	23
2-Nov-97	Sunday	220	13
3-Nov-97	Monday	1600	23
4-Nov-97	Tuesday	240	130
5-Nov-97	Wednesday	170	17
6-Nov-97	Thursday	130	130
7-Nov-97	Friday	500	50
8-Nov-97	Saturday	300	4
7-Dec-97	Sunday	5000	500
8-Dec-97	Monday	16000	3000
9-Dec-97	Tuesday	500	170
10-Dec-97	Wednesday	2400	170
11-Dec-97	Thursday	170	50
12-Dec-97	Friday	50	11
13-Dec-97	Saturday	30	11
Average		2329.29	189.17
Median		300.00	31.50
Minimum		30.00	4.00
Maximum		16000.00	3000.00
95th Percentile		16000.00	486.00

Ambient Monitoring Program Data

**Sacramento Regional Coordinated Monitoring Program
American River at Folsom 1993-97**

Sample Date	Location	As-d (ug/L)	As-tot (ug/L)	Cd-d (ug/L)	Cd-tr (ug/L)	Cr-d (ug/L)	Cr-tr (ug/L)	Cu-d (ug/L)	Cu-tr (ug/L)	Pb-d (ug/L)	Pb-tr (ug/L)	Hg-d (ug/L)	Hg-tot (ug/L)	Ni-d (ug/L)
01/07/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	21	1.3	1.7	<0.1	0.3			2.1
01/27/93	Folsom	<1.0	<1.0	0.03	0.26	<1.0	1.2	1.4	1.6	0.12	0.14			1.3
02/05/93	Folsom	<1.0	<1.0	0.03	0.04	<1.0	1.1	1.1	1.3	<0.1	0.2			<1.0
02/20/93	Folsom	<1.0	1.6	0.07	0.21	<1.0	<1.0	1	1.1	<0.1	<0.1			<1.0
03/07/93	Folsom	1.1	1.4	0.05	0.06	<1.0	1	1	1.2	<0.1	<0.1			2
03/22/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.9	<0.1	<0.1			1
04/06/93	Folsom	<1.0	<1.0	0.04	0.13	<1.0	<1.0	0.7	0.8	<0.1	0.1			<1.0
04/21/93	Folsom	<1.0	<1.0	<0.03	0.18	<1.0	<1.0	0.6	0.9	<0.1	0.2			<1.0
05/06/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	6.4	<0.5	0.7	<0.1	<0.1			1.1
05/21/93	Folsom	<1.0	<1.0	0.03	0.1	<1.0	<1.0	<0.5	-0.5	<0.1	<0.1			<1.0
06/07/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	-0.5	<0.1	0.2			1.8
06/22/93	Folsom	<1.0	<1.0	<0.03	0.33	<1.0	<1.0	<0.5	-0.5	<0.1	<0.1			<1.0
07/07/93	Folsom	<1.0	<1.0	<0.03	0.05	<1.0	<1.0		-0.5	<0.1	<0.1			2.8
07/22/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.7	<0.1	<0.1			<1.0
08/06/93	Folsom	<1.0	<1.0	<0.03	0.04	<1.0	<1.0	<0.5	0.6	<0.1	<0.1			<1.0
08/21/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	-0.5	<0.1	<0.1			<1.0
09/03/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	-0.5	<0.1	<0.1			<1.0
09/20/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.6	<0.1	<0.1			<1.0
10/5/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.7	<0.1	<0.1			<1.0
10/20/93	Folsom	<1.0	<1.0	<0.03	0.14	<1.0	<1.0	0.5	0.7	<0.1	0.2			<1.0
11/4/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.7	<0.1	<0.1			<1.0
11/18/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.5	0.7	<0.1	<0.1			<1.0
12/1/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.9	<0.1	<0.1			<1.0
12/19/93	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.7	<0.1	<0.1			<1.0
1/5/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1			1.4
1/19/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1	0.93	2.46	
2/2/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.7	<0.1	<0.1	1.79	1.8	<1.0
2/16/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.6	0.2	<0.1	0.65	1.23	
3/2/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	1.3	0.5	<0.5	<0.1	0.1	1.34	2.04	<1.0
3/16/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.9	0.8	<0.1	<0.1	0.96	1.72	
4/13/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.5	0.7	<0.1	<0.1	2.2	3.39	<1.0
4/27/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.7	<0.1	<0.1	1.8	2.69	
5/11/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.6	<0.1	<0.1	1.7	2.01	<1.0
5/25/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	0.8	<0.1	<0.1	1.38	2.06	
6/8/94	Folsom	<1.0	<1.0	<0.03	<0.03	1.5	1.1	0.8	0.5	<0.1	<0.1	1.74	2.87	<1.0
6/22/94	Folsom	<1.0	<1.0	0.03	0.03	<1.0	<1.0	0.8	1.2	<0.1	0.2	1.79	2.29	
7/6/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.7	0.2	<0.1	1.73	2.95	<1.0
07/19/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1	1.27	2.01	
08/17/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.7	<0.1	<0.1	1.73	6.18	<1.0
08/30/94	Folsom	<1.0	<1.0			<1.0	1.8	<0.5	0.8	<0.1	0.2	1.73	2.78	
09/14/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.9	0.9	<0.1	<0.1	1.39	2.55	<1.0
10/26/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.5	<0.1	0.1	1.64	3.215	
11/09/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.6	<0.1	0.1			<1.0
11/22/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.9	<0.1	<0.1	1.53	3.03	
12/07/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	1	1.7	<0.1	0.3	1.59	3.85	<1.0

**Sacramento Regional Coordinated Monitoring Program
American River at Folsom 1993-97**

Sample Date	Location	As-d (ug/L)	As-tot (ug/L)	Cd-d (ug/L)	Cd-tr (ug/L)	Cr-d (ug/L)	Cr-tr (ug/L)	Cu-d (ug/L)	Cu-tr (ug/L)	Pb-d (ug/L)	Pb-tr (ug/L)	Hg-d (ug/L)	Hg-tot (ug/L)	Ni-d (ug/L)
12/21/94	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	1	0.2	0.2	1.04	2.7	
01/04/95	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	1.1	<0.1	0.3	1.05	3.58	<1.0
01/17/95	Folsom			<0.03	<0.03	<1.0	<1.0	0.8	1.8	<0.1	0.5	1.84	8.59	
02/01/95	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	1.2	1.2	0.2	0.2	1.94	4.84	1.1
02/28/95	Folsom			<0.03	<0.03	<1.0	<1.0	0.6	0.8	<0.1	<0.1	1.07	2.535	
03/14/95	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	1.5	0.9	2.7	<0.1	0.5	1.48	6.62	1.3
03/28/95	Folsom			<0.03	<0.03	<1.0	1.3	1	1.1	0.1	0.2	1.6	3.78	
04/12/95	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.7	<0.1	0.1	1.58	3.05	<1.0
04/25/95	Folsom					<1.0	<1.0	<0.5	0.8	<0.1	<0.1	1.4	2.61	
05/09/95	Folsom	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.9	<0.1	0.2	1.3	2.56	<1.0
05/23/95	Folsom			<0.03	<0.03	<1.0	<1.0	1.3	1.6	<0.1	0.1	1.27	2.48	
06/05/95	Folsom	<1.0	8.5	<0.03	<0.03	<1.0	<1.0	<0.5	0.6	<0.1	0.2	0.78	1.38	<1.0
06/19/95	Folsom			<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1	0.69	1.02	
7/19/95	Folsom	<1.0	<1.0	<0.03	<0.03		<1.0	<0.5	<0.5	<0.1	<0.1	0.92	1.68	<1.0
8/1/95	Folsom			<0.03	<0.03		<1.0	0.7	1	0.2	0.5	0.79	2.04	
8/15/95	Folsom	<1.0	<1.0	<0.03	<0.03		<1.0	0.6	0.7	<0.1	<0.1	0.79	1.18	<1.0
8/29/95	Folsom			<0.03	<0.03		<1.0	0.5	0.8	0.1	0.1	1.72	2.97	
9/12/95	Folsom	<1.0	<1.0	<0.03	<0.03		<1.0	<0.5	<0.5	<0.1	<0.1	1.36	2.87	<1.0
9/26/95	Folsom			<0.03	<0.03		<1.0	0.6	0.7	<0.1	<0.1	1.78	2.22	
	Average	1.00	1.15	0.03	0.05	1.01	1.43	0.68	0.84	0.11	0.15	1.40	2.89	1.13
	Median	1.00	1.00	0.03	0.03	1.00	1.00	0.60	0.70	0.10	0.10	1.44	2.59	1.00
	Minimum	<1.00	<1.00	<0.03	<0.03	<1.00	<1.00	<0.5	<0.5	<0.1	<0.1	0.65	1.02	<1.00
	Maximum	1.10	8.50	0.07	0.33	1.50	21.00	1.40	2.70	0.20	0.50	2.20	8.59	2.80
	95th %	1.00	1.12	0.03	0.18	1.00	1.47	1.19	1.69	0.20	0.30	1.86	6.25	1.97

**Sacramento Regional Coordinated Monitoring Program
American River at Folsom 1993-97**

Sample Date	Location	Ni-tr (ug/L)	Zn-d (ug/L)	Zn-tr (ug/L)	Temp-C (C)	DO (mg/L)	pH (units)	EC (umho)	Hardness (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)
01/07/93	Folsom	26	7.5	2		11.3	7	75	36	3	2	2
01/27/93	Folsom	2.4	<5.0	5			7.57	80	32	6	<3.0	<3.0
02/05/93	Folsom	1.4	<4.0	<4.0		12.2	7.4	64	29	3	<3.0	<3.0
02/20/93	Folsom	<1.0	<4.0	<4.0		11.2	7.72	76	34	4	<3.0	<3.0
03/07/93	Folsom	2	<4.0	<4.0	8.8	11.7	6.48	80	33	1	<3.0	<3.0
03/22/93	Folsom	1	7.7	17	10.7	12.0	7.73	72	31	<1.0	<3.0	<3.0
04/06/93	Folsom	<1.0	<4.0	15	11.0	11.0	7.45	45	25	<1.0	<3.0	<3.0
04/21/93	Folsom	<1.0	6.2	4.3	11.3	11.0	7.57	49	25	<1.0	<3.0	<3.0
05/06/93	Folsom	7.5	<4.0	<4.0		10.2	6.32	51	26	<1.0	<3.0	<3.0
05/21/93	Folsom	<1.0	<4.0	<4.0	11.1	10.2	7.42	65	21	<1.0	<3.0	<3.0
06/07/93	Folsom	<1.0	<4.0	<4.0	12.2	8.9	7.98	40	19	<1.0	<3.0	<3.0
06/22/93	Folsom	<1.0	<4.0	<4.0	12.3	9.6	7.04	35	19	<1.0	<3.0	<3.0
07/07/93	Folsom	<1.0	<4.0	<4.0	12.7	9.6	8	34	19	<1.0	<3.0	<3.0
07/22/93	Folsom	<1.0	<4.0	31	14.9	8.9	6.41	54	17	<1.0	<3.0	<3.0
08/06/93	Folsom	1.3	<4.0	<4.0	14.3	8.5	6.93	21	17	<1.0	<3.0	<3.0
08/21/93	Folsom	<1.0	<4.0	<4.0	15.0	8.6	7.22	24	18	<1.0	<3.0	<3.0
09/03/93	Folsom	<1.0	5	5.2	14.0	7.4			23	<1.0	<3.0	<3.0
09/20/93	Folsom	<1.0	<4.0	6.4	13.4	8.9			18	1	<3.0	<3.0
10/5/93	Folsom	<1.0	<4.0	<4.0	12.0	8.6	7.04	37	17	<1.0	<3.0	<3.0
10/20/93	Folsom	<1.0	<4.0	<4.0	10.8	9.4	7.87	19	18	<1.0	<3.0	<3.0
11/4/93	Folsom	<1.0	<4.0	<4.0	13.5	6.8	7.78	20	19	<1.0	<3.0	<3.0
11/18/93	Folsom	<1.0	<4.0	<4.0	15.0	8.5	7.01	65	17	<1.0	<3.0	<3.0
12/1/93	Folsom	<1.0	<4.0	<4.0	9.0	12.2	7.23	51	18	2	<3.0	<3.0
12/19/93	Folsom	<1.0	<4.0	<4.0	10.2	10.3				<1.0	<3.0	<3.0
1/5/94	Folsom	1.4	<4.0	6.7	8.3	11.5	8.3	48		<1.0	<3.0	<3.0
1/19/94	Folsom		<4.0	<4.0	8.0	11.5	8.02	62	20	<1.0	<3.0	<3.0
2/2/94	Folsom	<1.0	<4.0	6.4	8.0	11.4	8.58	34	23	<1.0	<3.0	<3.0
2/16/94	Folsom		<4.0	<4.0	8.2	11.7	7.41	35		<1.0	<3.0	<3.0
3/2/94	Folsom	<1.0	<4.0	<4.0	7.6	10.9	7.94	42	31	<1.0	<3.0	<3.0
3/16/94	Folsom		<4.0	<4.0	8.0	12.0	6.79	106		<1.0	<3.0	<3.0
4/13/94	Folsom	<1.0	<4.0	<4.0	9.5	10.7			29	<1.0	<3.0	<3.0
4/27/94	Folsom		<4.0	<4.0	9.5	10.6	6.89	65		<1.0	<3.0	<3.0
5/11/94	Folsom	<1.0	<4.0	<4.0	10.0	10.7	8.27	28	43	<1.0	<3.0	<3.0
5/25/94	Folsom		<4.0	9.2	10.8	10.7	8.1	31		<1.0	<3.0	<3.0
6/8/94	Folsom	<1.0	<4.0	<4.0	12.4	9.7	6.32		25	<1.0	<3.0	<3.0
6/22/94	Folsom		<4.0	<4.0	14.0		6.52	62		1	<3.0	<3.0
7/6/94	Folsom	<1.0	<4.0	<4.0	15.6		7.68	64	26	<1.0	<3.0	<3.0
07/19/94	Folsom		<4.0	<4.0	16.6	6.2	6.62	82.5				
08/17/94	Folsom	<1.0	<4.0	<4.0	19.0	5.6	7.03	56	31	<1.0	<3.0	<3.0
08/30/94	Folsom		6.7	76	22.1	3.7	7.08	45		<1.0	<3.0	<3.0
09/14/94	Folsom	<1.0	4.2	12	21.0	6.3	6.47	54	23	<1.0	<3.0	<3.0
10/26/94	Folsom		<4.0	<4.0	17.5	8.3	6.89	62		<1.0	<3.0	<3.0
11/09/94	Folsom	<1.0	<4.0	<4.0	14.6	8.1	7.01	62	23	<1.0	<3.0	<3.0
11/22/94	Folsom		<4.0	110	12.3	10.1	7.01	66		2	<3.0	<3.0
12/07/94	Folsom	2	6.2	8.9	10.2	9.6	7.09	74	30	4	<3.0	<3.0

**Sacramento Regional Coordinated Monitoring Program
American River at Folsom 1993-97**

Sample Date	Location	Ni-tr (ug/L)	Zn-d (ug/L)	Zn-tr (ug/L)	Temp-C (C)	DO (mg/L)	pH (units)	EC (umho)	Hardness (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)
12/21/94	Folsom		<4.0	<4.0	8.8	10.6	7.19	72		<1.0	5.8	<3.0
01/04/95	Folsom	1.4	<4.0	7	8.0	12.9	7.57	88	34	<1.0		
01/17/95	Folsom		<4.0	<4.0	9.1	12.0	7.37	60		33		
02/01/95	Folsom	2.3	<4.0	<4.0	8.6	13.6	7.18	66	26	<1.0	<3.0	<3.0
02/28/95	Folsom		<4.0	<4.0	9.7	12.8	7.5	62		<1.0		
03/14/95	Folsom	7.5	<4.0	<4.0	9.6	11.3	6.9	58	24	22		
03/28/95	Folsom		<4.0	2.4	9.8	10.6	7.04	64		5		
04/12/95	Folsom	1.1	<4.0	<4.0	10.3	11.8	7.4	64	25	<1.0	<3.0	<3.0
04/25/95	Folsom		<4.0	<4.0	10.6	11.3	7.36	60		<1.0		
05/09/95	Folsom	1.2	<4.0	<4.0	11.6	11.7	6.98	42	25	2		
05/23/95	Folsom		<4.0	<4.0	12.1	10.6	7.38	52		<1.0		
06/05/95	Folsom	2	<4.0	<4.0	12.3		7.34	44	18	<1.0		
06/19/95	Folsom		<4.0	<4.0			6.81	40		<1.0		
7/19/95	Folsom	<1.0	<4.0	<4.0	16.5	13.1	7.03	38	13	<1.0	<3.0	<3.0
8/1/95	Folsom		<4.0	<4.0	20.6	9.3	7.26	40		<1.0		
8/15/95	Folsom	<1.0	<4.0	<4.0	16.8	8.0	6.81	40	30	<1.0		
8/29/95	Folsom		7	7.2	16.1	9.1	6.75	38		<1.0		
9/12/95	Folsom	1.5	<4.0	<4.0	16.8	7.7	6.6	33	13	<1.0		
9/26/95	Folsom		<4.0	<4.0	17.2	8.9	6.77	36		<1.0		
	Average	2.05	4.30	8.06	12.41	10.03	7.24	53.09	24.26	2.19	3.04	2.98
	Median	1.00	4.00	4.00	11.80	10.60	7.19	54.00	24.00	1.00	3.00	<3.00
	Minimum	<1.00	<4.00	2.00	7.60	3.73	6.32	19.00	13.00	<1.00	2.00	2.00
	Maximum	26.00	7.70	110.00	22.10	13.60	8.58	106.00	43.00	33.00	5.80	<3.00
	95th%	6.74	6.63	16.70	19.24	12.81	8.11	80.25	34.00	4.90	3.00	<3.00

