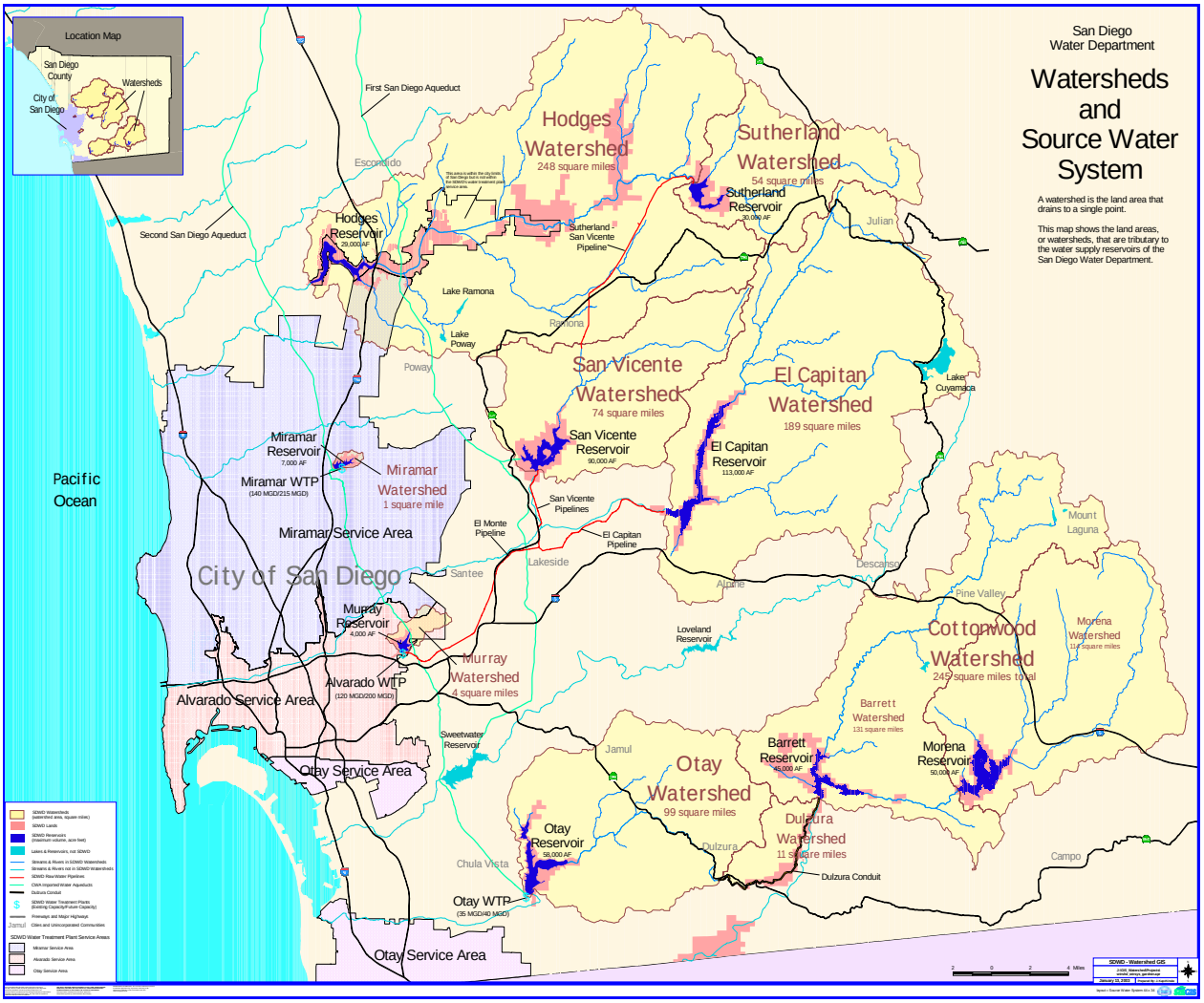

The City of San Diego Water Department 2005 Watershed Sanitary Survey

Executive Summary

Volume 1 of 5

Data Collected Between 01/01/01– 12/31/05

ABBREVIATIONS

ACOE	Army Corps of Engineers
ADT	Average daily traffic
ADWF	Average dry weather flow
AF/Y	Acre-Feet per Year
AWWA	American Water Works Association
BLM	Bureau of Land Management – U.S. Federal
BMPs	Best Management Practices
CDF	California Department of Forestry
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CDMG	California Division of Mines and Geology
CEQA	California Environmental Quality Act
CFR	California Federal Regulation
cfs	Cubic feet per second
City	City of San Diego
CNDDB	California Natural Diversity Database
CNF	Cleveland National Forest
CNPS	California Native Plant Society
County	County of San Diego
CWA	San Diego County Water Authority
D/DBP	Disinfection/Disinfection By-Product
DHS	Department of Health Services
DMG	Division of Mines and Geology – State of California
dS/M	Decisiemens per meter
DSOD	Division of Safety of Dams
EPA	Environmental Protection Agency
ESWTR	Enhanced Surface Water Treatment Rule
GIS	Geographic Information System
gpd	Gallons per day
Gpm	Gallons per minute
HAAs	Haloacetic Acids

ABBREVIATIONS

Helix	Helix Water District
HPC	Heterotrophic Plate Count
HSU	Hydrographic Subunit
HU	Hydrographic Unit
HUMAN CON	Human Consumption
IOCs	Inorganic Chemicals
LPG	Liquid Propane Gas
LSE LF	Loose Leaf
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MG	Million Gallons
mg/L	Milligrams per liter (parts per million)
mgd	Million gallons per day
mgy	Million gallons per year
MHCP	Multiple Species Conservation Program
MSL	Mean Sea Level
MWD	Metropolitan Water District
N-GRNHS	Nursery Greenhouse
N-OUTDR	Nursery Outdoor
NEPA	National Environmental Protection Act
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	Nephelometric Turbidity Unit
OTC	Olympic Training Center
PAHs	Polyaromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
RCA	Resource Conservation Area
RMWD	Ramona Municipal Water District
RO	Reverse Osmosis
RUIS	Regional Urban Information System

ABBREVIATIONS

RWQCB	California Regional Water Quality Board
SANDAG	San Diego Association of Governments
SCS	Soil Conservation Service – U.S.
SDWA	Safe Drinking Water Act - Federal
SMCL	Secondary Maximum Contaminant Level
SOCs	Synthetic Organic Chemicals
SP	Soluble Powder
SUB	Subtropical
SWPPPs	Storm Water Pollution Prevention Plans
TCR	Total Coliform Rule – Federal
TDH	Total Dynamic Head
TDS	Total Dissolved Solids
THMs	Trihalomethanes
TTHMs	Total Trihalomethanes
TOC	Total Organic Carbon
TRANSPL	Transplants
