Attachment 1

Authorization and Eligibility Requirements

Integrated Regional Water Management Implementation
Prop 84, Round 1

Santa Ana Watershed Project Authority

Santa Ana One Water One Watershed IRWM
Prop 84, Round 1 Implementation Proposal

Eligibility

The submitting entity is the Santa Ana Watershed Project Authority, a local agency. By authorization of the Steering Committee of the Santa Ana River Watershed “One Water One Watershed” Integrated Regional Water Management Plan and the governing board of the Santa Ana Watershed Project Authority. This submittal is representing the Santa Ana River Watershed area, also known as the Santa Ana Sub Region Funding Area, as defined in the State Proposition 84 Chapter 2 IRWM program

The Santa Ana Watershed Project Authority (SAWPA) was selected as the Regional Water Management Group (RWMG) for the Santa Ana Watershed. SAWPA was established as a joint powers authority (JPA) on December 6, 1974 under Article 1, Chapter 5, Division 7, Title 1 of the Government Code of the State of California. As stated in the founding joint powers exercise of agreement, SAWPA was formed as a “*public agency to undertake and implement the common power of undertaking projects for water quality control, and protection and pollution abatement in the Santa Ana River Watershed, including the development of waste treatment management plans for the area within the Santa Ana Watershed and construction, operation, and maintenance of works and facilities for collection, transmission, treatment, disposal, and/or reclamation of sewage, wastes, waste waters, poor quality groundwaters, and storm waters by utilizing funds contributed by the members and grants received from Federal and/or State government and by issuing bonds, notes, warrants, and other evidences of indebtedness to finance costs and expenses incidental to said projects*.”

The parties of the JPA are Orange County Water District, Inland Empire Utilities Agency, Western Municipal Water District, Eastern Municipal Water District, and San Bernardino Valley Municipal Water District. SAWPA has legal authority to enter into agreements with the State of California.

Groundwater Management Plan Compliance

The following project proponents have projects that may have potential groundwater management projects or had potential groundwater impacts:

Project Title	Lead Agency	
Groundwater Replenishment System (GWRS) – Flow	Orange County Water District	Has GWMP
East Garden grove Wintersburg Channel Urban Runoff Diversion	City of Huntington Beach	Participates in OCWD GWMP
Romoland Line A flood System	City of Menifee	Participates in EMWD GWMP
Perris II Desalination Facility	Eastern Municipal Water District	Has GWMP
Perchlorate wellhead Treatment system Pipelines	West Valley Water District	Participates in Upper Santa Ana River Watershed IRWM , and is subject to 1961 Basin Agreement
Chino Creek Wellfield Development	Western Municipal Water District	Subject to Chino Basin Water Master and participates in OBMP is subject to OBMP
Impaired Groundwater Recovery	Irvine Ranch Water District	Participates in OCWD GWMP

Groundwater Management Plans and Agreements are attached as supplemental information.

IRWM Project Implementation

All projects included in this project portfolio are found in the adopted One Water One Watershed Plan (Adopted November 2010 and included in the submission) and have been part of an objective ranking process described in the plan. All applicable Urban Water Management Plans have been attached as supplemental information to the Work Plan.

Other Legal Agreements

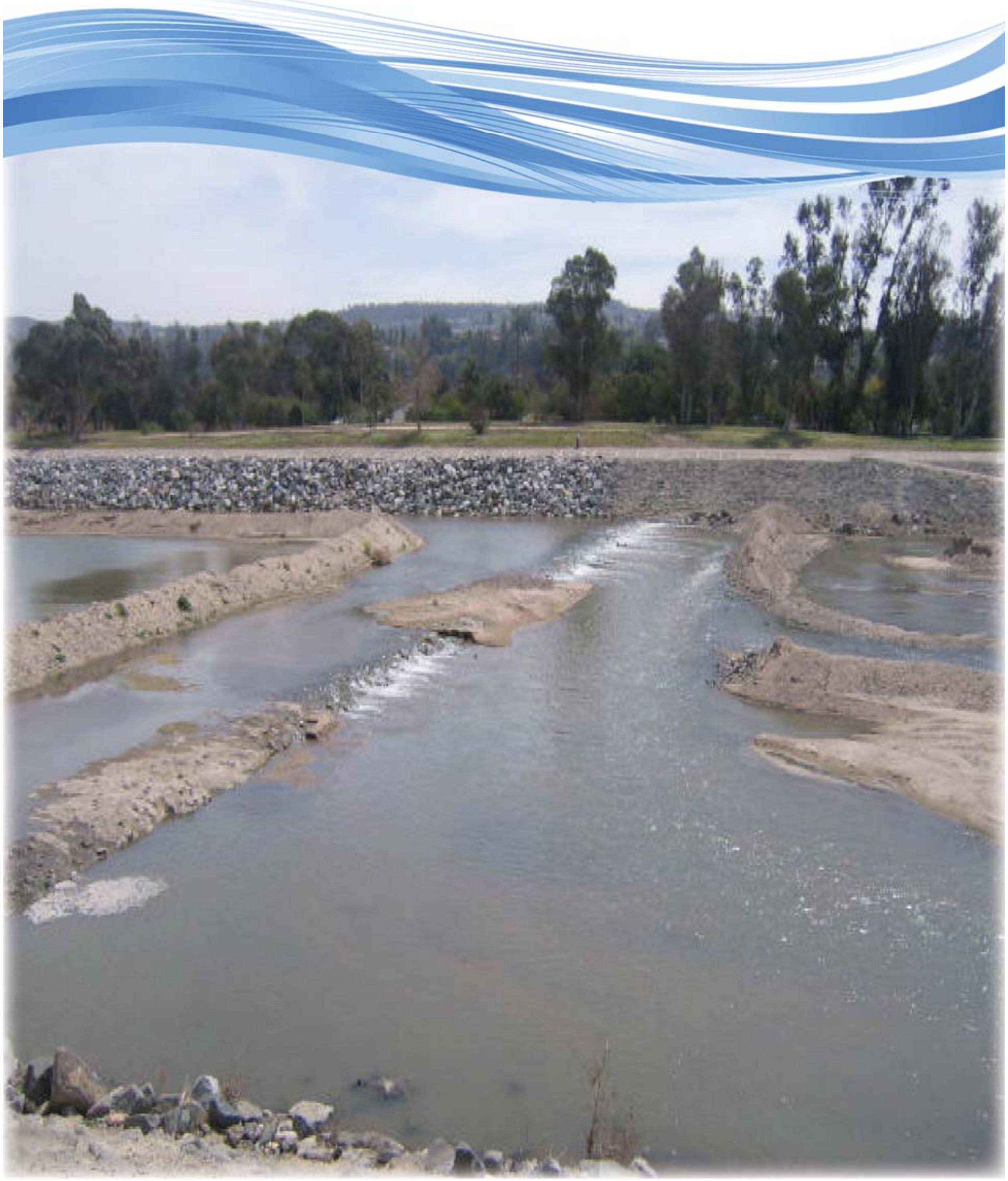
The Riverside County Flood Control and Water Conservation District, the County of Riverside, the City of Perris and Homeland,/Romoland ADP Inc. formed a Community Facilities District for the purpose of implementing, among other projects, the Romoland Line A Flood System Project.

2009 UPDATE

Groundwater Management Plan

Orange County Water District

SINCE 1933



ORANGE COUNTY WATER DISTRICT

GOUNDWATER MANAGEMENT PLAN
2009 UPDATE

Greg Woodside, PG CHg
Marsha Westropp, Senior Watershed Planner

July 9, 2009

EXECUTIVE SUMMARY

The Orange County Water District (OCWD) is a special district formed in 1933 by an act of the California Legislature. The District manages the groundwater basin that underlies north and central Orange County. Water produced from the basin is the primary water supply for approximately 2.5 million residents living within the District boundaries.

ES-1 Introduction

The mission of the OCWD is to provide local water retailers with a reliable, adequate, high quality water supply at the lowest reasonable cost in an environmentally responsible manner. The District implements a comprehensive program to manage the groundwater basin to assure a safe and sustainable supply. The *Groundwater Management Plan 2009 Update* documents the objectives, operations, and programs aimed at accomplishing the District's mission.

The Orange County groundwater basin meets approximately 60 to 70 percent of the water supply demand within the boundaries of the District as shown in Figures ES-1 and ES-2. Nineteen major producers, including cities, water districts, and private water companies, pump water from the basin and retail it to the public. There are also approximately 200 small wells that pump water from the basin, primarily for irrigation purposes.

OCWD History

Since its founding, the District has grown in size from 162,676 to 229,000 acres. Along with this growth in area has come a rapid growth in population. Facing the challenge of increasing demand for water has fostered a history of innovation and creativity that has enabled OCWD to increase available groundwater supplies while protecting the long-term sustainability of the basin. Groundwater pumping from the basin has grown from approximately 150,000 acre-feet per year (afy) in the mid-1950s to over 300,000 afy, as shown in Figure ES-3.

History of Active Groundwater Recharge

To accommodate increasing demand for water supplies, OCWD started actively recharging the groundwater basin over fifty years ago. In 1949, the District began purchasing imported Colorado River water from the Metropolitan Water District of Southern California (Metropolitan), which was delivered to Orange County via the Santa Ana River upstream of Prado Dam. In 1953, OCWD began making improvements in the Santa Ana River bed and constructing off-channel recharge basins to increase recharge capacity. The District currently operates 1,067 acres of recharge facilities adjacent to the Santa Ana River and its main Orange County tributary, Santiago Creek.

Control of Seawater Intrusion and Construction of the Groundwater Replenishment System

One of the District's primary efforts has been the control of seawater intrusion into the groundwater basin, especially in two areas: the Alamitos Gap and the Talbert Gap. OCWD began addressing the Alamitos Gap intrusion by entering a partnership in 1965 with the Los Angeles County Flood Control District to operate injection wells in the Alamitos Gap. Operation of the injection wells forms a hydraulic barrier to seawater intrusion.

FIGURE ES- 1
ORANGE COUNTY WATER DISTRICT BOUNDARY

To address seawater intrusion in the Talbert Gap, OCWD constructed Water Factory 21, a plant that treated secondary-treated water from the Orange County Sanitation District (OCSD) to produce purified water for injection. Water Factory 21 operated for approximately 30 years until it was taken off line in 2004. It was replaced by an advanced water treatment system, the Groundwater Replenishment (GWR) System. The GWR System, the largest water purification project of its kind, began operating in 2008 to provide water for the Talbert Injection Barrier as well as to supply water to recharge basins in the City of Anaheim.

FIGURE ES- 2
ORANGE COUNTY GROUNDWATER BASIN

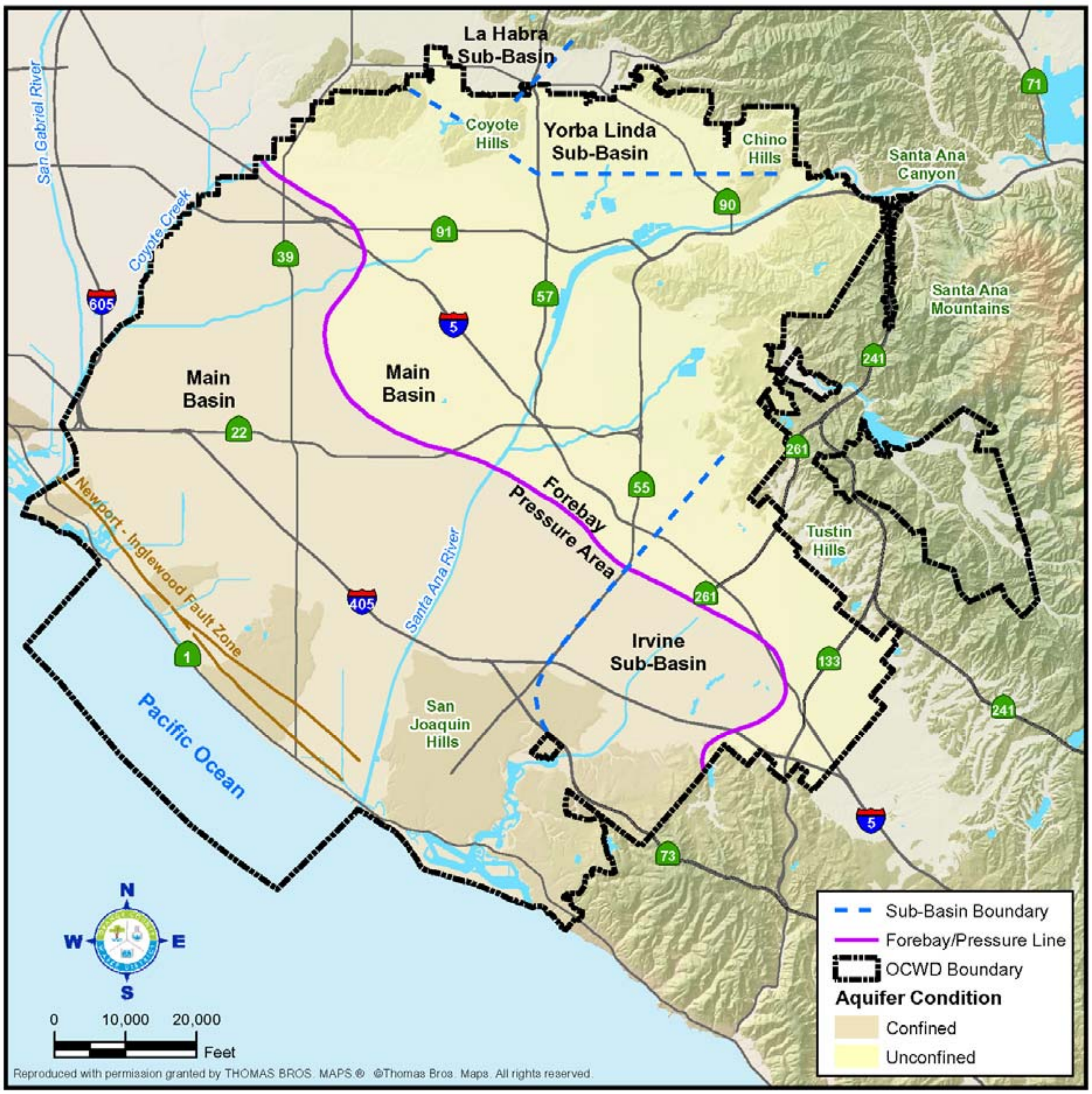
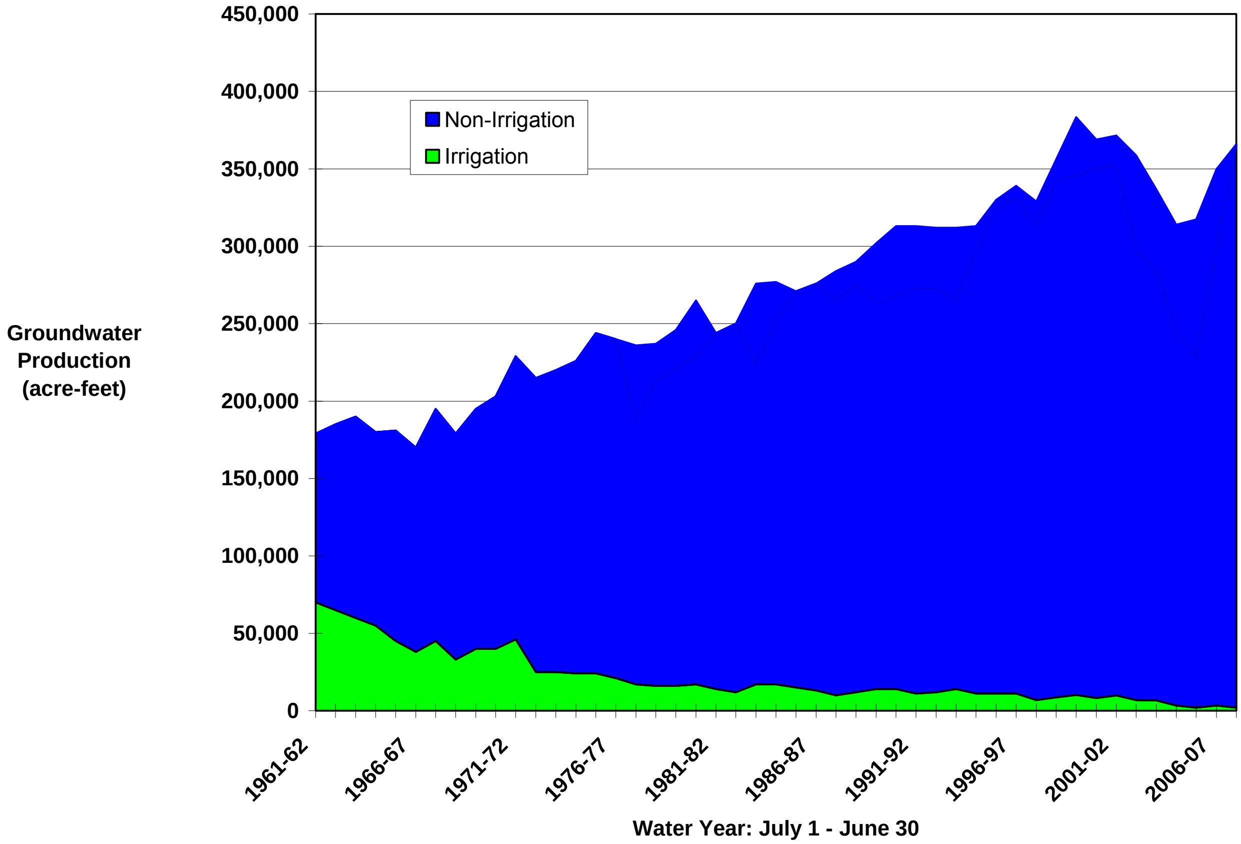


FIGURE ES- 3
GROUNDWATER PRODUCTION



Preparation of the Groundwater Management Plan

The District's previous update to the *Groundwater Management Plan* was prepared in 2004. The five Key Performance Indicators established in the 2004 plan were accomplished, as shown in Table ES-1. In addition, over eighteen major projects completed between 2004 and 2008 have improved District operations, increased groundwater recharge capacity, and improved water quality.

The *Groundwater Management Plan 2009 Update* provides information on District operations, lists projects completed since publication of the 2004 report, and discusses plans for future projects and operations. The updated plan was prepared and adopted in accordance with procedures stipulated by A.B. 3030 and Section 10750 et seq. of the California Water Code.

Goals and Objectives

The District's goals are to (1) protect and enhance groundwater quality, (2) to protect and increase the sustainable yield of the basin in a cost-effective manner and (3) to increase the efficiency of OCWD's operations. Section 1.8 contains a complete list of management objectives aimed at accomplishing these goals.

TABLE ES- 1
KEY PERFORMANCE INDICATORS

2004 Groundwater Management Plan Key Performance Indicators	2008 Status
Cease landward migration of 250 mg/L chloride contour by 2006	GWR System began operation in 2008.
	Reliable, local water supplies available for barrier injection increased from 5 mgd to 30 mgd.
	Reversal of landward migration at Talbert Barrier observed in 2008.
Increase Prado water conservation pool elevation by four feet by 2005	Memorandum of Agreement with the Army Corps of Engineers was executed in 2006 allowing a four-foot increase in the maximum winter pool elevation.
Increase recharge capacity by 10,000 afy	Increase in recharge capacity of greater than 10,000 afy occurred with (1) the La Jolla Recharge Basin coming on line in 2008 and (2) operation of Basin Cleaning Vehicles.
All water recharged into the basin through District facilities meets or is better than Department of Public Health MCLs and Notification Levels.	No exceedances of MCLs or Notification Levels in recharge water as documented in *Santa Ana River Water Quality Monitoring Reports* (OCWD 2005, 2006, 2007, and 2008) and GWR System permit reports.
Reduce basin overdraft by 20,000 afy	Basin's accumulated overdraft was reduced by 202,000 af between June 2004 and June 2007. (OCWD *Engineer's Report*, 2008)

ES-2 Basin Hydrogeology

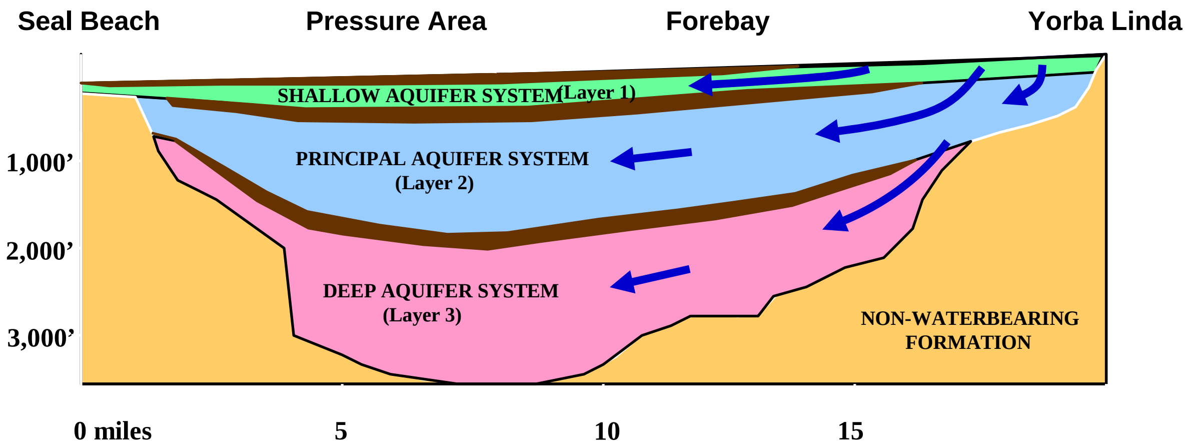
The Orange County groundwater basin covers an area of approximately 350 square miles underlying the north half of Orange County beneath broad lowlands known as the Tustin and Downey plains. The aquifers comprising the basin extend over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits. In the inland area, generally northeast of Interstate 5, the clay and silt deposits become thinner and more discontinuous, allowing larger quantities of groundwater to flow between shallow and deeper aquifers.

Forebay and Pressure Areas

The basin is divided into two primary hydrologic divisions; the Forebay and Pressure areas (see Figure ES-2). The boundary between the two areas generally delineates the areas where surface water or shallow groundwater can or cannot move downward to the first producible aquifer in significant quantities from a water supply perspective. Most of the groundwater recharge occurs in the Forebay.

OCWD conducts an extensive groundwater monitoring network to collect data to depths of up to 2,000 feet in the basin. Data from these monitoring wells were used to delineate the depth of the "principal" aquifer system, within which most of the groundwater production occurs. Figure ES-4 schematically depicts the basin's three aquifer systems, with groundwater flowing from Yorba Linda to the coast.

FIGURE ES- 4
GROUNDWATER BASIN CROSS-SECTION



Shallower aquifers exist above the principal aquifer system. Production from this system, principally for industrial and agricultural uses, is typically about five percent of total basin production. Deeper aquifers exist below the principal aquifer system, but these zones have been found to contain colored water or are too deep to economically construct production wells; few wells penetrate this system.

A vast amount of water is stored within the basin, although only a fraction of this amount can be removed without causing physical damage such as seawater intrusion or the potential for land subsidence.

Water Budget

OCWD developed a hydrologic budget in order to construct a Basin Model and to evaluate basin production capacity and recharge requirements. The hydrologic budget quantifies the amount of basin recharge, groundwater production, and subsurface flows along the coast and across the Orange/Los Angeles County line.

Calculation of Groundwater Elevation, Storage, and Accumulated Overdraft

Annual changes in the amount of groundwater stored in the basin are estimated using groundwater elevation measurements and aquifer storage coefficients for the three primary aquifer systems in the basin. This three-layer method involves measuring the water levels throughout the basin at the end of each water year at nearly every production and monitoring well in the basin. Water level measurements are contoured and digitized into the Geographic Information System. Storage change volumes for each of the three aquifer levels are determined and then totaled to provide a net annual storage change for the basin.

The District estimates that the basin can be operated on a short-term basis with a maximum accumulated overdraft (storage reduction from full condition) of approximately 500,000 acre-feet (af) without causing irreversible seawater intrusion and land subsidence. In 2007, OCWD developed a new methodology to calculate accumulated overdraft and storage change. The need for this change was driven by the record-setting wet year of 2004-05, which resulted in the basin approaching a near-full condition. Analysis showed that the traditional method of cumulatively adding the annual storage change each year contained considerable uncertainty. The updated approach is based on a determination of the amount of groundwater in storage in each of the three major aquifer systems.

Elevation Trends and Groundwater Model

Groundwater level profiles generally following the Santa Ana River in Orange County are prepared to evaluate changes in the basin due to groundwater pumping and OCWD recharge operations. Groundwater levels are managed within a safe basin operating range to protect the long-term sustainability of the basin and to protect against land subsidence.

The District has developed a comprehensive computer-based groundwater flow model. Development of the model substantially improved the overall understanding of processes and conditions in the basin. The model also allows analysis of how the basin reacts to various theoretical pumping and recharge conditions. The model's ability to simulate known and projected future conditions will evolve and improve as new data become available and updated simulations are completed.

ES-3 Groundwater Monitoring

For its size, the Orange County groundwater basin is one of the world's most extensively monitored. The comprehensive monitoring program tracks dynamic basin conditions including groundwater production, storage, elevations, and water quality.

OCWD's monitoring program has helped improve groundwater management throughout the basin by:

- Establishing on an annual basis the appropriate level of groundwater production.
- Determining the extent of seawater intrusion and subsequently building improvements to seawater barriers to prevent and reverse such intrusion.
- Discovering areas of groundwater contamination to protect public health and beneficial use of groundwater, and to begin remediation efforts at an early stage.
- Assuring that the groundwater basin is managed in accordance with relevant laws and regulations.