**Sacramento Regional Coordinated Monitoring Program
American River at Nimbus 1993 - 97**

Sample Date	Location	As-d (ug/L)	As-tot (ug/L)	Cd-d (ug/L)	Cd-tr (ug/L)	Cr-d (ug/L)	Cr-tr (ug/L)	Cu-d (ug/L)	Cu-tr (ug/L)	Pb-d (ug/L)	Pb-tr (ug/L)	Hg-d (ug/L)	Hg-tot (ug/L)	Ni-d (ug/L)	Ni-tr (ug/L)	Zn-d (ug/L)
01/07/93	Nimbus	<1.0	<1.0	0.03	<0.03	<1.0	41	1.3	1.4	<0.1	0.2			<1.0	8.2	5.5
01/27/93	Nimbus	<1.0	<1.0	0.03	0.26	<1.0	1.4	1.4	1.6	0.12	0.17			1	3	<5.0
02/05/93	Nimbus	<1.0	<1.0	0.04	0.05	<1.0	1.2	1.1	1.4	0.1	0.4			1.3	2	<4.0
02/20/93	Nimbus	<1.0	1.2	0.07	0.38	<1.0	2.6	1.9	2.3	<0.1	0.36			<1.0	2.3	<4.0
03/07/93	Nimbus	1.0	1.6	0.03	5.1	<1.0	<1.0	1	1.3	0.1	0.1			<1.0	1.1	<4.0
03/22/93	Nimbus	<1.0	<1.0	<0.03	0.12	<1.0	<1.0	0.8	0.9	<0.1	<0.1			<1.0	<1.0	5.7
04/06/93	Nimbus	<1.0	<1.0	0.03	0.63	<1.0	<1.0	0.8	0.9	0.2	0.2			<1.0	<1.0	4.6
04/21/93	Nimbus	<1.0	<1.0	<0.03	0.27	<1.0	<1.0	0.6	0.9	<0.1	0.9			<1.0	<1.0	<4.0
05/06/93	Nimbus	<1.0	<1.0	<0.03	0.08	<1.0	<1.0	<0.5	0.7	<0.1	<0.1			<1.0	30	<4.0
05/21/93	Nimbus	<1.0	<1.0	<0.03	0.04	<1.0	<1.0	0.5	0.9	<0.1	<0.1			<1.0	<1.0	<4.0
06/07/93	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1			<1.0	2.2	<4.0
06/22/93	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1			<1.0	<1.0	<4.0
07/07/93	Nimbus	<1.0	<1.0	0.06	<0.03	<1.0	<1.0		<0.5	<0.1	<0.1			<1.0	<1.0	<4.0
07/22/93	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	1.7	<0.1	<0.1			<1.0	<1.0	<4.0
08/06/93	Nimbus	<1.0	1	<0.03	<0.03	<1.0	<1.0	<0.5	0.5	<0.1	0.2			1.9	4.9	<4.0
08/21/93	Nimbus	<1.0	<1.0	<0.03	0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1			<1.0	<1.0	<4.0
09/03/93	Nimbus	<1.0	<1.0	<0.03	0.05	<1.0	<1.0	<0.5	0.7	<0.1	<0.1			<1.0	<1.0	<4.0
09/20/93	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.7	<0.1	<0.1			<1.0	<1.0	<4.0
10/5/93	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.7	<0.1	<0.1			<1.0	2	<4.0
10/20/93	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.6	<0.1	<0.1			<1.0	<1.0	<4.0
11/4/93	Nimbus	<1.0	<1.0	<0.03	0.05	<1.0	<1.0	<0.5	0.6	<0.1	<0.1			<1.0	<1.0	<4.0
11/18/93	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.9	0.8	<0.1	<0.1			<1.0	<1.0	<4.0
12/1/93	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	1	<0.1	0.1			<1.0	<1.0	<4.0
12/19/93	Nimbus	<1.0	<1.0	<0.03	0.08	<1.0	<1.0	0.7	0.7	<0.1	<0.1			<1.0	<1.0	<4.0
1/5/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1			<1.0	<1.0	<4.0
1/19/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1	0.67	0.88			<4.0
2/2/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.8	<0.1	<0.1	1.29	2.81	<1.0	<1.0	<4.0
2/16/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.9	0.7	<0.1	<0.1	1.41	2.14			<4.0
3/2/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	1.3	0.6	<0.5	<0.1	0.1	0.88	1.47			<4.0
4/13/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.5	0.7	<0.1	<0.1	0.34	0.75	<1.0	<1.0	<4.0
4/27/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	0.7	<0.1	<0.1	0.41	0.91			<4.0
5/11/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	1.4	0.6	<0.1	0.1	1.08	2.22	<1.0	<1.0	<4.0
5/25/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	2.3	0.6	0.8	<0.1	0.2	0.87	1.75			<4.0
6/8/94	Nimbus	<1.0	<1.0	<0.03	0.03	<1.0	<1.0	0.6	0.6	<0.1	0.1	0.91	2.03	<1.0	<1.0	<4.0
6/22/94	Nimbus	<1.0	<1.0	0.05	<0.03	<1.0	<1.0	0.8	0.8	<0.1	0.2	2.51	3.52			<4.0
7/6/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.7	<0.1	<0.1	2.08	3.38	<1.0	<1.0	<4.0
07/19/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.7	<0.1	<0.1	1.54	3.13			<4.0
08/17/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	0.7	<0.1	0.1	1.01	2.59	<1.0	<1.0	<4.0
08/30/94	Nimbus	<1.0	<1.0			<1.0	<1.0	<0.5	0.7	0.1	0.1	1.41	3.01			6
09/14/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.7	<0.1	0.2	0.69	1.44	<1.0	<1.0	5
10/26/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	0.9	<0.1	0.2	0.66	2.16			<4.0
11/09/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	1.1	0.1	0.2			<1.0	<1.0	<4.0
11/22/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	1	<0.1	0.2	1.01	1.83			6.8
12/07/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	1	1.2	0.2	0.2	1.18	4.66	<1.0	<1.0	<4.0
12/21/94	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.9	1	0.2	0.3	1.52	3.3			<4.0
01/04/95	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	1.8	<0.1	<0.1	1.93	3.86	<1.0	<1.0	<4.0
01/17/95	Nimbus			<0.03	<0.03	<1.0	<1.0	0.9	1.9	<0.1	0.6	3.345	10.63			<4.0
02/01/95	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	1.1	0.8	1.5	<0.1	0.3	4.43	8.94	1.1	2.6	<4.0
02/28/95	Nimbus			<0.03	<0.03	<1.0	<1.0	0.7	0.9	<0.1	0.2	1	2.13			<4.0
03/14/95	Nimbus	<1.0	1.1	<0.03	0.04	<1.0	1.3	0.8	4.3	<0.1	0.6	1.91	8.8	1.1	8.3	<4.0
03/28/95	Nimbus			<0.03	<0.03	<1.0	1	0.7	1.4	<0.1	0.3	2.66	5.41			<4.0
04/12/95	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.8	<0.1	0.1	1.65	3.09	<1.0	1.2	<4.0
04/25/95	Nimbus					<1.0	<1.0	<0.5	0.6	<0.1	<0.1	1.46	2.66			<4.0
05/09/95	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.5	0.8	<0.1	0.1	1.44	3.57	<1.0	1.3	<4.0

Nimbus samples collected 50 yards downstream of Nimbus Dam

**Sacramento Regional Coordinated Monitoring Program
American River at Nimbus 1993 - 97**

Sample Date	Location	As-d (ug/L)	As-tot (ug/L)	Cd-d (ug/L)	Cd-tr (ug/L)	Cr-d (ug/L)	Cr-tr (ug/L)	Cu-d (ug/L)	Cu-tr (ug/L)	Pb-d (ug/L)	Pb-tr (ug/L)	Hg-d (ug/L)	Hg-tot (ug/L)	Ni-d (ug/L)	Ni-tr (ug/L)	Zn-d (ug/L)
05/23/95	Nimbus			<0.03	<0.03	<1.0	<1.0	<0.5	0.9	<0.1	0.1	1.41	1.99			<4.0
06/05/95	Nimbus	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.6	<0.1	0.2	0.79	1.83	<1.0	1	<4.0
06/19/95	Nimbus			<0.03	<0.03	<1.0	<1.0	<0.5	0.6	<0.1	0.1	1.11	1.64			<4.0
7/19/95	Nimbus	<1.0	<1.0	<0.03	<0.03		<1.0	<0.5	<0.5	<0.1	<0.1	0.69	1.81	<1.0	<1.0	<4.0
8/1/95	Nimbus			<0.03	<0.03		<1.0	<0.5	1.2	0.2	0.3	0.29	2.29			6.2
8/15/95	Nimbus	<1.0	<1.0	<0.03	<0.03		<1.0	<0.5	0.8	0.1	0.2	0.86	1.59	<1.0	5.3	<4.0
8/29/95	Nimbus			<0.03	<0.03		<1.0	<0.5	1.3	0.2	1.4	1	1.72			<4.0
9/12/95	Nimbus	<1.0	2.9	<0.03	<0.03		<1.0	<0.5	<0.5	<0.1	<0.1	0.47	1.37	1	1.6	5.4
9/26/95	Nimbus			<0.03	<0.03		<1.0	<0.5	0.8	<0.1	<0.1	0.61	1.18			<4.0
10/11/95	Nimbus		<1.0	<0.03	<0.03		<1.0	<0.5	<0.5	<0.1	<0.1	0.4	1.17		<1.0	<4.0
11/14/95	Nimbus		<1.0	0.03	0.04		<1.0	<0.5	0.6	0.1	0.2	0.76	1.87		<1.0	<4.0
12/11/95	Nimbus		<1.0	<0.03	<0.03		<1.0	<0.5	0.6	0.2	0.2	<0.18	1.08		<1.0	<4.0
1/15/96	Nimbus		0.15	0.03	0.04		0.24	0.61	0.74	<0.1	0.13	<0.5	1.55		0.61	0.5
2/19/96	Nimbus		0.35	<0.01	0.01		0.7	0.67	1.41	<0.1	0.46	1.25	5.67		1.81	0.8
3/4/96	Nimbus		0.15	<0.01	<0.01		0.33	0.59	0.87	<0.1	0.17	0.93	2.44		1.43	<0.1
3/18/96	Nimbus		<0.25	<0.05	<0.05		0.45	0.66	0.86	<0.1	0.16	1.5	3.8		1.37	0.26
4/22/96	Nimbus		0.1	0.01	<0.01		0.2	0.39	0.39	<0.1	0.12	0.88	1.48		0.36	<0.1
5/20/96	Nimbus		<0.05	<0.01	<0.01		0.5	0.52	0.97	<0.1	0.34	1.72	1.72		1.15	0.5
6/17/96	Nimbus		0.08	<0.01	<0.01		0.1	0.35	0.45	<0.1	0.15	1.22	2.26		0.53	0.15
7/17/96	Nimbus		0.29		0.011		0.2	0.31	0.38	<0.1	<0.1	0.72	2.39	0.38	0.45	0.14
8/19/96	Nimbus		0.24	<0.01	<0.01		0.2	0.38	0.38	<0.1	<0.1	0.72	9.09		0.48	0.67
9/16/96	Nimbus		0.26	<0.01	<0.01		0.09	0.38	0.39	0.1	<0.1	1.31	1.13		0.39	<0.1
10/16/96	Nimbus		0.39	<0.01	0.011		0.19	0.38	0.51	<0.1	<0.1	1.82	3.32		0.55	0.2
10/29/96	Nimbus		0.74	<0.01	0.013		0.24	0.41	0.53	<0.1	<0.1	1.93	2.3		0.54	0.19
11/18/96	Nimbus		0.3	<0.01	<0.01		0.19	0.43	0.59	<0.1	<0.1	2.33	3.49	0.34	0.65	0.46
12/18/96	Nimbus		0.56	<0.01	0.016		1.54	0.69	1.68	<0.1	0.34	1.67	5.41		3.31	<0.1
1/20/97	Nimbus		1.16	0.011	0.02		1.39	0.59	3.36	<0.1	0.82	1.95	15.4		4.59	<0.5
2/19/97	Nimbus		0.84	0.01	0.021		1.3	0.46	1.81	<0.1	0.35	1.68	6.06		1.81	<0.5
3/19/97	Nimbus		0.54	<0.01	0.01		0.43	0.46	0.8	<0.1	0.14	1.19	4.3		0.91	<0.5
4/23/97	Nimbus		0.32	<0.01	<0.01		0.28	0.39	0.52	<0.1	<0.1	0.5	1.81		0.59	<0.5
5/21/97	Nimbus		0.28	<0.01	<0.01		0.17	0.42	0.53	<0.1	<0.1	0.69	1.36		0.55	<0.5
6/25/97	Nimbus		0.18	<0.01	<0.01		0.2	0.3	0.41	<0.1	<0.1	0.87	1.43		0.39	<0.5
7/23/97	Nimbus		0.18	<0.01	<0.01		0.18	0.41	0.46	<0.1	<0.1	0.55	1.25		0.45	<0.5
8/20/97	Nimbus		0.2	<0.01	<0.01		0.24	0.36	0.43	<0.1	<0.1	3.45	3.05		0.32	<0.5
9/17/97	Nimbus		0.44	<0.01	<0.01		0.54	0.73	0.68	<0.1	<0.1	<0.5	0.74		0.38	0.28
10/8/97	Nimbus		0.15	<0.01	<0.01		0.21	0.53	0.63	<0.1	<0.1	<0.5	0.91		0.37	<0.1
10/22/97	Nimbus		0.38	<0.01	<0.01		0.23	0.51	0.62	<0.1	<0.1	<0.5	1.04		0.26	0.11
11/19/97	Nimbus		0.42	<0.01	<0.01		0.64	0.45	0.6	<0.1	<0.1	<0.5	1.13	<0.15	0.21	<0.1
12/17/97	Nimbus		0.43	<0.01	<0.01		0.69	0.687	1.04	<0.1	0.142	0.97	2.83		0.96	0.14
	Average	<1.00	0.82	0.03	0.10	<1.00	1.31	0.63	0.89	0.11	0.19	1.23	2.98	0.98	1.81	3.09
	Median	<1.00	1.00	0.03	0.03	<1.00	1.00	0.51	0.80	0.10	0.10	1.01	2.16	1.00	1.00	4.00
	Minimum	<1.00	<0.05	<0.01	<0.01	<1.00	0.09	0.30	0.38	<0.1	<0.1	<0.18	0.74	<0.15	0.21	<0.1
	Maximum	1.00	2.90	0.07	5.10	<1.00	41.00	1.90	4.30	0.20	1.40	4.43	15.40	1.90	30.00	6.80
	95th%	<1.00	1.09	0.04	0.19	<1.00	1.39	1.05	1.80	0.20	0.52	2.62	8.90	1.10	5.06	5.44

Nimbus samples collected 50 yards downstream of Nimbus Dam

**Sacramento Regional Coordinated Monitoring Program
American River at Nimbus 1993 - 97**

Sample Date	Location	Zn-tr (ug/L)	Temp-C (C)	DO (mg/L)	pH (units)	EC (umho)	Hardness (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)
01/07/93	Nimbus	30			6.9	80	36	1.5	2	2
01/27/93	Nimbus	<5.0	8.9		7.46	70	35	25	<3.0	<3.0
02/05/93	Nimbus	<4.0	8.0	12.8	6.7	23	29	4	<3.0	<3.0
02/20/93	Nimbus	6.9	9.0	12.2	7.68	75	33	4	<3.0	<3.0
03/07/93	Nimbus	7.4	9.5	12.0	7.13	81	37	2.5	<3.0	<3.0
03/22/93	Nimbus	4	11.0	13.0	7.85	72	33	1	<3.0	<3.0
04/06/93	Nimbus	50	11.0	11.2	7.73	46	22	1	<3.0	<3.0
04/21/93	Nimbus	41	12.4	11.2	7.6		27	<1.0	<3.0	<3.0
05/06/93	Nimbus	14			6.69	52	25	<1.0	<3.0	<3.0
05/21/93	Nimbus	7.3	12.5	9.8	7.31	65	25	<1.0	<3.0	<3.0
06/07/93	Nimbus	<4.0		10.5	8.22	32	21	<1.0	<3.0	<3.0
06/22/93	Nimbus	<4.0	13.0	9.7	7.17	34	18	<1.0	<3.0	<3.0
07/07/93	Nimbus	<4.0	14.1	11.2	7.9	38	19	2	<3.0	<3.0
07/22/93	Nimbus	5.5	15.7	8.8	6.57	49	17	<1.0	<3.0	<3.0
08/06/93	Nimbus	<4.0	15.0	8.2	7.05	21	17	1	<3.0	<3.0
08/21/93	Nimbus	<4.0	15.0	9.0	7.18	22	18	<1.0	<3.0	<3.0
09/03/93	Nimbus	12	15.0	8.3	6.6	41	20	<1.0	<3.0	<3.0
09/20/93	Nimbus	<4.0	14.2	9.4	7.13	55	18	2	<3.0	<3.0
10/5/93	Nimbus	<4.0	12.5	8.6	7.19	19	18	<1.0	<3.0	<3.0
10/20/93	Nimbus	<4.0	10.8	8.4	7.51	25	18	<1.0	<3.0	<3.0
11/4/93	Nimbus	<4.0	16.5		7.83	18.5	18	<1.0	<3.0	<3.0
11/18/93	Nimbus	<4.0	14.5	8.3	7.12	59	19	<1.0	<3.0	<3.0
12/1/93	Nimbus	5.2	12.0	8.9	7.12	54	21	4	<3.0	<3.0
12/19/93	Nimbus	<4.0	9.8	8.3	7.38	65		<1.0	<3.0	<3.0
1/5/94	Nimbus	<4.0	8.5	10.3	8.32	48		<1.0	<3.0	<3.0
1/19/94	Nimbus	<4.0	8.2	11.3	7.86	60		<1.0	<3.0	<3.0
2/2/94	Nimbus	17			8.2	37	23	<1.0	<3.0	<3.0
2/16/94	Nimbus	<4.0	8.4	12.8	7.33	36		<1.0	<3.0	<3.0
3/2/94	Nimbus	<4.0	9.2	11.6	7.72	123	26	1	<3.0	<3.0
4/13/94	Nimbus	<4.0	11.5	10.8	7.57	50	30	<1.0	<3.0	<3.0
4/27/94	Nimbus	<4.0	11.6	11.0	6.61	78		<1.0	<3.0	<3.0
5/11/94	Nimbus	<4.0	12.2	11.1	8.46	38	49	<1.0	<3.0	<3.0
5/25/94	Nimbus	8.6	12.5	11.1	8.06	60		<1.0	<3.0	<3.0
6/8/94	Nimbus	<4.0	14.9	9.4	5.92		26	<1.0	<3.0	3.5
6/22/94	Nimbus	<4.0	14.0	10.0	6.58	66		1	<3.0	<3.0
7/6/94	Nimbus	<4.0	16.5		7.74	65	29	<1.0	<3.0	<3.0
07/19/94	Nimbus	<4.0	17.4	7.7	6.49	62				
08/17/94	Nimbus	<4.0	20.0	6.1	6.27	53	24	<1.0	<3.0	<3.0
08/30/94	Nimbus	17	21.8	6.4	6.65	60		<1.0	<3.0	<3.0
09/14/94	Nimbus	10	21.2	6.9	6.48	60	31	<1.0	<3.0	<3.0
10/26/94	Nimbus	<4.0	17.9	9.3	7.13	60		<1.0	<3.0	<3.0
11/09/94	Nimbus	<4.0	14.9	8.9	6.86	66	24	<1.0	<3.0	<3.0
11/22/94	Nimbus	60	12.2	11.7	7.51	66		2	<3.0	<3.0
12/07/94	Nimbus	<4.0	10.5	9.1	6.91	76	50	<1.0	<3.0	<3.0
12/21/94	Nimbus	<4.0	9.0	11.1	7.42	76		<1.0	<3.0	<3.0
01/04/95	Nimbus	<4.0	8.4	13.0	7.37	76	29	<1.0		
01/17/95	Nimbus	9.4	9.6	13.0	7	70		25		
02/01/95	Nimbus	4.2	8.9	12.7	7.13	68	27	<1.0	<3.0	<3.0
02/28/95	Nimbus	<4.0	10.0	13.4	7.5	67		<1.0		
03/14/95	Nimbus	5	10.7	10.4	7.5	60	24	30		
03/28/95	Nimbus	2.9	9.7	11.0	6.86	66		<1.0		
04/12/95	Nimbus	<4.0	10.3	12.8	7.4	66	25	<1.0	<3.0	<3.0
04/25/95	Nimbus	<4.0	10.6	12.8	7.44	60		<1.0		
05/09/95	Nimbus	<4.0	11.9	12.4	7.49	52	25	2		