ug/L	Micrograms per liter (parts per billion)
UNCUL	Uncultivated
UNSP	Unspecified
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Society
VOCs	Volatile Organic Compounds
WDRs	Waste Discharge Requirements
WPCF	Water Pollution Control Facility
WRF	Water Reclamation Facility
WSS	Watershed Sanitary Survey
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

VOLUME 1
EXECUTIVE SUMMARY

CHAPTER 1: SYNOPSIS

Introduction

This is the executive summary of the 2005 Watershed Sanitary Survey Update for the City of San Diego Water Department. The Watershed Sanitary Survey (WSS) covers eight watersheds and nine surface water reservoirs, which comprise the local source waters used by the City of San Diego Water Department. The initial WSS was completed in 1996. This report is the second five-year update of that survey.

Watershed Sanitary Survey Requirements

The California Surface Water Treatment Rule, Title 22 of the State Code of Regulations, requires every public water system using surface water to conduct a comprehensive sanitary survey of its watersheds every five years. The purpose of such a survey is to identify actual or potential sources of contamination or any other watershed-related factor which might adversely affect the quality of water used for domestic drinking water.

The City of San Diego Water Department and its oversight agencies will use the Watershed Sanitary Survey Update (WSS Update) to evaluate water quality problems which might result from contaminants in the watersheds. The WSS Update will also serve as a basis for future watershed management and planning efforts.

Objectives

The main objectives of this WSS Update are to:

- Satisfy the regulatory requirement for a watershed sanitary survey.
- Identify and assess existing and potential sources of contamination in the watersheds.
- Provide a general description of existing watershed control and management practices.
- Provide general recommendations for improving watershed management practices in order to protect the quality of the surface waters entering the reservoirs.

Conduct of the Study

This update of the WSS for the San Diego River System Watersheds was produced by the staff of the City of San Diego Water Department, Water Quality Laboratory. The survey covers the water supply system from the most remote points of the San Diego River System Watersheds to the treatment facility. It was conducted by reviewing existing aerial photographs, GIS data, reports, water quality data and other record documents, and was supplemented by field surveys and personal knowledge of Water Department staff.