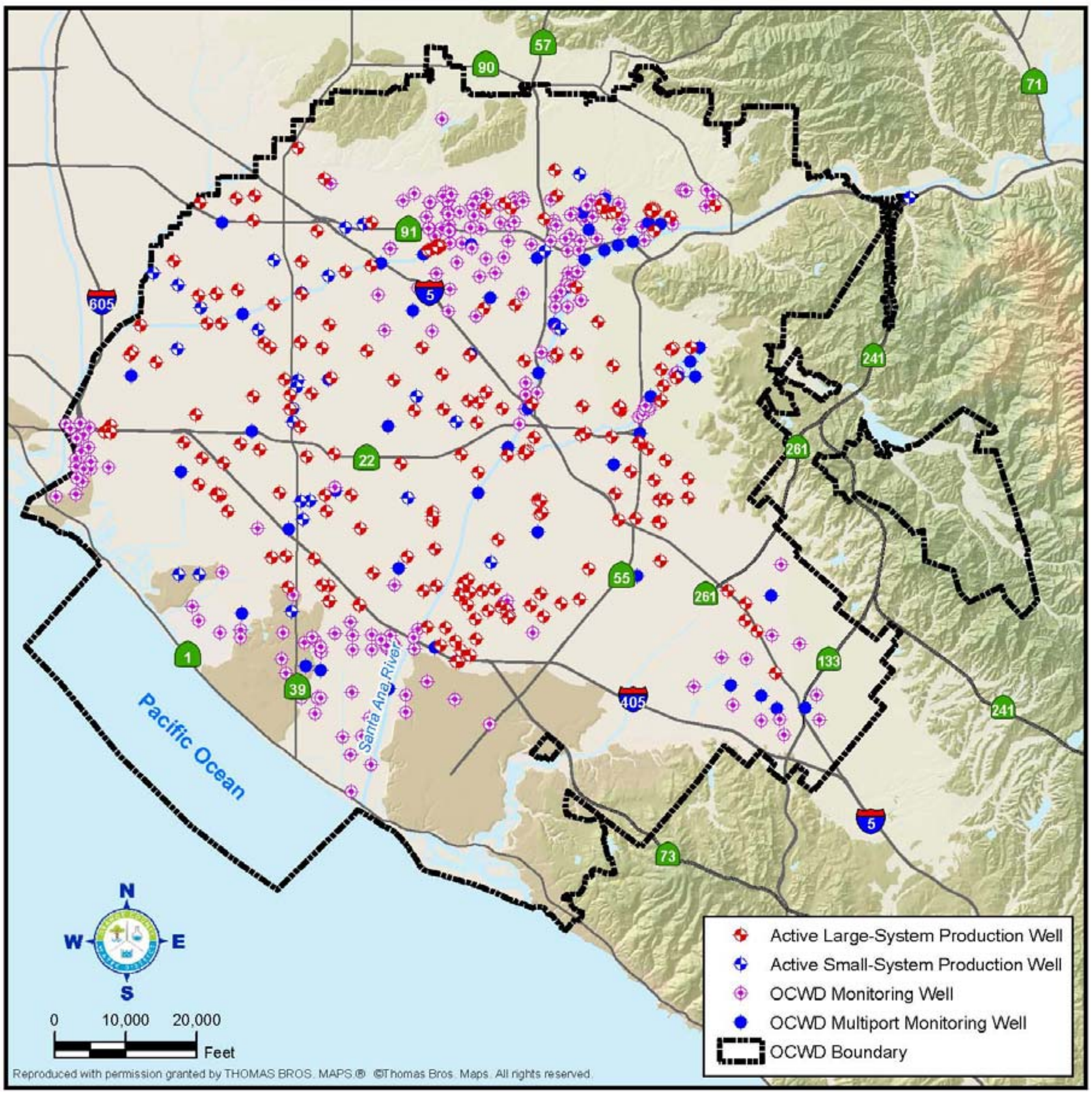
Collection and Management of Monitoring Data

Large-capacity well owners report monthly groundwater production for each of their wells. OCWD operates its own groundwater monitoring network with a diverse cross-section of well types and broad range of well depths and screened intervals. The type and number of wells in the basin wide monitoring program are shown in Table ES-2; the distribution of wells is shown in Figure ES-5.

TABLE ES- 2
DISTRIBUTION OF WELLS IN BASIN WIDE MONITORING PROGRAM

Well Type	No. of Wells	No. of Individual Sample Points
Drinking Water Wells	228	228
Industrial And Irrigation wells	123	123
OCWD Monitoring Wells (excluding seawater monitoring)	254	728
OCWD Seawater Intrusion Monitoring Wells	93	244
Total	**698**	**1323**

FIGURE ES- 5
PRODUCTION AND MONITORING WELL NETWORK



In 2008, nearly 14,000 groundwater samples were collected and analyzed in order to comply with state and federal regulations and to enable OCWD to monitor the water quality of the basin. The number of water quality samples continues to increase in response to new regulatory requirements and to gain a better understanding of the basin. OCWD's laboratory is state-certified to perform bacteriological, inorganic, and organic analyses. State-certified contractor laboratories analyze radiological samples.

OCWD's water quality monitoring program includes:

- Testing groundwater samples for more than 100 regulated and unregulated chemicals at a specified monitoring frequency established by the U.S. Environmental Protection Agency (EPA) and the California Department of Public Health (CDPH) regulations.
- Monitoring and preventing the encroachment of seawater into fresh groundwater zones along coastal Orange County.
- Assessing Santa Ana River water quality. Since the quality of the surface water that is used to recharge the groundwater basin affects groundwater quality, a routine monitoring program is maintained to continually assess ambient river water quality. Water samples are collected each month from the river. The District also monitors the quality of imported replenishment water and tests selected monitoring wells to assess the water quality in areas where GWR System water is being injected and recharged.

Data Management and Publication

Data collected in OCWD's monitoring program are stored in the District's electronic database, the Water Resources Management System (WRMS). WRMS contains comprehensive well information, as well as information on subsurface geology, groundwater modeling, and water quality. Data are used in calibrating the basin model, evaluating the causes of seasonal groundwater fluctuations, and estimating changes in basin storage throughout the year.

Regular District publications include the annual release of the Engineer's Report on Groundwater Conditions, Water Supply and Basin Utilization; the Santa Ana River Water Quality Monitoring Report; and the Groundwater Replenishment System Operations Annual Report.

ES-4 Recharge Water Supply Management

OCWD operates recharge facilities to maximize groundwater recharge. Recharging water into the basin through natural and artificial means is essential to support pumping from the basin. The basin's primary source of water for groundwater recharge is flow from the Santa Ana River. OCWD diverts river flows into recharge basins located in and adjacent to the Santa Ana River and its main Orange County tributary, Santiago Creek. Other sources of recharge water include natural infiltration, recycled water, and imported water.

History of Recharge Operations

Active recharge of groundwater began in 1949, in response to increasing drawdown of the basin and, consequently, the serious threat of seawater intrusion. In 1953, OCWD began to make improvements in the Santa Ana River bed and areas adjacent to the river to increase recharge capacity. Today the District owns and operates a network of recharge facilities that cover 1,067 acres, as shown in Figure ES-6. The District has an ongoing program to assess enhancements in the existing recharge facilities, evaluate new recharge methods, and analyze potential new recharge facilities.

OCWD Recharge Facilities

Surface water from the Santa Ana River flows into Orange County through the Prado Dam. The District is able to recharge essentially all non-storm flow in the Santa Ana River that enters Orange County through Prado Dam. The dam was built and is operated by the Army Corps of Engineers (ACOE) for flood control purposes. Agreements between the ACOE and OCWD enable the dam to be operated for water conservation purposes, such that the District is able to capture a portion of the storm flows for groundwater recharge.

Water released at Prado Dam naturally flows downstream into Orange County and percolates through the river's 300-400 foot-wide unlined channel bottom. Active management of recharge begins at the intersection of the river and Imperial Highway in the City of Anaheim. It is in the six-mile reach of the river below Imperial Highway and areas adjacent to the river where many of the recharge basins are located. The recharge facilities are grouped into four major components: the Main River System, the Off-River System, the Deep Basin System, and the Burris Basin/Santiago System.

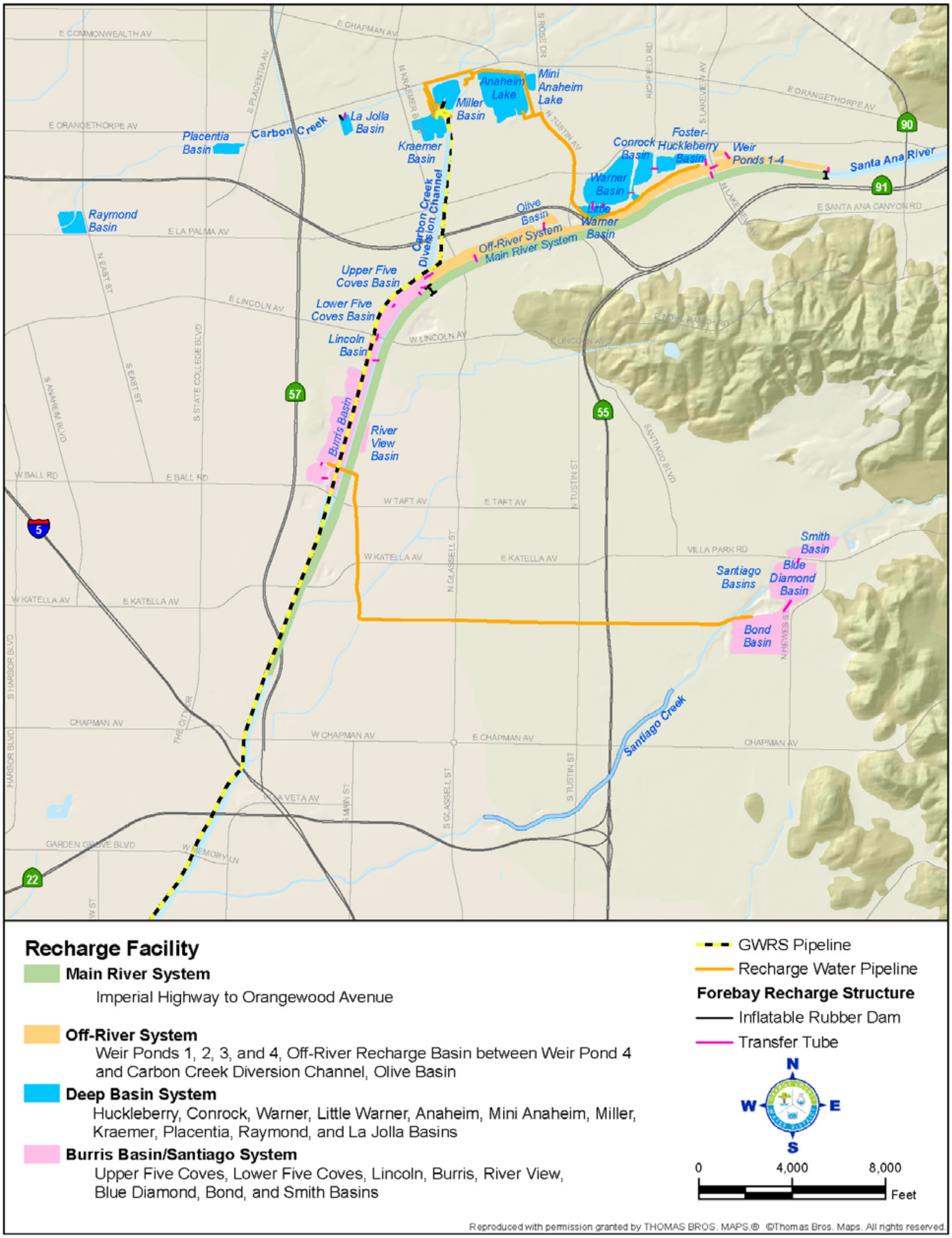
The Main River System consists of approximately 290 acres of the Santa Ana River Channel. One of the District's main control facilities, the Imperial Inflatable Dam and Bypass structure diverts Santa Ana River water flows from the Main River System into the Off-River System. The Off-River System is a shallow, sandy bottom, 100- to 200-foot wide channel that runs parallel to the Main River System; a levee separates these two systems.

Water can be diverted from the Off-River System into the Deep Basin System. These recharge basins range in depth from ten to sixty feet. Flows are regulated between these basins to maximize recharge.

Water in the Santa Ana River can also be diverted at the Five Coves Inflatable Dam into the Burris Basin/Santiago System. This system includes 373 acres of shallow and deep recharge basins. The Santiago Pipeline allows water to be diverted from Burris Basin into the Santiago Basins.

The Santiago Basins recharge water diverted from Burris Basin as well as flows from Santiago Creek. The creek is a tributary of the Santa Ana River that extends from the Santa Ana Mountains through the City of Orange to its confluence with the Santa Ana River in the City of Santa Ana.

FIGURE ES- 6
OCWD RECHARGE FACILITIES IN ANAHEIM AND ORANGE



Sources of Recharge Water Supplies

In addition to Santa Ana River and Santiago Creek, other sources of recharge water include natural recharge, imported water, and water purified by OCWD's GWR System. The GWR System (Figure ES-7) is a cooperative project with the OCSD that began operating in 2008. Secondary-treated wastewater from OCSD undergoes treatment consisting of microfiltration, reverse osmosis, and advanced oxidation with ultraviolet light and hydrogen peroxide. The water purified through the GWR System is injected into the groundwater basin near the coast to maintain a barrier preventing seawater intrusion and provides an additional supply of water for recharge operations.

FIGURE ES-7
GROUNDWATER REPLENISHMENT SYSTEM

ES-5 Groundwater Quality Management

OCWD conducts an extensive program aimed at protecting the quality of the water in the basin. These efforts include groundwater monitoring, participating in and supporting regulatory programs, remediation projects, working with groundwater producers, and providing technical assistance.

Groundwater Protection Policy

The District adopted a Groundwater Protection Policy in May 1987, in recognition of the serious threat posed by groundwater contamination. This policy is described in Section 5 of the Plan.

Salinity and Nitrate Management

Managing salinity, the amount of dissolved minerals in water, and nitrates are significant water quality challenges in southern California. Elevated levels of nitrates pose a risk to human health. High concentrations of salts can contaminate groundwater supplies, constrain implementation of water recycling projects, and cause other negative economic impacts such as the need for increased water treatment by residential, industrial and commercial users.

Sources of salinity in water used to recharge the groundwater basin include Santa Ana River water, imported water, shallow groundwater within Orange County, seawater migrating into the basin, precipitation, and legacy contamination from historical agricultural operations. Water treatment plants, also referred to as desalters, have been built in Riverside and San Bernardino Counties to reduce salinity levels in water supplies. Within Orange County, desalters in Tustin and Irvine are reducing salinity levels in the groundwater basin. The GWR System provides a dependable supply of low salinity water that is expected to reduce the basin salt imbalance by approximately 47,000 tons/year.

Nitrates are one of the most common and widespread contaminants in groundwater supplies. Elevated levels of nitrates in soil and water supplies originate from fertilizer use, animal feedlots and wastewater disposal systems. OCWD conducts an extensive program to protect the basin from nitrate contamination, including operating 450 acres of wetlands in the Prado Basin (Figure ES-8) to naturally remove nitrate before the water enters the District's recharge facilities.

FIGURE ES-8
PRADO WETLANDS

Ninety-eight percent of the drinking water wells pumping from the Orange County groundwater basin meet the nitrate drinking water standard. The two percent that do not meet the nitrate standard are treated to reduce nitrate levels prior to being served to customers.

The Irvine and Tustin desalters are in operation to remove salts and nitrate from groundwater. The Irvine Desalter also addresses contamination from organic compounds.

Synthetic Organic Contaminants

Ninety-five percent of the basin's groundwater that is used for drinking water is pumped from the main aquifer. Water from this aquifer continues to be of high quality. OCWD routinely monitors potential contamination and is working to remediate some localized contamination in the shallow aquifer.

One contaminant of concern is methyl tertiary butyl ether (MTBE), a chemical previously added to gasoline. The District analyzes groundwater for MTBE and other fuel-related contaminants. The District is implementing remediation efforts to address contamination from volatile organic compounds (VOCs). Two particular projects are the North Basin Groundwater Protection Project and the South Basin Groundwater Protection Project. The North Basin Groundwater Protection Project is being constructed in Anaheim and Fullerton to remove and contain groundwater contaminated with VOCs. The South Basin Groundwater Protection Project is being designed to address VOC and perchlorate contamination in the area of southeast Santa Ana/South Tustin and the western portion of Irvine.

ES-6 Integrated Management of Production and Recharge

OCWD is internationally known for its unique, proactive, supply-side management approach. This is a major factor that has enabled the District to develop one of the most advanced and progressive groundwater management systems in the world. Growth in demand for water supplies has challenged the District to augment recharge water supplies, effectively manage demands on the basin, and balance the amount of total recharge and total pumping to protect the basin.

Cooperative Efforts to Protect Water Supplies and Water Quality

OCWD participates in cooperative efforts with local, state, and federal regulatory agencies and stakeholders within the District boundaries and in the Santa Ana River Watershed. For example, the ACOE works cooperatively with OCWD to store water behind Prado Dam and to release flows at rates that allow for the maximum capture of water for recharge operations. Other cooperative efforts include natural resource conservation efforts in the Prado Basin and participating in working groups and task forces with stakeholders throughout the watershed.

Water Supplies

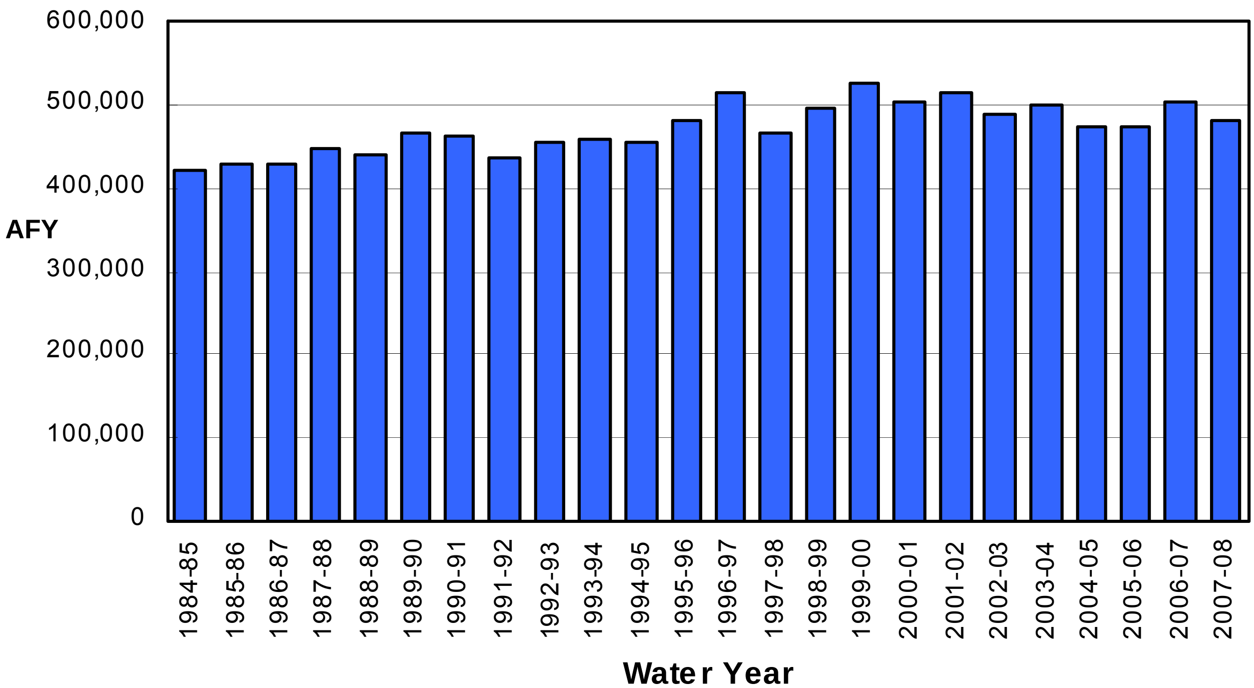
OCWD provides access to basin supplies at a uniform cost to all entities without regard to the length of time they have been producing from the basin. The District's programs include operating the groundwater recharge basins, increasing supplies of recycled water available for groundwater recharge, producing recycled water for irrigation and other non-potable uses, participating in water conservation efforts, and working with the Municipal Water District of Orange County (MWDOC) in developing and conducting other supply augmentation projects and strategies.

Water Demand

Numerous factors influence water demands such as population growth, economic conditions, conservation programs, and hydrologic conditions. Estimates of future demands are therefore subject to some uncertainty and are updated on a regular basis.

Total water demand within the District's boundary for water year 2007-08 (July 1-June 30) was 480,000 af. Total demand is met with a combination of groundwater, imported potable water, local surface water, and recycled water used for irrigation and industrial purposes. Figure ES-9 shows historical total District water demands from 1984 to the present. Estimating water demands is necessary for the planning of future water supply project and programs.

FIGURE ES-9
HISTORICAL TOTAL DISTRICT WATER DEMANDS



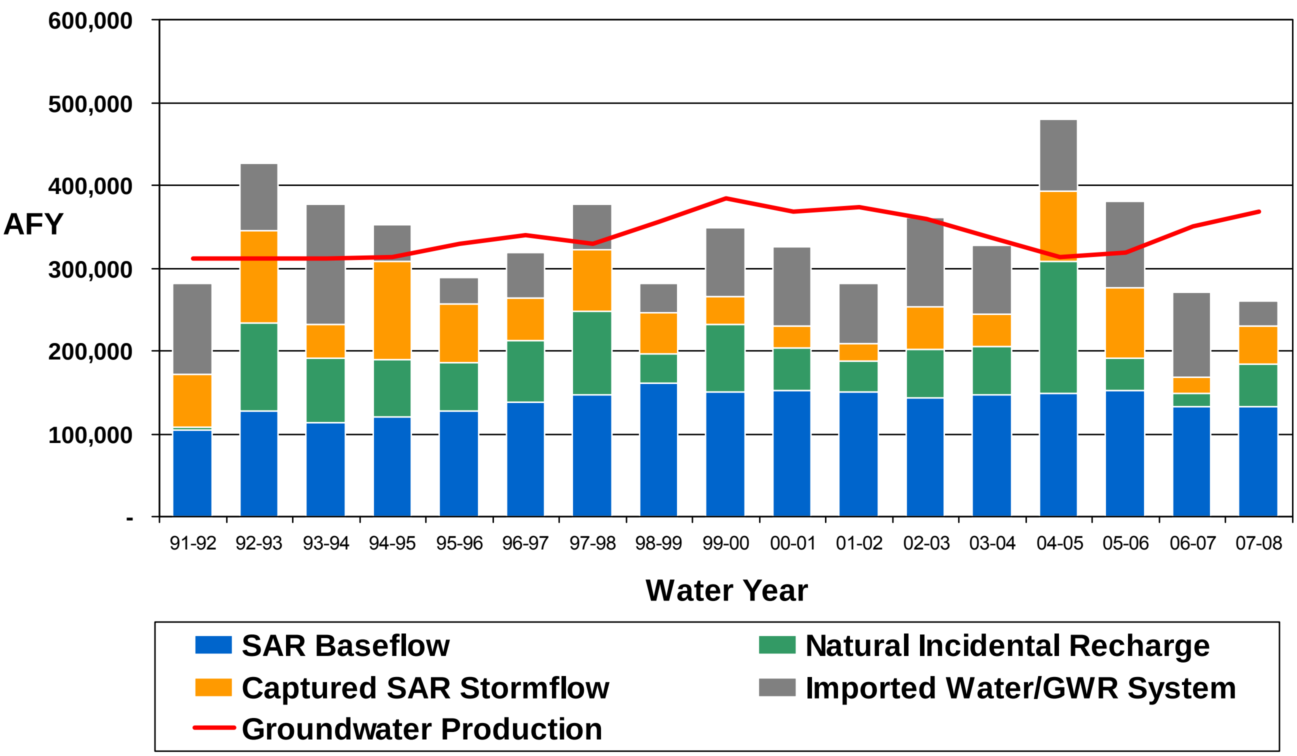
Basin Operating Range

Total pumping from the basin is managed through a process that uses financial incentives to encourage groundwater producers to pump an aggregate amount of water that is sustainable without harming the basin. The process that determines a sustainable level of pumping considers the basin's safe operating range and the amount of recharge water available to the District. The basin operating range refers to the upper and lower levels of groundwater storage in the basin that can be reached without causing negative impacts. Each year the District estimates the level of storage for the following year.

Integrated Management of Recharge and Production

Over the long term, the basin must be maintained in an approximate balance to ensure the long term viability of the water supply. In one particular year, water withdrawals may exceed water recharged as long as over the course of a number of years this is balanced by years where water recharged exceeds withdrawals. Levels of basin production and water recharged since water year 1991-92 are shown in Figure ES-10. The primary mechanism used by OCWD to manage pumping is the Basin Production Percentage (BPP). The BPP is the percentage of each Producer's total water supply that comes from groundwater pumped from the basin. The BPP is set uniformly for all Producers. Groundwater production at or below the BPP is assessed the Replenishment Assessment. Pumping above the BPP is also assessed a Basin Equity Assessment, which is calculated so that the cost of groundwater production is higher than purchasing imported potable water. This serves to discourage production above the BPP.