Nimbus samples collected 50 yards downstream of Nimbus Dam

**Sacramento Regional Coordinated Monitoring Program
American River at Nimbus 1993 - 97**

Sample Date	Location	Zn-tr (ug/L)	Temp-C (C)	DO (mg/L)	pH (units)	EC (umho)	Hardness (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)
05/23/95	Nimbus	<4.0	12.5	11.6	7.27	52		<1.0		
06/05/95	Nimbus	<4.0	12.8		7.36	46	25	<1.0		
06/19/95	Nimbus	22			6.8	39		<1.0		
7/19/95	Nimbus	5.4	17.2	11.4	7.26	38	12	<1.0	<3.0	<3.0
8/1/95	Nimbus	7.8	19.6	9.1	7.09	40		5		
8/15/95	Nimbus	<4.0	17.9	8.3	7.09	38	12	68		
8/29/95	Nimbus	5.2	17.0	9.5	7.38	40		<1.0		
9/12/95	Nimbus	5.2	17.3	8.2	6.8	35	25	<1.0		
9/26/95	Nimbus	<4.0	17.6	8.2	7.04	38		<1.0		
10/11/95	Nimbus	<4.0	17.6	9.2	6.6	40	13	4		
11/14/95	Nimbus	<4.0	14.5	8.9	6.12	42	22	<1.0		
12/11/95	Nimbus	<4.0	13.8	9.0	6.3	41.2	45	7		
1/15/96	Nimbus	0.55	9.6	11.8	5.82	58	50	2		
2/19/96	Nimbus	1.8	10.4	12.2	6.18	53.9	26	8		
3/4/96	Nimbus	0.67	8.8	13.6	7.74	55.3	26	6		
3/18/96	Nimbus	0.36	9.3	13.6	6.42	55	26	3		
4/22/96	Nimbus	0.1	11.2	10.9	7.14	56.3	28	<2.0		
5/20/96	Nimbus	0.72	11.0	11.6	6.29	50	32	10		
6/17/96	Nimbus	0.32	14.2	9.9	6.89	38.4		3		
7/17/96	Nimbus	0.54	18.81	9.07	7.04	42	24	2		
8/19/96	Nimbus	0.21	18.08	8.3	6.88	43.4	16	2		
9/16/96	Nimbus	<0.1	18	8.41	6.8	45.9	17	2.4		
10/16/96	Nimbus	0.34	14.04	9.23	5.96	42.3	15	<2.0		
10/29/96	Nimbus	1.23	14.37	8.08	7.33	37.5	15	3		
11/18/96	Nimbus	1.62	13.93	8.09	6.09	48.3	18	3		
12/18/96	Nimbus	1.6	9.89	12.58	7.24	42.7	15	18		
1/20/97	Nimbus	2.83	7.04	12.34	7.34	44.8	20	34		
2/19/97	Nimbus	1.17					24	11		
3/19/97	Nimbus	0.8	9.03	13.22	7	49.4	64	36		
4/23/97	Nimbus	<0.5	12.24	10.96	7.04	51.8	26	2		
5/21/97	Nimbus	0.65	14.37	10.27	6.76	49.8	22	<2		
6/25/97	Nimbus	<0.5	18.22	8.99	7.1	49.3	26	2		
7/23/97	Nimbus	<0.5	12.51	8.38	7.05	45.5	26	4		
8/20/97	Nimbus	<0.5	18.33	7.34	6.69	46.9	20	<2.9		
9/17/97	Nimbus	0.49	18.07	7.32	7.01	44.6	52	<2		
10/8/97	Nimbus	0.24	17.19	8.22	6.8	40	34	<2		
10/22/97	Nimbus	0.26	17.2	10.42	6.75	47	48	2.5		
11/19/97	Nimbus	0.28	14.78	8.86	7.24		48	2.1		
12/17/97	Nimbus	0.65	11.25	9.52	7.3	64	26	3.9		
	Average	5.89	13.25	10.17	7.11	51.83	26.54	4.45	2.98	2.99
	Median	4.00	12.50	9.93	7.13	50.00	25.00	1.00	3.00	3.00
	Minimum	<0.1	7.04	6.10	5.82	18.50	12.00	<1.00	2.00	2.00
	Maximum	60.00	21.80	13.63	8.46	123.00	64.00	68.00	<3.00	3.50
	95th%	19.00	18.67	13.00	7.97	76.00	49.50	25.00	3.00	3.00

Nimbus samples collected 50 yards downstream of Nimbus Dam

**Sacramento Regional Coordinated Monitoring Program
American River at Discovery Park 1993-97**

Sample Date	Location	As-d (ug/L)	As-tot (ug/L)	Cd-d (ug/L)	Cd-tr (ug/L)	Cr-d (ug/L)	Cr-tr (ug/L)	Cu-d (ug/L)	Cu-tr (ug/L)	Pb-d (ug/L)	Pb-tr (ug/L)	Hg-d (ug/L)	Hg-tot (ug/L)	Ni-d (ug/L)
01/06/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	1.8	1.9	2.5	<0.1	0.5			<1.0
01/27/93	Discovery Park	<1.0	<1.0	0.03	0.36	<1.0	1.1	1.1	3.2	<0.1	0.12			<1.0
02/07/93	Discovery Park	<1.0	<1.0	<0.03	0.51	<1.0	1.3	1.2	1.3	<0.1	0.4			<1.0
02/21/93	Discovery Park	<1.0	1.1	0.04	0.05	<1.0	1.4	1.2	1.3	<0.1	0.21			<1.0
03/07/93	Discovery Park	1.1	1.2	0.03	0.75	<1.0	<1.0	1.3	1.4	0.1	0.1			<1.0
03/22/93	Discovery Park	<1.0	1	0.05	3.3	<1.0	<1.0	0.7	0.9	0.1	0.1			<1.0
04/07/93	Discovery Park	<1.0	<1.0	<0.03	0.51	<1.0	<1.0	0.7	0.8	<0.1	0.1			<1.0
04/21/93	Discovery Park	<1.0	<1.0	<0.03	0.07	<1.0	<1.0	0.7	0.9	<0.1	0.3			<1.0
05/06/93	Discovery Park	<1.0	<1.0	0.03	0.25	<1.0	<1.0	0.5	1.1	<0.1	0.3			<1.0
05/21/93	Discovery Park	<1.0	<1.0	<0.03	0.04	<1.0	<1.0	0.5	0.6	0.1	0.1			<1.0
06/07/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.6	<0.1	<0.1			<1.0
06/22/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	0.1			<1.0
07/07/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.5	0.9	<0.1	0.3			<1.0
07/21/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.6	<0.1	<0.1			<1.0
08/06/93	Discovery Park	<1.0	<1.0	<0.03	0.05	<1.0	<1.0	0.5	0.6	<0.1	0.2			<1.0
08/20/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.5	0.6	<0.1	0.1			<1.0
09/02/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.6	<0.1	<0.1			<1.0
09/19/93	Discovery Park	<1.0	<1.0	<0.03	0.03	<1.0	<1.0	<0.5	0.8	<0.1	<0.1			<1.0
10/4/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.9	0.1	0.2			<1.0
10/19/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.8	<0.1	1.3			<1.0
11/3/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.8	<0.1	<0.1			<1.0
11/18/93	Discovery Park	<1.0	<1.0	<0.03	0.03	<1.0	<1.0	0.7	0.8	<0.1	<0.1			<1.0
12/2/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	0.9	<0.1	0.1			<1.0
12/18/93	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.8	<0.1	<0.1			<1.0
1/4/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	<0.5	<0.1	<0.1			<1.0
1/18/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.5	<0.1	0.2	1.61	1.98	
2/1/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.7	<0.1	0.1		1.86	<1.0
2/15/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.7	<0.1	<0.1	1.2	1.62	
3/1/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	1.3		<0.5	<0.1	0.1	2.73	8.12	<1.0
3/15/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.7	<0.1	0.1		2.78	
4/12/94	Discovery Park	<1.0	<1.0	0.04	0.07	<1.0	<1.0	0.7	0.9	0.2	0.2	1.71	3.38	<1.0
4/26/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	1.2	1.2	0.1	0.3	2.24	4.68	
5/10/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	1	0.1	0.3	1.07	3.61	<1.0
5/24/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.6	0.2	0.3	1.34	8.74	
6/7/94	Discovery Park	<1.0	<1.0	0.03	0.03	<1.0	<1.0	0.9	1.7	<0.1	0.9	1.26	4.39	<1.0
6/21/94	Discovery Park	<1.0	<1.0	0.03	0.03	<1.0	<1.0	1.3	1.1	<0.1	0.4	2.14	4.44	
7/5/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	1	<0.1	0.4	2.12	5.7	<1.0
07/19/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.7	<0.1	0.2	1.22	3.39	
08/17/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	0.8	<0.1	0.3	0.8	2.33	<1.0
08/30/94	Discovery Park	<1.0	<1.0			<1.0	<1.0	0.7	1	<0.1	0.4	2.05	3.92	
09/14/94	Discovery Park	<1.0	<1.0	<0.03	0.2	<1.0	<1.0	0.8	0.8	<0.1	0.4	1.51	3.05	<1.0
10/26/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	1.1	<0.1	0.3	2.85	6.03	
11/09/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	0.9	<0.1	0.2			<1.0
11/22/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.7	0.8	<0.1	0.2	1.8	3.15	
12/07/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	1.2	1.1	<0.1	0.1	3.09	5.3	<1.0
12/21/94	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.9	1.1	0.1	0.2	1.61	2.71	
01/04/95	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.8	1.1	0.1	0.4	2.05	3.94	<1.0
01/17/95	Discovery Park			<0.03	<0.03	<1.0	<1.0	1.1	2.6	<0.1	0.5	3.04	10.53	
02/01/95	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	1.3	0.9	1.5	<0.1	0.3	2.96	6.84	1.1
02/28/95	Discovery Park			<0.03	<0.03	<1.0	<1.0	0.7	1.1	<0.1	0.3	1.54	3.57	
03/14/95	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	1.6	1.2	3.6	<0.1	0.8	<1.95	9.55	1
03/28/95	Discovery Park			<0.03	<0.03	<1.0	<1.0	0.6	1.4	<0.1	0.3	2.74	6.12	
04/12/95	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.6	0.8	<0.1	0.2	1.82	3.97	<1.0

Discovery Park samples collected 100 yards upstream of I5 bridge

**Sacramento Regional Coordinated Monitoring Program
American River at Discovery Park 1993-97**

Sample Date	Location	As-d (ug/L)	As-tot (ug/L)	Cd-d (ug/L)	Cd-tr (ug/L)	Cr-d (ug/L)	Cr-tr (ug/L)	Cu-d (ug/L)	Cu-tr (ug/L)	Pb-d (ug/L)	Pb-tr (ug/L)	Hg-d (ug/L)	Hg-tot (ug/L)	Ni-d (ug/L)
04/25/95	Discovery Park					<1.0	<1.0	0.5	1.3	<0.1	0.3	1.37	4.32	
05/09/95	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	<0.5	1	<0.1	0.2	1.75	4.48	<1.0
05/23/95	Discovery Park			<0.03	<0.03	<1.0	<1.0	0.8	0.9	<0.1	0.2	3.25	3.915	
06/05/95	Discovery Park	<1.0	<1.0	<0.03	<0.03	<1.0	<1.0	0.5	0.9	0.2	0.5	1.2	2.05	<1.0
06/19/95	Discovery Park			<0.03	<0.03	<1.0	<1.0	<0.5	0.9	0.3	0.3	1.35	3.3	
7/19/95	Discovery Park	<1.0	<1.0	<0.03	<0.03		1.1	<0.5	1.8	0.5	1.2	0.79	7.74	<1.0
8/1/95	Discovery Park													
8/15/95	Discovery Park	<1.0	<1.0	<0.03	<0.03		<1.0	<0.5	<0.5	<0.1	0.2	1.08	2.42	<1.0
8/29/95	Discovery Park			<0.03	<0.03		<1.0	<0.5	1	0.1	0.2	1	1.72	
9/12/95	Discovery Park	<1.0	<1.0	<0.03	<0.03		<1.0	<0.5	0.6	0.1	0.2	0.07	2.21	<1.0
9/26/95	Discovery Park			<0.03	<0.03		2.2	0.5	1.1	<0.1	0.1	0.87	3.23	
10/11/95	Discovery Park		1.1	<0.03	0.03		<1.0	<0.5	0.6	<0.1	0.1	3.81	7.11	
11/14/95	Discovery Park		<1.0	0.03	0.04		<1.0	<0.5	0.6	0.2	0.2	2.51	3.63	
12/11/95	Discovery Park		<1.0	<0.03	0.04		<1.0	<0.5	2.4	<0.1	1.1	0.67	4.96	
1/15/96	Discovery Park		0.19	<0.01	<0.01		0.21	0.49	0.71	<0.1	0.23	0.85	2.68	
2/19/96	Discovery Park		0.49	0.01	0.01		0.75	0.89	1.57	0.11	1.28	3.01	5.94	
3/4/96	Discovery Park		0.24	<0.01	<0.01		0.46	0.69	1.02	<0.1	0.23	2.6	3.43	
3/18/96	Discovery Park		<0.25	<0.05	<0.05		0.41	0.65	0.84	<0.1	0.19	2.21	3.83	
4/22/96	Discovery Park		0.1	0.01	0.015		0.24	0.4	0.52	<0.1	0.21	0.62	1.95	
5/20/96	Discovery Park		<0.05	<0.01	<0.01		0.43	0.43	1.03	<0.1	0.36	1.22	2.96	
6/17/96	Discovery Park		0.07	<0.01	<0.01		0.13	0.39	0.52	<0.1	0.15	2.19	2.42	
7/17/96	Discovery Park		0.15	0.013	0.011		0.25	0.36	0.52	<0.1	0.15	2.29	2.61	0.43
8/19/96	Discovery Park		0.29	0.013	0.014		0.25	0.43	0.52	<0.1	0.13	<0.5	1.1	
9/16/96	Discovery Park		0.34	0.011	0.015		0.14	0.36	0.58	<0.1	<0.1	0.84	1.29	
10/16/96	Discovery Park		0.29	<0.01	0.011		0.21	0.4	0.51	<0.1	<0.1		2.52	
10/29/96	Discovery Park		0.21	<0.01	0.015		0.21	0.46	0.64	<0.1	0.16		1.35	
11/18/96	Discovery Park		0.52	0.012	0.016		0.33	0.98	1.17	0.22	0.64	3.54	13.1	0.47
12/18/96	Discovery Park		0.62	<0.01	0.012		1.49	0.71	1.81	<0.1	0.37	1.74	5.32	
1/20/97	Discovery Park		1.23	0.013	0.019		1.35	0.87	3.12	0.1	0.81	1.91	13.3	
2/19/97	Discovery Park		0.94	<0.01	0.012		1.28	0.48	1.94	<0.1	0.42	3.89	5.69	
3/19/97	Discovery Park		0.47	<0.01	<0.01		0.3	0.42	0.81	<0.1	0.16	0.95	3.72	
4/23/97	Discovery Park		0.3	<0.01	0.01		0.22	0.52	0.62	<0.1	0.15	0.67	2.46	
5/21/97	Discovery Park		0.24		<0.01		0.18		0.65		0.12	0.7	1.6	
6/25/97	Discovery Park		0.4	<0.01	0.013		0.32	0.36	0.63	<0.1	0.15	1.43	3.66	
7/23/97	Discovery Park		0.23	<0.01	<0.01		0.21	0.48	0.79	<0.1	<0.1	<0.5	1.53	
8/20/97	Discovery Park		0.23	<0.01	<0.01		0.25	0.41	0.67	<0.1	0.12	0.74	1.57	
9/17/97	Discovery Park		0.54	<0.01	<0.01		0.6	0.57	0.79	<0.1	0.11	0.5	1.19	
10/9/97	Discovery Park		0.35	<0.01	0.018		0.67	1	1.73	0.1	0.9	0.76	3.5	
10/22/97	Discovery Park		0.35	<0.01	<0.01		0.3	0.52	0.78	<0.1	0.12	0.61	1.79	
11/19/97	Discovery Park		0.41	<0.01	<0.01		0.62	0.46	0.64	<0.1	<0.1	<0.5	1.71	<0.15
12/17/97	Discovery Park		0.39	<0.01	<0.01		0.5	0.733	1.05	<0.1	0.172	0.93	2.31	
	Average	1.00	0.80	0.03	0.09	<1.00	0.89	0.67	1.03	0.11	0.28	1.65	4.05	0.96
	Median	1.00	1.00	0.03	0.03	<1.00	1.00	0.57	0.84	0.10	0.20	1.51	3.43	1.00
	Minimum	<1.00	<0.05	<0.01	<0.01	<1.00	0.13	0.36	0.50	<0.1	<0.1	0.07	1.10	<0.15
	Maximum	1.10	1.23	0.05	3.30	<1.00	2.20	1.90	3.60	0.50	1.30	3.89	13.30	1.10
	95th%	1.00	1.00	0.03	0.31	<1.00	1.37	1.20	2.44	0.20	0.90	3.23	9.31	1.00