Report Organization

The organization of this WSS Update has been modified from that of the previous WSS Update. The watersheds and reservoirs are grouped according to the water treatment plant they supply. A separate volume is devoted to each system as follows:

- Volume 1: The Executive Summary of the entire WSS Update.
- Volume 2: The San Diego River System, comprising the San Vicente, El Capitan, Sutherland, and Murray Watersheds, which supplies the Alvarado Water Treatment Plant.

- Volume 3: The Otay-Cottonwood System, comprising the Otay, Dulzura, and Cottonwood Watersheds, which supplies the Otay Water Treatment Plant.
- Volume 4: The Miramar Watershed, which supplies the Miramar Water Treatment Plant.
- Volume 5: The Hodges Watershed, containing the Hodges Reservoir, which does not supply water to any of San Diego's water treatment plants.

The organization of Volumes 2 through 5 has changed. The Executive Summary, formerly Chapter 1, has been removed from the individual volumes. The remaining chapters have been rearranged as follows:

Chapter 1: Synopsis
Chapter 2: Description of Watersheds/Source Water System and Review of previous Watershed Sanitary Survey Recommendations
Chapter 3: Existing Conditions in the Watersheds
Chapter 4: Water Quality Assessment
Chapter 5: Conclusions and Recommendations

CHAPTER 2: DESCRIPTION OF WATERSHEDS/SOURCE WATER SYSTEM AND REVIEW OF PREVIOUS WSS RECOMMENDATIONS

Overview of The Source Water System

The City of San Diego Water Department's local source water system consists of nine reservoirs, the watershed lands tributary to these reservoirs, and raw water conveyances connecting the reservoirs to one another and to the water treatment plants.

The Water Department operates three water treatment plants. It is useful to group the reservoirs and watersheds into three systems, each supplying raw water to a water treatment plant. The San Diego River System supplies the Alvarado Water Treatment Plant; the Otay-Cottonwood System supplies the Otay Water Treatment Plant; and the Miramar System supplies the Miramar Water Treatment Plant. The Hodges Watershed currently does not serve the San Diego Water Department, but is monitored for possible future use. Each system is described separately on the following pages.

The local source water system is located in southern and central San Diego County on the western slope of the peninsular mountains. The region has a Mediterranean climate with distinct wet and dry seasons. Precipitation generally increases from west to east, with annual precipitation ranging from an average of about 10 inches per year at Lake Murray to over 40 inches per year in the upper portions of the El Capitan and Sutherland Watersheds. Nearly all precipitation occurs from October through April. Winter snowfalls are common in the highest elevations of the watersheds. Summers are dry and hot.

The San Diego River System

Reservoirs and Watersheds -

The San Diego River System consists of four reservoirs and their watersheds, plus interconnecting raw water pipelines, all located in the central portion of San Diego County. The reservoirs are San Vicente, El Capitan, Murray, and Sutherland. The four watersheds of the San Diego River System have a combined area of 205,140 acres, or approximately 321 square miles.

The San Vicente, El Capitan, and Murray Watersheds belong to the San Diego River Basin, while the Sutherland Watershed is located in the San Dieguito River Basin. However, since water from the Sutherland Reservoir is transferred to the San Vicente Reservoir, the Sutherland Watershed is considered part of the San Diego River System.

The San Vicente Watershed covers 47,545 acres of foothills, interior valleys, and low mountains. Land use in the watershed ranges from remote and rural to highly developed and densely populated. Although the overall population density remains low, new development and population growth have accelerated over the past five years. Approximately 60% of the land in the watershed is privately owned and much of this private land is available for residential, commercial, or agricultural development.

The El Capitan Watershed is the largest of the four at 120,773 acres, and encompasses foothills, interior valleys, and the highest mountains in San Diego County. About 52% of the watershed is publicly owned land. The Cleveland National Forest is the major public land management agency in the watershed. The Cuyamaca Reservoir, owned by the Helix Water District, is located in the

northeastern part of the watershed. Only 6% of the watershed is currently in residential and commercial use and the overall population density is 0.13 persons per acre. However, significant development and growth have taken place in the past five years, both in the suburban community of Alpine in the south, and the rural community of Julian to the north.