FIGURE ES-10
BASIN PRODUCTION AND RECHARGE SOURCES



Drought Management

During a drought, flexibility to maintain pumping from the basin becomes increasingly important. To the extent that the basin has water in storage that can be pumped out during a drought, the basin provides a valuable water supply asset during drought conditions. For the basin to serve as a safe, reliable supply, sufficient groundwater must be stored before a drought occurs and the basin needs to be refilled after a period of storage reduction occurs.

ES-7 Financial Management

The District has an excellent revenue base and a strong "AA+" financial rating. The District also has the ability to issue additional long-term debt, if necessary, to develop projects to increase the basin's yield and protect water quality. The annual operating budget for fiscal year 2008-09 was approximately $116.3 million.

OCWD maintains reserve funds to ensure financial integrity and to purchase supplemental water when it becomes available for groundwater recharge. The District's primary sources of revenue include the Replenishment Assessment, Basin Equity Assessment, property taxes, and other miscellaneous revenues such as rental fees on District property.

The District's programs to protect and increase the basin's sustainable yield in a cost-effective manner continue to evolve due to changes in the availability of recharge water supplies. Below average rainfall over the past four years in the Santa Ana River Watershed as well as other factors has reduced the availability of Santa Ana River water. The availability of imported water supplies for groundwater recharge has also changed significantly in the last few years. The occurrence of wet and dry periods, the future availability and cost of imported water supplies for recharge, and changing water management practices of agencies in the watershed will continue to affect the District's management of the basin.

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1 INTRODUCTION

The Orange County Water District (OCWD) manages the Orange County Groundwater Basin (the basin) in coastal Southern California This section provides background information on the District and sets the framework for the Groundwater Management Plan 2009 Update (Plan). The subsections below:

- **Discuss the District's formation, mission, and operating authorities.**
- **Trace changing conditions in the basin that are important to development of the Plan.**
- **Describe the public participation component of the Plan.**
- **Discuss the Plan's compliance with the California Water Code.**
- **Present basin management objectives that guide the District's management of the basin.**
- **Explain the District's public education programs.**

1.1 History of OCWD

The OCWD was formed by a special act of the California Legislature in 1933 to manage the groundwater basin that underlies north and central Orange County. District boundaries are shown in Figure 1-1. OCWD is not a water retailer and does not serve water to the public; rather, the District manages the groundwater basin.

Figure 1-1
Orange County Water District Boundary

Nineteen major producers, including cities, water districts, and private water companies, pump water from the basin and retail it to the public. There are also approximately 200 small wells that pump water from the basin, primarily for irrigation purposes. OCWD protects and manages the quantity and quality of the groundwater resource that meets approximately 60 to 70 percent of the water supply demand for a population of over 2.5 million.

Since its founding, the District has grown in area from 162,676 to 229,000 acres and has experienced an increase in population from approximately

120,000 to 2.5 million people. Facing the challenge of increasing demand for water has fostered a history of innovation and creativity that has enabled OCWD to increase available groundwater supplies while protecting the long-term sustainability of the basin.

The District's powers, as defined in its enabling legislation by the State of California (Water Code App §40-1, *et seq*., or the 'OCWD Act'), include the following:

> *Within or outside the District to construct, purchase, lease or otherwise acquire, and to operate and maintain necessary waterworks… to replenish the undergroundwater basin within the district, or to augment and protect the quality of the common water supplies of the district, … (portions of Section 2.5 of OCWD Act)*
>
> *For the common benefit of the district and for the purpose of managing the groundwater basin and managing, replenishing, regulating, and protecting the groundwater supplies within the district to exercise the following powers:*
>
> > *Provide for the conjunctive use of groundwater and surface water resources within the district area.*
> >
> > *Store water in undergroundwater basins or reservoirs within or outside of the district. Regulate and control the storage of water and the use of groundwater basin storage space in the groundwater basin.*
> >
> > *Purchase and import water into the district.*
> >
> > *Transport, reclaim, purify, treat, inject, extract, or otherwise manage and control water for the beneficial use of persons or property within the district and to improve and protect the quality of the groundwater supplies within the district. (Portions of Section 2.6 of OCWD Act)*
>
> *To provide for the protection and enhancement of the environment within and outside the district in connection with the water activities of the district. (Section 2.7 of OCWD Act)*

These powers illustrate the range of activities the District is involved with in managing the groundwater basin.

The Orange County Groundwater Basin was used by early settlers to supplement Santa Ana River surface water. Adequate, dependable water supplies were always a challenge for the residents of this semi-arid land. By 1900, conflicts over water supplies were escalating. The county's economic growth into an agricultural center was only one source of the problem. The other source was upstream: Santa Ana River flows were decreasing due to increased water use in the basins upstream of Orange County. San

Bernardino, Riverside, and Orange Counties were dependent on the same water source – the Santa Ana River in the Santa Ana River Watershed (shown in Figure 1-2).

FIGURE 1-2
SANTA ANA RIVER WATERSHED

In the early 1900s, reduced river flows and lowering of the Orange County groundwater table heightened conflicts between water users. Lower basin users initiated legal and other efforts to secure rights to water supplies. In 1932, The Irvine Company filed suit against upper basin users to protect its rights to river flows. Around the same time, the Orange County Farm Bureau formed the Santa Ana Basin Water Rights Protective Association to consider options to secure adequate supplies. This group developed a series of proposals, one of which led to legislation that created the OCWD.

The Orange County Water District Act was passed by the state legislature on June 4, 1933. The new District promptly joined The Irvine Company's lawsuit and was party to the 1942 settlement of that suit. The agreement limited the amount of river water that could be used for recharge in the upper basin to ensure that Orange County would have a share of Santa Ana River water.

Creation of the District and settlement of the lawsuit did not immediately solve the water supply problems in Orange County. Throughout the 1930s to early 1950s, groundwater pumping continued to exceed the rate of water recharged into the basin, a condition referred to as "overdraft." OCWD began looking for additional water supplies.

Efforts to bring more water into southern California were already underway. The Metropolitan Water District of Southern California (Metropolitan), created in 1927, built an aqueduct to transport and sell Colorado River water. Between 1949 and 1953, OCWD purchased 28,000 acre feet per year (afy) of Metropolitan water for groundwater recharge. However, these additional supplies were not enough to satisfy growing demand; by 1954, groundwater levels fell an average of fifteen feet below sea level. Now, the principal limitation faced by OCWD was the lack of an adequate, dependable funding base for purchasing the large amounts of recharge water needed to refill the overdrafted basin.

OCWD's only funding source at that time was local *ad valorem* taxes. Using property taxes to buy imported water was becoming controversial. Property owners in most of the District belonged to Metropolitan so their property taxes were funding imported water purchases. But water users pumping from the basin who were not Metropolitan members were benefiting from the imported supply without paying for it. In addition, some tax-paying property owners were not using the water that they were being charged for.

A twelve-person Orange County Water Basin Conservation Committee (the Committee of Twelve) was formed in 1952 to develop a solution to the funding problem. This process is described by author William Blomquist in his book "Dividing the Waters" (Blomquist, 1992).

> *"The area's water management problems were discussed at a joint meeting in 1952 of the Water Problems Committee of the Orange County Farm Bureau, the Water Committee of the Associated Chambers of Commerce, and the Board of Directors of the Orange County Water District. The twelve-man Orange County Water Basin Conservation Committee (the Committee of 12) was formed to study the issues further and develop recommendations. The Committee of 12 maintained the area's basic commitment to increasing supply rather than restricting*

demand. They considered and rejected centralized control over water consumption and distribution by an agency empowered to enforce conservation, or adjudication and limitation of water rights using the court-reference procedure. They supported instead a proposal to fund replenishment by taxing pumping. This approach held the promise of raising the necessary funds, relating producers' taxation to their benefits received, and relieving non-producers from paying for replenishment except to the extent that they purchased water from producers. Furthermore, at least theoretically, a tax on pumping would build in conservation incentives without mandating conservation.

OCWD was not authorized to tax pumping, so the Orange County Water District Act would have to be amended. The Committee of 12 assembled a package of amendments that amounted to a substantial redesign of the district. To be fair, a pump tax would have to be implemented basin-wide, so the Committee proposed enlarging the district's territory to include Anaheim, Fullerton, and Santa Ana, plus areas owned by the Anaheim Union Water Company and the Santa Ana Valley Irrigation Company near the canyon. A pump tax would make it necessary to measure and record water production from the thousands of wells within the district, so an amendment was proposed requiring every producer therein to register wells with OCWD and to record and submit production data to the District twice per year. The Committee also proposed that an annual District Engineer's Report on basin conditions and groundwater production be submitted to the District and water users, to allow them to monitor the effects of the replenishment program and to provide a shared picture on a regular basis of basin conditions, including the extent of seawater intrusion and the level of the water table."

Passage of these proposed amendments in 1954 was one of the most significant modifications to the original District Act. These major revisions gave OCWD the authority to assess a charge to pump groundwater, known as a Replenishment Assessment (RA). The OCWD Board of Directors voted to institute the first RA on June 9, 1954. The District now had adequate funds to purchase the amount of imported water needed for groundwater recharge, to monitor water quality and basin conditions, maintain and improve spreading facilities and pay for administrative costs.

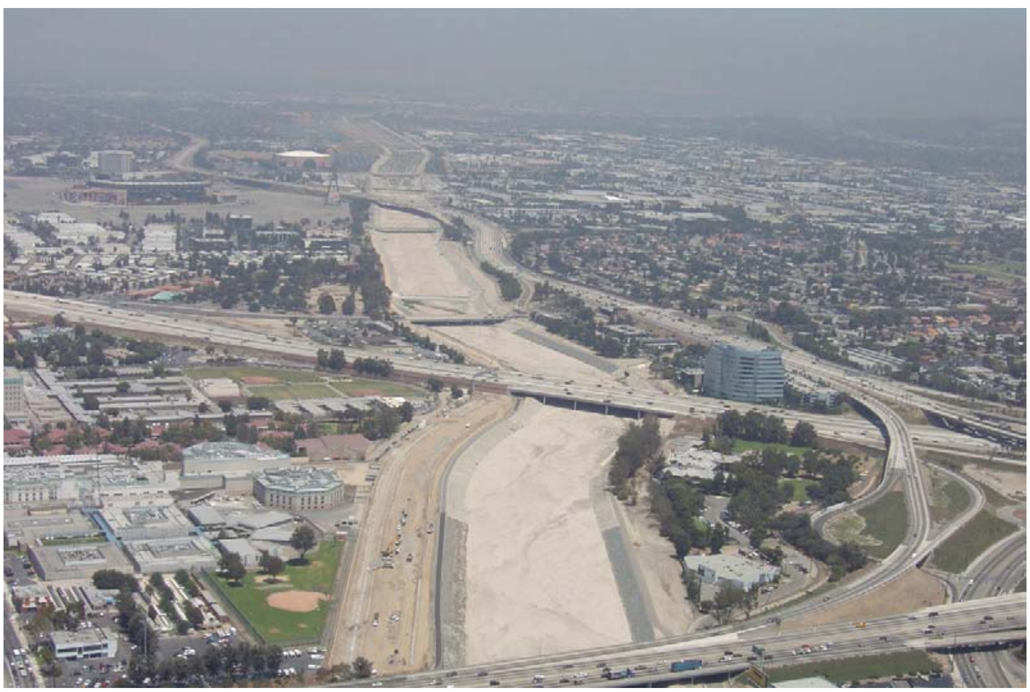
One pressing problem arising from overdrafting the basin was seawater intrusion. In 1956, the groundwater level dropped to its lowest historical point, as much as 40 feet below sea level, and seawater intruded 3 ½ miles inland. Although imported water was helping refill the basin, the challenge of seawater intrusion remained. This was a problem primarily in two areas: the Alamitos Gap at the mouth of the San Gabriel River at the Orange County/Los Angeles County border and the Talbert Gap in Fountain Valley. In 1965, the District began a joint program that continues to the present with the Los Angeles County Flood Control District to inject fresh water in the Alamitos Gap to prevent saltwater intrusion.

The Talbert Gap was a greater challenge as it needed nearly six times the amount of water. After much research and planning, the District built Water Factory 21 (WF-21), a water treatment plant that treated secondary-treated water from the Orange County Sanitation District (OCSD) to produce purified water for injection into the Talbert Gap. For over 20 years, a blend of WF-21 water and imported water was used to successfully manage seawater intrusion at the Talbert Gap.

WF-21, with a capacity that varied through time from four to fifteen million gallons per day (mgd), operated until 2004 when it was shut down to allow for construction of the Groundwater Replenishment (GWR) System. In operation since 2008, the GWR System is capable of producing up to 72 mgd of water for use in Talbert Barrier operations and for groundwater recharge.

OCWD's recharge operations have played a central role in expanding water supplies. Efforts to increase the capture of Santa Ana River baseflows and stormflows and to recharge imported water date back to 1949. Currently, OCWD operates approximately 1,067 acres of riverbed and off-stream infiltration basins in the cities of Anaheim and Orange. Figure 1-3 is a view of the Santa Ana River looking upstream. Freeway 22 crosses the river in the foreground, Freeway 5 in the middle of the photograph, and Freeway 57 in the background.

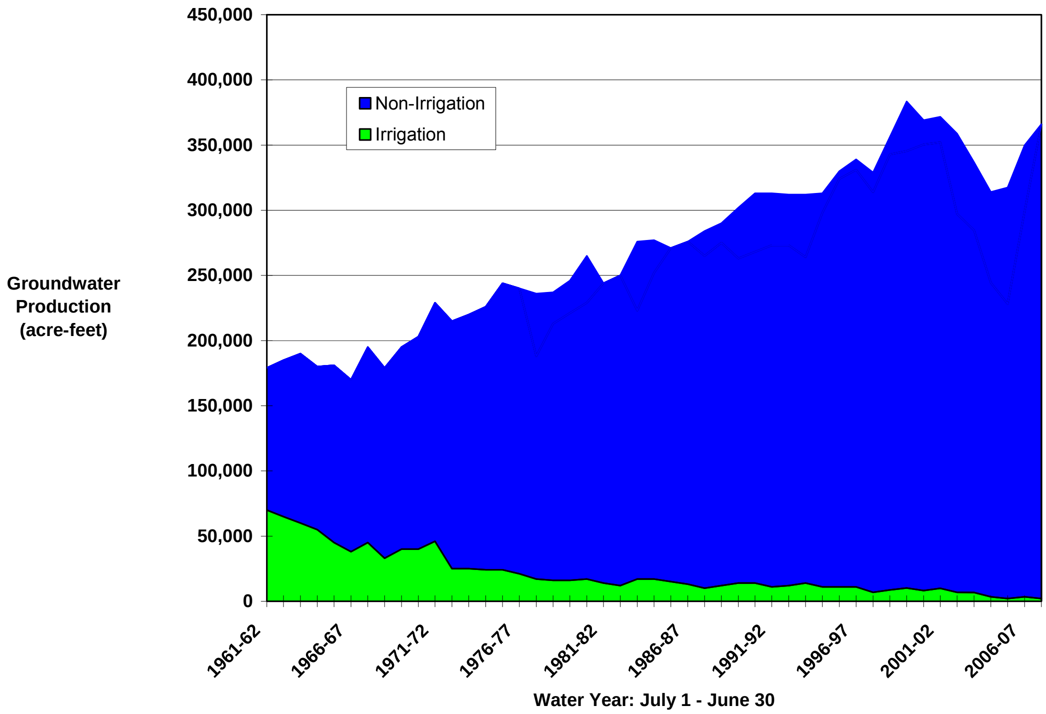
FIGURE 1-3
SANTA ANA RIVER LOOKING UPSTREAM IN ANAHEIM AND ORANGE



OCWD has achieved world-renowned status for its innovative approach to groundwater recharge, water quality protection, and groundwater resource management. The District has employed groundwater management techniques to increase the annual yield from the basin as shown in Figure 1-4. Annual production increased from approximately 150,000 afy in the mid-1950s to approximately 350,000 afy in water year 2007-08.

OCWD has managed the basin in order to provide a reliable supply of relatively low-cost water and to accommodate rapid population growth while at the same time avoiding the costly and time-consuming adjudication of water rights experienced in nearly every other major groundwater basin in Southern California.

FIGURE 1-4
GROUNDWATER PRODUCTION 1961-2008



Note: Non-irrigation includes In-lieu recharge. (See explanation of In-lieu recharge water in Section 4.2.4.3)

1.2 Groundwater Producers

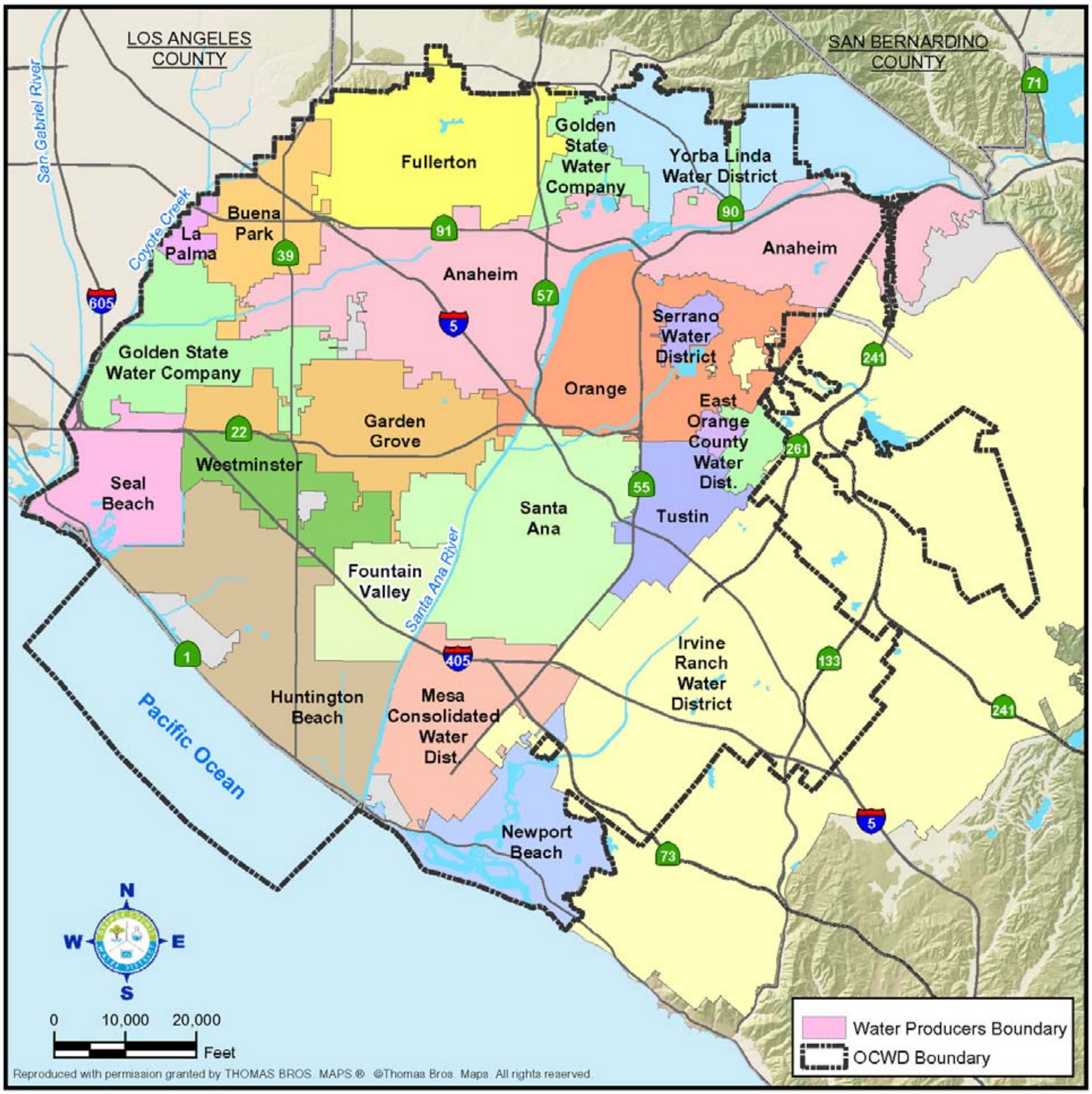
The local agencies that produce the majority of the groundwater from the basin are shown in Figure 1-5. As part of its plan to involve other affected agencies and work cooperatively where service areas or boundaries overlie the basin, the District meets monthly with nineteen local, major water producers to discuss and evaluate important basin management issues. This group is referred to as the groundwater producers (Producers). Generally each year a chairman is elected to represent the group. This monthly meeting provides a forum for the Producers to provide their input to the District on important issues such as:

- Setting the Basin Production Percentage (BPP) each year;
- Reviewing the merits of proposed capital improvement projects;
- Purchasing imported replenishment water to recharge the groundwater basin;
- Reviewing water quality data and regulations;

- Maintaining and monitoring basin water quality; and
- Budgeting and considering other important policy decisions.

The District as the groundwater basin manager and the Producers as the local retailers cooperate to serve the 2.5 million residents within the OCWD service territory. The Producers and OCWD served as the Advisory Committee for the preparation of this *Groundwater Management Plan*.

FIGURE 1-5
RETAIL WATER AGENCIES WITHIN OCWD



1.3 Public Education Programs

Proactive community outreach and public education are central to the operation of the OCWD. Each year, staff members give more than 120 presentations to community leaders and citizens, conduct more than 70 tours of OCWD facilities, and take an active part in community events. In addition to presentations and tours, OCWD administers multiple education programs as described below.

Since its inception in 1996, the Children's Water Education Festival has been the largest of its kind in the nation, hosting more than 6,000 children each year. This two-day outdoor event teaches children about water resources, recycling, pollution prevention, wetland preservation, and other environmental topics through interactive and hands-on activities.

In 2007, the O.C. Water Hero program was initiated to make water conservation fun while helping children and parents develop effective water-use efficiency habits that will last a lifetime. The program challenges both children and their parents to commit to saving 20 gallons of water a day.

O.C. Water 101 is a free water education class that is offered to the public. This one-day session focuses on the global water crisis, how water affects health, California's unique water situation, future challenges for water supplies in Orange County, and how water agencies are helping to conserve available water resources. Discussions include high-tech solutions to help alleviate water shortages today and in the future, as well as providing individuals with the resources and information necessary to save water.

The Hotel/Motel Water Conservation Program began in 1999 to assist hotels and motels in Orange County. At no cost, hotels and motels can order laminated towel rack hangers, bed cards, or combination cards that ask guests to consider reusing their towels and bed linens during their stay. The cards, which gently encourage guests to be environmentally aware, help hotels and motels save money and water.

In 2008, the District, in conjunction with the Municipal Water District of Orange County (MWDOC) and the Orange County Business Council, hosted the O.C. Water Summit, which brought over 400 key policy makers, community leaders and business professionals together to discuss the state's water challenges and possible regional solutions.

The District was recognized as a Groundwater Guardian member in 1996, thereafter forming the OCWD Groundwater Guardian Team. This program is designed to empower local citizens and communities to take voluntary steps toward protecting groundwater resources. The OCWD Groundwater Guardian Team attends and supports community events that are related to this cause.

Through its programs and outreach efforts OCWD informs and educates the public about Orange County's water supply, as well as overall water issues. OCWD strives to draw the communities' attention to the state's water needs and teaches them effective ways to minimize water consumption. The community is encouraged to make life-long commitments to conserving water and respecting it as a precious resource.

1.4 Preparation of the Orange County Water District Groundwater Management Plan

OCWD prepared the first *Groundwater Management Plan* in 1989 and updated the plan in 1990, 1994, and 2004.

The 2009 update of the Plan includes new information about projects completed by the District in the past five years and the updated approach to calculating basin storage changes. The Plan identifies OCWD's goals and basin management objectives in protecting and managing the Orange County groundwater basin. The Plan also describes factors for the District's Board to consider in making decisions regarding how much pumping the basin can sustain.

Specific projects that may be developed as a result of recommendations in the Plan would be separately reviewed and approved by the District's Board of Directors and processed for environmental review prior to project implementation. The Plan does not commit the District to a particular program or level of basin production, but describes the factors to consider and key issues as the Board makes basin management decisions on a regular basis each year. Potential projects that are conceptually described in the Plan are described in greater detail in the District's *Long-Term Facilities Plan* (OCWD, 2009).

1.5 OCWD Accomplishments, 2004-2008

In the *OCWD 2004 Groundwater Management Plan*, the District established quantifiable objectives, identified as Key Performance Indicators. Those Key Performance Indicators are listed in Table 1-1 along with a summary of actions taken and projects completed to accomplish them.

TABLE 1-1
KEY PERFORMANCE INDICATORS

2004 Groundwater Management Plan Key Performance Indicators	2008 Status
Cease landward migration of 250 mg/L chloride contour by 2006	GWR System began operation in 2008.
	Reliable, local water supplies available for barrier injection increased from 5 mgd to 30 mgd.
	Reversal of landward migration at Talbert Barrier observed in 2008.
Increase Prado water conservation pool elevation by four feet by 2005	Memorandum of Agreement with the Army Corps of Engineers was executed in 2006 allowing a 5,000 af increase in the maximum winter pool elevation.
Increase recharge capacity by 10,000 afy	Increase in recharge capacity of greater than 10,000 afy occurred with (1) the La Jolla Recharge Basin coming on line in 2008 and (2) operation of Basin Cleaning Vehicles.