Discovery Park samples collected 100 yards upstream of I5 bridge

**Sacramento Regional Coordinated Monitoring Program
American River at Discovery Park 1993-97**

Sample Date	Location	Ni-tr (ug/L)	Zn-d (ug/L)	Zn-tr (ug/L)	Temp-C (C)	DO (mg/L)	pH (units)	EC (umho)	Hardness (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)
01/06/93	Discovery Park	1.6	11	8.4		12.7	6.5	100	36	13	2	2
01/27/93	Discovery Park	3	<4.0	<5.0	9.0		8.02	80	35	8	<3.0	<3.0
02/07/93	Discovery Park	1.4	<4.0	<4.0		11.0	6.7	65	29	7	<3.0	<3.0
02/21/93	Discovery Park	1.5	<4.0	4.6	8.9	12.2	7.88	78	30	5	<3.0	<3.0
03/07/93	Discovery Park	1.7	6.9	13	12.0	10.5	7.26	79	33	1.5	<3.0	<3.0
03/22/93	Discovery Park	2.1	<4.0	<4.0	11.0	9.2	7.52	70	32	2	<3.0	<3.0
04/07/93	Discovery Park	<1.0	<4.0	13	12.0	10.5	7.69	49	23	2	<3.0	<3.0
04/21/93	Discovery Park	<1.0	<4.0	<4.0	13.8	9.8	7.7	55	27	2	<3.0	<3.0
05/06/93	Discovery Park	1.4	<4.0	13		7.64	55	26	11	<3.0	<3.0	<3.0
05/21/93	Discovery Park	<1.0	<4.0	<4.0	13.9	10.0	7.52	55	24	<1.0	<3.0	<3.0
06/07/93	Discovery Park	<1.0	7	<4.0	11.8	10.2			19	1	<3.0	<3.0
06/22/93	Discovery Park	<1.0	<4.0	<4.0	14.3	9.3	6.85	26	18	2	<3.0	<3.0
07/07/93	Discovery Park	<1.0	<4.0	8	14.6	9.8	7.72	40	25	20	<3.0	<3.0
07/21/93	Discovery Park	<1.0	4.3	<4.0	15.5	8.7	8.3	27	18	4	<3.0	<3.0
08/06/93	Discovery Park	<1.0	<4.0	4.3	16.1	8.6	6.95	32	19	2	<3.0	<3.0
08/20/93	Discovery Park	<1.0	<4.0	4	15.7	8.4	8	23	18	6	<3.0	<3.0
09/02/93	Discovery Park	<1.0	<4.0	7.7	17.8	8.5	7.95	35	21	2	<3.0	<3.0
09/19/93	Discovery Park	<1.0	<4.0	4.4	15.1	9.3	7.52	23	19	5	<3.0	<3.0
10/4/93	Discovery Park	<1.0	<4.0	4.5	13.3	9.1	7.98	17	17	3	<3.0	<3.0
10/19/93	Discovery Park	<1.0	<4.0	<4.0	10.5	9.4	7.18	17	17	1	<3.0	<3.0
11/3/93	Discovery Park	<1.0	<4.0	<4.0	17.0	10.8			18	<1.0	<3.0	<3.0
11/18/93	Discovery Park	<1.0	<4.0	<4.0	14.0	9.5	6.43	75	18	<1.0	<3.0	<3.0
12/2/93	Discovery Park	<1.0	<4.0	5	11.0	9.9	8.05	45	19	1	<3.0	<3.0
12/18/93	Discovery Park	<1.0	<4.0	7.4	9.1	9.9	8.4	29		<1.0	<3.0	<3.0
1/4/94	Discovery Park	1.8	<4.0	4.3	8.0	10.8	8.1	44		<1.0	<3.0	<3.0
1/18/94	Discovery Park		<4.0	72	9.0	11.0	7.69	60	20	<1.0	<3.0	<3.0
2/1/94	Discovery Park	<1.0	<4.0	<4.0	8.5	11.6	7.7	38	21	<1.0	<3.0	<3.0
2/15/94	Discovery Park		<4.0	<4.0	8.5	12.0	6.41	37		<1.0	<3.0	<3.0
3/1/94	Discovery Park	1	<4.0	<4.0	11.0	11.3	7.66	37.5	25	<1.0	<3.0	<3.0
3/15/94	Discovery Park		<4.0	<4.0	12.0	11.2	7.18	40		<1.0	<3.0	<3.0
4/12/94	Discovery Park	<1.0	<4.0	<4.0	15.5	10.0	8.62	47	35	1	<3.0	<3.0
4/26/94	Discovery Park		<4.0	<4.0	13.0	9.7		43		<1.0	<3.0	<3.0
5/10/94	Discovery Park	<1.0	<4.0	<4.0	17.9	10.1			33	1.5	<3.0	<3.0
5/24/94	Discovery Park		<4.0	23	16.0	9.8	6.73	29		<1.0	<3.0	<3.0
6/7/94	Discovery Park	<1.0	<4.0	<4.0	19.1	7.6	7.13	28	28	10	<3.0	<3.0
6/21/94	Discovery Park		<4.0	<4.0	17.0	10.2	7.14	67		2	<3.0	<3.0
7/5/94	Discovery Park	<1.0	<4.0	<4.0	19.5		7.58	106	24	5	<3.0	<3.0
07/19/94	Discovery Park		<4.0	<4.0	20.3	8.3	7.49	67				
08/17/94	Discovery Park	<1.0	<4.0	<4.0	23.0	8.3	6.95	53	22	<1.0	<3.0	<3.0
08/30/94	Discovery Park		<4.0	100	24.4	8.8	7.59	61		<1.0	<3.0	<3.0
09/14/94	Discovery Park	<1.0	<4.0	89	22.3	8.9	7.68	60	24	<1.0	<3.0	<3.0
10/26/94	Discovery Park		<4.0	<4.0	18.0	9.3	7.46	60		<1.0	<3.0	<3.0
11/09/94	Discovery Park	<1.0	<4.0	<4.0	14.3	9.3	6.85	60	22	<1.0	<3.0	<3.0
11/22/94	Discovery Park		<4.0	230	11.4	10.8	6.67	66		<1.0	<3.0	<3.0
12/07/94	Discovery Park	<1.0	<4.0	<4.0	10.1	9.3	6.87	80	30	<1.0	<3.0	<3.0
12/21/94	Discovery Park		<4.0	<4.0	9.1	11.1	7.55	76		<1.0	<3.0	<3.0
01/04/95	Discovery Park	<1.0	7.4	9	8.7	12.0	7.05	74	29	<1.0		
01/17/95	Discovery Park		<4.0	7.6	9.1	11.4	7.22	70		20		
02/01/95	Discovery Park	2.6	<4.0	<4.0	9.4	12.2		70	29	<1.0	<3.0	<3.0
02/28/95	Discovery Park		<4.0	<4.0	10.0	6.8	7.2	68		1		
03/14/95	Discovery Park	8	<4.0	4.9	9.9	10.3	7.22	58	25	31		
03/28/95	Discovery Park		<4.0	4.1	10.1	10.5	7.09	66		7		
04/12/95	Discovery Park	1.2	<4.0	<4.0	12.0	11.9	7.7	68	26	<1.0	<3.0	<3.0

Discovery Park samples collected 100 yards upstream of I5 bridge

**Sacramento Regional Coordinated Monitoring Program
American River at Discovery Park 1993-97**

Sample Date	Location	Ni-tr (ug/L)	Zn-d (ug/L)	Zn-tr (ug/L)	Temp-C (C)	DO (mg/L)	pH (units)	EC (umho)	Hardness (mg/L)	TSS (mg/L)	DOC (mg/L)	TOC (mg/L)
04/25/95	Discovery Park		<4.0	<4.0	11.7	11.1	7.06	64		5.5		
05/09/95	Discovery Park	1.3	<4.0	<4.0	11.3	12.0	7.22	54	22	3		
05/23/95	Discovery Park		<4.0	<4.0	13.1	10.6	7.41	54		<1.0		
06/05/95	Discovery Park	2.2	<4.0	<4.0	13.6		7.1		22	<1.0		
06/19/95	Discovery Park		<4.0	7.8	14.3		7.09	44		5		
7/19/95	Discovery Park	2.2	<4.0	<4.0	16.3	11.6	6.93	38	14	41	<3.0	<3.0
8/1/95	Discovery Park											
8/15/95	Discovery Park	1	<4.0	<4.0	21.3	7.9	7.08	42	15	<1.0		
8/29/95	Discovery Park		<4.0	<4.0	19.0	10.1	7.31	40		<1.0		
9/12/95	Discovery Park	<1.0	<4.0	<4.0	18.4	8.5	6.96	36	20	<1.0		
9/26/95	Discovery Park		<4.0	<4.0	18.3	9.0	7.22	40		1		
10/11/95	Discovery Park	<1.0	<4.0	<4.0	18.6	9.2	7.07	44	17	5		
11/14/95	Discovery Park	<1.0	<4.0	<4.0	14.9	9.2	6.67	46	22	<1.0	2.6	
12/11/95	Discovery Park	1.3	<4.0	6.6	13.5	10.6	6.55	48	22	<1.0		
1/15/96	Discovery Park	0.54	0.46	0.62	9.5	11.7	6.57	58	52	8		
2/19/96	Discovery Park	1.84	2.1	5.7	10.2	12.2	6.97	50.9	36	14		
3/4/96	Discovery Park	1.65	0.69	1.47	9.1	6.2	7.37	62	24	25		
3/18/96	Discovery Park	1.17	0.11	0.38	11.5	13.5	7.55	56	32	<2.0		
4/22/96	Discovery Park	0.58	0.56	0.84	11.4	9.4	7.15	59.8	26	3		
5/20/96	Discovery Park	1.28	0.19	0.72	11.0	11.2	6.86	49	28	11		
6/17/96	Discovery Park	0.6	0.17	0.42	14.4	9.8	6.99	39.2	25	3		
7/17/96	Discovery Park	0.58	0.39	0.96	18.94	9.02	7.04	42.4	24	3.2		
8/19/96	Discovery Park	0.55	0.57	0.29	20.66	8.8	7.11	44.6	16	3		
9/16/96	Discovery Park	0.18	<0.1	0.18	18.96	8.68	6.94	46.3	16	3.2		
10/16/96	Discovery Park	0.47	0.33	1.6	14.91	9.02	6.37	43.8	16	32		
10/29/96	Discovery Park	0.41	0.75	2.77	13.42	10.11	6.96	42.3	14	3		
11/18/96	Discovery Park	0.75	3.17	4.68	14.25	8.36	6.89	49.8	16	5		
12/18/96	Discovery Park	3.41	<0.1	2.28	9.89	11.92	7.24	42.7	17	17		
1/20/97	Discovery Park	4.64	0.79	2.99	7.56	11.47	7.08	47.5	20	35		
2/19/97	Discovery Park	1.99	<0.5	1.28					48	14		
3/19/97	Discovery Park	0.91	<0.5	0.83	9.67	11.92	7.27	51.5	44	6		
4/23/97	Discovery Park	0.64	0.69	0.91	14.18	10.56	7.13	55.1	26	3		
5/21/97	Discovery Park	0.62		<0.5	16.75		6.88	51.9	30	3		
6/25/97	Discovery Park	0.61	<0.5	<0.5	21.74	8.23	7.42	51.6	34	5		
7/23/97	Discovery Park	0.67	<0.5	<0.5	20.47	9.14	7.7	46.8	18	4		
8/20/97	Discovery Park	0.45	<0.5	0.74	19.84	8.42	7.2	48	22	3.4		
9/17/97	Discovery Park	0.4	0.36	0.64	20.35	8.3	7.04	47	31	2.4		
10/9/97	Discovery Park	0.6	2.45	5.61	17.07	8.94	7.4	45.3	20	7		
10/22/97	Discovery Park	0.41	0.14	0.59	16.95	9.4	6.9	45.6	22	5		
11/19/97	Discovery Park	0.23	0.29	0.46	14.25	8.7	7.2	50.6	30	3		
12/17/97	Discovery Park	0.88	0.31	0.87	10.89	9.77	7.3	64.4	32	3.4		
	Average	1.25	3.25	9.25	14.11	9.96	7.27	51.71	24.75	5.37	2.97	2.98
	Median	1.00	4.00	4.00	13.92	9.80	7.20	49.40	24.00	2.20	3.00	3.00
	Minimum	0.18	<0.1	0.18	7.56	6.18	6.37	17.00	14.00	<1.00	2.00	2.00
	Maximum	8.00	11.00	230.00	24.40	13.50	8.62	106.00	52.00	41.00	<3.00	<3.00
	95th%	2.74	4.62	17.00	21.04	12.12	8.04	78.65	36.00	22.25	3.00	3.00

Discovery Park samples collected 100 yards upstream of I5 bridge

Sacramento AMP

Pesticide Data Detection Summary from October 29, 1996

Parameter	Discovery Park (ng/L)	Nimbus (ng/L)
Propachlor	<7	<7
Simazine	<5	<5
Prometon	<18	<18
Fonofos	<3	<3
Alpha BHC	<2	<2
P,P DDE	<6	<6
Lindane	<4	<4
Dieldrin	<1	<1
Metolachlor	<2	<2
Malathion	<5	<5
Parathion	<4	<4
Diazinon	<2	<2
Atrazine	<1	<1
Alachlor	<2	<2
Acetochlor	<2	<2
Metribuzin	<4	<4
Terbacil	<7	<7
Linuron	<2	<2
Methyl Parathion	<6	<6
EPTC	<2	<2
Molinate	<4	<4
Carbofuran	<3	<3
Terbufos	<13	<13
Disulfoton	<17	<17
Carbaryl	<3	<3
Thiobencarb	<2	<2
DCPA	<2	<2

**Sacramento Regional
Ambient Monitoring Program
Low Level Pesticide Detection Data for the American River**

Location	Date	Parameter Name	Units	Value
Discovery Park	10/29/96	Propachlor	ug/L	<0.007
Discovery Park	10/29/96	Butylate	ug/L	<0.002
Discovery Park	10/29/96	Simazine	ug/L	<0.005
Discovery Park	10/29/96	Prometon	ug/L	<0.018
Discovery Park	10/29/96	Deethyl Atrazine	ug/L	<0.002
Discovery Park	10/29/96	Cyanazine	ug/L	<0.004
Discovery Park	10/29/96	Fonofox	ug/L	<0.003
Discovery Park	10/29/96	Alpha BHC	ug/L	<0.002
Discovery Park	10/29/96	P,P' DDE	ug/L	<0.006
Discovery Park	10/29/96	Chlorpyrifos	ug/L	<0.004
Discovery Park	10/29/96	Lindane	ug/L	<0.004
Discovery Park	10/29/96	Dieldrin	ug/L	<0.001
Discovery Park	10/29/96	Metolachlor	ug/L	<0.002
Discovery Park	10/29/96	Malathion	ug/L	<0.005
Discovery Park	10/29/96	Parathion	ug/L	<0.004
Discovery Park	10/29/96	Diazinon	ug/L	<0.002
Discovery Park	10/29/96	Atrazine	ug/L	<0.001
Discovery Park	10/29/96	Alachlor	ug/L	<0.002
Discovery Park	10/29/96	Acetochlor	ug/L	<0.002
Discovery Park	10/29/96	Metribuzin	ug/L	<0.004
Discovery Park	10/29/96	26Diethylaniline	ug/L	<0.003
Discovery Park	10/29/96	Trifluralin	ug/L	<0.002
Discovery Park	10/29/96	Ethalfuralin	ug/L	<0.004
Discovery Park	10/29/96	Phorate	ug/L	<0.002
Discovery Park	10/29/96	Terbacil	ug/L	<0.007
Discovery Park	10/29/96	Linuron	ug/L	<0.002
Discovery Park	10/29/96	Methyl Parathion	ug/L	<0.006
Discovery Park	10/29/96	EPTC	ug/L	<0.002
Discovery Park	10/29/96	Pebulate	ug/L	<0.004
Discovery Park	10/29/96	Tebuthiuron	ug/L	<0.01
Discovery Park	10/29/96	Molinate	ug/L	<0.004
Discovery Park	10/29/96	Ethoprop	ug/L	<0.003
Discovery Park	10/29/96	Benfluralin	ug/L	<0.002
Discovery Park	10/29/96	Carbofuran	ug/L	<0.003
Discovery Park	10/29/96	Terbufos	ug/L	<0.013
Discovery Park	10/29/96	Pronamide	ug/L	<0.003
Discovery Park	10/29/96	Disulfoton	ug/L	<0.017
Discovery Park	10/29/96	Triallate	ug/L	<0.001
Discovery Park	10/29/96	Propanil	ug/L	<0.004
Discovery Park	10/29/96	Carbaryl	ug/L	<0.003
Discovery Park	10/29/96	Thiobencarb	ug/L	<0.002
Discovery Park	10/29/96	DCPA	ug/L	<0.002
Discovery Park	10/29/96	Pendimethalin	ug/L	<0.004
Discovery Park	10/29/96	Napropamide	ug/L	<0.003
Discovery Park	10/29/96	Propargite	ug/L	<0.013
Discovery Park	10/29/96	Methyl Azinphos	ug/L	<0.001
Discovery Park	10/29/96	Permethrin	ug/L	<0.005
Nimbus	10/29/96	Propachlor	ug/L	<0.007
Nimbus	10/29/96	Butylate	ug/L	<0.002
Nimbus	10/29/96	Simazine	ug/L	<0.005

**Sacramento Regional
Ambient Monitoring Program
Low Level Pesticide Detection Data for the American River**

Nimbus	10/29/96	Prometon	ug/L	<0.018
Nimbus	10/29/96	Deethyl Atrazine	ug/L	<0.002
Nimbus	10/29/96	Cyanazine	ug/L	<0.004
Nimbus	10/29/96	Fonofox	ug/L	<0.003
Nimbus	10/29/96	Alpha BHC	ug/L	<0.002
Nimbus	10/29/96	P,P' DDE	ug/L	<0.006
Nimbus	10/29/96	Chlorpyrifos	ug/L	<0.004
Nimbus	10/29/96	Lindane	ug/L	<0.004
Nimbus	10/29/96	Dieldrin	ug/L	<0.001
Nimbus	10/29/96	Metolachlor	ug/L	<0.002
Nimbus	10/29/96	Malathion	ug/L	<0.005
Nimbus	10/29/96	Parathion	ug/L	<0.004
Nimbus	10/29/96	Diazinon	ug/L	<0.002
Nimbus	10/29/96	Atrazine	ug/L	<0.001
Nimbus	10/29/96	Alachlor	ug/L	<0.002
Nimbus	10/29/96	Acetochlor	ug/L	<0.002
Nimbus	10/29/96	Metribuzin	ug/L	<0.004
Nimbus	10/29/96	26Diethylaniline	ug/L	<0.003
Nimbus	10/29/96	Trifluralin	ug/L	<0.002
Nimbus	10/29/96	Ethalfuralin	ug/L	<0.004
Nimbus	10/29/96	Phorate	ug/L	<0.002
Nimbus	10/29/96	Terbacil	ug/L	<0.007
Nimbus	10/29/96	Linuron	ug/L	<0.002
Nimbus	10/29/96	Methyl Parathion	ug/L	<0.006
Nimbus	10/29/96	EPTC	ug/L	<0.002
Nimbus	10/29/96	Pebulate	ug/L	<0.004
Nimbus	10/29/96	Tebuthiuron	ug/L	<0.01
Nimbus	10/29/96	Molinate	ug/L	<0.004
Nimbus	10/29/96	Ethoprop	ug/L	<0.003
Nimbus	10/29/96	Benfluralin	ug/L	<0.002
Nimbus	10/29/96	Carbofuran	ug/L	<0.003
Nimbus	10/29/96	Terbufos	ug/L	<0.013
Nimbus	10/29/96	Pronamide	ug/L	<0.003
Nimbus	10/29/96	Disulfoton	ug/L	<0.017
Nimbus	10/29/96	Triallate	ug/L	<0.001
Nimbus	10/29/96	Propanil	ug/L	<0.004
Nimbus	10/29/96	Carbaryl	ug/L	<0.003
Nimbus	10/29/96	Thiobencarb	ug/L	<0.002
Nimbus	10/29/96	DCPA	ug/L	<0.002
Nimbus	10/29/96	Pendimethalin	ug/L	<0.004
Nimbus	10/29/96	Napropamide	ug/L	<0.003
Nimbus	10/29/96	Propargite	ug/L	<0.013
Nimbus	10/29/96	Methyl Azinphos	ug/L	<0.001
Nimbus	10/29/96	Permethrin	ug/L	<0.005

**Sacramento Regional Ambient Monitoring Program
Organophosphate Pesticides Data***

Constituent	Nimbus	Discovery Park
	µg/L	µg/L
Azinphosmethyl	<1.0	<1.0
Biostar	<0.1	<0.1
Chlorpyrifos	<0.05	<0.05
Coumaphos	<0.1	<0.1
Def	<0.1	<0.1
Demeton	<0.2	<0.2
Diazinon	<0.05	<0.05
Dichlorvos	<0.2	<0.2
Dimethoate	<0.1	<0.1
Diphenamid	<0.1	<0.1
Disulfoton	<0.1	<0.1
Ethion	<0.1	<0.1
Ethoprop	<0.1	<0.1
Fensulfothion	<0.2	<0.2
Fenthion	<0.1	<0.1
Malathion	<0.4	<0.4
Merphos	<0.1	<0.1
Methyl Parathion	<0.1	<0.1
Methyl Trithion	<0.2	<0.2
Merivphos	<0.7	<0.7
Naled	<0.5	<0.5
Parathion	<0.1	<0.1
Phorate	<0.1	<0.1
Phosalone	<0.1	<0.1
Prometon	<0.1	<0.1
Prowl	<0.1	<0.1
Ronnel	<0.1	<0.1
Trichloronate	<0.1	<0.1
Trifluralin	<0.1	<0.1
EPTC	<0.1	<0.1

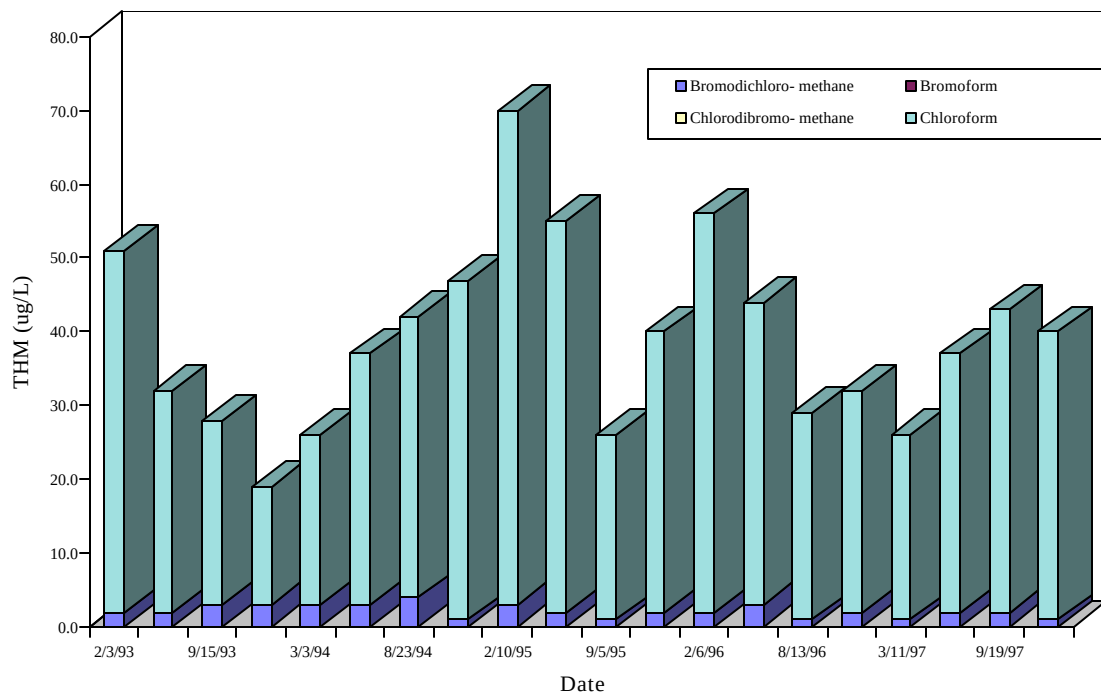
*Samples were collected on 11/8/94, 11/21/94, 12/6/94, 12/20/94, 1/3/95, 1/17/95, 1/31/95, 2/14/95, 2/27/95, 3/13/95, 3/27/95, 4/11/95, 4/24/95, 5/8/95, 6/5/95, 7/18/95, 8/14/95, 9/11/95, 10/10/95, 11/13/95.