The Murray Watershed includes 2,298 acres of highly urbanized land. About 71% of the land is fully developed for residential and commercial uses. The population density is about 10 persons per acre. The remaining 29% of the watershed is publicly owned, and is nearly evenly divided between urban parks and open space parkland in the Mission Trails Regional Park. The Murray Reservoir is surrounded by a diversion ditch, which intercepts low levels of runoff and diverts it around the reservoir to a discharge point below the dam. At higher runoff levels, though, surface flow carries past the diversion system and into the reservoir.

The Sutherland Watershed covers 34,525 acres of mostly mountainous terrain at the eastern end of the San Dieguito River. It is rural and sparsely populated, about 0.03 persons per acre. Approximately 51% of the watershed is privately owned, and another 23% is Indian Reservation. Less than 2% of the watershed is devoted to residential and urban types of development, centered mainly around the small community of Santa Ysabel.

Water Supply System -

Local runoff from the San Diego River System watersheds is impounded in the San Vicente, El Capitan, Murray, Sutherland, and Cuyamaca Reservoirs. Water from the Cuyamaca Reservoir is carried along natural channels to El Capitan Reservoir. Water in Sutherland Reservoir is conveyed via a pipeline and a natural channel to San Vicente Reservoir.

Average annual runoff for El Capitan, San Vicente, and Sutherland Reservoirs is 27,800 AF/year, 7,400 AF/year, and 11,200 AF/year, respectively. Local runoff to Murray Reservoir is much less, about 100 AF/year.

Imported water from the San Diego County Water Authority can be delivered to San Vicente, El Capitan, and Murray Reservoirs and stored there for future use.

Water stored in the San Vicente, El Capitan, and Murray Reservoirs is delivered via a system of pipelines to the San Diego Water Department's Alvarado Water Treatment Plant. Water from El Capitan Reservoir is also delivered to the Helix Water District's R.M. Levy Water Treatment Plant.

The Alvarado Water Treatment Plant is a 120 MGD conventional water treatment plant using flocculation, sedimentation, and dual media filters. The plant is currently undergoing an expansion to 200 MGD. Ultimately the improvements will include ozone for primary disinfection.

The Otay-Cottonwood System

Reservoirs and Watersheds -

The Otay-Cottonwood System consists of the Morena, Barrett, Upper Otay, and Lower Otay Reservoirs, the Dulzura Conduit, and their surrounding watersheds. The system covers a combined area of 226,245 acres, or about 354 square miles.

Morena and Barrett Reservoirs are impoundments along Cottonwood Creek. Below Barrett Dam, Cottonwood Creek flows into Mexico and joins the Tijuana River. Water from Barrett Reservoir is diverted into the Dulzura Conduit, which discharges into Dulzura Creek at the headwaters of the Otay River. The water ultimately reaches the Otay Reservoir. Essentially, this system transfers water from the Tijuana River Basin to the Otay River Basin.

Natural runoff from a small area upslope of the Dulzura Conduit can be captured into the conduit, via a series of diverting structures. This area is known as the Dulzura Watershed. Since it contributes directly to Otay Reservoir, it is considered part of the Otay-Cottonwood System.

The Cottonwood Watershed covers an area of 155,984 acres and extends from steep-sided, low elevation valleys in the west to high mountains in the east. It is the least developed of all the watersheds which contribute to the San Diego Water Department's local water supply. Over 75% of the watershed is vacant and undeveloped land, and approximately 1% is devoted to residential developments. Much of the Cottonwood Watershed is under the jurisdiction of the Cleveland National Forest. Average annual runoff is 22,200 AF/year.

The Otay-Dulzura Watershed covers 70,322 acres including steep mountains in the east with gentler rolling hills and valleys to the west. Average annual runoff is 6,400AF/year. At present, more than 50% of the watershed land is vacant and undeveloped. Agriculture occurs on approximately 2% of the land, and residential development occupies another 8%.

In recent years there has been significant residential and commercial growth near the Otay Reservoir, and a number of new developments are anticipated in the western portion of Otay Watershed in the next few years.

Water Supply System -

Local runoff from the Otay-Cottonwood System is impounded in the Morena, Barrett, Upper Otay, and Lower Otay Reservoirs. Water from Morena Reservoir flows to Barrett Reservoir, by way of Cottonwood Creek. From Barrett Reservoir, the water is transferred to the Lower Otay Reservoir via the Dulzura Conduit and Dulzura

Creek. Some of the runoff from the Dulzura Watershed is captured by the Dulzura Conduit and then to Lower Otay Reservoir. Water captured in Upper Otay Reservoir is also released to Lower Otay Reservoir, which is located just below Upper Otay Dam.