2004 Groundwater Management Plan Key Performance Indicators	2008 Status
All water recharged into the basin through District facilities meets or is better than Department of Public Health MCLs and Notification Levels	No exceedances of MCLs or Notification Levels in recharge water as documented in *Santa Ana River Water Quality Monitoring Reports* (OCWD 2005, 2006, 2007, 2008) and GWR System permit reports.
Reduce basin overdraft by 20,000 afy	Basin's accumulated overdraft was reduced by 202,000 af between June 2004 and June 2007. (OCWD Engineer's Report, 2008)

Major accomplishments since adoption of the 2004 Plan include:

- Phase 1 of the GWR System began operating in 2008 with a capacity of purifying 72 afy of water for the Talbert Barrier and groundwater recharge.
- The Irvine Desalter Project, a cooperative project between OCWD and Irvine Ranch Water District (IRWD), began operating in 2007 to remediate groundwater contamination and provide 8,000 afy of additional water supplies.
- The *Report on Evaluation of Orange County Groundwater Basin Storage and Operational Strategy*, published in February 2007, established a new methodology for calculating accumulated overdraft and establishing new full-basin benchmarks (see Appendix D).
- Development of a groundwater model.
- Beginning the construction of the North Basin Groundwater Protection Project.
- Securing the rights to divert and use up to 362,000 afy of Santa Ana River water through a decision of the State Water Resources Control Board in December 2008.

A comprehensive list of projects completed between 2004 and 2009 and the location in the Plan of the project description is shown in Table 1-2.

Table 1-2
Summary of Completed Projects 2004-2009

Project	Description	Location in GWMP	Construction Completed	Operation Began
Groundwater Replenishment System	Purifies up to 72,000 afy of secondary-treated water from OCSD to create a new water supply for seawater intrusion barrier and groundwater recharge	Section 4.2.3.1	2007	2008
Prado Basin Water Conservation Project	Increases winter-time storage level at Prado Dam by 5,000 af	Section 4.1.1	N/A	2006
Talbert Barrier Expansion	Expanded Talbert Seawater Intrusion Barrier by constructing 8 new injection wells (4 with 1 casing each and 4 with 3 casings each)	Section 6.3.3	2007	2008
Irvine Desalter Project	Constructed extraction and treatment system to pump and treat up to 8,000 afy contaminated groundwater	Section 5.8.4	2007	2007
La Jolla Recharge Basin	New 6-acre recharge basin increases recharge capacity up to 9,000 afy	Section 4.4.1	2008	2008
Olive Basin Intake Structure Improvements	Construction of new intake structure and transfer pipe decreases sediment fouling of recharge basin	Section 4.4.1	2006	2007
Basin Cleaning Vehicles	Construction of four basin cleaning vehicles removes sediment from recharge basins	Section 4.1	2004	2004
Santiago Creek Recharge Enhancement	Grading of Santiago Creek bed improves recharge rate by an estimated 3,600 afy	Section 4.4.1	2008	2008
Conjunctive Use “8 Well Project”	Construction of 8 new extraction wells as part of Conjunctive Use Project with MWD to allow storage and withdrawal of imported water in the groundwater basin for use in drought years	Section 6.3.3	2007	N/A

Project	Description	Location in GWMP	Construction Completed	Operation Began
Mini-Anaheim Recharge Basin Modifications	Modifications to increase recharge basin performance	Section 4.4.1	2005	2005
Kraemer-Miller Pipeline Improvements	New pipelines to provide enhanced supply of recharge water to recharge basins	Section 4.4.1	2007	2007
Santiago Creek Monitoring Wells	Three new monitoring wells constructed to assess hydrogeologic conditions along Santiago Creek	Section 4.2.2	2009	2009
Monitoring Wells for GWR System	Construction of three new monitoring wells for GWR System compliance monitoring	Section 3.7.3	2004	2005
Monitoring Wells for North Basin Groundwater Protection Project	Construction of new monitoring wells to assess occurrence of groundwater contamination	Section 5.8.1	2008	2008
Extraction Wells for North Basin Groundwater Protection Project	Four new extraction wells constructed to remove contaminated groundwater	Section 5.8.1	2009	Estimated in 2010
Lincoln & Burris Exploratory Wells	Construction of ten monitoring wells to characterize the ability of sediments adjacent to the basin to percolate water	Section 4.4.1	2006	2007
Prado Wetlands Reconstruction	Flood damage repairs restore wetlands function	Section 5.3.3	2008	2008
Warner Basin Dam	Construction of a dam to replace need for building temporary earthen berms for each basin cleaning.	Section 4.4.1	2007	2007

1.6 Public Outreach

The California Water Code describes the process for development and adoption of a groundwater management plan that includes a public participation component. To adopt this plan, publicly-noticed meetings held as part of the District's regularly-scheduled board meetings and information were posted on the OCWD website. Appendix A contains copies of the public notices.

In addition to the publicly-noticed public participation opportunities and postings on the web site, the District held workshops with the Producers. The Producers include cities, special districts, and investor-owned utilities that produce more than 90 percent of the water pumped from the basin. The content of the Plan was developed with input and review from the Producers through holding workshops and providing the Producers with draft versions of the Plan prior to its finalization. This group and OCWD served as the advisory committee of stakeholders guiding the development and implementation of the plan and providing a forum for resolving controversial issues.

As part of its overall outreach program, the District informs and engages the public in groundwater discussions through an active speaker's bureau, media releases, and the water education class "Orange County Water 101".

1.7 Compliance with California Water Code

Criteria regarding adoption of a groundwater management plan are included in Section 10750 et seq. of the California Water Code, also referred to as A.B. 3030. A complete list of required and recommended components of groundwater management plans and the location of those components in the Plan can be found in Appendix B. This plan is developed to meet the requirements of the California Water Code.

1.8 Groundwater Management Goals and Basin Management Objectives

OCWD's goals in managing the Orange County groundwater basin are as follows:

- To protect and enhance the groundwater quality of the Orange County groundwater basin,
- To protect and increase the sustainable yield of the basin in a cost-effective manner, and
- To increase the efficiency of OCWD's operations.

Basin management objectives that accomplish all three of the above mentioned goals include:

- Updating the *Groundwater Management Plan* periodically,
- Updating the *Long-Term Facilities Plan* periodically, and
- Continuing annual publication of the *Santa Ana River Water Quality Report*; the *Engineer's Report on the Groundwater Conditions, Water Supply and Basin*

Utilization; the *Santa Ana River Watermaster Report*; and the *Groundwater Replenishment System Operations Annual Report*.

More specific basin management objectives set to accomplish one of the above mentioned goals are summarized below and described in detail in this report.

1.8.1 PROTECT AND ENHANCE GROUNDWATER QUALITY

Basin management objectives established by OCWD to protect and enhance groundwater quality include:

- Conducting groundwater quality monitoring programs throughout the basin.
- Monitoring and managing recharge water supplies so that water recharged through District facilities meets or is better than primary drinking water levels and notification levels.
- Monitoring the quality of Santa Ana River water on a routine basis at Imperial Highway and in the upper watershed.
- Implementing the District's Groundwater Quality Protection Policy.
- Constructing and managing water quality treatment projects.
- Operating seawater intrusion barriers to prevent landward migration of seawater into the groundwater basin.
- Supporting natural resource programs in the Santa Ana River Watershed to improve water quality.
- Participating in cooperative efforts with regulators and stakeholders within the Santa Ana River Watershed.

1.8.2 PROTECT AND INCREASE THE BASIN'S SUSTAINABLE YIELD IN A COST EFFECTIVE MANNER

Basin management objectives established by OCWD to protect and increase the basin's sustainable yield include:

- Monitoring groundwater levels, recharge rates, and production rates.
- Operating the groundwater basin in accordance with the *Groundwater Basin Storage and Operational Strategy*.
- Managing recharge operations to maximize recharge of the groundwater basin.
- Researching and implementing new strategies and programs to increase recharge capacity.
- Promoting incidental recharge to the extent feasible without negatively impacting groundwater quality.

- Planning for and conducting programs that maximize the capacity of the basin to respond to and recover from droughts.
- Supporting natural resource programs in the Santa Ana River watershed.

1.8.3 Increase Operational Efficiency

Basin management objectives established by OCWD to increase operational efficiency include:

- Managing the District's finances to provide long-term fiscal stability and to maintain financial resources to implement District programs.
- Operating District programs in a cost-effective and efficient manner.
- Managing natural resource programs in the Santa Ana River watershed in an efficient manner.
- Implementing efficient environmental management programs to reduce greenhouse gas emissions, such as use of solar power where feasible.

District programs that are conducted to meet the state goals and basin management objectives and to contribute to a more reliable supply for long-term beneficial uses of groundwater are described in the following sections, a summary of which can be found in Appendix C.

2 BASIN HYDROGEOLOGY

The groundwater basin covers approximately 350 square miles in north-central Orange County and is composed of layers of sediment with variable thickness and hydraulic properties. Because of the basin's size and complexity, understanding basin hydrogeology is critical to successful water management. This section:

- **Describes the hydrogeologic characteristics of the basin, including aquifer systems, basin boundaries, and physiographic features.**
- **Describes the major components of inflows and outflows that compromise the basin water budget.**
- **Presents groundwater storage and elevation trends and issues related to land subsidence.**
- **Explains the updated methodology for calculating accumulated overdraft and groundwater storage change implemented in 2007.**
- **Traces the history, development, and operation of the District's Basin Model.**

2.1 DESCRIPTION OF BASIN HYDROGEOLOGY

The Orange County Groundwater Basin is located in the area designated by the California Department of Water Resources (DWR) as Basin 8-1, the "Coastal Plain of Orange County Groundwater Basin" in Bulletin 118 (DWR, 2003).

Figure 2-1 displays the OCWD boundaries in relation to the boundaries of Basin 8-1. The groundwater basin underlies the north half of Orange County beneath broad lowlands known as the Tustin and Downey plains. The basin covers an area of approximately 350 square miles, bordered by the Coyote and Chino Hills to the north, the Santa Ana Mountains to the northeast, and the Pacific Ocean to the southwest. The basin boundary extends to the Orange County-Los Angeles line to the northwest, where groundwater flow is unrestricted across the county line into the Central Basin of Los Angeles County (see Figure 2-2). The Newport-Inglewood fault zone forms the southwestern boundary of all but the shallow aquifer in the basin.

Basin aquifers are over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits (DWR, 1967). In coastal and central portions of the basin, these deposits are extensively separated by lower-permeability clay and silt deposits, known as aquitards. In the inland area, generally northeast of Interstate 5, the clay and silt deposits become thinner and more discontinuous, allowing larger quantities of groundwater to flow more easily between shallow and deeper aquifers. Figure 2-3 presents a geologic cross section through the basin along the Santa Ana River.

Shallower aquifers exist above the principal aquifer system, the most prolific being known as the Talbert aquifer. Production from this shallow aquifer system is typically about five percent of total basin production. The majority of water from the shallow aquifer is pumped by small systems for industrial and agricultural use although the cities of Garden Grove, Anaheim, and Tustin have a few large system wells that pump from the shallow aquifer for municipal use.

Deeper aquifers exist below the principal aquifer system. Few wells penetrate into this region because of the high cost of drilling deep wells and because the aquifers contain colored water in some areas. The treatment and use of colored water is discussed in detail in Section 5.4.

FIGURE 2-1
DWR Bulletin 118 Groundwater Basins

2.1.1 FOREBAY AND PRESSURE AREAS

The Department of Water Resources, formerly the Division of Water Resources (DWR, 1934), divided the basin into two primary hydrologic divisions, the Forebay and Pressure areas, as shown in Figure 2-2. The Forebay/Pressure area boundary generally delineates the areas where surface water or shallow groundwater can or cannot move downward to the first producible aquifer in quantities significant from a water-supply perspective. From a water-quality perspective, the amount of vertical flow to deeper aquifers from surface water or shallow groundwater may be significant in terms of impacts of past agricultural or industrial land uses (e.g., fertilizer application and leaky underground storage tanks).

FIGURE 2-2
ORANGE COUNTY GROUNDWATER BASIN

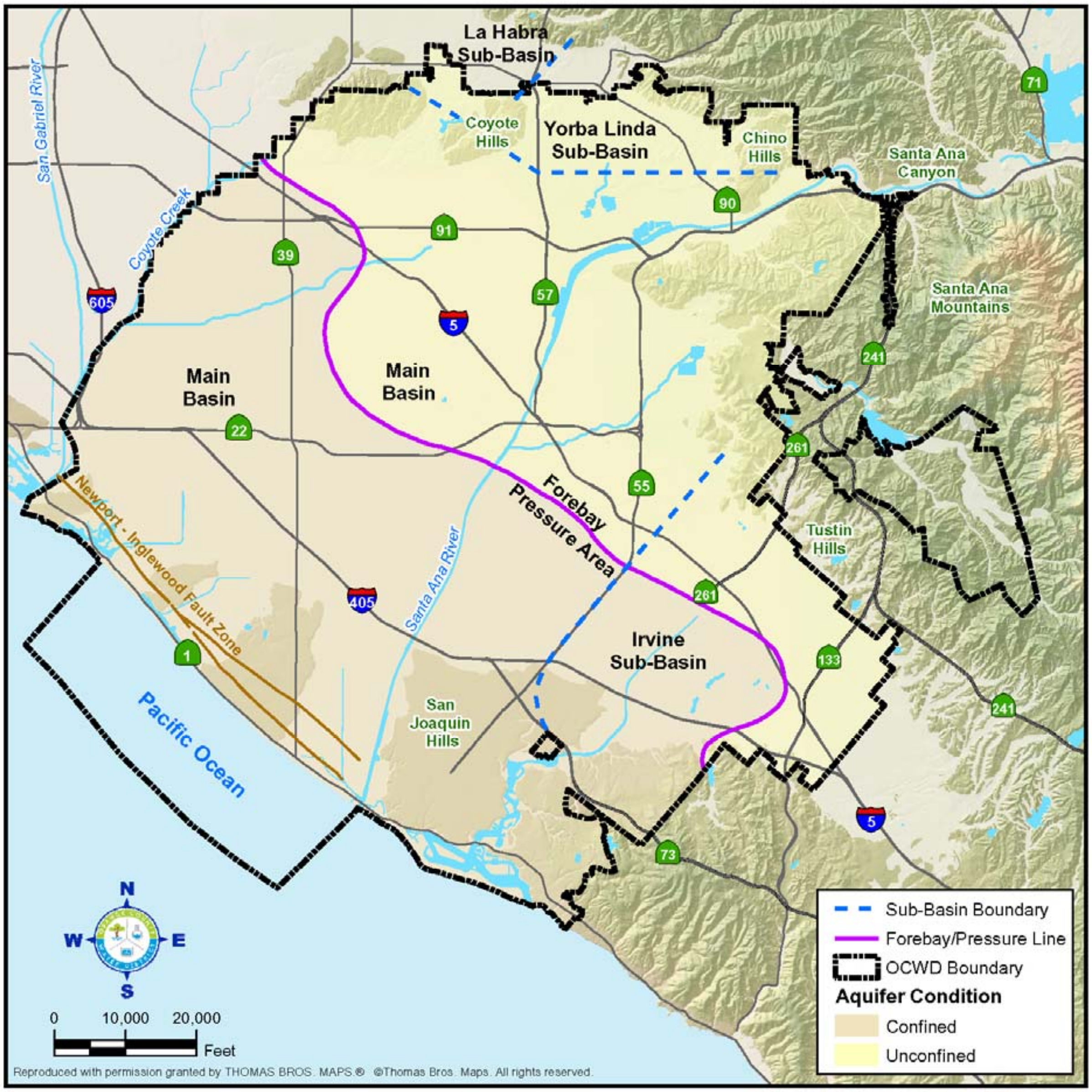
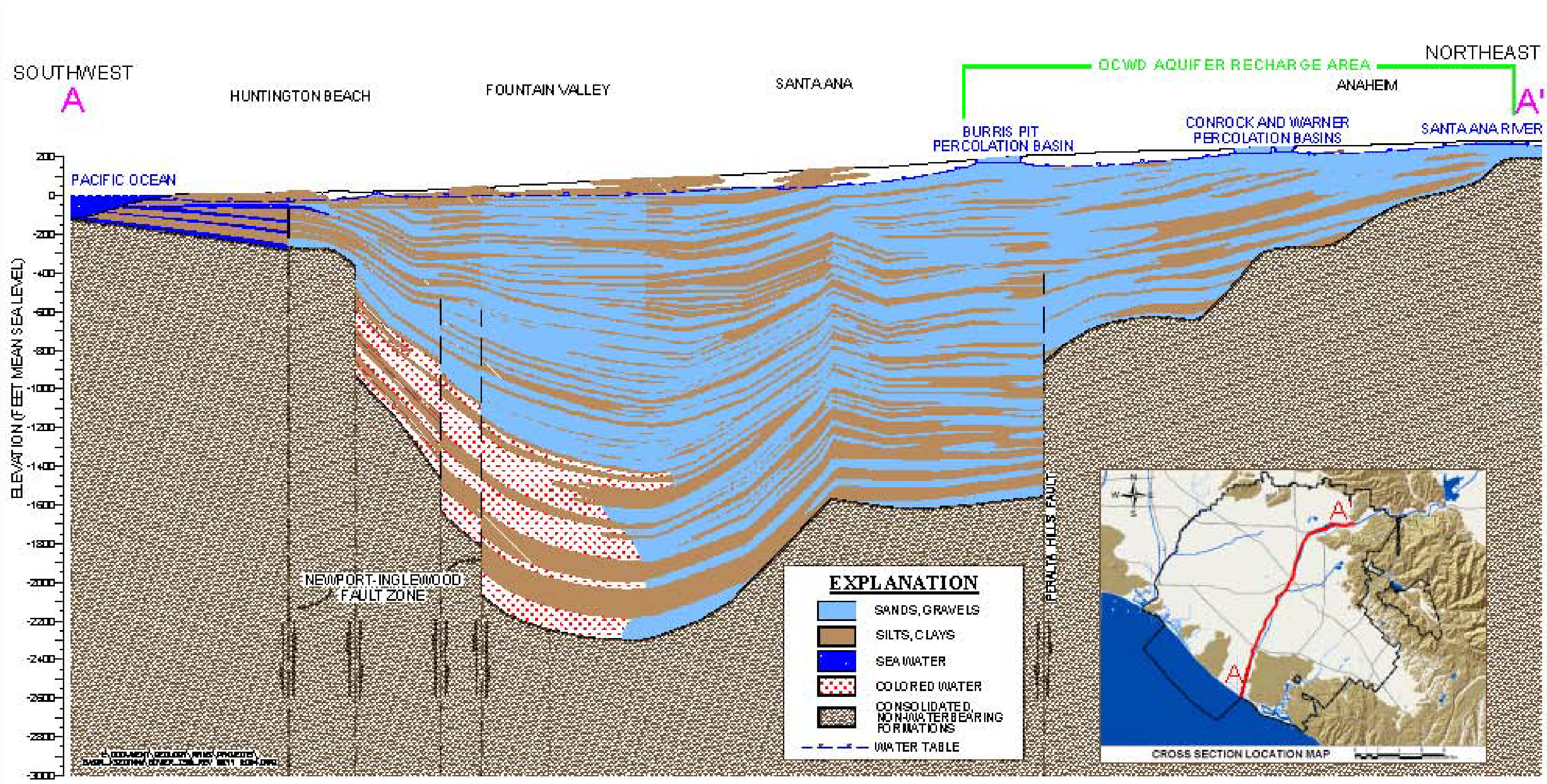


FIGURE 2-3
GEOLOGIC CROSS-SECTION THROUGH ORANGE COUNTY GROUNDWATER BASIN



The Forebay refers to the area of intake or recharge where most of the groundwater recharge occurs. Highly-permeable sands and gravels with few and discontinuous clay and silt deposits allow direct percolation of Santa Ana River and other surface water. The Forebay area encompasses most of the cities of Anaheim, Fullerton, and Villa Park and portions of the cities of Orange and Yorba Linda.

The Pressure Area, in a general sense, is defined as the area of the basin where large quantities of surface water and near-surface groundwater is impeded from percolating into the major producible aquifers by clay and silt layers at shallow depths (upper 50 feet). The principal and deeper aquifers in this area are under “confined” conditions (under hydrostatic pressure); the water levels of wells penetrating these aquifers exhibit large seasonal variations. Most of the central and coastal portions of the basin fall within the Pressure Area.

2.1.2 GROUNDWATER SUBBASINS, MESAS AND GAPS

The Irvine subbasin, bounded by the Santa Ana Mountains and the San Joaquin Hills, forms the southern-most portion of the basin. The Costa Mesa Freeway (State Route 55) and Newport Boulevard form the subbasin’s approximate western boundary with the main basin. Here the aquifers are thinner and contain more clay and silt deposits than aquifers in the main portion of the basin. The Irvine Ranch Water District (IRWD) is the primary groundwater producer.

The aquifer base in the Irvine subbasin ranges from approximately 1,000 feet deep beneath the former Marine Corps Air Station (MCAS) Tustin to less than 200 feet deep at the eastern boundary of the former MCAS El Toro. East of former MCAS El Toro, the aquifer further thins and transitions into lower-permeability sandstones and other semi-consolidated sediments, which have minor water storage and transmission capacity. Groundwater historically flowed out of the Irvine subbasin westerly into the main basin since the amount of natural recharge in the area, predominantly from the Santa Ana Mountains, was typically greater than the amount of pumping (Singer, 1973; Banks, 1984). With the operation of the Irvine Desalter Project commencing in 2007, groundwater production in the Irvine subbasin may exceed the natural replenishment from the adjacent hills and mountains, in which case groundwater would be drawn into the Irvine subbasin from the Main Basin.

The Yorba Linda subbasin is located north of the Anaheim Forebay recharge area, within the cities of Yorba Linda and Placentia. Due to low transmissivity and high total dissolved solids (TDS) concentrations (Mills, 1987) there is little groundwater pumped from this subbasin. Groundwater from the Yorba Linda subbasin flows southward into the Main basin since the limited groundwater production is less than the natural replenishment from the adjacent Chino Hills.

The La Habra Basin is located north of the Main Basin within the cities of La Habra and Brea. It comprises a shallow alluvial depression between the Coyote Hills and the Puente Hills. Similar to the Yorba Linda subbasin, little groundwater production occurs in the La Habra Basin due to low transmissivity and poor water quality (high TDS). Hydrogeologic studies have indicated that 2,200 to 5,500 afy of groundwater flows out of the La Habra Basin in two areas: (1) southerly into the Main Basin along the Brea

Creek drainage between the East and West Coyote Hills and (2) westerly into the Central basin in Los Angeles County (James M. Montgomery, 1977; Ramsey, 1980; OCWD, 1994).

Four relatively flat elevated areas, known as mesas, occur along the coastal boundary of the basin. The mesas were formed by ground surface uplift along the Newport Inglewood Fault Zone. Ancient meandering of the Santa Ana River carved notches through the uplifted area and left behind sand- and gravel-filled deposits beneath the lowland areas between the mesas, known as gaps (Poland et al., 1956). Groundwater in the shallow aquifers within the gaps is susceptible to seawater intrusion. The Talbert and Alamitos seawater intrusion barriers were constructed to address this problem. Locations of mesas and details of seawater barrier operations are discussed in Section 3.6.

2.2 DETERMINATION OF TOTAL BASIN VOLUME

A vast amount of fresh water is stored within the basin, although only a fraction of this water can be removed practically using pumping wells and without causing physical damage such as seawater intrusion or the potential for land subsidence (Alley, 2006). Nonetheless, it is important to note the total volume of groundwater that is within the active flow system, i.e., within the influence of pumping and recharge operations.

OCWD used its geographic information system and the aquifer system boundaries described in detail in Section 2.8 to calculate the total volume of each of the three major aquifer systems as well as the intervening aquitards. The total volume was calculated by multiplying the area and thickness of each hydrogeologic unit. Because groundwater fills the pore spaces that represent typically between 20 and 30 percent of the total volume, the total volume was multiplied by this porosity percentage to arrive at a total groundwater volume. Assuming the basin is completely full, based on District estimates, the total amount of fresh groundwater stored in the basin is approximately 66 million acre-feet (maf), as shown in Table 2-1.

TABLE 2-1
ESTIMATED BASIN GROUNDWATER STORAGE BY HYDROGEOLOGIC UNIT
(Volumes in Acre-feet)

Hydrogeologic Unit	Pressure Area	Forebay	Total
Shallow Aquifer System	3,800,000	1,200,000	5,000,000
Aquitard	900,000	200,000	1,100,000
Principal Aquifer System	24,300,000	8,600,000	32,900,000
Aquitard	1,600,000	300,000	1,900,000
Deep Aquifer System	18,800,000	6,300,000	25,100,000
Total	**49,400,000**	**16,600,000**	**66,000,000**

Notes: 1. Volumes calculated using the 3-layer basin model surfaces with ArcInfo Workstation GRID.
2. A porosity of 0.25 was assumed for aquifer systems.
3. A porosity of 0.30 was assumed for aquitards.

For comparison, DWR (1967) estimated that about 38 maf of fresh water is stored in the groundwater basin when full. DWR used a factor known as the specific yield to calculate this volume. The specific yield (typically between 10 and 20 percent) is the amount of water that can be drained by gravity from a certain volume of aquifer and reflects the soil's ability to retain and hold a significant volume of water due to capillary effects. Thus, DWR's *drainable* groundwater volume, although technically correct, is roughly half of OCWD's estimate of *total* groundwater volume in the basin.