**Sacramento Regional Ambient Monitoring Program
Carbamates and Orthophosphate Pesticides**

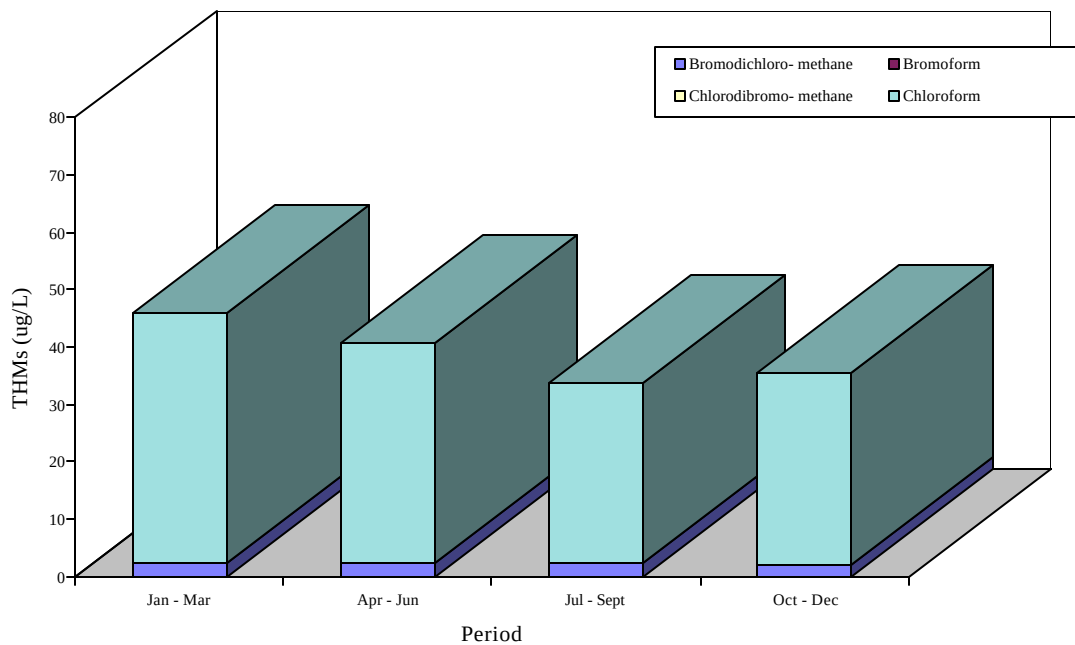
Constituent	December 11, 1995		March 4, 1996	
	Nimbus	Discovery Park	Nimbus	Discovery Park
	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Aminocarb	<0.8	<0.4	<0.4	<0.4
Aldicarb	<0.8	<0.4	<0.4	<0.4
Barban	<7.0	<3.5	<3.5	<3.5
Benomyl (Carbendazim)	<0.8	<0.4	<0.4	<0.4
Bromacil	<0.8	<0.4	<0.4	<0.4
Carbaryl	<0.14	<0.07	<0.07	<0.07
Carbofuran	<0.14	<0.07	<0.07	<0.07
Chloropropham	<7.0	<3.5	<3.5	<3.5
Chloroxuron	<0.8	<0.4	<0.4	<0.4
Diuron	<0.8	<0.4	<0.4	<0.4
Fenuron	<0.8	<0.4	<0.4	<0.4
Fluometuron	<0.8	<0.4	<0.4	<0.4
Linuron	<0.14	<0.07	<0.07	<0.07
Methomyl	<0.14	<0.07	<0.07	<0.07
Methiocarb	<0.8	<0.4	<0.4	<0.4
Mexacarbate	<7.0	<3.5	<3.5	<3.5
Monuron	<0.8	<0.4	<0.4	<0.4
Neburon	<0.8	<0.4	<0.4	<0.4
Oxamyl	<0.8	<0.4	<0.4	<0.4
Propachlor	<7.0	<3.5	<3.5	<3.5
Propham	<7.0	<3.5	<3.5	<3.5
Propoxur	<0.8	<0.4	<0.4	<0.4
Siduron	<0.8	<0.4	<0.4	<0.4
Tebuthiuron	<0.8	<0.4	<0.4	<0.4
Azinphosmethyl	<1.0	<1.0	<1.0	<1.0
Bolstar	<0.10	<0.10	<0.10	<0.10
Chlorpyrifos	<0.05	<0.05	<0.05	<0.05
Coumaphos	<0.20	<0.20	<0.10	<0.10
Def	<0.10	<0.10	<0.10	<0.10
Demeton	<0.20	<0.20	<0.20	<0.20
Diazinon	<0.05	<0.05	<0.05	<0.05
Dichlorvos	<0.20	<0.20	<0.20	<0.20
Dimethoate	<0.10	<0.10	<0.10	<0.10
Diphenamid			<0.10	<0.10
Disulfoton	<0.10	<0.10	<0.10	<0.10
EPN	<0.10	<0.10		
EPTC	<0.10	<0.10		
Ethion	<0.10	<0.10	<0.10	<0.10
Ethoprop	<0.10	<0.10	<0.10	<0.10
Fensulfothion	<0.50	<0.50	<0.20	<0.20
Fenthion	<0.10	<0.10	<0.10	<0.10
Malathion	<0.10	<0.10	<0.40	<0.40
Merphos	<0.10	<0.10	<0.10	<0.10
Methyl Trithion			<0.20	<0.20
Mevinphos	<0.70	<0.70	<0.70	<0.70
Naled	<0.50	<0.50	<0.50	<0.50
Parathion, ethyl	<0.10	<0.10	<0.10	<0.10
Parathion, methyl	<0.10	<0.10	<0.10	<0.10
Phorate	<0.10	<0.10	<0.10	<0.10
Phosalon			<0.10	<0.10
Prometon			<0.10	<0.10
Prowl	<0.10	<0.10	<0.10	<0.10
Ronnel	<0.10	<0.10	<0.10	<0.10
Simazine			<0.50	<0.50
Stirophos	<0.10	<0.10		
Tokuthion	<0.10	<0.10		
Trichloronate	<0.10	<0.10	<0.10	<0.10
Trifluralin	<0.10	<0.10	<0.10	<0.10

Distribution System THM Levels

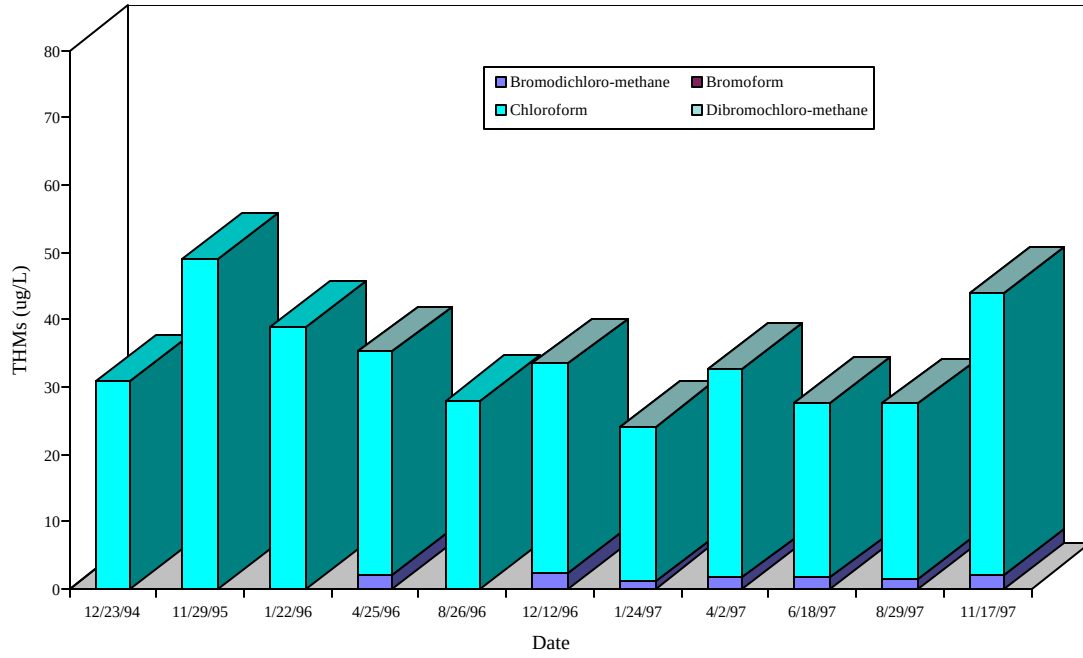
Quarterly Distribution System TTHMs for the City of Roseville



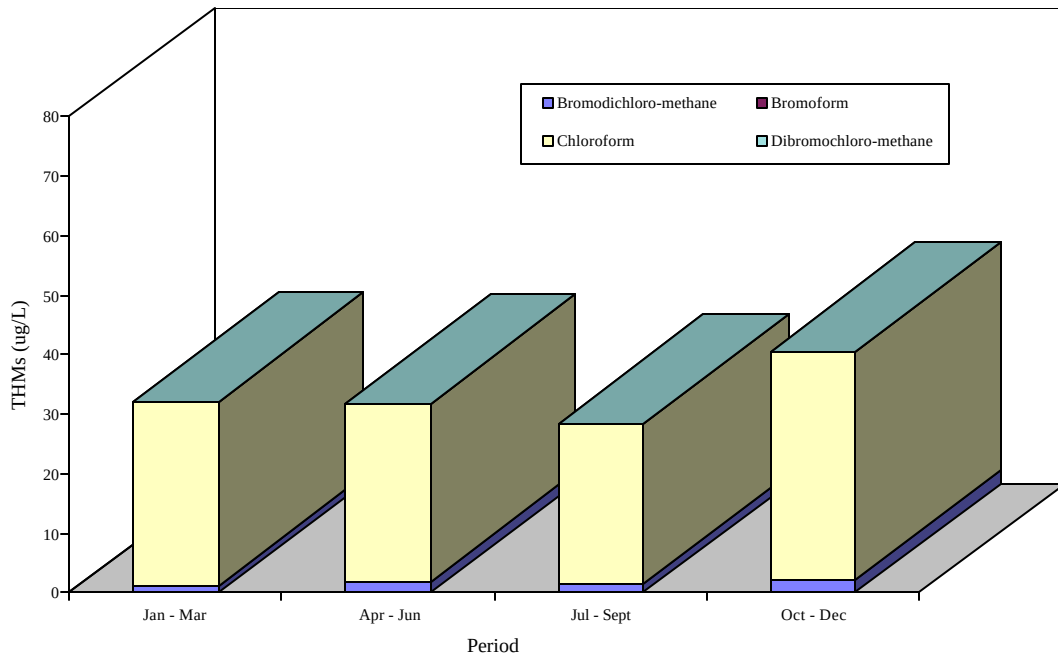
City of Roseville Quarterly Distribution System TTHMs



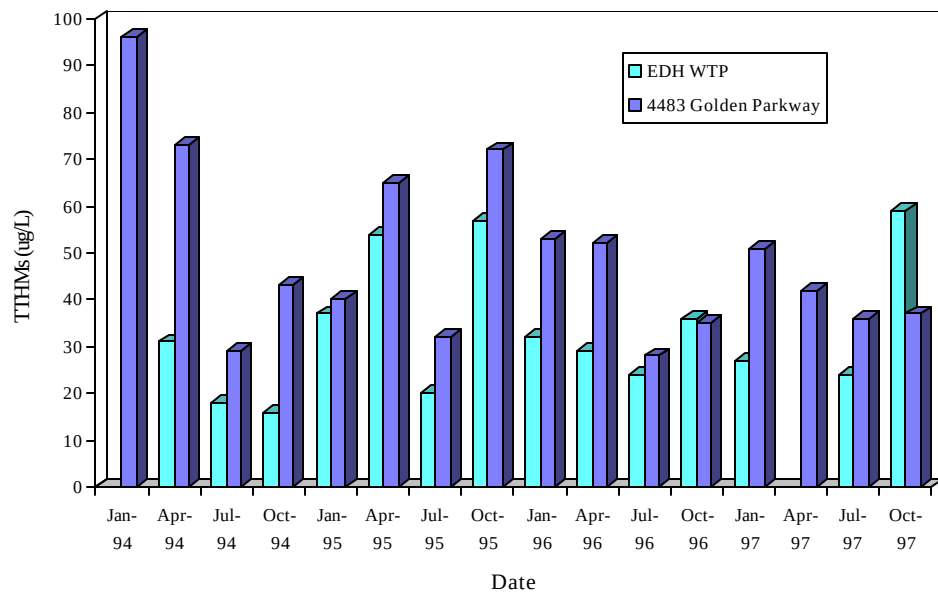
Quarterly Distribution System TTHMs for San Juan Water District



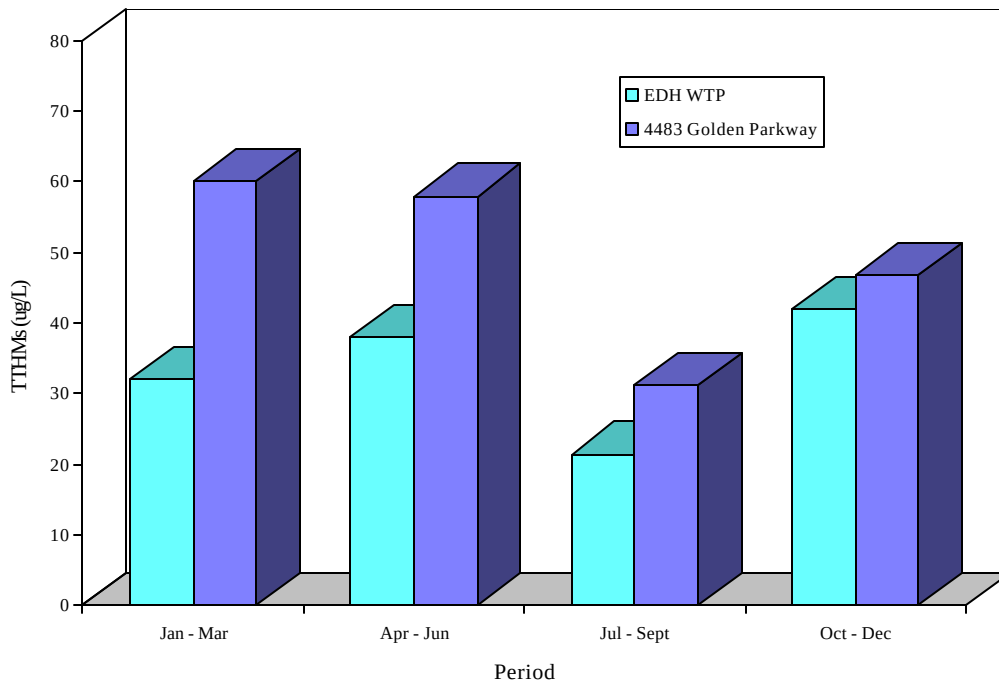
San Juan Water District Quarterly Distribution System TTHMs



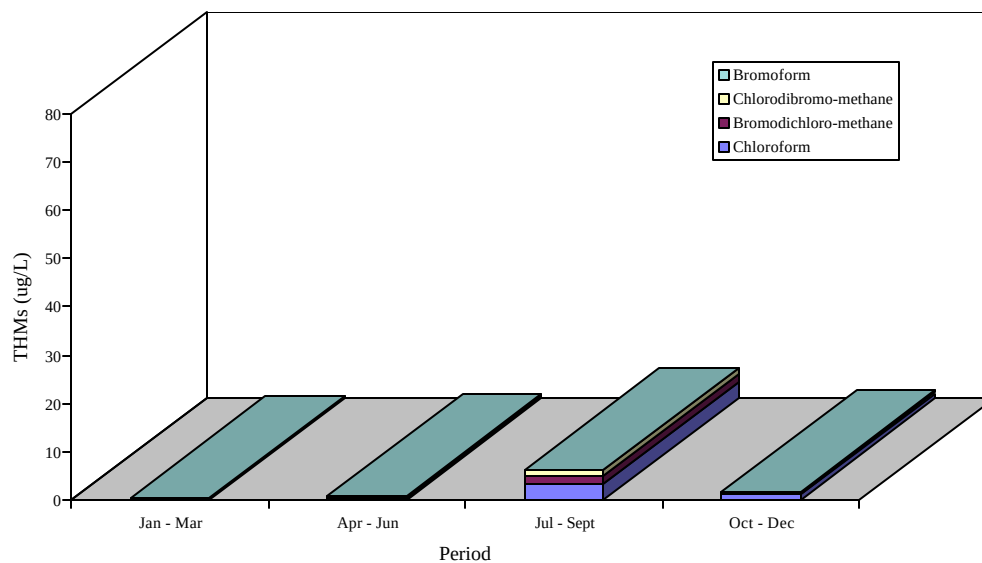
Quarterly TTHMs for El Dorado Irrigation District at El Dorado Hills WTP



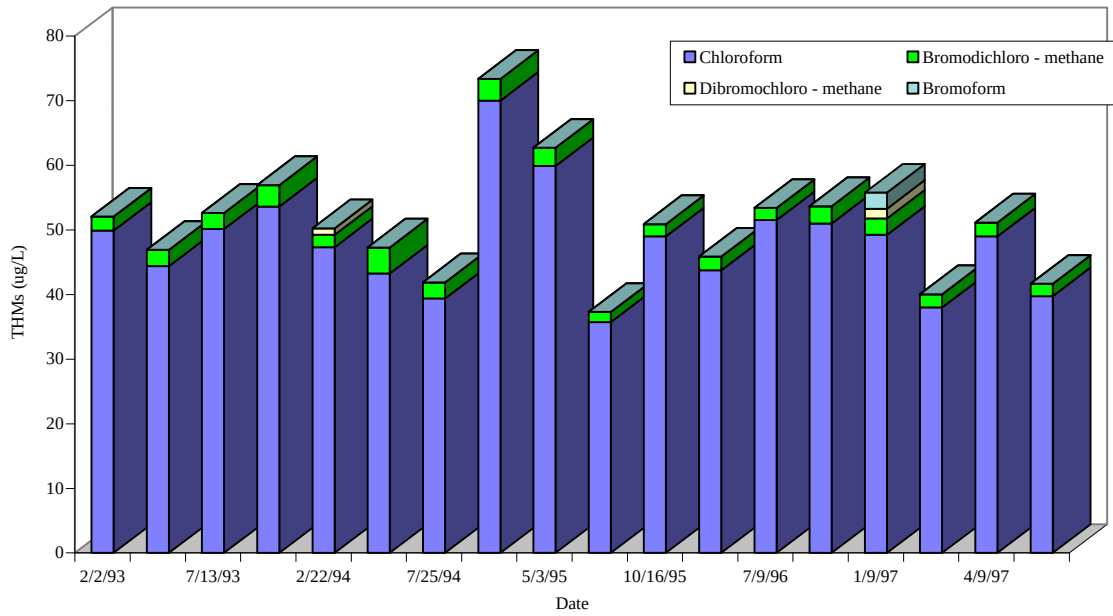
El Dorado Irrigation District Quarterly TTHMs at El Dorado Hills WTP