Lower Otay Reservoir is the southern terminus of the San Diego County Water Authority Second San Diego Aqueduct, which carries imported water to the San Diego area. Therefore, the Lower Otay Reservoir contains a blend of local source water and imported water from the Colorado River and California State Water Project.

The Otay Water Treatment Plant is a conventional 40 MGD water treatment plant using flocculation, sedimentation, and dual media filters.

The Miramar System

Reservoir and Watershed -

The Miramar System consists solely of Miramar Reservoir and its watershed. The Miramar Watershed has an area of only 645 acres, or about one square mile. It is located within the City of San Diego, toward the City's northeastern limits. The reservoir occupies 21% of the watershed area, while 24% is used for residential purposes. The remaining 55% is taken up by surface streets, community parks, open space parks, and the Miramar Water Treatment Plant.

Water Supply System-

Miramar Reservoir depends almost entirely on water imported from the Colorado River and the California State Water Project, via the San Diego County Water Authority Second San Diego Aqueduct. Most runoff is diverted out of the watershed

through storm drains. The Miramar Reservoir functions as storage against peak and emergency demands for the Miramar Water Treatment Plant.

The Miramar Water Treatment Plant is located adjacent to the Miramar Reservoir, and serves the northern section of the City. The plant currently uses flocculation, sedimentation, and dual media filters, and has a capacity of 140 MGD. Future plans are to increase the capacity to 215 MGD, and add new treatment processes, notably ozone.

The Hodges Watershed

Reservoir and Watershed -

Although it is owned and operated by the San Diego Water Department, Hodges Reservoir is not currently connected to the San Diego Water Department's system. Water impounded in Hodges Reservoir is supplied to other agencies.

The Hodges Watershed is located in the west central portion of San Diego County, and has an area of 158,417 acres, about 248 square miles. The topography ranges from steep hills and narrow valleys in the east, to lower hills and open valleys to the west. The main tributary is Santa Ysabel Creek, which begins at Sutherland Dam and flows through San Pasqual Valley to Hodges Reservoir. About 47% of the watershed is vacant and undeveloped, while 19% is given to agriculture such as intensive farming and livestock grazing. The developed areas are mostly residential and commercial.

Water collected in Hodges Reservoir is sold as raw water to the San Dieguito Water District and the Santa Fe Irrigation District. The water is treated at the Badger Filtration Plant and distributed to the communities of Rancho Santa Fe, Solana Beach, and Encinitas.

Several options are under consideration to maximize the use of water from Hodges Reservoir. One project would connect the reservoir to the San Diego Water Department's system via the Second San Diego Aqueduct, for treatment at the Miramar Filtration Plant. An alternative plan would connect Hodges Reservoir to the new Olivenhain Reservoir, for distribution to the community of Olivenhain.

Review Of The Recommendations Of The Previous WSS Update

The previous WSS Update included extensive recommendations for improved watershed management and source water control. Detailed discussions of the implementation and success of these recommendations are given in Chapter 2 of Volumes 2 through 5.

The underlying theme of all recommendations is protection of the watershed and source water quality. The recommendations fell into four categories:

- Water Quality Monitoring
- Interjurisdictional Coordination
- Watershed Management and Control Practices
- Public Education

Generally, only a few of the specific recommendations were implemented and success was limited. In the five years since the previous WSS Update, some progress was made in increased water quality monitoring at the reservoirs and in the watersheds. Inter-jurisdictional coordination became a focus of the staff of the San Diego Water Department. However, this inter-jurisdictional coordination was mostly on a person-to-person basis and included few formal agreements between jurisdictions.

CHAPTER 3: EXISTING CONDITIONS IN THE WATERSHEDS

Survey Methods

This update of the WSS was conducted entirely by staff of the City of San Diego Water Department.

The WSS Update assesses information and data for the five year period of January 2001 through December 2005. Information and data for this study were gathered from many sources, including the databases of at least seven governmental agencies. The WSS Update draws upon technical reports, aerial photographs, interviews with key contacts, and the personal knowledge of staff. All of this was supplemented by extensive field surveys by staff of the San Diego Water Department.

Much of the data and information collected for the WSS Update was transformed into geospatial formats, and analyzed and archived in the Watershed Geographic Information System in the San Diego Water Department. Details of the methods used to conduct the Survey are given in Chapter 3 of Volumes 2 through 5. Sources of information are referenced throughout those volumes.