2.3 WATER BUDGET

OCWD staff developed a hydrologic budget (inflows and outflows) for the purpose of constructing the Basin Model and for evaluating basin production capacity and recharge requirements. The key components of the budget include measured and unmeasured (estimated) recharge, groundwater production, and subsurface flows along the coast and across the Orange/Los Angeles County line. Because the basin is not operated on an annual safe-yield basis, the net change in storage in any given year may be positive or negative; however, over the period of several years, the basin must be maintained in an approximate balance.

Table 2-2 presents the components of a balanced basin water budget (no annual change in storage) and does not represent data for any given year. The annual budget presented is based on the following assumptions: (1) average precipitation, (2) accumulated overdraft of 400,000 af, (3) recharge of 235,000 af at the Forebay recharge facilities, and (4) adjusted groundwater production so that total basin inflows and outflows are equal. The 235,000 af of Forebay recharge consists of 148,000 af of Santa Ana River baseflow, 50,000 af of Santa Ana River stormflow, and 37,000 af of GWR System water. The major components of the water budget are described in the following sections.

2.3.1 MEASURED RECHARGE

Measured recharge consists of all water artificially recharged at OCWD's Forebay percolation facilities and water injected at the Talbert Barrier and on the Orange County side of the Alamitos Barrier. Santa Ana River stormflows and baseflows serve as the primary source of recharge in the Forebay.

OCWD's Talbert Barrier is a series of injection wells that span the 2.5-mile wide Talbert Gap, between the Newport and Huntington Beach mesas. A blend of imported and purified water is injected into multiple aquifers that are used for municipal supply. Over 95 percent of the injected water flows inland and becomes part of the basin's replenishment supply.

The Alamitos Barrier is a series of wells injecting a blend of imported and purified water into multiple aquifer zones that span the Alamitos Gap at the Los Angeles/Orange County line. Essentially all of the injected water flows inland, replenishing groundwater basins in the two counties. From inspection of groundwater contour maps, it appears that roughly one-third of the Alamitos Barrier injection water remains within or flows into Orange County.

TABLE 2-2
REPRESENTATIVE ANNUAL BASIN WATER BUDGET

FLOW COMPONENT	Acre-feet
INFLOW	
Measured Recharge	
1. Forebay recharge facilities	235,000
2. Talbert Barrier injection	35,000
3. Alamitos Barrier injection, Orange County portion only	2,500
Subtotal:	**272,500**
Estimated Unmeasured Recharge (average precipitation)	
1. Inflow from La Habra basin	3,000
2. Recharge from foothills into Irvine subbasin	14,000
3. Areal recharge from rainfall/irrigation into Main basin	17,500
4. Recharge from foothills into Yorba Linda subbasin	6,000
5. Subsurface inflow at Imperial Highway beneath Santa Ana River	4,000
6. Santa Ana River recharge, Imperial Highway to Rubber Dam	4,000
7. Subsurface inflow from Santiago Canyon	10,000
8. Recharge along Peralta Hills	4,000
9. Recharge along Tustin Hills	6,000
10. Seawater inflow through coastal gaps	500
Subtotal:	**69,000**
TOTAL INFLOW:	**341,500**
OUTFLOW	
1. Groundwater Production	333,500
2. Subsurface Outflow	8,000
TOTAL OUTFLOW:	**341,500**
CHANGE IN STORAGE:	**0**

2.3.2 UNMEASURED RECHARGE

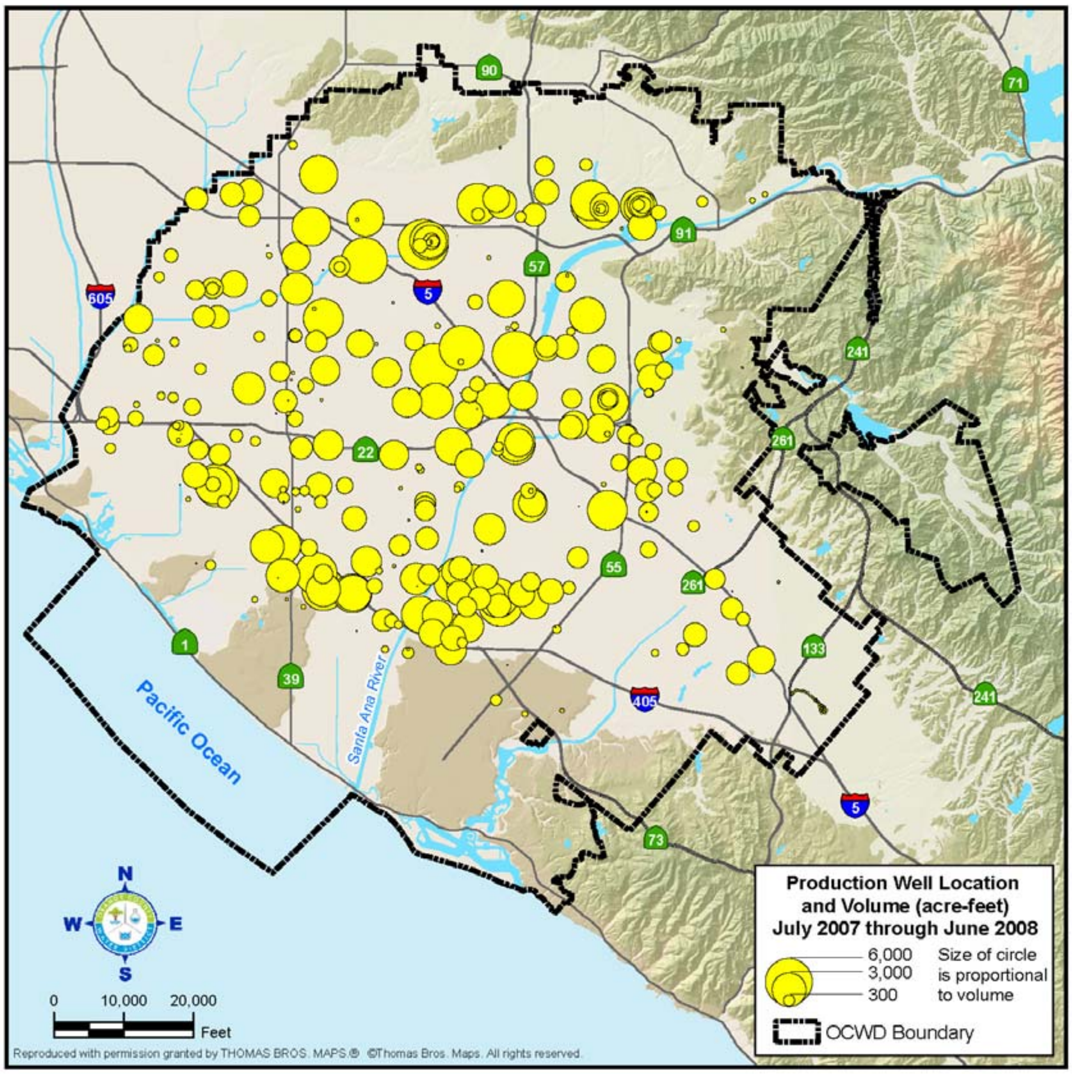
Unmeasured recharge also referred to as “incidental recharge” accounts for a significant amount of the basin’s producible yield. This includes recharge from precipitation at the basin margin along the Chino, Coyote, and San Joaquin Hills and the Santa Ana Mountains; Santa Ana River recharge between Imperial Highway and the OCWD rubber diversion dam; irrigation return flows; urban runoff; and underflow beneath the Santa Ana River and Santiago Creek. This latter refers to groundwater that enters the basin at the mouth of Santa Ana Canyon, the Santiago Creek drainage below Villa Park Dam, and seawater inflow through the gaps.

Unmeasured recharge is estimated at an average of 60,000 afy. This number is derived from estimating annual changes in groundwater storage by comparing groundwater elevation changes, after subtracting losses to Los Angeles County. Net incidental recharge is used to refer to the amount of incidental recharge after accounting for groundwater losses, such as outflow to Los Angeles County. This average unmeasured recharge was substantiated during calibration of the Basin Model and is also consistent with the estimate of 58,000 afy reported by Hardt and Cordes (1971) as part of a U.S. Geological Survey (USGS) modeling study of the basin. Because unmeasured recharge is one of the least understood components of the basin's water budget, the error margin of staff's estimate for any given year is probably in the range of 10,000 to 20,000 af. Since the unmeasured recharge is well distributed throughout the basin, the physical significance (e.g., water level drawdown or mounding in any given area) of over- or underestimating the total recharge volume within this error margin is considered to be minor.

2.3.3 GROUNDWATER PRODUCTION

Groundwater production from the basin, as shown in Figure 2-4, occurs from approximately 450 active wells within the District, approximately 200 of which produce less than 25 afy.

FIGURE 2-4
DISTRIBUTION OF GROUNDWATER PRODUCTION



Groundwater production from approximately 200 large-capacity or large-system wells operated by the 21 largest water retail agencies accounted for an estimated 97 percent of the total production in 2006-07. Large-capacity wells are all metered, as required by the District Act, and monthly individual well production has been documented since 1988. Prior to 1988, per-well production data were recorded semi-annually.

Groundwater production is distributed uniformly throughout the majority of the basin with the exceptions of the Yorba Linda subbasin, the immediate coastal areas, and the foothill margins of the basin, where little to no production occurs. Increases in coastal production would lead to increased stress on the Talbert and Alamitos barriers, requiring additional barrier capacity. Inasmuch as it is technically and economically feasible, future increases in coastal groundwater demand should be addressed by wells constructed inland in areas of lower well density and higher aquifer transmissivity.

The distribution of existing wells and the siting of future wells depend on many different factors, including logistics, property boundaries, hydrogeology, and regulatory guidelines. Logistical considerations include property availability, city and other political boundaries, and proximity to other water facilities. Proximity to existing water transmission pipelines can be extremely important, given the cost of new reaches of pipeline. Hydrogeologic considerations for siting a well may include: thickness of permeable aquifer units, groundwater quality, drawdown interference from nearby wells, seasonal water level fluctuations, and potential impacts to the basin such as seawater intrusion.

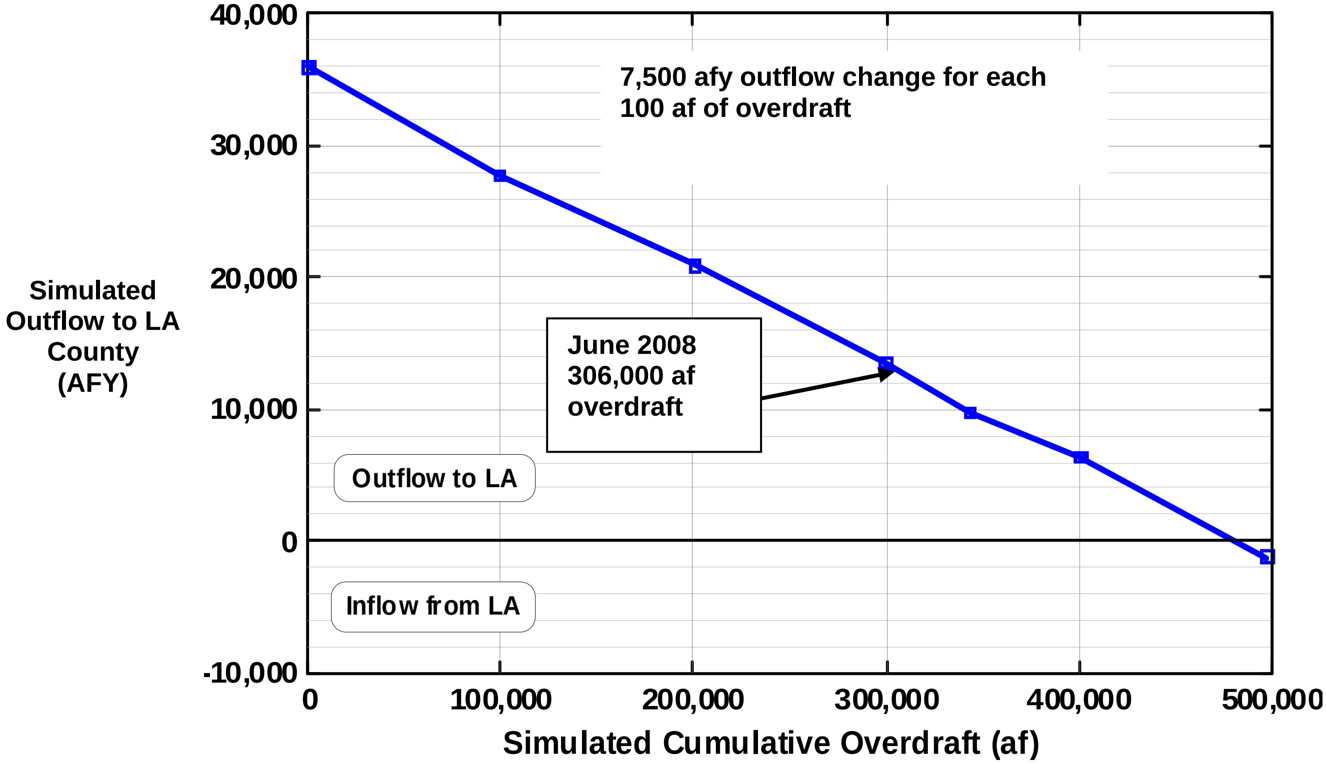
2.3.4 SUBSURFACE OUTFLOW

Groundwater outflow from the basin across the Los Angeles/Orange County line has been estimated to range from approximately 1,000 to 14,000 afy based on groundwater elevation gradients and aquifer transmissivity (DWR, 1967; McGillicuddy, 1989). The Water Replenishment District has also indicated underflow from Orange County to Los Angeles County within the aforementioned range. Underflow varies annually and seasonally depending upon hydrologic conditions on either side of the county line.

Modeling by OCWD indicated that, assuming groundwater elevations in the Central Basin remain constant; underflow to Los Angeles County increases approximately 7,500 afy for every 100,000 af of increased groundwater in storage in Orange County (see Figure 2-5).

With the exception of unknown amounts of semi-perched (near-surface) groundwater being intercepted and drained by submerged sewer trunk lines and unlined flood control channels along coastal portions of the basin, no other significant basin outflows are known to occur.

FIGURE 2-5
RELATIONSHIP BETWEEN BASIN STORAGE AND ESTIMATED OUTFLOW



2.4 GROUNDWATER ELEVATION AND STORAGE CALCULATION

OCWD estimates annual changes in the amount of groundwater stored in the basin using groundwater elevation measurements and aquifer storage coefficients for the three primary aquifer systems in the basin. This three-layer method involves measuring the water levels at the end of each water year at nearly every production and monitoring well in the basin. Water level measurements are contoured, as shown in Figure 2-6, and then digitized into the Geographic Information System (GIS). The GIS is then used to subtract the previous year's water level maps from the current water year, resulting in a water level change contour map for each of the three aquifer layers. Figure 2-7 shows the water level change for the principal aquifer (layer 2). For each of the three aquifer layers, the GIS is then used to multiply these water level changes by a grid of aquifer storage coefficients from OCWD's calibrated basin groundwater model. This results in a storage change volume for each of the three aquifer layers, which are totaled to provide a net annual storage change for the basin.

A more detailed description of the three-layer methodology is presented in OCWD's *Report on Evaluation of Orange County Groundwater Basin Storage and Operational Strategy* (February 2007).

FIGURE 2-6
JUNE 2008 WATER LEVELS

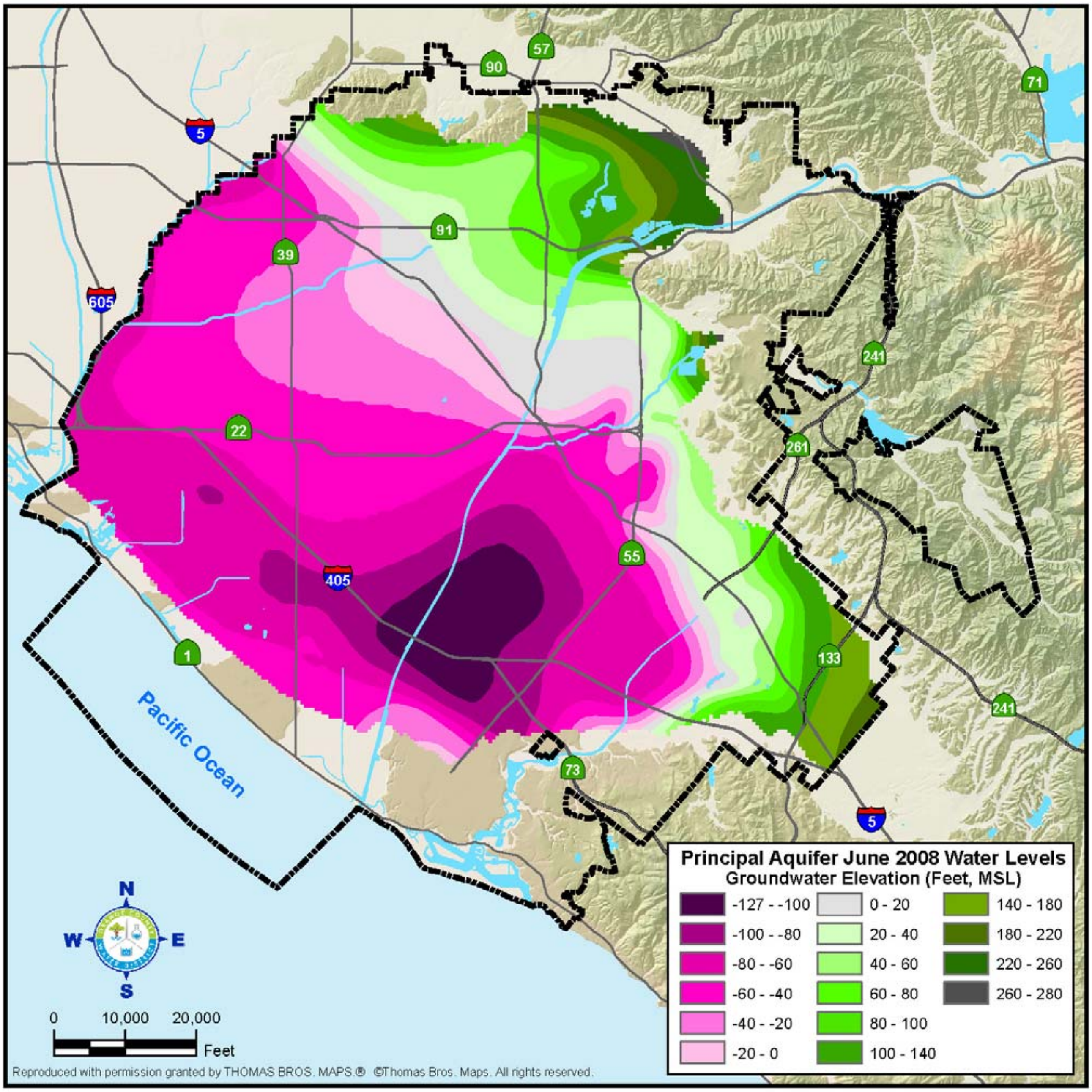
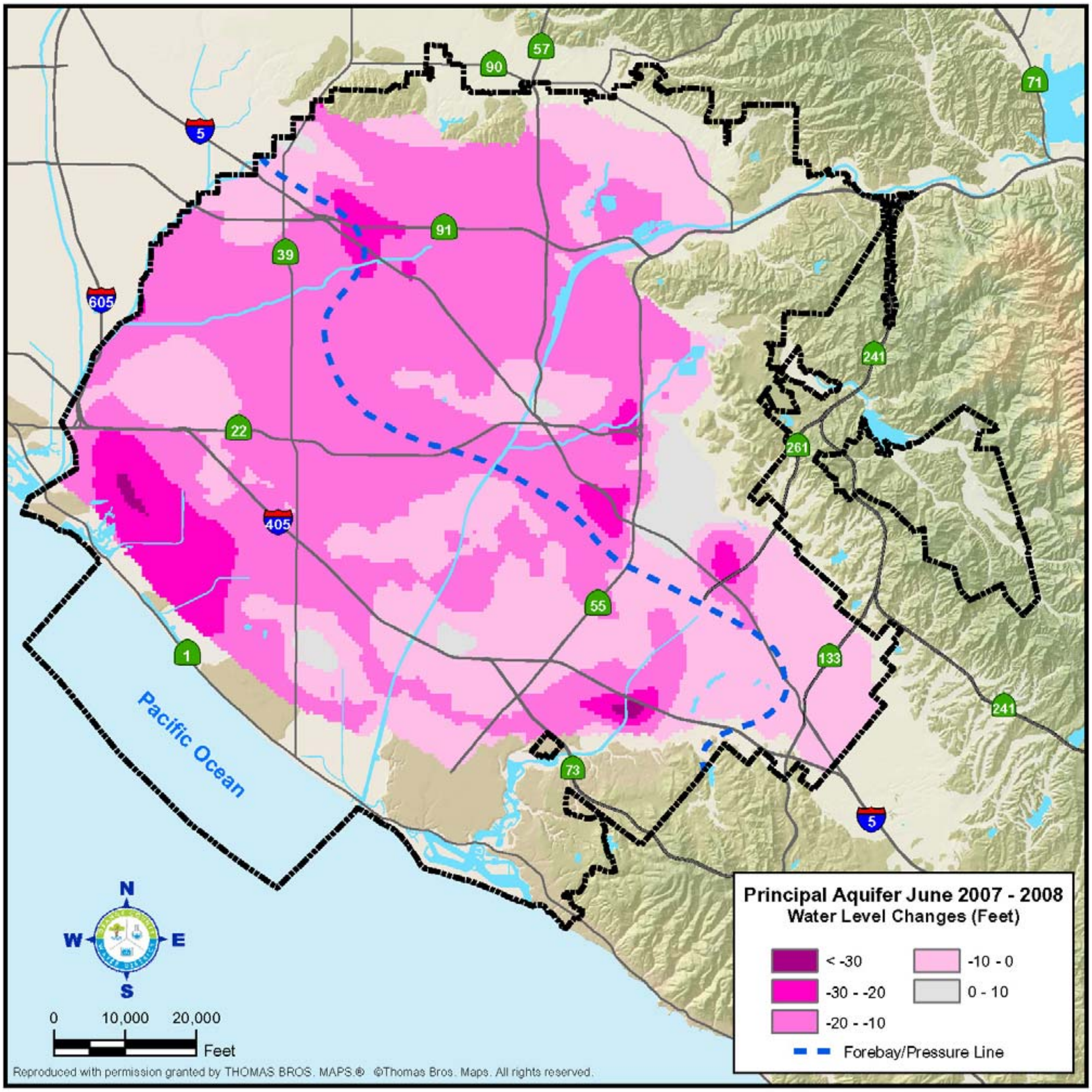


FIGURE 2-7
WATER LEVEL CHANGES

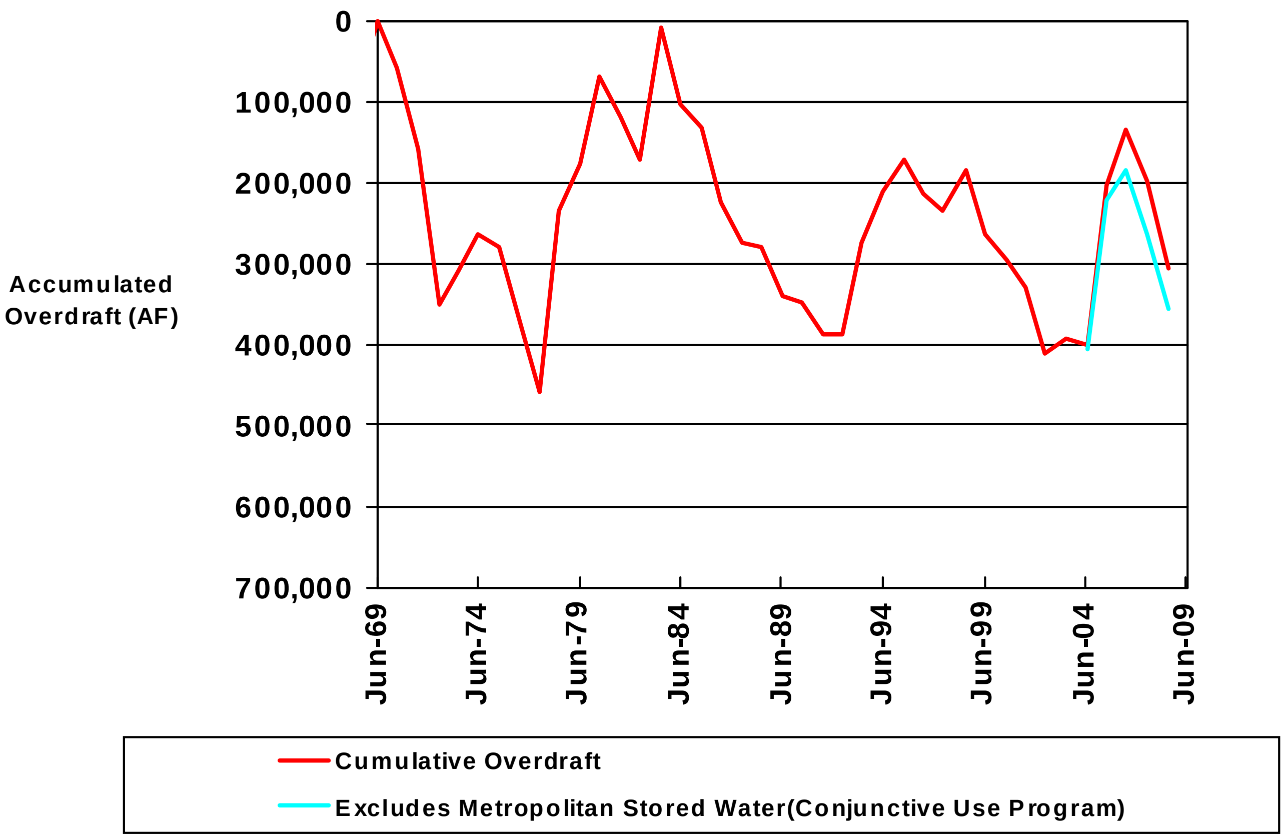


2.5 ACCUMULATED OVERDRAFT CALCULATION

OCWD estimates that the basin can be operated on a short-term basis with a maximum accumulated overdraft (storage reduction from full condition) of approximately 500,000 af without causing irreversible seawater intrusion and land subsidence.