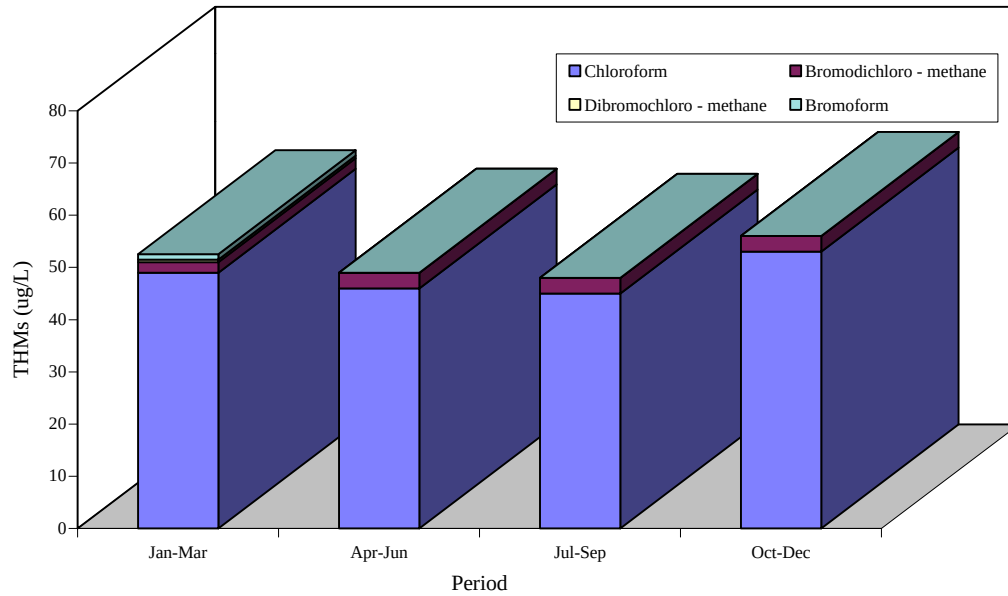
Arden Cordova Water Service Quarterly Distribution System TTHMs



Quarterly Distribution System TTHMs for the City of Sacramento



City of Sacramento Quarterly Distribution System TTHMs



USGS Data
American River at J Street

**USGS National Ambient Water Quality Monitoring Program
American River at I Street**

Sample Date	Specific Cond. - Field	Specific Cond. - Lab	pH- Field	pH - Lab	Temp	DO	DO	Hardness	Sodium- Dissolved	Potassium- Dissolved	Sulfate - Dissolved	Chloride- Dissolved	Fluoride- Dissolved
	(uS/cm)	(uS/cm)	(units)	(units)	(Deg C)	(mg/L)	(% Sat.)	(mg/L as CaCO3)	(mg/L as NA)	(mg/L as K)	(mg/L as SO4)	(mg/L as Cl)	(mg/L as F)
2/21/96	58	58	7.5	7.2	11.0	10.8	99	22	2.4	0.70	2.00	2.00	<0.1
3/18/96	57	61	7.4	7.0	10.0	12.4	109	23	2.3	0.60	2.10	1.90	<0.1
4/5/96	54	59	7.0	7.0	10.0	12.0	106	22	2.4	0.60	1.80	1.70	<0.1
5/15/96	50	53	7.5	7.4	14.5	11.1	110	19	2.2	0.50	2.00	1.50	<0.1
6/12/96	40	43	7.4	7.5	16.0	10.0	101	16	1.7	0.60	1.40	1.00	<0.1
7/19/96	42	47	7.5	7.7	17.0	8.2	84	16	1.8	0.70	1.30	1.20	<0.1
8/13/96	44	48	7.2	7.3	19.0	9.0	97	17	1.9	0.70	1.50	1.30	<0.1
9/13/96	46	49	7.4	7.4	18.0	10.7	114	18	1.9	0.60	1.50	1.40	<0.1
10/11/96	45	49	7.3	7.5	17.5	9.0	94	18	1.8	0.60	1.40	1.30	<0.1
11/12/96	48	50	7.3	7.4	14.5	10.2	99	18	2.0	0.60	1.60	1.40	<0.1
12/6/96	47	51	7.7	7.5	13.0	11.2	106	20	2.0	0.70	1.60	1.70	<0.1
1/10/97	45	53	7.6	7.7	8.5	12.8	109	19	1.4	1.00	1.70	0.90	<0.1
2/5/97	56	56	7.5	7.5	8.5	10.6	90	21	2.1	0.80	2.10	1.40	<0.1
3/24/97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/25/97	54	57	7.6	7.7	12.5	10.2	96	22	2.1	0.73	2.20	1.50	<0.1
5/15/97	51	53	7.6	7.1	14.5	10.0	98	20	2.0	0.74	1.90	1.40	<0.1
6/12/97	49	51	7.4	7.3	17.0	9.2	96	19	2.0	0.69	1.70	1.30	<0.1
7/25/97	47	48	7.5	7.4	19.0	8.6	93	17	1.8	0.73	1.50	1.40	<0.1
8/19/97	48	51	7.2	7.5	19.5	8.6	94	18	1.9	0.74	1.50	1.40	<0.1
9/15/97	47	47	7.3	7.8	19.0	9.2	99	18	1.9	0.79	1.60	1.40	<0.1
10/24/97	47	48	7.4	7.5	16.0	9.3	95	18	1.9	0.76	1.70	1.30	<0.1
11/21/97	50	NA	7.4	NA	14.5	10.9	106	NA	NA	NA	NA	NA	NA
Average	48.81	51.60	7.41	7.42	14.74	10.19	99.76	19.05	1.98	0.69	1.71	1.42	<0.1
Median	48.00	51.00	7.40	7.45	14.50	10.20	99.00	18.50	1.95	0.70	1.65	1.40	<0.1
Minimum	40.00	43.00	7.00	7.00	8.50	8.20	84.00	16.00	1.40	0.50	1.30	0.90	<0.1
Maximum	58.00	61.00	7.70	7.80	19.50	12.80	114.00	23.00	2.40	1.00	2.20	2.00	<0.1
95th Percentile	57.00	59.10	7.60	7.71	19.00	12.40	110.00	22.05	2.40	0.81	2.11	1.91	<0.1

Statistics calculated assuming non-detects equal to the detection limit.

ND - Non-detect

NA - Not analyzed

**USGS National Ambient Water Quality Monitoring Program
American River at I Street**

Sample Date	Silica-Dissolved (mg/L as SiO2)	Nitrate (mg/L as N)	Nitrite (mg/L as N)	Ammonia Nitrogen (mg/L as N)	Phosphorus- Total (mg/L as P)	Phosphorus- Dissolved (mg/L as P)	Ortho- phosphorus (mg/L as P)	Aluminum- Dissolved (ug/L Al)	Barium- Dissolved (ug/L Ba)	Cadmium- Dissolved (ug/L Cd)	Chromium- Dissolved (ug/L Cr)	Cobalt - Dissolved (ug/L Co)
2/21/96	11.00	NA	<0.01	0.02	<0.01	<0.01	0.02	NA	NA	NA	NA	NA
3/18/96	11.00	NA	<0.01	0.02	0.02	0.01	<0.01	14	12	<1.0	<1.0	<1.0
4/5/96	12.00	NA	<0.01	<0.015	0.02	0.02	<0.01	12	12	<1.0	<1.0	<1.0
5/15/96	11.00	NA	<0.01	<0.015	0.01	<0.01	<0.01	9	11	<1.0	<1.0	<1.0
6/12/96	9.70	0.06	0.01	0.06	0.05	<0.01	<0.01	29	10	<1.0	<1.0	<1.0
7/19/96	10.00	0.05	0.01	0.04	0.07	0.03	0.02	10	10	<1.0	<1.0	<1.0
8/13/96	10.00	NA	0.01	0.02	<0.01	0.01	0.01	7	11	<1.0	<1.0	<1.0
9/13/96	9.90	NA	<0.01	<0.015	0.01	<0.01	<0.01	6	11	<1.0	<1.0	<1.0
10/11/96	9.90	NA	<0.01	<0.015	<0.01	<0.01	<0.01	7	12	<1.0	<1.0	<1.0
11/12/96	9.50	0.06	0.02	0.07	<0.01	<0.01	0.01	9	11	<1.0	<1.0	<1.0
12/6/96	9.40	NA	0.01	<0.015	<0.01	<0.01	<0.01	7	11	<1.0	<1.0	<1.0
1/10/97	9.70	0.1	0.01	<0.015	0.09	<0.01	<0.01	47	8	<1.0	<1.0	<1.0
2/5/97	12.00	0.18	0.02	<0.015	0.04	<0.01	<0.01	12	8	<1.0	<1.0	<1.0
3/24/97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/25/97	11.00	NA	<0.01	<0.015	0.017	<0.01	<0.01	9.5	11	<1.0	<1.0	<1.0
5/15/97	11.00	NA	<0.01	<0.015	<0.01	<0.01	<0.01	7.2	9.6	<1.0	<1.0	<1.0
6/12/97	11.00	NA	<0.01	<0.015	<0.01	<0.01	<0.01	7.5	11	<1.0	<1.0	<1.0
7/25/97	9.40	NA	<0.01	<0.015	<0.01	<0.01	<0.01	7	9.7	<1.0	<1.0	<1.0
8/19/97	9.80	NA	<0.01	0.022	0.017	<0.01	<0.01	5.7	11	<1.0	<1.0	<1.0
9/15/97	9.80	NA	<0.01	<0.015	<0.01	<0.01	<0.01	7.6	11	<1.0	<1.0	<1.0
10/24/97	8.80	NA	<0.01	0.017	<0.01	<0.01	<0.01	5.6	10	<1.0	<1.0	<1.0
11/21/97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average	10.30	0.09	0.01	0.02	0.02	0.01	0.01	11.53	10.54	<1.0	<1.0	<1.0
Median	9.95	0.06	0.01	0.02	0.01	0.01	0.01	7.60	11.00	<1.0	<1.0	<1.0
Minimum	8.80	0.05	<0.01	<0.015	<0.01	<0.01	<0.01	5.60	8.00	<1.0	<1.0	<1.0
Maximum	12.00	0.18	0.02	0.07	0.09	0.03	0.02	47.00	12.00	<1.0	<1.0	<1.0
95th Percentile	12.00	0.16	0.02	0.06	0.07	0.02	0.02	30.80	12.00	<1.0	<1.0	<1.0

Statistics calculated assuming non-detects equal to the detection limit.

ND - Non-detect

NA - Not analyzed

**USGS National Ambient Water Quality Monitoring Program
American River at I Street**

Sample Date	Copper - Dissolved	Iron - Dissolved	Lead - Dissolved	Manganese- Dissolved	Molybdenum- Dissolved	Nickel - Dissolved	Selenium - Dissolved	Silver- Dissolved	Zinc - Dissolved	Uranium- Natural	Dissolved Organic Carbon	Total Organic Carbon	Simazine	Mercury
	(ug/L Cu)	(ug/L Fe)	(ug/L Pb)	(ug/L Mn)	(ug/L Mo)	(ug/L Ni)	(ug/L Se)	(ug/L Ag)	(ug/L Zn)	(ug/L U)	(mg/L C)	(mg/L C)	(ng/L)	(ng/L)
2/21/96	NA	25	NA	10	NA	NA	NA	NA	NA	NA	6.4	1.7	ND	4.220
3/18/96	<1.0	17	<1.0	6	<1.0	1.0	<1.0	<1.0	1.0	<1.0	3.7	0.4	32	2.240
4/5/96	<1.0	14	<1.0	3	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	1.3	<0.1	ND	1.860
5/15/96	<1.0	9	<1.0	3	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	1.5	0.2	ND	1.540
6/12/96	1	25	<1.0	2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	0.2	ND	1.560
7/19/96	<1.0	11	<1.0	2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	0.3	ND	1.290
8/13/96	<1.0	6	<1.0	2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.5	0.4	7	1.240
9/13/96	<1.0	7	<1.0	2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.5	0.4	ND	0.930
10/11/96	<1.0	7	<1.0	2	<1.0	<1.0	<1.0	<1.0	<1	<1.0	1.6	0.3	ND	0.870
11/12/96	<1.0	10	<1.0	4	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	1.9	0.2	ND	1.160
12/6/96	<1.0	8	<1.0	11	<1.0	<1.0	<1.0	<1.0	<1	<1.0	1.5	0.5	ND	4.280
1/10/97	<1.0	48	<1.0	5	<1.0	<1.0	<1.0	<1.0	<1	<1.0	1.8	1.0	ND	18.510
2/5/97	2	12	<1.0	8	<1.0	1.0	<1.0	<1.0	2.0	<1.0	1.6	0.5	ND	7.180
3/24/97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	3.560
4/25/97	<1.0	7.9	<1.0	4.6	<1.0	<1.0	<1.0	<1.0	<1	<1.0	1.3	NA	ND	3.460
5/15/97	<1.0	27	<1.0	3.3	<1.0	<1.0	<1.0	<1.0	1.8	<1.0	1.1	0.2	ND	1.470
6/12/97	2.2	6.7	<1.0	2	<1.0	<1.0	<1.0	<1.0	2.2	<1.0	1.5	0.1	ND	1.290
7/25/97	1.2	3.7	<1.0	1.8	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	1.3	0.2	ND	1.080
8/19/97	2.8	5.1	<1.0	1.7	<1.0	1.3	<1.0	<1.0	2.7	<1.0	1.3	0.2	ND	1.380
9/15/97	<1	3.5	<1.0	3	<1.0	<1.0	2.0	<1.0	11.0	<1.0	1.3	0.9	ND	1.122
10/24/97	<1.0	<3.0	<1.0	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	ND	NA
11/21/97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average	1.22	12.80	<1.0	3.90	<1.0	1.10	2.00	<1.0	2.49	<1.0	1.84	0.45	19.50	3.01
Median	1.00	8.50	<1.0	3.00	<1.0	1.00	2.00	<1.0	1.50	<1.0	1.50	0.30	19.50	1.51
Minimum	<1.0	<3.0	<1.0	1.50	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.10	0.10	ND	0.87
Maximum	2.80	48.00	<1.0	11.00	<1.0	1.30	2.00	<1.0	11.00	<1.0	6.40	1.70	32.00	18.51
95th Percentile	2.26	28.05	<1.0	10.05	<1.0	1.27	2.00	<1.0	7.26	<1.0	3.97	1.14	30.75	7.75

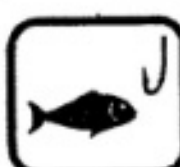
Statistics calculated assuming non-detects equal to the detection limit.

ND - Non-detect

NA - Not analyzed

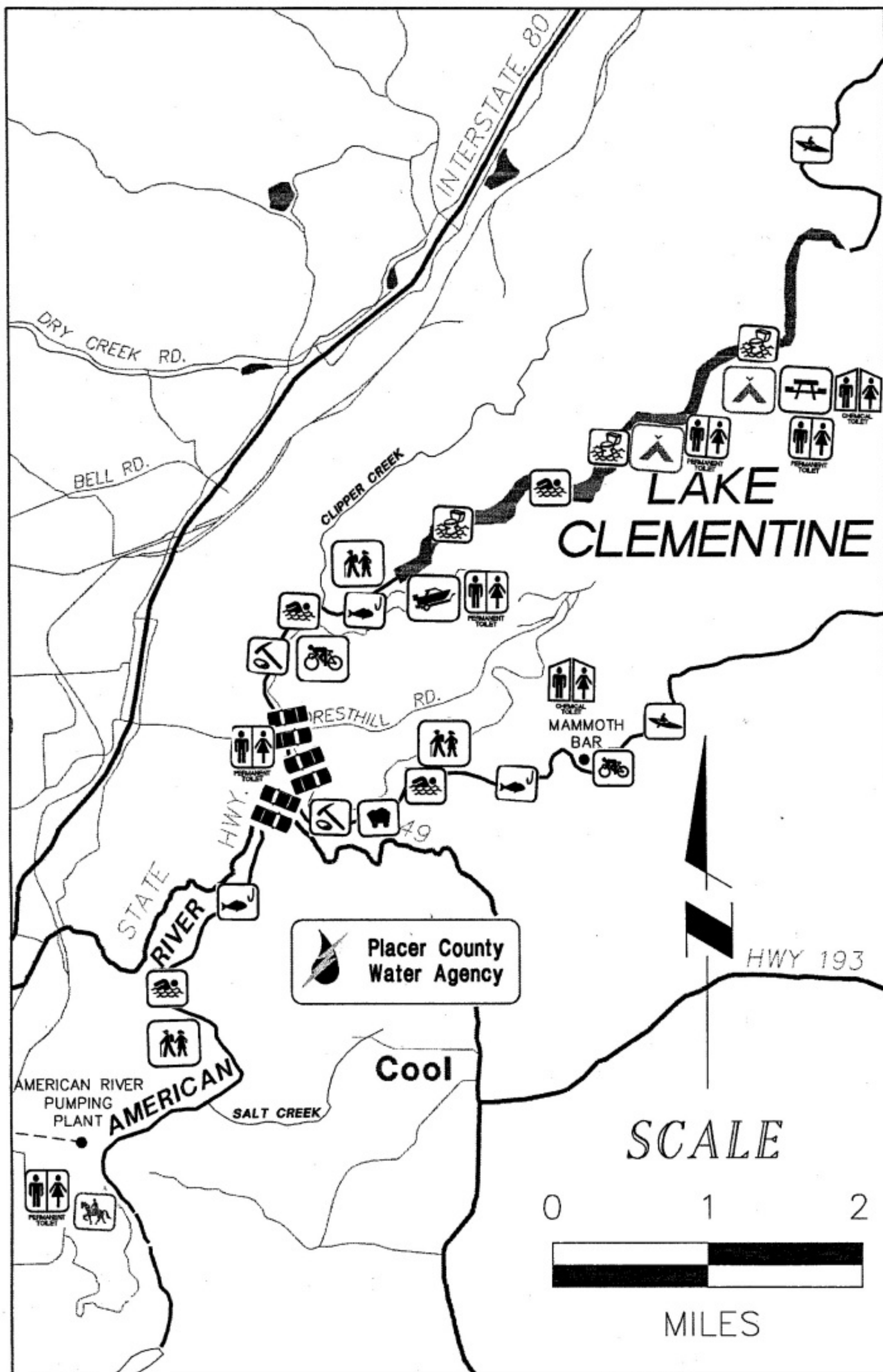
Appendix F: Near-Intake Zone Maps

Legend

	Biking		Homeless Camp		River Crossing
	Boat Ramp/Launch		Houseboats		Sailing
	Camping		Kayak Activity/ Rafting		Sanitary Pump
	Chemical Toilet		Nimbus Fish Hatcheries		Septic Tank/ Leach Field
	Contaminated Groundwater Intrusion		Outfall to River		Stormwater Pump
	Dredging		Overnight Boating		Swimming
	Equestrian Center		Permanent Toilet		Water Intake
	Fishing		Picknicking		
	Floating Toilet		Quarry		
	Hiking		Railroad Crossing		