Potential Contaminant Sources

The WSS Update identified the following as major potential contaminant sources within the watersheds:

- The Cedar Fire of 2003.
- The extreme rainy season of 2004-2005.
- Non-point source pollution from residential and commercial development.
- Spills from sewer collection systems and pump stations.
- Discharges, both intentional and accidental, at several small wastewater treatment plants.
- Discharges of partially treated sewage from failing, older septic systems.

- Livestock grazing.
- Hazardous waste spills at hazardous waste storage sites or along transportation corridors.

The Cedar Fire of 2003 has been identified as the greatest non-point source of contamination in the watersheds, followed by the extreme rainy season of 2004 to 2005. The two together have had a significant impact on sourcewater quality.

Most of these potential sources of contamination are likely to occur infrequently or at identifiable locations. However, diffuse, non-point source pollution from residential and commercial development is widespread throughout the watersheds and occurs continuously. This WSS Update finds that such non-point source pollution is a considerable potential source of contamination in the watersheds.

Watershed Management and Control Practices

Two key factors limit the San Diego Water Department's control over its watershed areas. First, the San Diego Water Department owns 6% of all watershed lands. Second, 10% percent of all watershed lands lie within the City of San Diego. Therefore, most of the watershed lands are outside the City's jurisdiction for land use planning, zoning, building codes, and enforcement of environmental regulations.

To protect its source waters, the City of San Diego must work effectively with the other governmental agencies which have jurisdiction over the watershed lands. To this end, San Diego Water Department staff has become increasingly involved in reviewing and commenting on development proposals and other land use decisions. A network of inter-agency contacts, both formal and informal, serves to alert the Water Department about contamination events in the watersheds.

CHAPTER 4: WATER QUALITY ASSESSMENT

Summary Of Source Water Quality Since 2000

As part of the WSS Update, five years of water quality monitoring data at the reservoirs and in the watersheds were compared to current and proposed regulatory standards for drinking water. An extensive discussion of source water quality versus drinking water standards can be found in Chapter 4 of Volumes 2 through 5.

Comparison of raw source water quality to drinking water standards is for reference purposes only, as the potable drinking water standards do not apply to raw source water. Keeping that in mind, raw source water commonly exceeded drinking water limits for pH, turbidity, color, odor, coliform bacteria, manganese and aluminum, and sometimes exceeded drinking water limits for arsenic, iron, total dissolved solids, and conductivity. Methyl Tertiary Butyl Ether (MTBE) was the only organic contaminant present in the source waters at levels higher than drinking water standards. Concentrations of MTBE exceeded the MCL or SMCL at El Capitan, San Vicente, and Hodges Reservoirs. Levels of MTBE are declining due to the removal of MTBE from gasoline and replacement of 2-stroke boat motors with 4-stroke motors. No radiological constituents were found at levels higher than drinking water standards in the reservoirs or watersheds. Levels of Total Organic Carbon (TOC) have risen since the Cedar Fire of 2003.

Assessment of System's Ability to Meet Drinking Water Standards

Existing water quality data shows that all three treatment plants produce water which meets current water quality standards. Some modification to the treatment plants will be necessary to meet the new requirements of the Stage 2 Disinfectants and Disinfectant Byproducts Rule (D/DBP) and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), starting in 2012. Proposed Arsenic, Radon, and Sulfate regulations can be met with our current water supplies.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

Water Quality Monitoring

Maintain the long-term monitoring program for the watersheds and reservoirs to establish baseline conditions, identify trends in degradation, isolate sources of contamination, and determine effects of management practices. Watershed monitoring should include water quality, land use, and land conditions.

Inter-jurisdictional Coordination

- Continue to centralize and strengthen Water Department relationships and networks with other agencies and jurisdictions in the watersheds.
- Implement written guidelines for the review of new residential or commercial development.
- Implement written guidelines for review of proposed activities that are potential contamination sources.
- Resume meetings with established workgroups and watershed agencies such as the County of San Diego Department of Planning and Land Use, the Cleveland National Forest, Native American governments, and the land use and planning functions of the cities of Chula Vista, Escondido, and Poway.

Watershed Management and Control Practices

- Continue to work with landowners and regulatory agencies in reducing the potential effects of cattle grazing.
- Formulate a watershed land strategy to acquire parcels, conservation easements, or development rights for lands proximal to the source waters that, if preserved, would protect water quality.

Public Education

Continue to generate and distribute educational materials for people living, working, or recreating in the watersheds.