The estimated maximum historical accumulated basin overdraft of 500,000 to 700,000 af occurred in 1956-57 (DWR, 1967; OCWD, 2003). Until 2007, water level elevations in November 1969 were used as the baseline to represent near-full conditions. The net decrease in storage from 1969 conditions represented the accumulated overdraft. Since 2004, OCWD has participated in Metropolitan's Conjunctive Use Program. This program allows for the storage of Metropolitan water in the Orange County groundwater basin. Figure 2-8 illustrates the basin accumulated overdraft since 1962. The accumulated overdraft including the Metropolitan Conjunctive Use water is shown in red. The blue line indicates the basin accumulated overdraft calculated without Metropolitan's stored water.

FIGURE 2-8
ACCUMULATED BASIN OVERDRAFT



2.5.1 DEVELOPMENT OF NEW METHODOLOGY

The traditional full-basin benchmark of 1969 was revised in 2007. A new methodology was developed to calculate accumulated overdraft and storage change. The need for this new methodology was driven by the record-setting wet year of 2004-05, in which an unprecedented storage increase of 170,000 af was estimated by OCWD staff.

During that year, water levels throughout the basin rose approximately 30 feet overall, approaching a near-full condition. Analysis showed that groundwater in storage in November 2005 was only 40,000 af less than the full basin 1969 benchmark. However, the traditional method of cumulatively adding the annual storage change each year to the previous year's accumulated overdraft produced an accumulated overdraft of approximately 190,000 acre-feet for November 2005. The discrepancy of 150,000 af in the two different calculations indicated that the current condition could not be properly rectified back to the 1969 benchmark. This brought to light three important discoveries:

- The traditional storage change calculation contained considerable uncertainty that when cumulatively added over tens of years, led to a large discrepancy in the accumulated overdraft relative to 1969.
- Water level conditions in 1969 no longer represent a full basin, particularly because of changes in pumping and recharge conditions.
- A more accurate storage change calculation should be based on water level changes and storage coefficients for each of the three major aquifer systems.

In February 2007, the District adopted an updated approach to defining the full basin condition and calculating storage changes. This updated approach includes:

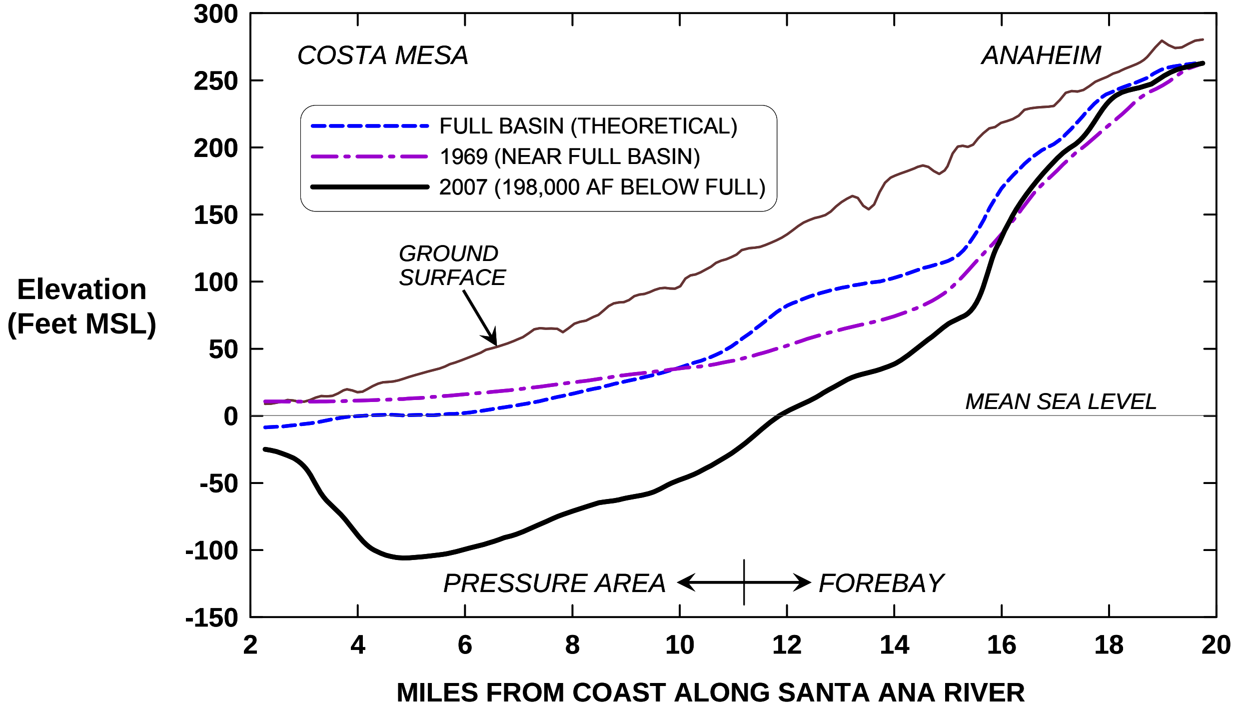
- A new full-basin groundwater level based on the following prescribed conditions:
  - Observed historical high water levels
  - Present-day pumping and recharge conditions
  - Protective of seawater intrusion
  - Minimal potential for mounding at or near recharge basins
- Calculation of the amount of groundwater in storage in each of the three major aquifer systems.

A more detailed description of this new methodology is presented in OCWD's *Report on Evaluation of Orange County Groundwater Basin Storage and Operational Strategy* (February 2007), which is included as Appendix D.

2.6 ELEVATION TRENDS

Groundwater elevation profiles for the principal aquifer, generally following the Santa Ana River from Costa Mesa to the Anaheim Forebay area, are shown in Figure 2-9. The groundwater elevation profiles represent the newly-calculated full basin condition, 1969 conditions (formerly considered full), and 2007 conditions. A comparison of these profiles shows that groundwater elevations in the Forebay recharge area are relatively close while elevations in 2007 are significantly lower in the central and coastal portions of the basin than the full or 1969 conditions.

FIGURE 2-9
PRINCIPAL AQUIFER HISTORICAL GROUNDWATER ELEVATION PROFILES



The lowering of coastal area groundwater levels relative to groundwater levels further inland in the Forebay translates into a steeper hydraulic gradient, which drives greater flow from the Forebay to the coastal areas. However, the lowering of coastal water levels also increases seawater intrusion potential.

Figure 2-10 presents average groundwater elevations for the principal aquifer in the Forebay, coastal areas, and the total basin on November 1 of each year, when groundwater levels are somewhat intermediate between the late summer low and late winter high. Average values were calculated using a 1,000-foot square grid and the groundwater elevation contour map prepared each year. Groundwater elevations were estimated at each grid point using the groundwater elevation contours, and the average values were calculated for each of the three areas.

A comparison of the groundwater level trends in Figure 2-10 to the changes in accumulated overdraft in Figure 2-8 provides insights into the basin's response during filling and emptying cycles. From November 2003 to November 2005, the basin's accumulated overdraft reduced 220,000 af due to the near-record high precipitation in water year 2004-05. During this period of refill, average groundwater levels in the coastal area increased approximately 20 feet, while groundwater levels in the Forebay increased approximately 40 feet. Between November 2005 and November 2007, basin accumulated overdraft increased approximately 100,000 af as groundwater withdrawals exceeded recharge due to several factors, including near-record low precipitation. Average groundwater levels during this period fell by 40 feet in the Forebay and coastal areas.

FIGURE 2-10
AVERAGE PRINCIPAL AQUIFER GROUNDWATER ELEVATIONS FOR THE FOREBAY, TOTAL BASIN, AND COASTAL AREA

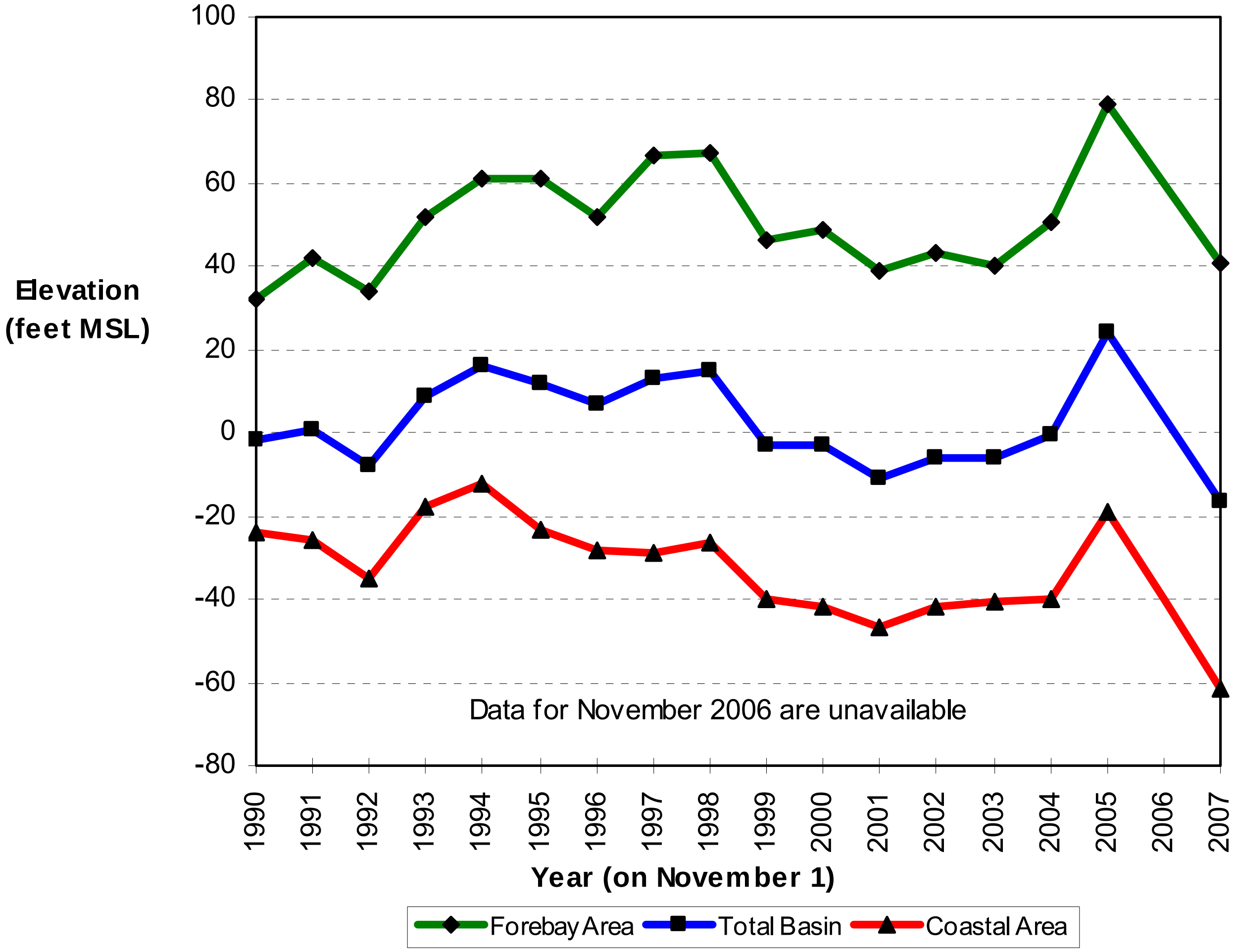


Figure 2-11 shows the locations of four wells, A-27, SA-21, SAR-1, and OCWD-CTG1, with long-term groundwater level data. Figure 2-12 presents water level hydrographs and locations of wells A-27 and SA-21, representing historical conditions in the Forebay and Pressure area, respectively. The hydrograph data for well A-27 near Anaheim Lake date back to 1932 and indicate that the historic low water level in this area occurred in 1951-52. The subsequent replenishment of Colorado River water essentially refilled the basin by 1965. Water levels in this well reached an historic high in 1994 and have generally remained high as recharge has been nearly continuous at Anaheim Lake since the late 1950s.

The hydrograph for well SA-21 indicates that water levels in this area have decreased since 1970. In addition, the magnitude of the seasonal water level fluctuations has approximately doubled from pre-1990 to the present. The increased water level fluctuations are due to a combination seasonal water demand-driven pumping and participation in the Metropolitan Short-Term Seasonal Storage Program by local

Producers (Boyle Engineering and OCWD, 1997), which encouraged increased pumping from the groundwater basin during summer months when Metropolitan was experiencing high demand for imported water. Although this program did not increase the amount of pumping from the basin on an annual basis, it did result in greater water level declines during the summer.

FIGURE 2-11
LOCATION OF LONG-TERM GROUNDWATER ELEVATION HYDROGRAPH

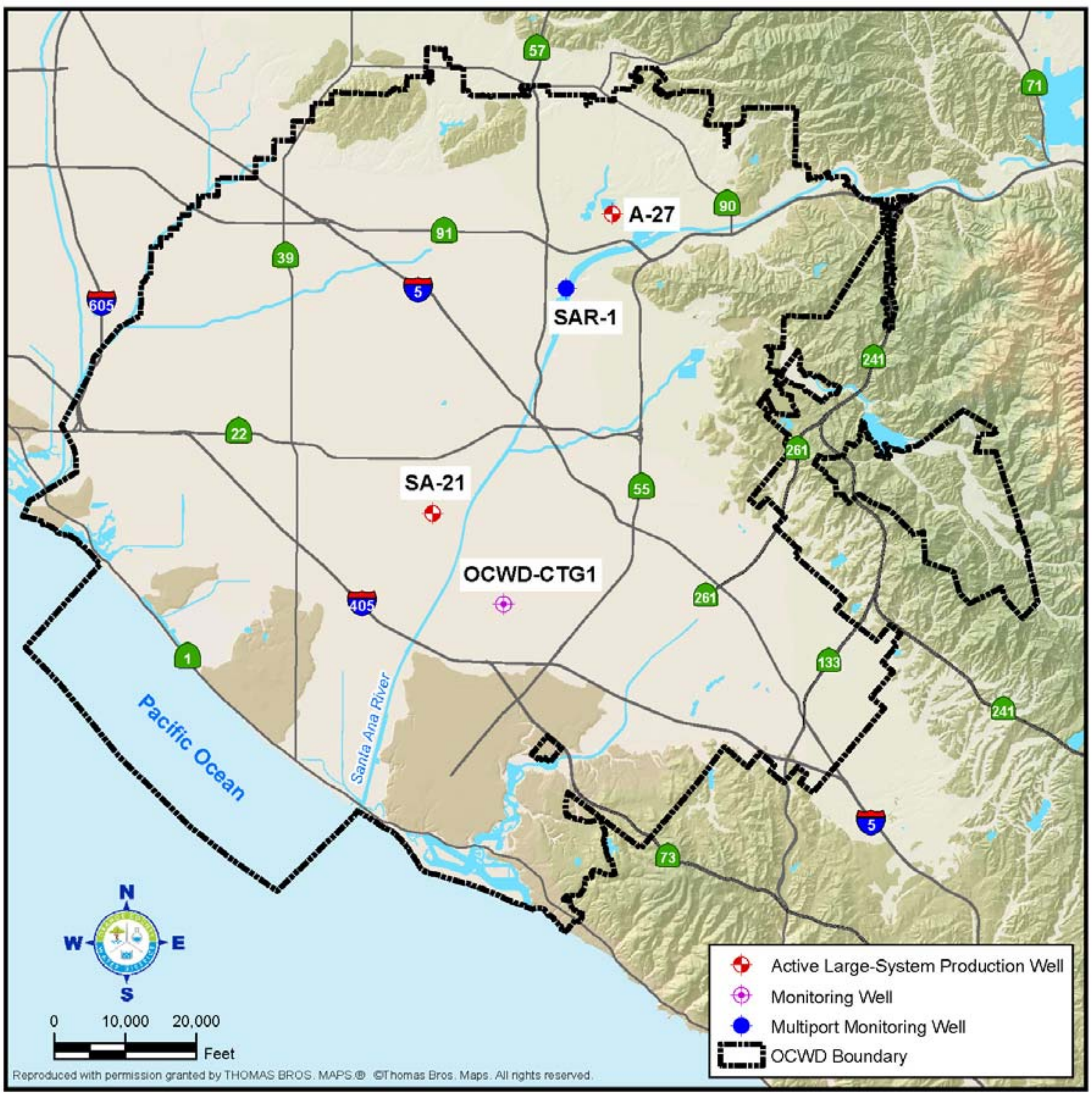
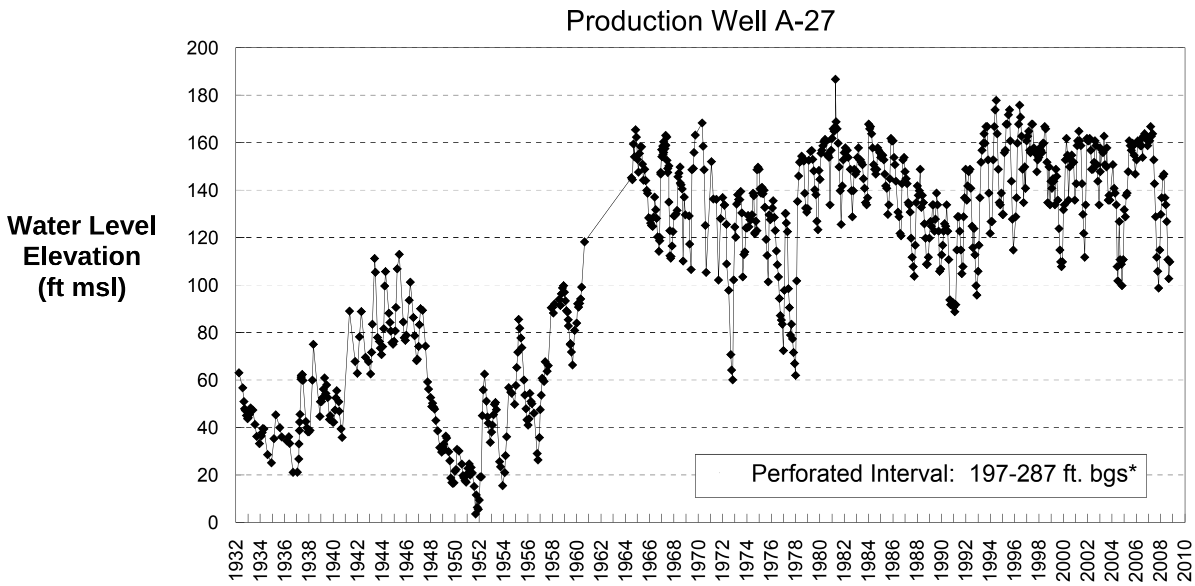
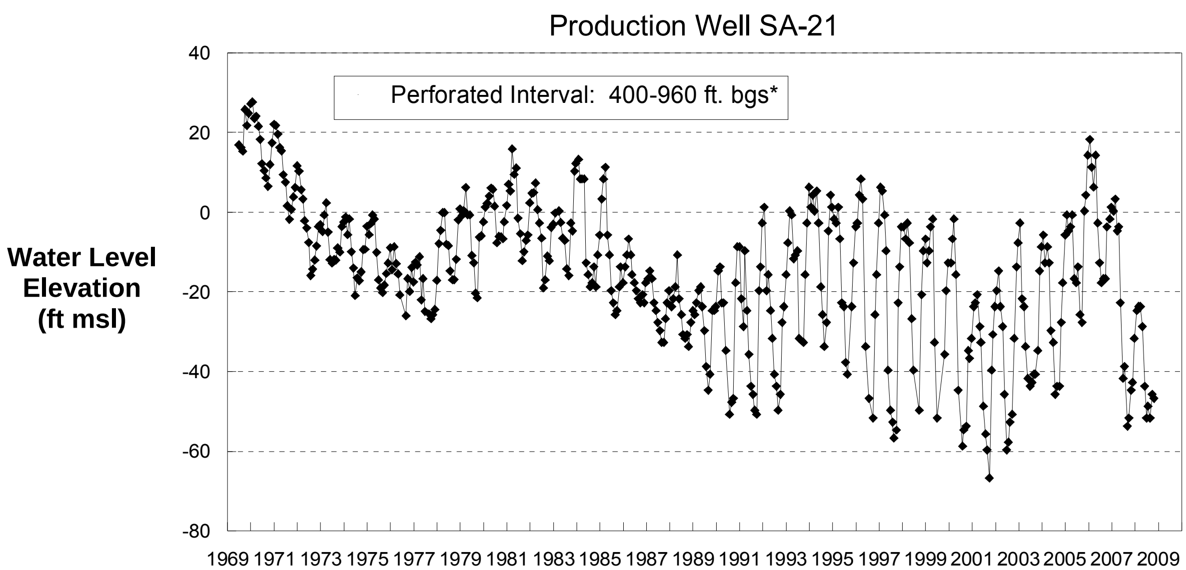


FIGURE 2-12
WATER LEVEL HYDROGRAPHS OF WELLS A-27 AND SA-21

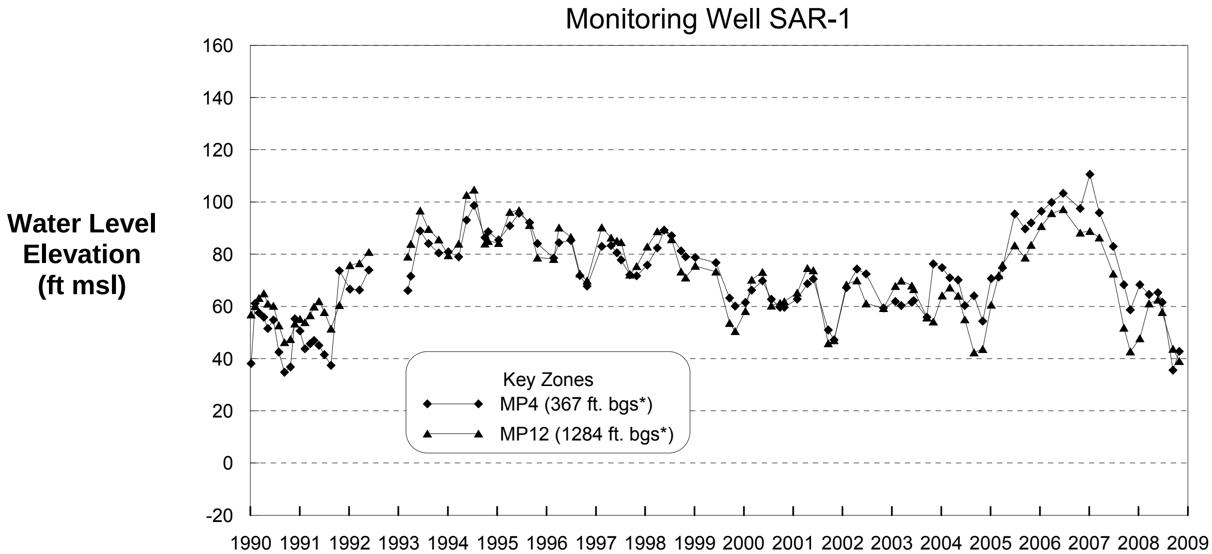


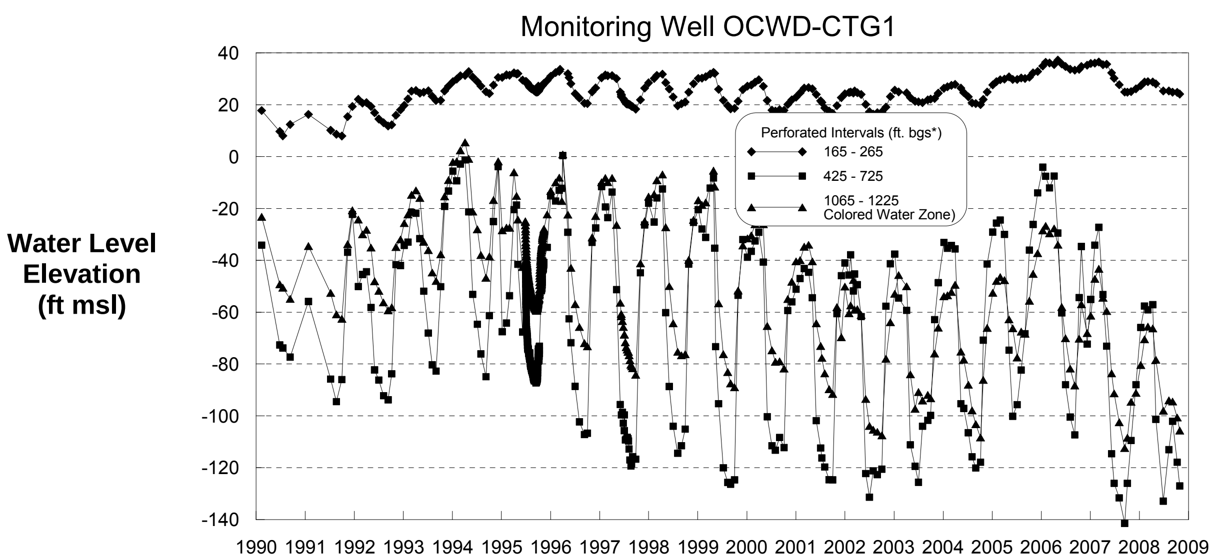


*msl = mean sea level *bgs = below ground surface

Figure 2-13 presents water level hydrographs and locations of two OCWD multi-depth monitoring wells, SAR-1 and OCWD-CTG1, showing the relationship between water level elevations in aquifer zones at different depths. The hydrograph of well SAR-1 in the Forebay exhibits a similarity in water levels between shallow and deep aquifers, which indicates the high degree of hydraulic interconnection between aquifers characteristic of much of the Forebay.