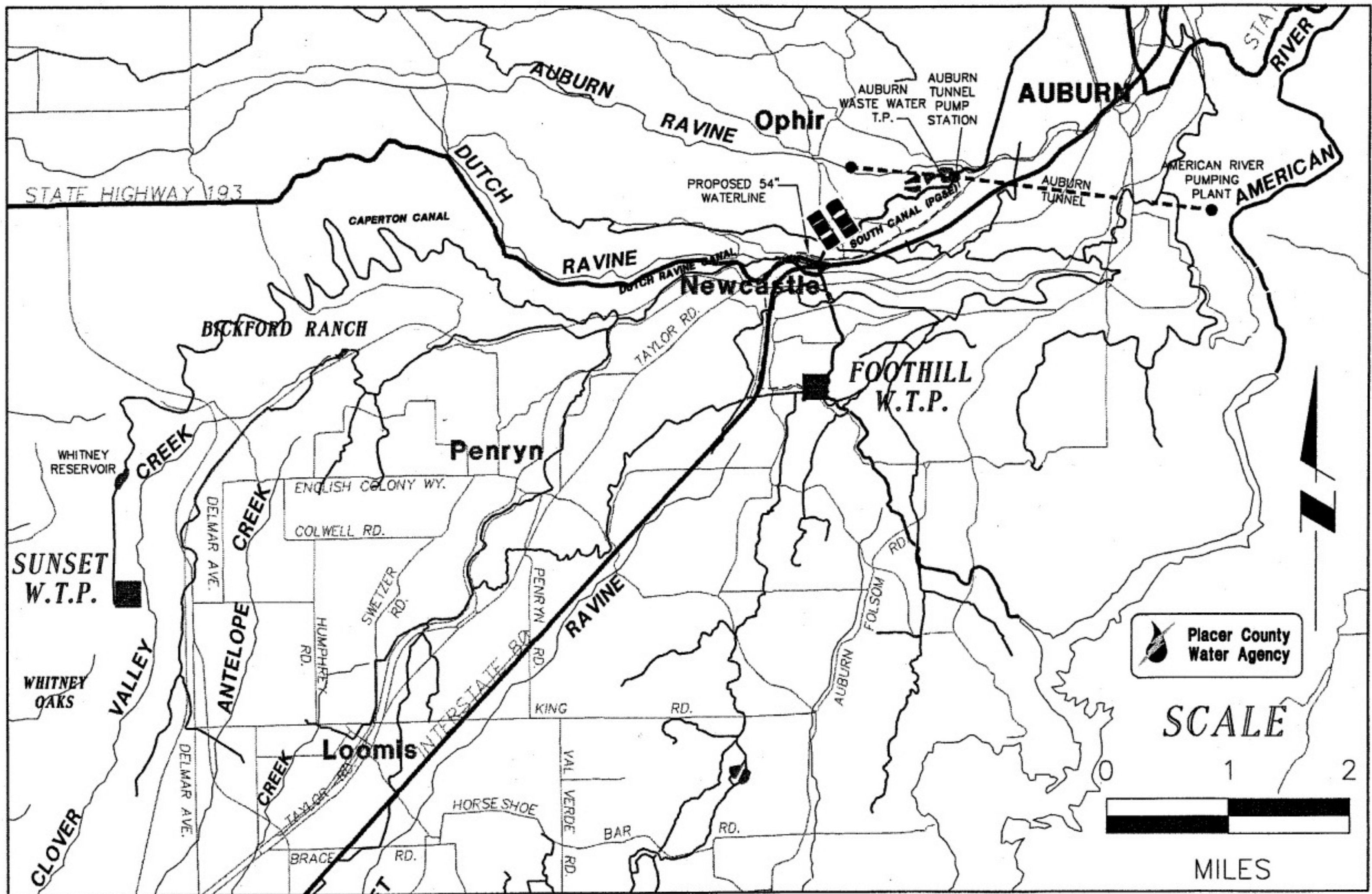
North/Middle Fork American River Near-Intake Zone

Placer County Water Agency



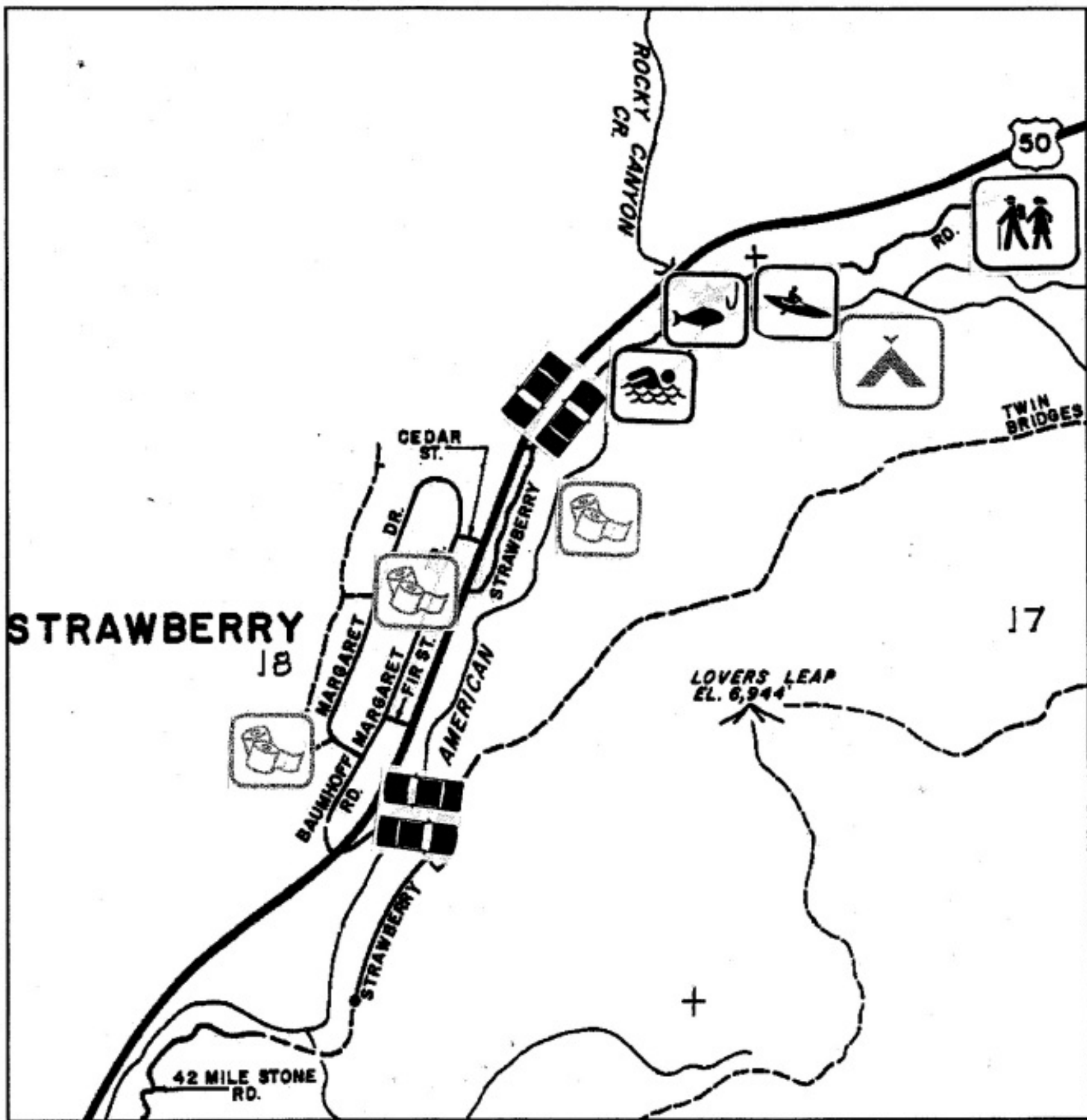
Canal Near-Intake Zone

Placer County Water Agency



**South Fork American River
Strawberry Water Treatment Plant
Near-Intake Zone**

El Dorado Irrigation District



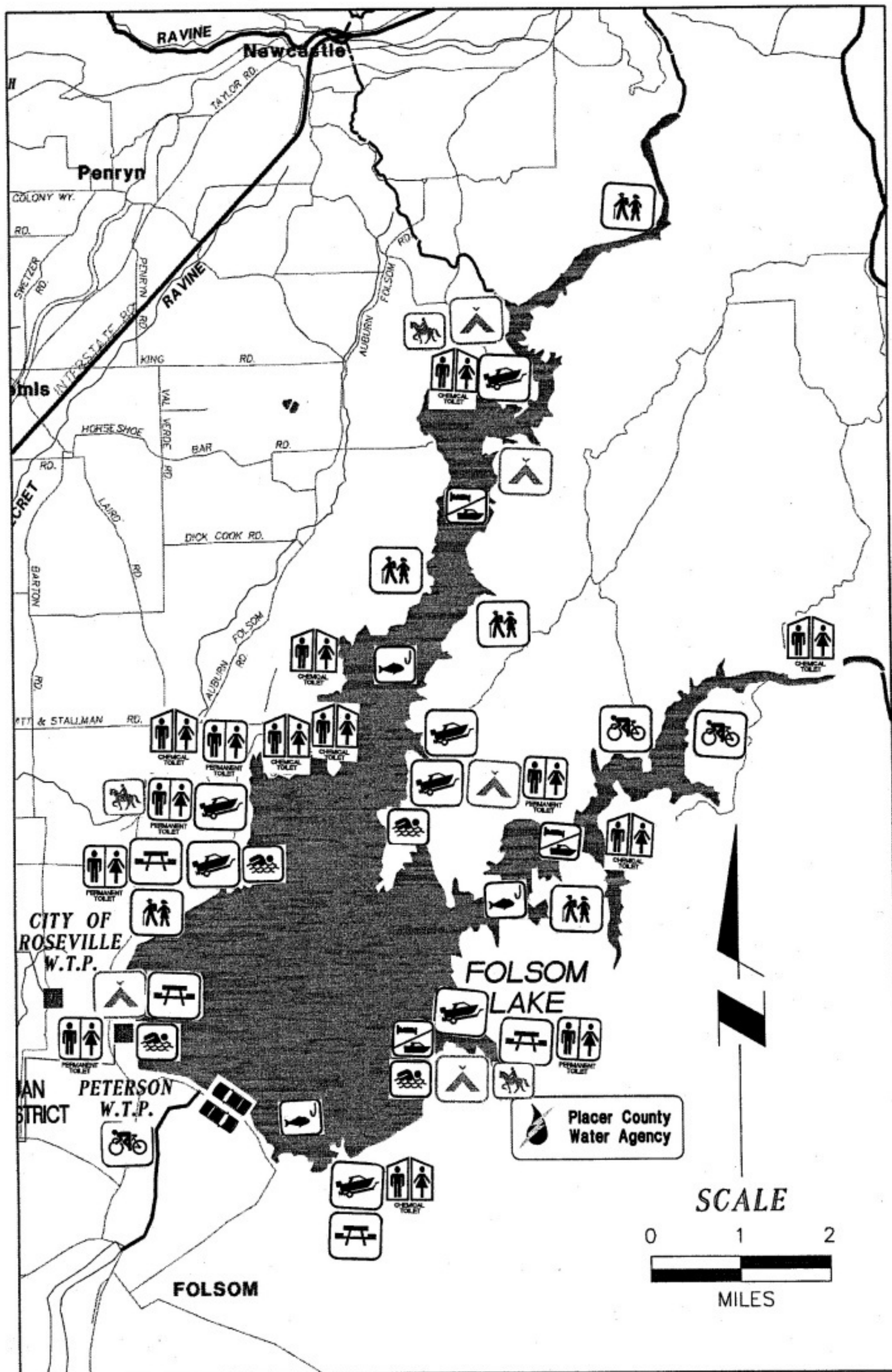
NOT TO SCALE

**Folsom Lake
El Dorado Hills Water Treatment Plant
Near-Intake Zone**

El Dorado Irrigation District

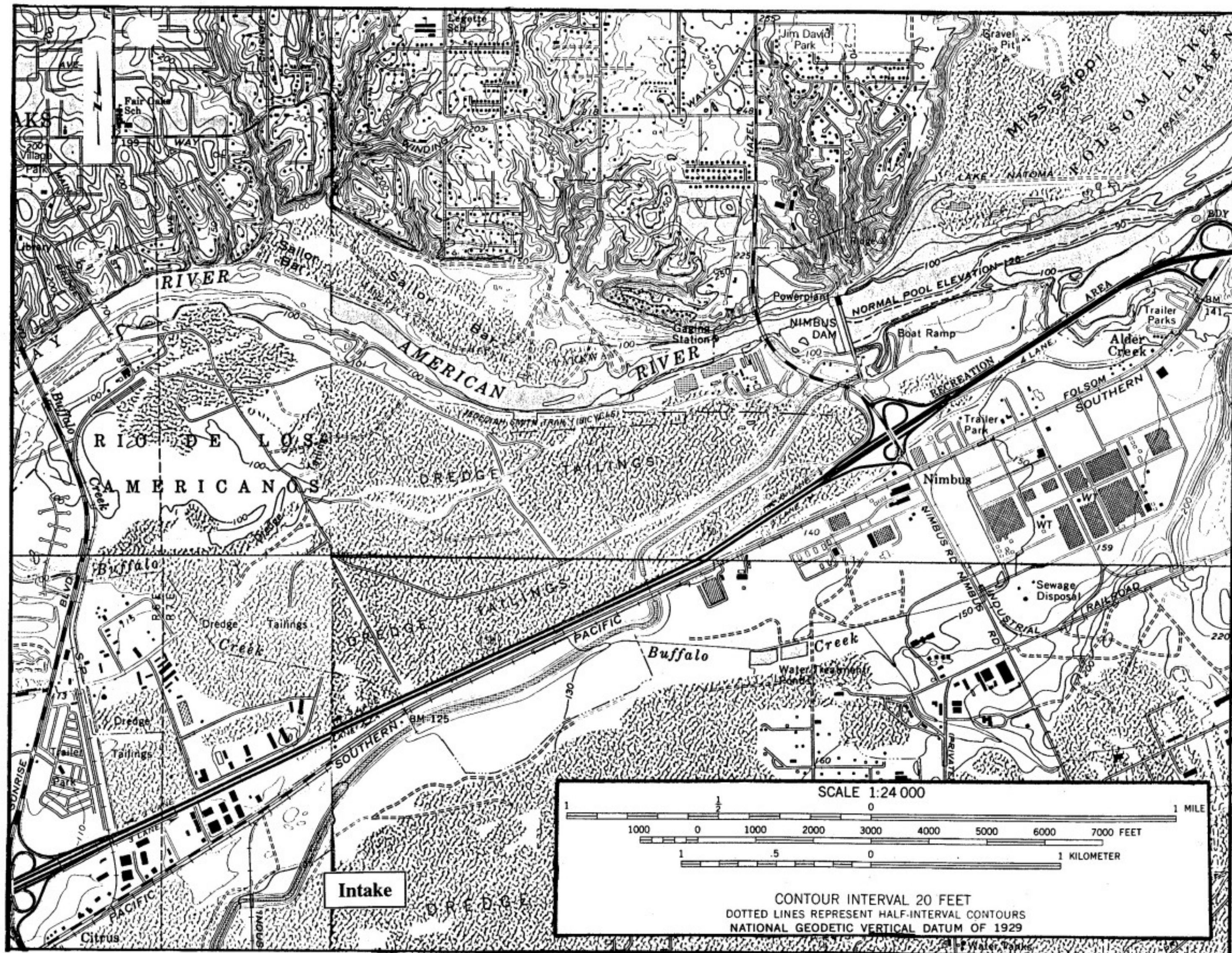
Folsom Lake Near-Intake Zone

City of Folsom
City of Roseville
Folsom State Prison
San Juan Water District



Folsom South Canal Near-Intake Zone

Arden Cordova Water Service



Lake Natoma and Lower American River Near-Intake Zone

Arden Cordova Water Service (Plates 5 and 6)

Carmichael Water District (Plates 4–6)

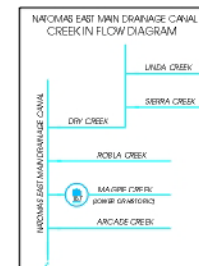
Arcade Water District (Plates 3–6)

City of Sacramento (Plates 1–6)

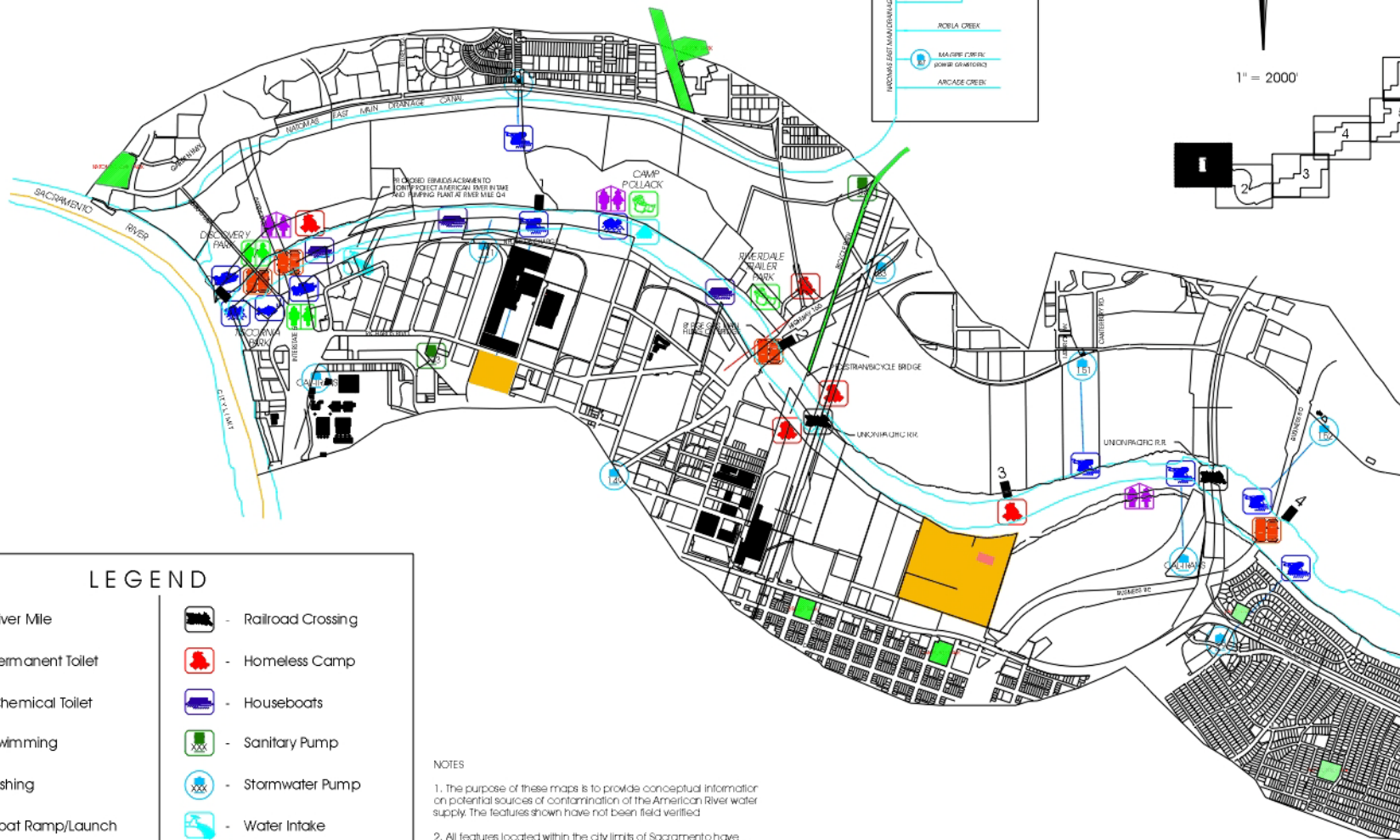
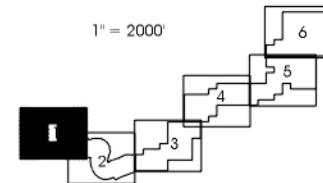
East Bay Municipal Utility District (Plates 1–6)

1998 American River Watershed Sanitary Survey Update - PLATE

1



1" = 2000'



LEGEND

3 - River Mile	- Railroad Crossing
- Permanent Toilet	- Homeless Camp
- Chemical Toilet	- Houseboats
- Swimming	- Sanitary Pump
- Fishing	- Stormwater Pump
- Boat Ramp/Launch	- Water Intake
- Sailing	- Outfall to river
- River Crossing	- Septic Tank/Leach Field

NOTES

1. The purpose of these maps is to provide conceptual information on potential sources of contamination of the American River water supply. The features shown have not been field verified.