FIGURE 2-13
WATER LEVEL HYDROGRAPHS OF WELLS SAR-1 AND OCWD-CTG1





*msl = mean sea level *bgs = below ground surface

The hydrograph of well OCWD-CTG1 is typical of the Pressure Area in that a large water level distinction is observed between shallow and deep aquifers, indicating the effects of a clay/silt layer that restricts vertical groundwater flow. Water levels in the deepest aquifer zone at well OCWD-CTG1 have higher elevations than overlying aquifers, in part, because few wells directly produce water from these zones, primarily due to their associated colored water.

2.7 LAND SUBSIDENCE

Subsidence of the ground surface has been associated with groundwater withdrawal in many regions of the world. In the case of thick sedimentary groundwater basins comprised of alternating “confined” or “pressure” aquifers (permeable sands and gravels) and aquitards (less permeable silts and clays), the extraction of groundwater reduces the fluid pressure of the saturated pore spaces within the buried sediments. The pressure reduction in the deeper sediments allows the weight of the overlying sediments to compact the deeper sediments, particularly the clays and silts. If groundwater withdrawals cause water level drawdowns to be sustained for several years or more, the incremental amount of sediment compaction can eventually manifest itself in a measurable lowering of the land surface (USGS, 1999).

OCWD commissioned a study by the DWR (1980) to evaluate the potential for land subsidence in the basin. Because the study was limited in scope, its findings were deemed preliminary pending further investigation. Nevertheless, the study cited survey data from the Orange County Surveyor that indicated that the land surface in the city of Santa Ana declined a maximum of 0.84 inch/year from 1956 to 1961. Surveys during the period 1970 to 1976 indicated maximum land surface declines of 0.24 inch/year in Santa Ana. Key findings of the study included the following:

- Subsidence in the City of Santa Ana is apparently related to the removal of groundwater. However, it is not possible to directly correlate observed subsidence and historic water-level declines.
- Subsidence in the vicinity of the City of Huntington Beach can be attributed to the removal of oil.
- Most of the compaction takes place in the fine-grained sediments.
- Water squeezed out of the compacted fine-grained sediments, known as “water of compaction,” results in a permanent loss of storage in fine-grained sediments.

Land surface changes (rising and lowering) of similar magnitude to those noted by DWR were reported by Bawden (Bawden et al, 2001) while reviewing satellite radar images for a seismic assessment of Southern California. Bawden reported seasonal land surface changes of up to 4.3 inches (total seasonal amplitude from high to low) in the Los Angeles-Orange County area and a net decline of approximately 0.5 inch/year near Santa Ana over the period 1993 to 1999, which coincides with a period of net withdrawal of groundwater from the basin. Despite the indications of land subsidence to some degree in portions of Orange County, there has been no indication that the suggested land surface changes have caused, or are likely to cause, any structural damage in the area. By maintaining groundwater levels and basin storage within its historical operating range, the potential for problematic land subsidence is reduced. Conversely, land subsidence could become a problem if the basin was overdrafted beyond the historical operating range.

Groundwater withdrawals are regulated within the basin operating range, which is explained in detail in Section 6.5. In the event that land subsidence becomes a problem in a localized area, OCWD will work with local officials to investigate and remediate the problem.

2.8 GROUNDWATER MODEL DESCRIPTION

In general, a groundwater flow model contains two major components: the mathematical model and the conceptual model. The mathematical model is the computer program used to solve the complex system of equations that govern the flow of groundwater. The conceptual model is the hydrogeologic framework of the area being modeled, obtained by gathering, analyzing, interpreting, and finally integrating all the geologic and hydrologic data for a given area into a conceptual understanding of how the flow system looks and behaves.

For a properly-constructed model, the mathematical model needs to be appropriate for the level of detail inherent in the conceptual model. For a mathematical model solved by numerical methods, the modeled area must be divided into a mesh of grid cells – the smaller the grid cells, generally the more accurate the computations – assuming the hydrogeology can be reasonably-defined at the grid cell level of detail. Based on all the input data, the model calculates a water level elevation and fluxes for each and every grid cell of the modeled area at a given point in time.

OCWD's basin model encompasses the entire basin and extends approximately three miles into the Central Basin in Los Angeles County to provide for more accurate model results than if the model boundary stopped at the county line (see Figure 2-14). As noted previously in this chapter, the county line is not a hydrogeologic boundary, i.e., groundwater freely flows through aquifers that have been correlated across the county line.

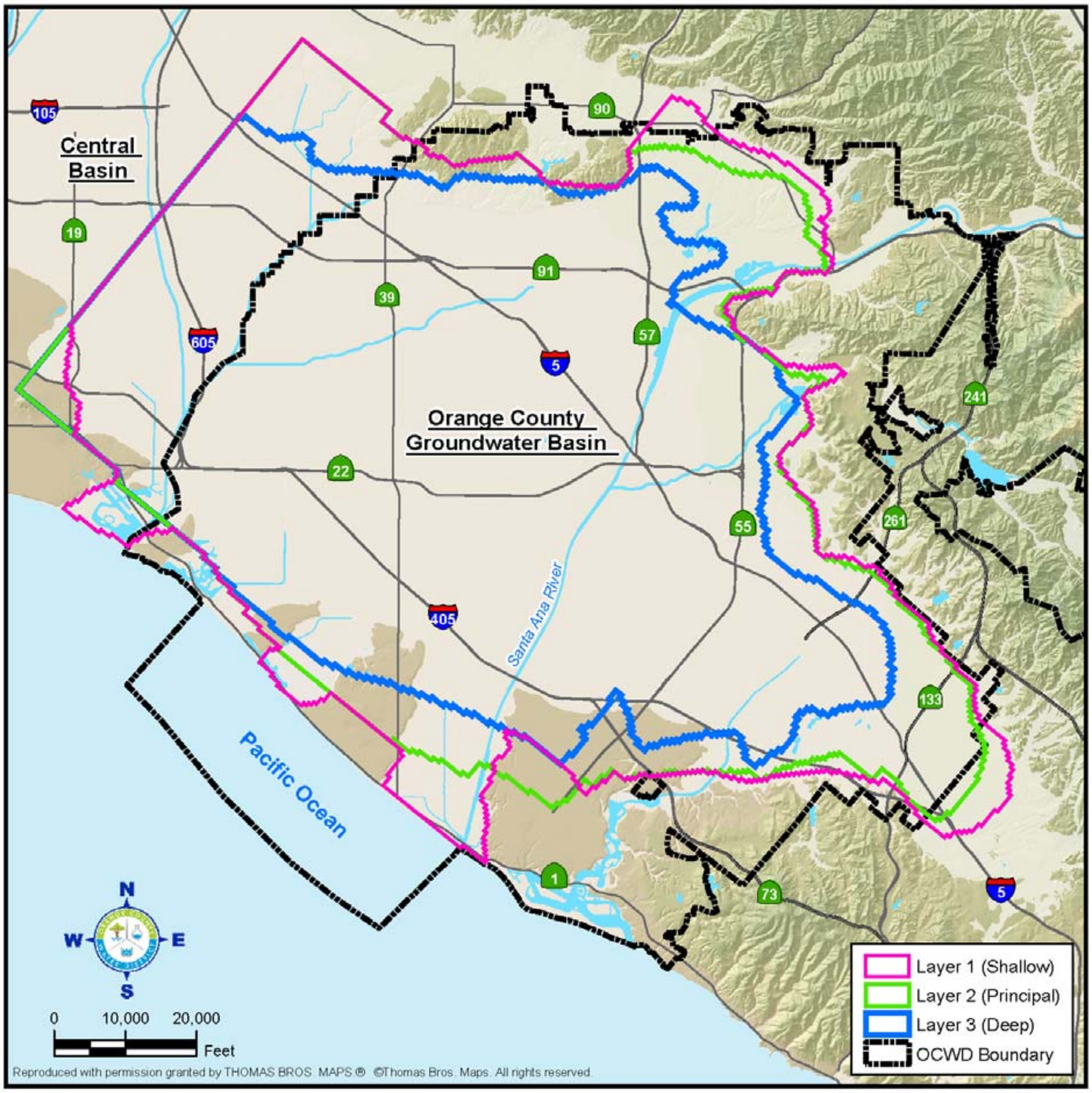
Coverage of the modeled area is accomplished with grid cells having horizontal dimensions of 500 feet by 500 feet (approximately 5.7 acres) and vertical dimensions ranging from approximately 50 to 1,800 feet, depending on the thickness of each model layer at that grid cell location. Basin aquifers and aquitards were grouped into three composite model layers thought sufficient to describe the three distinguishable flow systems referred to as the shallow, principal, and deep aquifer systems. The three model layers comprise a network of over 90,000 grid cells.

The widely-accepted computer program, "MODFLOW," developed by the USGS, was used as the base modeling code for the mathematical model (McDonald and Harbaugh, 1988). Analogous to an off-the-shelf spreadsheet program needing data to be functional, MODFLOW requires vast amounts of input data to define the hydrogeologic conditions in the conceptual model. The types of information that must be input in digital format (data files) for each grid cell in each model layer include the following:

- Aquifer top and bottom elevations

- Aquifer lateral boundary conditions (ocean, faults, mountains)
- Aquifer hydraulic conductivity and storage coefficient/specific yield
- Initial groundwater surface elevation
- Natural and artificial recharge rates (runoff, precipitation, percolation, injection)
- Groundwater production rates for approximately 200 large system and 200 small system wells

FIGURE 2-14
BASIN MODEL EXTENT

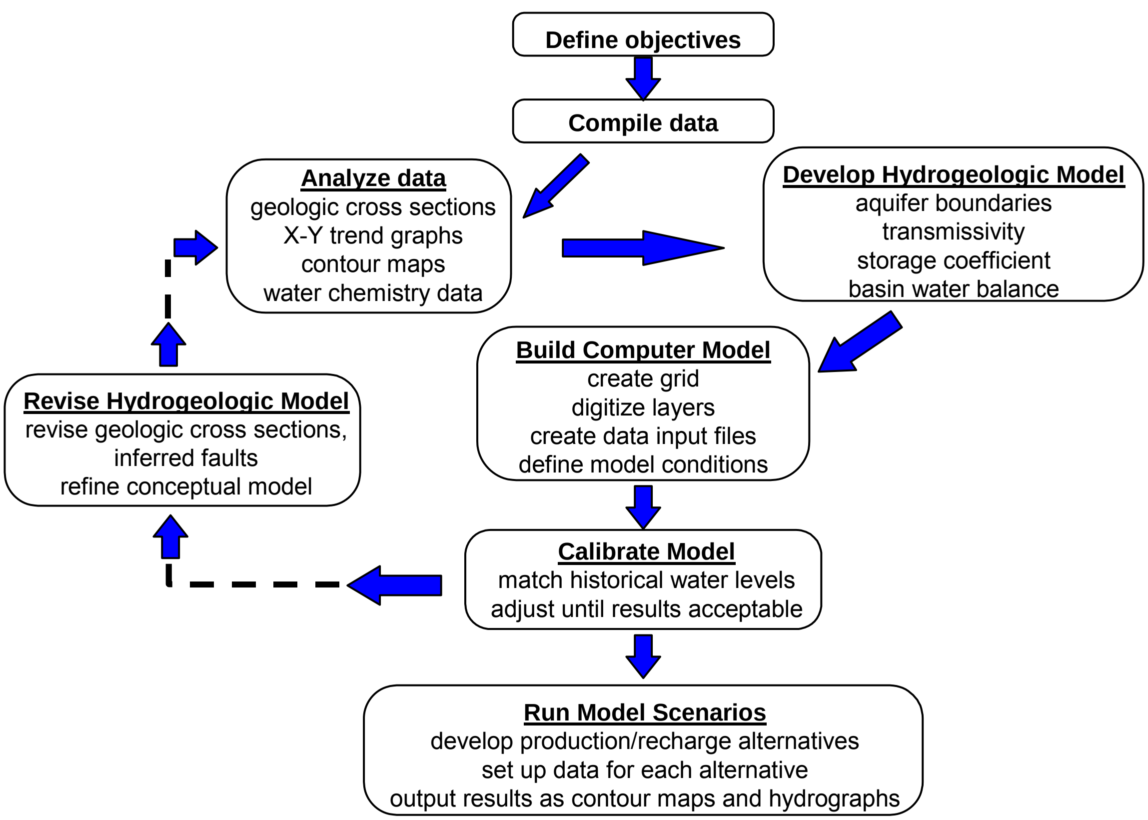


These data originate from hand-drawn contour maps, spreadsheets, and the Water Resources Management System (WRMS) historical database. Because MODFLOW requires the input data files in a specific format, staff developed a customized database and GIS program to automate data compilation and formatting functions. These data pre-processing tasks form one of the key activities in the model development process.

Before a groundwater model can be reliably used as a predictive tool for simulating future conditions, the model must be calibrated to reach an acceptable match between simulated and actual observed conditions. The basin model was first calibrated to steady-state conditions to numerically stabilize the simulations, to make rough adjustments to the water budget terms, and to generally match regional groundwater flow patterns. Also, the steady-state calibration helped to determine the sensitivity of simulated groundwater levels to changes in incidental recharge and aquifer parameters such as hydraulic conductivity. Steady-state calibration of the basin model is documented in more detail in the *OCWD Master Plan Report* (OCWD, 1999).

Typical transient model output consists of water level elevations at each grid cell that can be plotted as a contour map for one point in time or as a time-series graph at a single location. Post-processing of model results into usable graphics is performed using a combination of semi-automated GIS and database program applications. Figure 2-15 presents a simplified schematic of the modeling process.

FIGURE 2-15
MODEL DEVELOPMENT FLOWCHART



Model construction, calibration, and operation were built upon 12 years of effort by OCWD staff to collect, compile, digitize, and interpret hundreds of borehole geologic and geophysical logs, water level hydrographs, and water quality analyses. The process was composed of ten main tasks comprising over 120 subtasks. The major tasks are summarized below:

1. Finalize conceptual hydrogeologic model layers and program GIS/database applications to create properly formatted MODFLOW input data files. Over 40 geologic cross sections were used to form the basis of the vertical and lateral aquifer boundaries.

2. Define model layer boundaries. The top and bottom elevations of the three aquifer system layers and intervening aquitards were hand-contoured, digitized, and overlain on the model grid to populate the model input arrays with a top and bottom elevation for each layer at every grid cell location. Model layer thickness values were then calculated by using the GIS.

3. Develop model layer hydraulic conductivity (K) grids. Estimates of K for each layer were based on (in order of importance): available aquifer test data, well specific capacity data, and lithologic data. In the absence of reliable aquifer test or specific capacity data for areas in Layers 1 and 3, lithology-based K estimates were calculated by assigning literature values of K to each lithology type (e.g., sand, gravel, clay) within a model layer and then calculating an effective K value for the entire layer at that well location. Layer 2 had the most available aquifer test and specific capacity data. Therefore, a Layer 2 transmissivity contour map was prepared and digitized, and the GIS was then used to calculate a K surface by dividing the transmissivity grid by the aquifer thickness grid. Initial values of K were adjusted during model calibration to achieve a better match of model results with known groundwater elevations.

4. Develop layer production factors for active production wells simulated in the model. Many production wells had long screened intervals that spanned at least two of the three model layers. Therefore, groundwater production for each of these wells had to be divided among each layer screened by use of layer production factors. These factors were calculated using both the relative length of screen within each model layer and the hydraulic conductivity of each layer. Well production was then multiplied by the layer factors for each individual well. For example, if a well had a screened interval equally divided across Layers 1 and 2, but the hydraulic conductivity of Layer 1 was twice that of Layer 2, then the calculated Layer 1 and 2 production factors for that well would have been one-third and two-thirds, respectively, such that when multiplied by the total production for this well, the production assigned to Layer 1 would have been twice that of Layer 2. For the current three-layer model, approximately 25 percent of the production wells in the model were screened across more than one model layer. In this context, further vertical refinement of the model (more model layers) may better represent

the aquifer architecture in certain areas but may also increase the uncertainty and potential error involved in the amount of production assigned to each model layer.

5. Develop basin model water budget input parameters, including groundwater production, artificial recharge, and unmeasured recharge. Groundwater production and artificial recharge volumes were applied to grid cells in which production wells or recharge facilities were located. The most uncertain component of the water budget – unmeasured or incidental recharge – was applied to the model as an average monthly volume based on estimates calculated annually for the OCWD *Engineer's Report*. Unmeasured recharge was distributed to cells throughout the model, but was mostly applied to cells along margins of the basin at the base of the hills and mountains. The underflow component of the incidental recharge represents the amount of groundwater flowing into and out of the model along open boundaries. Prescribed groundwater elevations were assigned to open boundaries along the northwest model boundary in Los Angeles County; the ocean at the Alamitos, Bolsa, and Talbert Gaps; the mouth of the Santa Ana Canyon; and the mouth of Santiago Creek Canyon. Groundwater elevations for the boundaries other than the ocean boundaries were based on historical groundwater elevation data from nearby wells. The model automatically calculated the dynamic flow across these open boundaries as part of the overall water budget.

6. Develop model layer storage coefficients. Storage coefficient values for portions of model layers representing confined aquifer conditions were prepared based on available aquifer test data and were adjusted within reasonable limits based on calibration results.

7. Develop vertical leakance parameters between model layers. Vertical groundwater flow between aquifer systems in the basin is generally not directly measured, yet it is one of the critically-important factors in the model's ability to represent actual basin hydraulic processes. Using geologic cross-sections and depth-specific water level and water quality data from the OCWD multi-depth monitoring well network, staff identified areas where vertical groundwater flow between the modeled aquifer systems is either likely to occur or be significantly impeded, depending on the relative abundance and continuity of lower-permeability aquitards between model layers. During model calibration, the initial parameter estimates for vertical leakance were adjusted to achieve closer matches to known vertical groundwater gradients.

8. Develop groundwater contour maps for each model layer to be used for starting conditions and for visual comparison of water level patterns during calibration. Staff used observed water level data from multi-depth and other wells to prepare contour maps of each layer for November 1990 as a starting point for the calibration period. Care was taken to use wells screened within the appropriate vertical interval representing each model

layer. The hand-drawn contour maps were then digitized and used as model input to represent starting conditions.

9. Perform transient calibration runs. The nine-year period of November 1990 to November 1999 was selected for transient calibration, as it represented the period corresponding to the most detailed set of groundwater elevation, production, and recharge data. The transient calibration process and results are described in Section 2.8.1.

10. Perform various basin production and recharge scenarios using the calibrated model. Criteria for pumping and recharge, including facility locations and quantities, were developed for each scenario and input for each model run.

2.8.1 MODEL CALIBRATION

Calibration of the transient basin model involved a series of simulations of the period 1990 to 1999, using monthly flow and water level data. The time period selected for calibration represents a period during which basic data required for monthly transient calibration were essentially complete (compared to pre-1990 historical records). The calibration period spans at least one “wet/dry” rainfall cycle. Monthly water level data from almost 250 target locations were used to determine if the simulated water levels adequately matched observed water levels. As shown in Figure 2-16, the calibration target points were densely distributed throughout the basin and also covered all three model layers.

After each model run, a hydrograph of observed versus simulated water levels was created and reviewed for each calibration target point. In addition, a groundwater elevation contour map for each layer was also generated from the simulated data. The simulated groundwater contours for all three layers were compared to interpreted contours of observed data (November 1997) to assess closeness of fit and to qualitatively evaluate whether the simulated gradients and overall flow patterns were consistent with the conceptual hydrogeologic model. November 1997 was chosen for the observed versus simulated contour map comparison since these hand-drawn contour maps had already been created for the prior steady state calibration step. Although November 1997 observed data were contoured for all three layers, the contour maps for Layers 1 and 3 were somewhat more generalized than for Layer 2 due to a lower density of data points (wells) in these two layers.

Depending on the results of each calibration run, model input parameters were adjusted, including hydraulic conductivity, storage coefficient, boundary conditions, and recharge distribution. Time-varying head boundaries along the Orange/Los Angeles County line were found to be extremely useful in obtaining a close fit with observed historical water levels in the northwestern portion of the model. Fifty calibration runs were required to reach an acceptable level of calibration in which model-generated water levels were within reasonable limits of observed water level elevations during the calibration period. Figures 2-17 through 2-19 show examples of hydrographs of observed versus simulated water levels for three wells used as calibration targets.