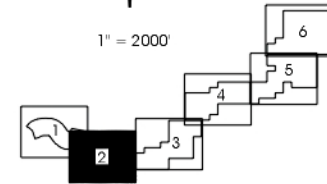
2. All features located within the city limits of Sacramento have been positioned relative to the City of Sacramento's GIS base map. The City's base map was created using aerial orthophotography established in April, 1991 and registered to the NAD27 datum. Accuracy is generally within 10 feet of real world coordinates.

1998 American River Watershed Sanitary Survey Update - PLATE

2



1" = 2000'



LEGEND

- River Mile	- Homeless Camp
- Permanent Toilet	- Sanitary Pump
- Chemical Toilet	- Stormwater Pump
- Swimming	- Water Intake
- Boat Ramp/Launch	- Outfall to river
- River Crossing	- Fishing
- Railroad Crossing	

NOTES:

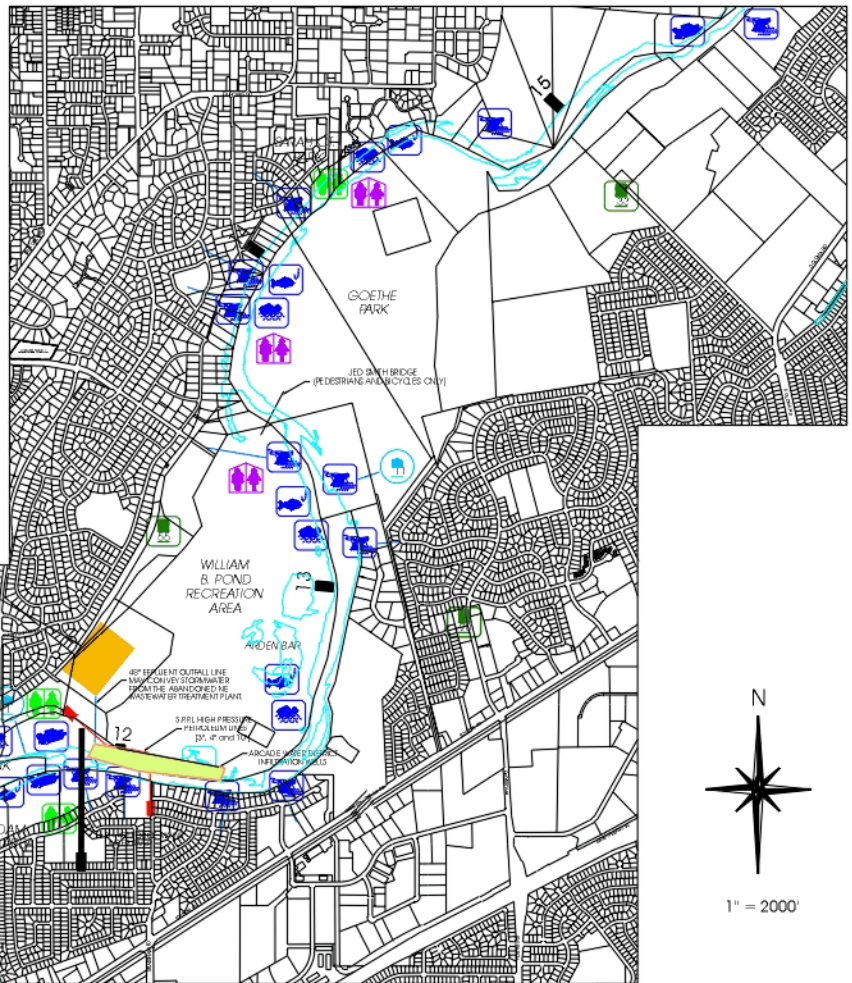
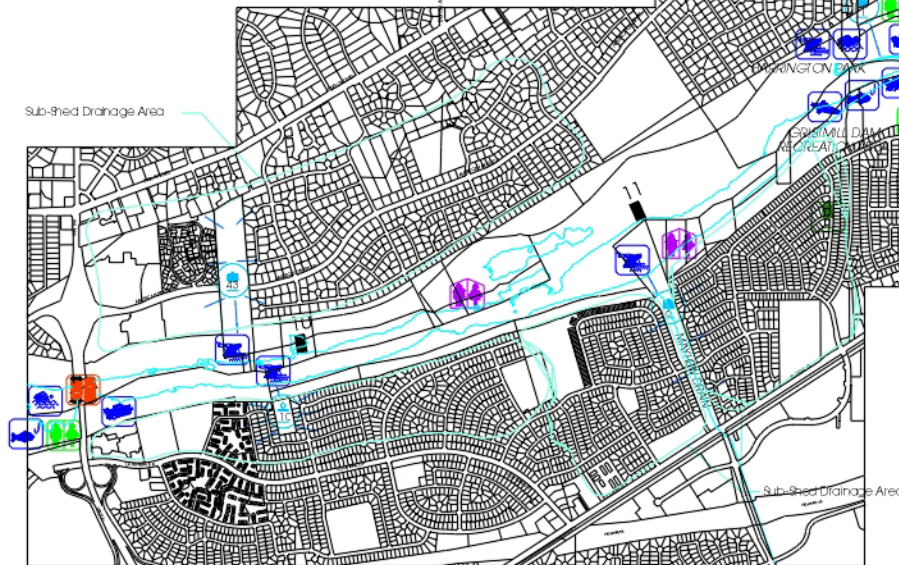
1. The purpose of these maps is to provide conceptual information on potential sources of contamination of the American River water supply. The features shown have not been field verified.
2. All features located within the city limits of Sacramento have been positioned relative to the City of Sacramento's GIS base map. The City's base map was created using aerial orthophotography established in April, 1991 and registered to the NAD27 datum. Accuracy is generally within 10 feet of real world coordinates.

LEGEND

 - River Mile	 - River Crossing
 - Permanent Toilet	 - Sanitary Pump
 - Chemical Toilet	 - Stormwater Pump
 - Swimming	 - Water Intake
 - Fishing	 - Outfall to river
 - Boat Ramp/Launch	 - Kayak activity

NE WASTEWATER TREATMENT PLANT (DECOMMISSIONED)

The Northeast Wastewater Treatment Plant is no longer used as a wastewater treatment facility, and the pump station at this site are inactive. The site is currently used as a training facility for the Sacramento County Streets Department. Wastewater from on-site activities and from the tributary sewer basin is transported via gravity flow across the river for treatment at the Sacramento Regional Wastewater Treatment Plant.

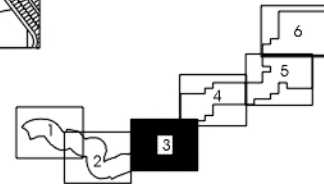


NOTES:

1. The purpose of these maps is to provide conceptual information on potential sources of contamination of the American River water supply. The features shown have not been field verified.
2. All features located outside the Sacramento city limits, but within the county limits of Sacramento, have been positioned relative to the county of Sacramento's GIS base map. The county's base map is a reasonable schematic diagram of their cadastral layers, registered to the NAD27 datum. Accuracy is generally within 10 feet of real world coordinates.



1" = 2000'





⑤



	- River Mile		- Major River Crossing
	- Sanitary Pump		- Nimbus Fish Hatchery
	- Boat Ramp/Launch		- Fishing
	- Outfall to river		- Sailing
	- Contaminated groundwater intrusion		

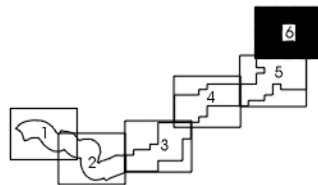
NOTES

1. The purpose of these maps is to provide conceptual information on potential sources of contamination of the American River water supply. The features shown have not been field verified.

2. All features located outside the Sacramento city limits, but within the county limits of Sacramento, have been positioned relative to the county of Sacramento's GIS base map. The county's base map is a reasonable schematic diagram of their cadastral layers, registered to the NAD27 datum. Accuracy is generally within 10 feet of real world coordinates.



1" = 2000



LEGEND

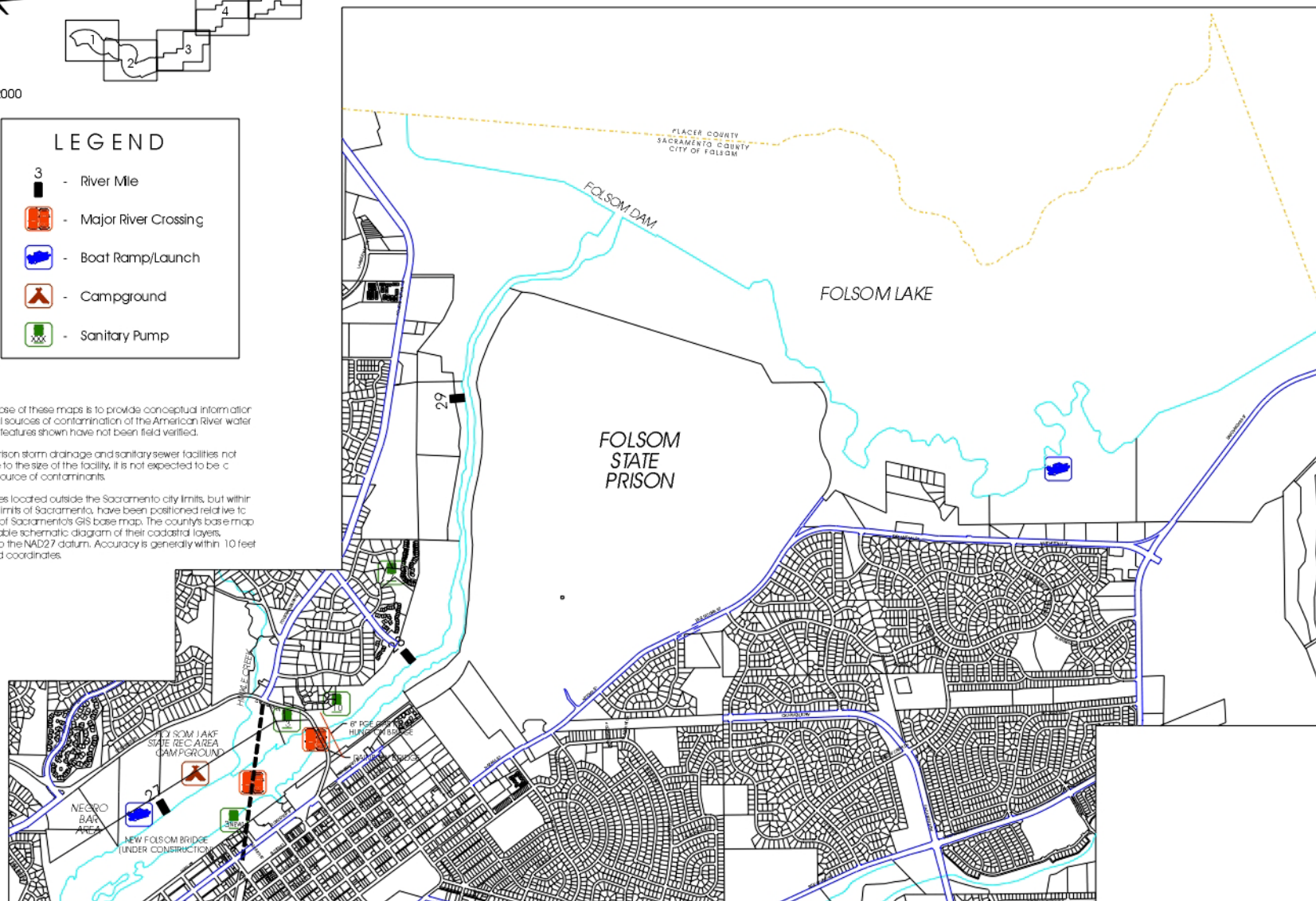
-  - River Mile
-  - Major River Crossing
-  - Boat Ramp/Launch
-  - Campground
-  - Sanitary Pump

NOTES

1. The purpose of these maps is to provide conceptual information on potential sources of contamination of the American River water supply. The features shown have not been field verified.

2. Folsom Prison storm drainage and sanitary sewer facilities not shown. Due to the size of the facility, it is not expected to be a significant source of contaminants.

3. All features located outside the Sacramento city limits, but within the county limits of Sacramento, have been positioned relative to the county of Sacramento's GIS base map. The county's base map is a reasonable schematic diagram of their cadastral layers, registered to the NAD27 datum. Accuracy is generally within 10 feet of real world coordinates.



Appendix G: Emergency Notification Contacts

Emergency Notification Contact Form
for
Placer County Water Agency
(Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: Don Reighley

Telephone Number: (530) 823 - 4951

Cellular Phone Number: (530) 305 - 0480

Pager Number: (530) 883 - 1039

Hours Available: 24 Hours Per Day, Sunday through Saturday

Secondary Contact

Name: On-Call Distribution / Water Quality Technician

Telephone Number: (530) 823 - 4850

Cellular Phone Number: (530) 305 - 0458

Pager Number: (530) 883 - 1019

Hours Available: 24 Hours Per Day, Sunday through Saturday

Emergency Notification Contact Form

for

El Dorado Irrigation District

(Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: Margie Lopez-Read

Telephone Number: "(530) 642 - 4129

Cellular Phone Number: () NA

Dispatch Number: (530) 642 - 4043 or 622 - 4513

Hours Available: Sunday - Saturday 24 Hours Per Day

Secondary Contact

Name: Gary Myers

Telephone Number: (530) 642 - 4060

Cellular Phone Number: () NA

Dispatch Number: (530) 642 - 4043 or 622 - 4513

Hours Available: Sunday - Saturday 24 Hours Per Day

Emergency Notification Contact Form
for
City of Folsom
(Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: Plant Operator (Jim, Phil or Mitch)

Telephone Number: (916) 355 - 8337

Cellular Phone Number: (916) 798 - 5344

Pager Number: (916) 948 - 8776

Hours Available: 7:00 AM - 3:30 PM at WTP, 24 Hours Per Day on Pager

Secondary Contact

Name: Roy Hafar

Telephone Number: Home (916) 863 - 6920, Office (916) 355 - 8336

Cellular Phone Number: (916) 531 - 7616

Pager Number: (916) 592 - 1591

Hours Available: Sunday - Saturday 24 Hours Per Day

Emergency Notification Contact Form

for

City of Roseville, Dept. of Utilities **(Agency)**

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: Water Treatment Plant Operator on Duty

Telephone Number: (916) 791 - 4586

Cellular Phone Number: () NA

Pager Number: () NA

Hours Available: 24 Hours per Day

Secondary Contact

Name: Ed Kriz

Telephone Number: (916) 774-5714

Cellular Phone Number: () NA

Pager Number: (916) 535 - 1436

Hours Available: 24 Hours per Day

Emergency Notification Contact Form

for

San Juan Water District

(Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: Mike O'Bleness

Telephone Number: (916) 791 - 1715

Cellular Phone Number: (916) 955 - 5351

Pager Number: (916) 353 - 7002

Hours Available: Sunday - Saturday 24 Hours Per Day

Secondary Contact

Name: Bill Sadler

Telephone Number: (916) 791 - 1715

Cellular Phone Number: () NA

Pager Number: (916) 353 - 7005

Hours Available: Sunday - Saturday 24 Hours Per Day

Emergency Notification Contact Form

for

Folsom State Prison

(Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: Stan Muraki

Telephone Number: (916) 985 - 8610 ext 7399

Cellular Phone Number: ()

Pager Number: ()

Hours Available: Sunday through Saturday, 0500 - 2400

Secondary Contact

Name: Joe Franz

Telephone Number: (916) 985 - 2561 ext 3020

Cellular Phone Number: ()

Pager Number: ()

Hours Available: Sunday through Saturday 0800 - 1500

Emergency Notification Contact Form

for

Arden Cordova Water Service

(Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: Ernest Gisler, Water Supply Superintendent

Telephone Number: (916) 635 -6209

Cellular Phone Number: (916) 761 - 8373

Pager Number: (916) 506 - 0879

Hours Available: 8:00 AM - 5:00 PM, Monday through Friday

Secondary Contact

Name: Southern California Water Co.

Telephone Number: (800) 999 - 4033

Cellular Phone Number: ()

Pager Number: ()

Hours Available: 24 Hours Per Day, Sunday through Saturday

Emergency Notification Contact Form for

Arcade Water District (Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: On-Call Technician (Rotating Schedule)

Telephone Number: (916) 972-7171

Cellular Phone Number: (916) 698-2041

Pager Number: (916) 828-0552

Hours Available: 24 Hours per Day

Secondary Contact

Name: Dan York

Telephone Number: (916) 991-2932

Cellular Phone Number: () N / A

Pager Number: (916) 828-6217

Hours Available: 24 Hours per Day

Emergency Notification Contact Form
for
Carmichael Water District
(Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: Steve Nugent, Assistant Manager

Telephone Number: (916) 483 - 2452

Cellular Phone Number: (916) 612 - 8111

Pager Number: (916) 612 - 8111

Hours Available: 24 Hours Per Day, Sunday through Saturday

Secondary Contact

Name: LaNell K. Little, General Manager

Telephone Number: (916) 483 - 2452

Cellular Phone Number: (916) 612 - 8111

Pager Number: (916) 612 - 8111

Hours Available: 24 Hours Per Day, Sunday through Saturday

Emergency Notification Contact Form for

City of Sacramento, Dept. of Utilities (Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: E.A. Fairbairn Water Treatment Plant (Operator)

Telephone Number: (916) 382 - 3106

Alternate Phone Number: (916) 383 - 1516

Pager Number: () NA

Hours Available: Sunday - Saturday 24 Hours Per Day

Secondary Contact

Name: Sacramento River Water Treatment Plant (Operator)

Telephone Number: (916) 264 5433

Alternate Phone Number: (916) 447 - 2696

Pager Number: () NA

Hours Available: Sunday - Saturday 24 Hours Per Day

Backup Contact

Name: City Operator

Telephone Number: (916) 264 - 5011

Hours Available: Sunday - Saturday 24 Hours Per Day

Emergency Notification Contact Form
for
East Bay Municipal Utility District
(Agency)

In the event of an emergency, please contact the person(s) listed below.

Primary Contact

Name: Pardee Area Control Center (ACC) Operator

Telephone Number: (209) 772 - 8208 / 8209

Alternate Phone Number: (209) 772 - 8246

Pager Number: () NA

Hours Available: Sunday - Saturday 24 Hours Per Day

Secondary Contact

Name: Oakland Control Center (OCC) Senior Operator

Telephone Number: (510) 287 - 0755

Alternate Phone Number: (510) 287 - 0756 / 57 / 58 / 59

Pager Number: () NA

Hours Available: Sunday - Saturday 24 Hours Per Day

Appendix H. Classification of Significance of Contaminant Sources

**Table H-1. Classification of Contaminant Sources
American River Participating Agencies**

[illegible]