FIGURE 2-16
BASIN MODEL CALIBRATION WELLS

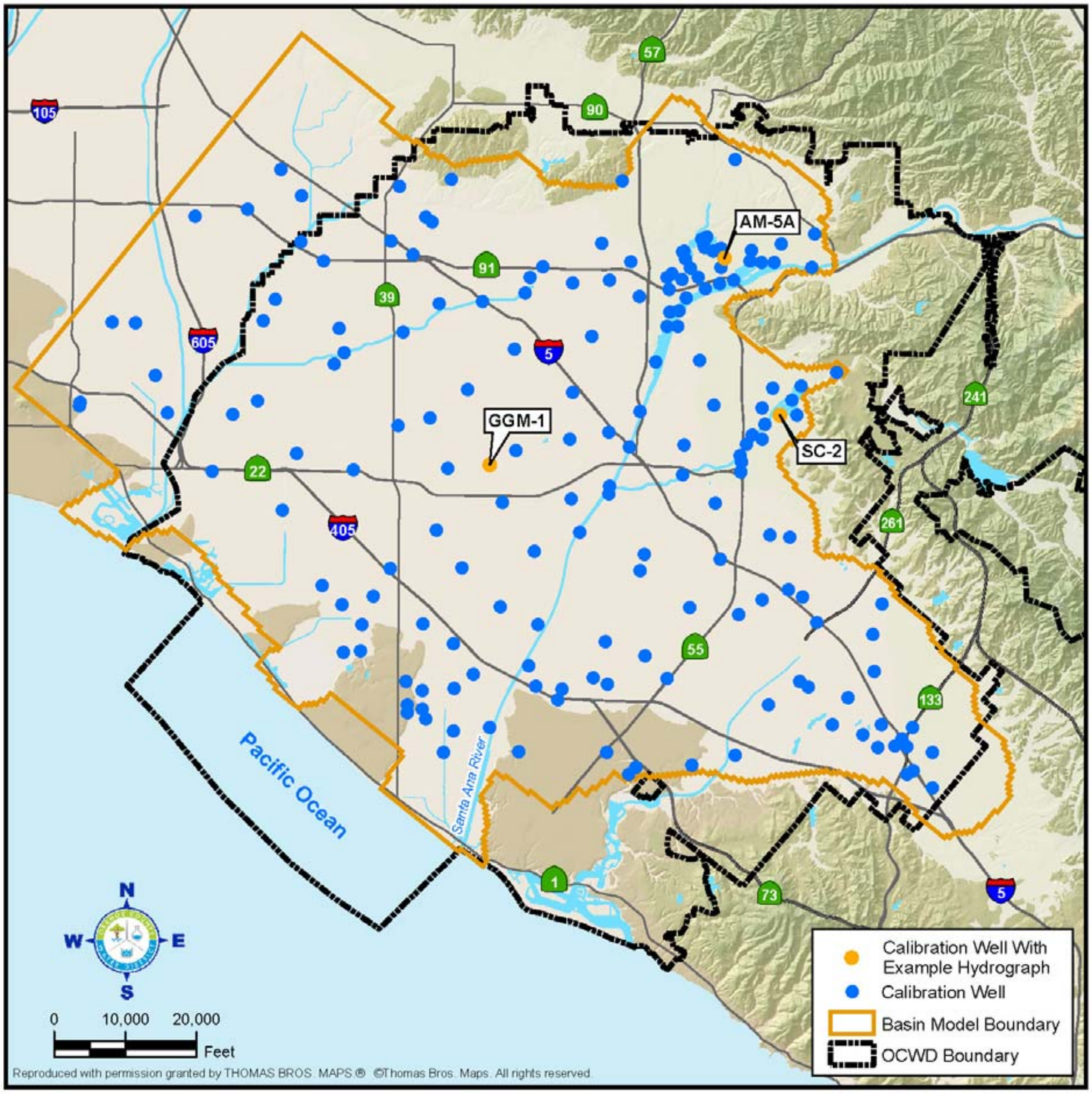


Figure 2-17
CALIBRATION HYDROGRAPH FOR MONITORING WELL AM-5A

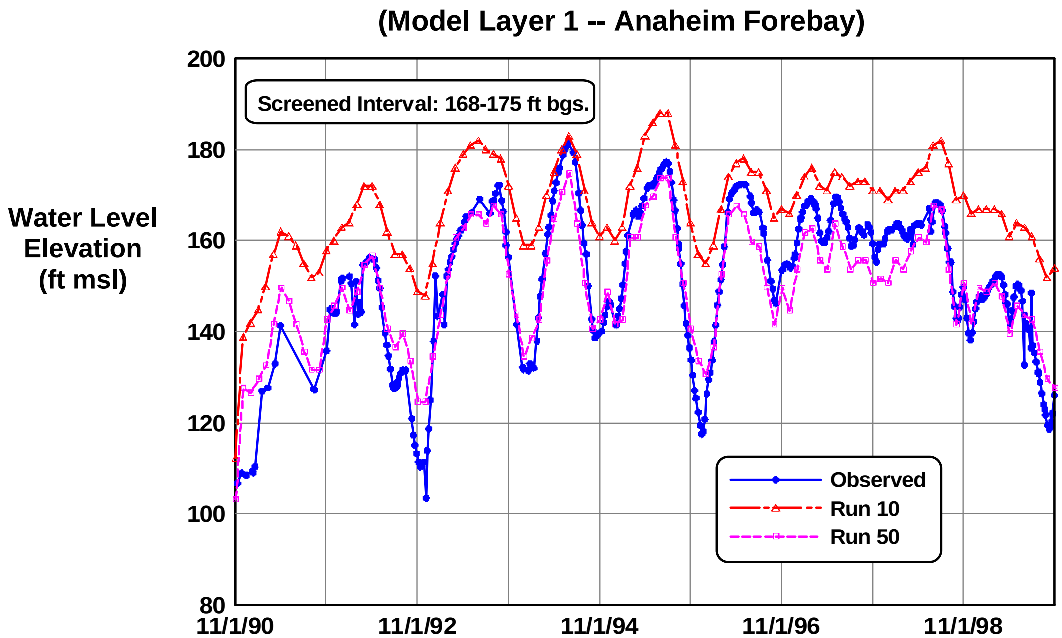


FIGURE 2-18
CALIBRATION HYDROGRAPH FOR MONITORING WELL SC-2

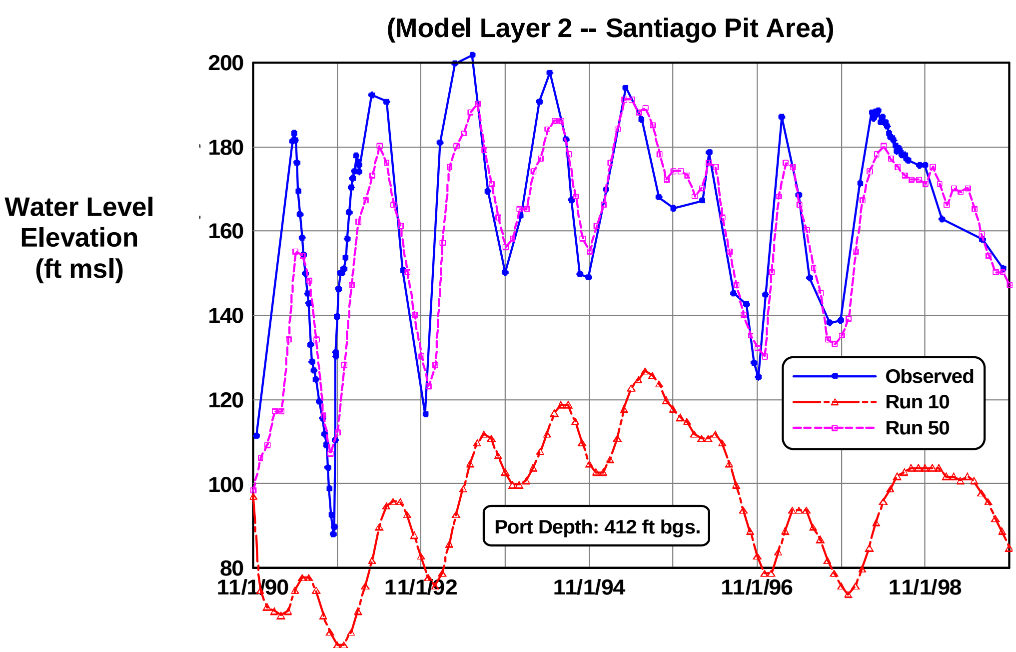
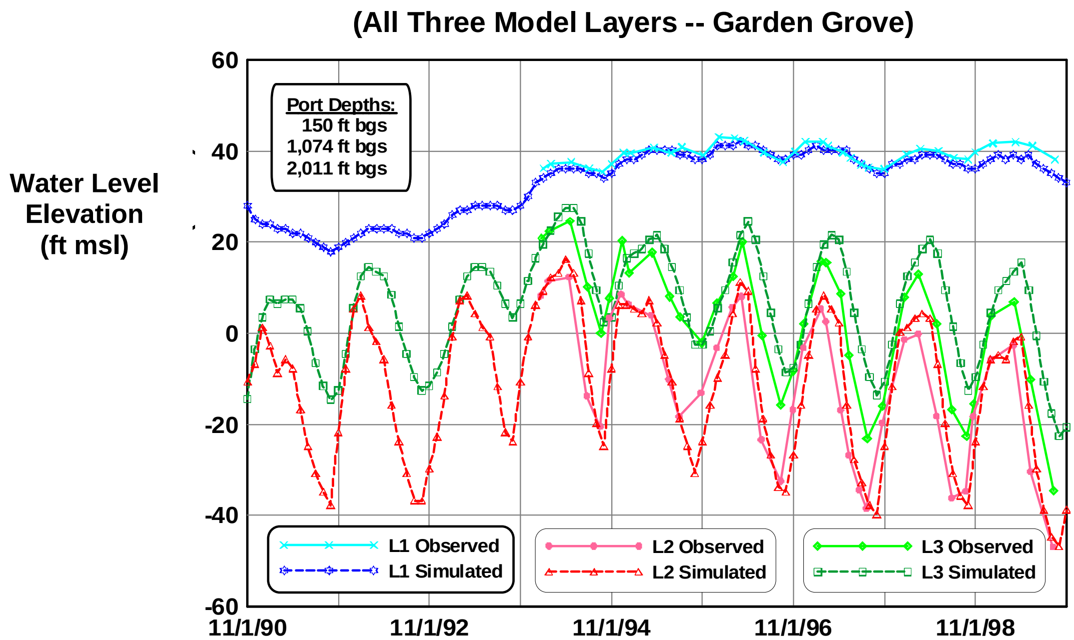


FIGURE 2-19
CALIBRATION HYDROGRAPH FOR MONITORING WELL GGM-1



Noteworthy findings of the model calibration process are summarized below:

- The model was most sensitive to adjustments to hydraulic conductivity and recharge distribution. In other words, minor variations in these input parameters caused significant changes in the model water level output.
- The model was less sensitive to changes in storage coefficient, requiring order-of-magnitude changes in this parameter to cause significant changes in simulated water levels, primarily affecting the amplitude of seasonal water level variations.
- The vast amount of observed historical water level data made it readily evident when the model was closely matching observed conditions.
- Incidental (unmeasured) recharge averaging approximately 70,000 afy during the 1990-1999 period appeared to be reasonable, as the model was fairly sensitive to variations in this recharge amount.
- Groundwater outflow to Los Angeles County was estimated to range between 5,000 and 12,000 afy between 1990 and 1999, most of this occurring in Layers 1 and 3.
- Groundwater flow at the Talbert Gap was inland during the entire model calibration period, indicating moderate seawater intrusion conditions. Model-derived seawater inflow ranged from 500 to 2,700 afy in the Talbert Gap and is consistent with chloride concentration trends during the calibration period that indicated inland movement of saline groundwater in these areas.
- Model-derived groundwater inflow from the ocean at Bolsa Gap was only 100-200 afy due to the Newport-Inglewood Fault zone, which offsets the Bolsa

aquifer and significantly restricts the inland migration of saline water across the fault.

- Model adjustments (mainly hydraulic conductivity and recharge) in the Santiago Pits area in Orange significantly affected simulated water levels in the coastal areas.
- Model reductions to the hydraulic conductivity of Layer 2 (Principal aquifer system) along the Peralta Hills Fault in Anaheim/Orange had the desired effect of steepening the gradient and restricting groundwater flow across the fault into the Orange area. These simulation results were consistent with observed hydrogeologic data indicating that the Peralta Hills Fault acts as a partial groundwater barrier.
- Potential unmapped faults immediately downgradient from the Santiago Pits appear to restrict groundwater flow in the Principal aquifer system, as evidenced by observed steep gradients in that area, which were reproduced by the model. As with the Peralta Hills Fault, an approximate order-of-magnitude reduction in hydraulic conductivity along these suspected faults achieved the desired effect of reproducing observed water levels with the model.

2.8.2 MODEL ADVISORY PANEL

The model development and calibration process was regularly presented to and reviewed by a Model Advisory Panel. This technical panel consisted of four groundwater modeling experts who were familiar with the basin and highly qualified to provide insight and guidance during the model construction and calibration process. Twelve panel meetings were held between 1999 and 2002. The panel was tasked with providing written independent assessments of the strengths, weaknesses, and overall validity and usefulness of the model in evaluating various basin management alternatives. Two memoranda were prepared: one at the completion of the steady-state model calibration and steady-state scenarios (Harley et al., 1999) and one at the completion of the transient model calibration and initial transient basin operational scenarios (Harley et al., 2001). Key conclusions and findings of the panel regarding the transient model are summarized below.

- Transient modeling has substantially improved the overall understanding of processes and conditions that determine how and why the basin reacts to pumping and recharge. This improved understanding, coupled with the model's ability to simulate existing and possible future facilities and alternative operations, significantly improves the District's potential ability to enhance and actively manage basin water resources.
- Modeling has helped verify major elements of the basin conceptual model and has been instrumental in clarifying:
  - Variations in the annual water balance
  - Hydrostratigraphy of the basin
  - Horizontal flow between basin subareas

   - The potential degree of interconnection and magnitude of vertical flow between major aquifers
   - The potential hydraulic significance of the Peralta Hills Fault in the Anaheim Forebay
   - Variations in aquifer hydraulic properties
   - The relative significance of engineered versus natural recharge and groundwater outflow within the basin
   - Numerous other issues and conditions.
- The ability of the model to simulate known and projected future conditions will evolve and improve as new data become available and updated calibration runs are completed.
- Parameters used to set up the model appear to be within limits justified by known, estimated, and assumed subsurface conditions based upon available historic data.
- Initial transient calibration completed using a nine-year calibration period (1990-1999) is considered adequate to confirm the initial validity of the model for use in evaluating a variety of potential future projects and conditions.
- Areas of the basin that could benefit from future exploration, testing, monitoring, analysis and/or additional model calibration were identified.
- The model is not considered appropriate for assessing detailed local impacts related to new recharge facilities or well fields. These impacts should be assessed using more detailed local submodels and by conducting detailed field studies.
- The model does not, nor is it intended to, address water supply availability, cost, water quality, or land subsidence.

Recommendations of the panel included suggestions that thorough documentation be prepared on model configuration and calibration and that the model calibration period be extended as new data become available.

2.8.3 TALBERT GAP MODEL

Between 1999 and 2000, OCWD contracted with Camp Dresser & McKee Inc. to develop a detailed groundwater flow model of the Talbert Gap and surrounding area for the purpose of evaluating and estimating the amount and location of fresh water injection wells needed to control seawater intrusion under current and projected future basin conditions. The Talbert Gap modeling effort was undertaken as part of the design scope of work for Phase 1 of the GWR System, which included expansion of the existing Talbert Barrier. The configuration and initial calibration of the Talbert Gap Model and further model refinement and calibration were documented by Camp Dresser & McKee Inc. (2000, 2003).

Consistent with the Basin Model Advisory Panel's findings, OCWD determined that a more detailed model of the Talbert Gap was necessary to evaluate the local water level changes associated with various potential injection barrier alignments and flow rates. The Talbert model comprises an area of 85 square miles, 13 Layers (seven aquifers and six aquitards), and 509,000 grid cells (250 feet x 250 feet horizontal dimensions). Figures 2-20 and 2-21 show the model area and layering schematic, respectively.

FIGURE 2-20
TALBERT GAP MODEL AND BASIN MODEL BOUNDARIES

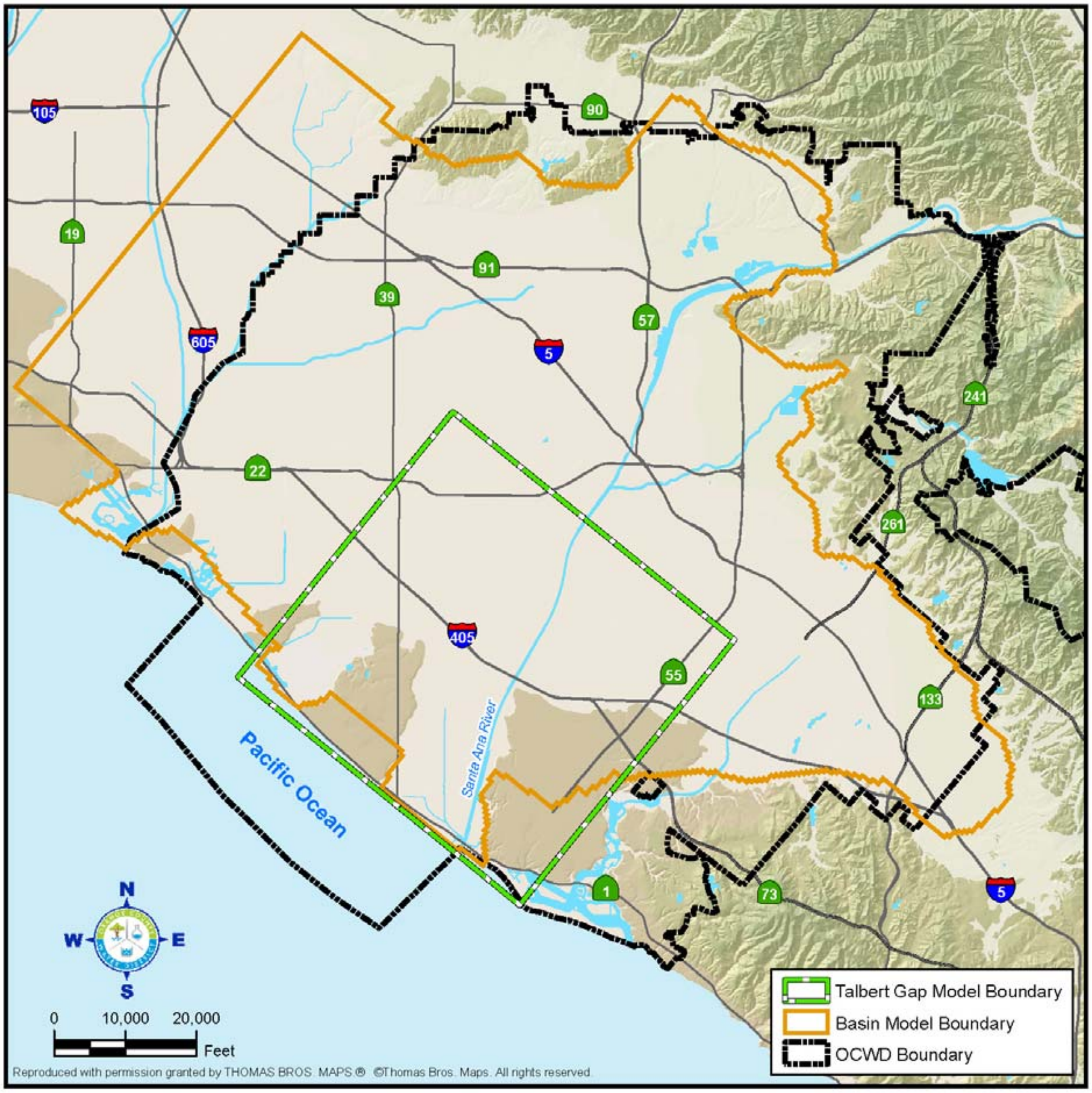
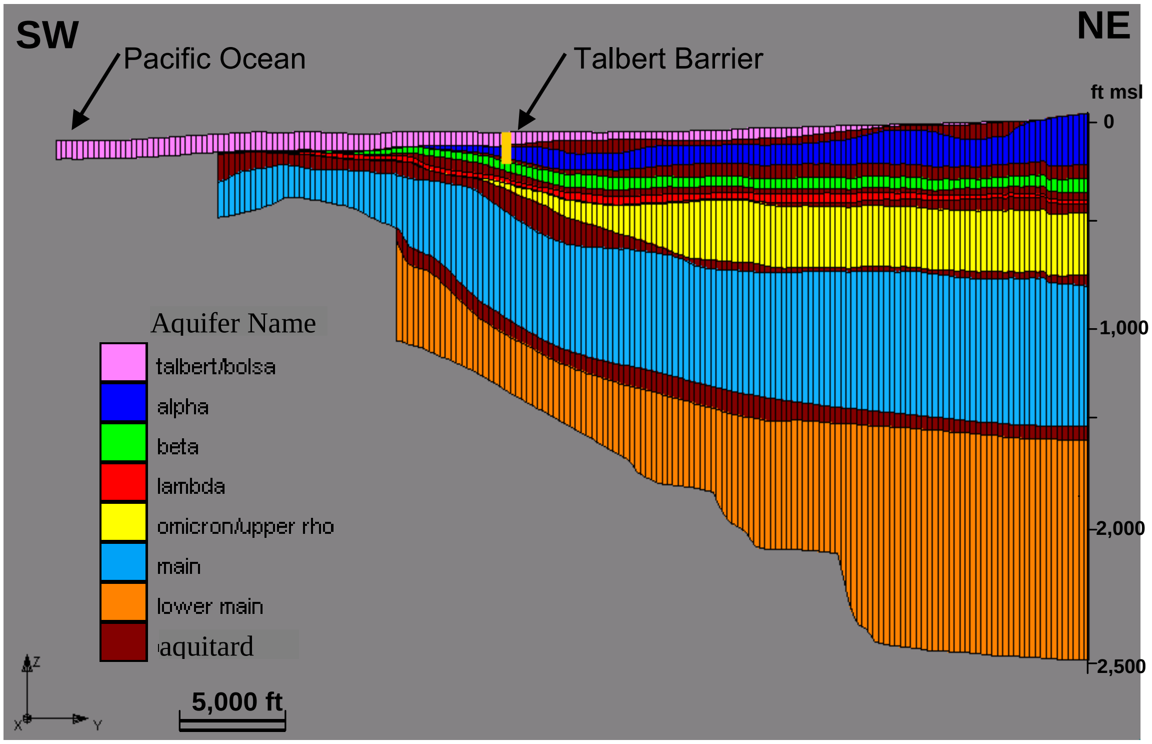


FIGURE 2-21
TALBERT GAP MODEL AQUIFER LAYERING SCHEMATIC



Key findings of the Talbert Gap model are summarized below.

- Depending on the amount of basin production, particularly near the Talbert Barrier, 30 mgd (approximately 34,000 afy) of injection will substantially raise water levels, yet may not be sufficient to fully prevent seawater intrusion in the Talbert Gap. Additional injection wells beyond those planned for Phase 1 of the GWR System may be required.
- Under projected 2020 conditions, the future Talbert Barrier may require an annual average injection rate of up to 45 mgd based on the results of existing analyses. This estimated future injection requirement will be further evaluated as additional data are collected.
- The Talbert model inland boundaries do not coincide with hydrologic or geologic features, e.g., recharge area, faults. Therefore, simulated water levels are highly influenced by the time-varying water levels specified along the boundaries. For future Talbert model predictive runs, the basin model should be used to generate water levels that can then be specified along the inland Talbert model boundaries.
- The Talbert model was less sensitive to adjustment hydraulic conductivity and storage coefficient than the basin model, primarily because of the stronger influence of the specified-head boundaries in the Talbert model.

3 GROUNDWATER MONITORING

OCWD conducts a comprehensive monitoring program of the groundwater basin and surface water supplies in the watershed to properly manage water supplies and to safeguard the basin's water quality. This section describes OCWD's basin monitoring programs, including the following:

- **Groundwater monitoring locations;**
- **Water sample collection and analysis procedures;**
- **Monitoring of production rates, groundwater elevation, groundwater quality, and recharge water quality; and**
- **Seawater intrusion monitoring and prevention.**

3.1 Introduction

For its size, the Orange County groundwater basin is one of the world's most extensively monitored. The District's comprehensive monitoring program tracks dynamic basin conditions including groundwater production, storage, elevations, and water quality.

OCWD's monitoring program has helped improve groundwater management throughout the basin by:

- Establishing on an annual basis the safe and sustainable level of groundwater production.
- Determining the extent of seawater intrusion and subsequently building improvements to seawater barriers to prevent and reverse such intrusion.
- Discovering areas of groundwater contamination to protect public health and beneficial use of groundwater, and to begin remediation efforts at an early stage.
- Assuring that the groundwater basin is managed in full compliance with all relevant laws and regulations.

3.2 Collection and Management of Monitoring Data

Data are collected through a vast network of production and monitoring wells at frequencies necessary for short- and long-term trend analyses. The wells are located throughout the basin to enable not only analysis of the basin as a whole but also to focus on local or sub-regional investigations. Multi-depth monitoring wells provide depth-specific water level and quality data allowing analysis of the basin's multiple-aquifer configuration.

The network of nearly 700 municipal drinking water, private domestic, industrial, irrigation, and monitoring wells is used to collect data for a variety of purposes. A list of each OCWD monitoring well with well type, cased depth, and top and bottom perforation is shown in Appendix E. Figure 3-1 shows the locations of over 200 production wells that extract groundwater for municipal use. Monthly individual well production rates for large-capacity wells have been collected since 1988. Monitoring wells, shown in Figure 3-2, are operated by OCWD to supplement the water quality data collected at production wells and to fill data gaps.

FIGURE 3-1
PRODUCTION WELL LOCATIONS

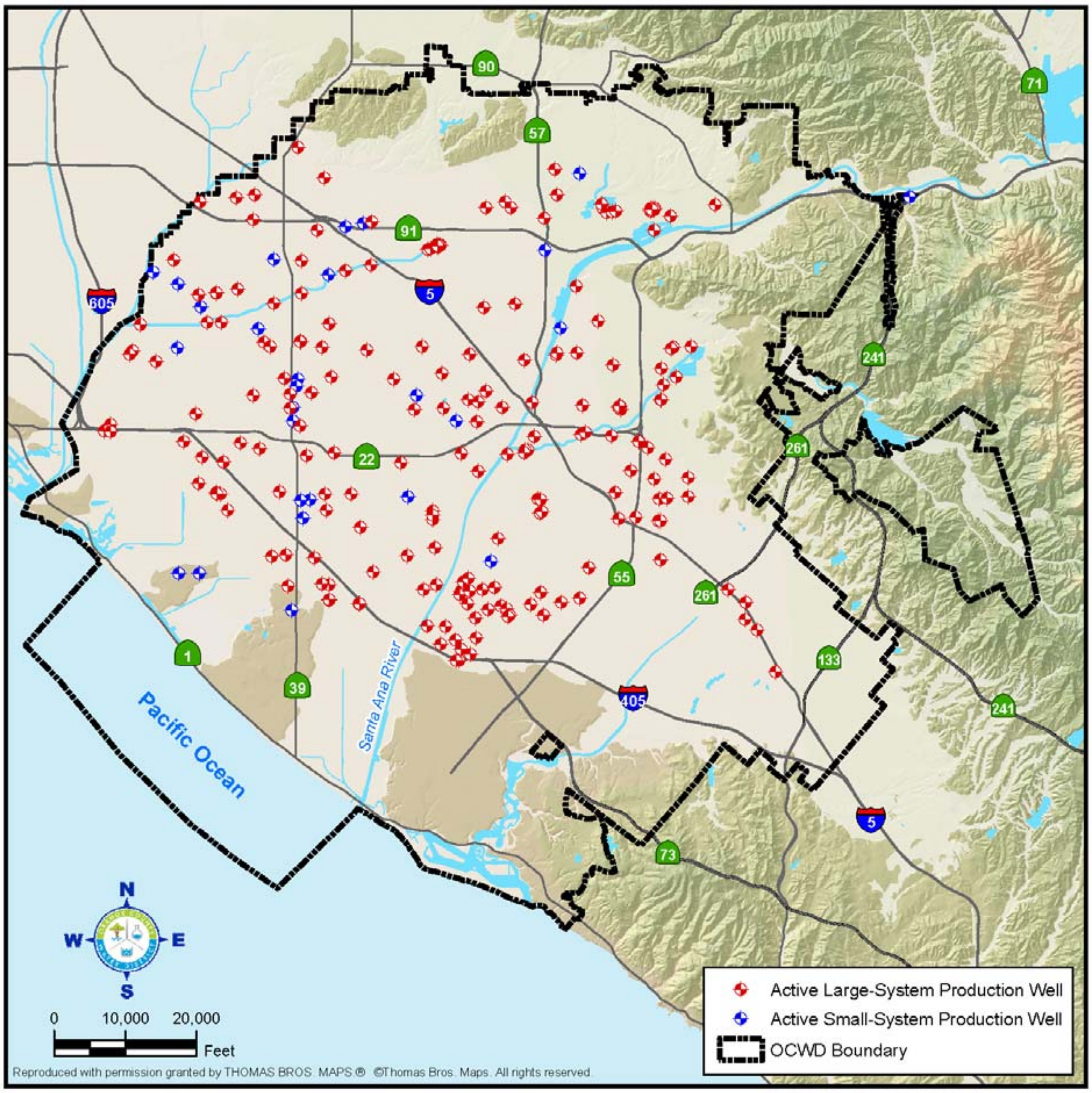
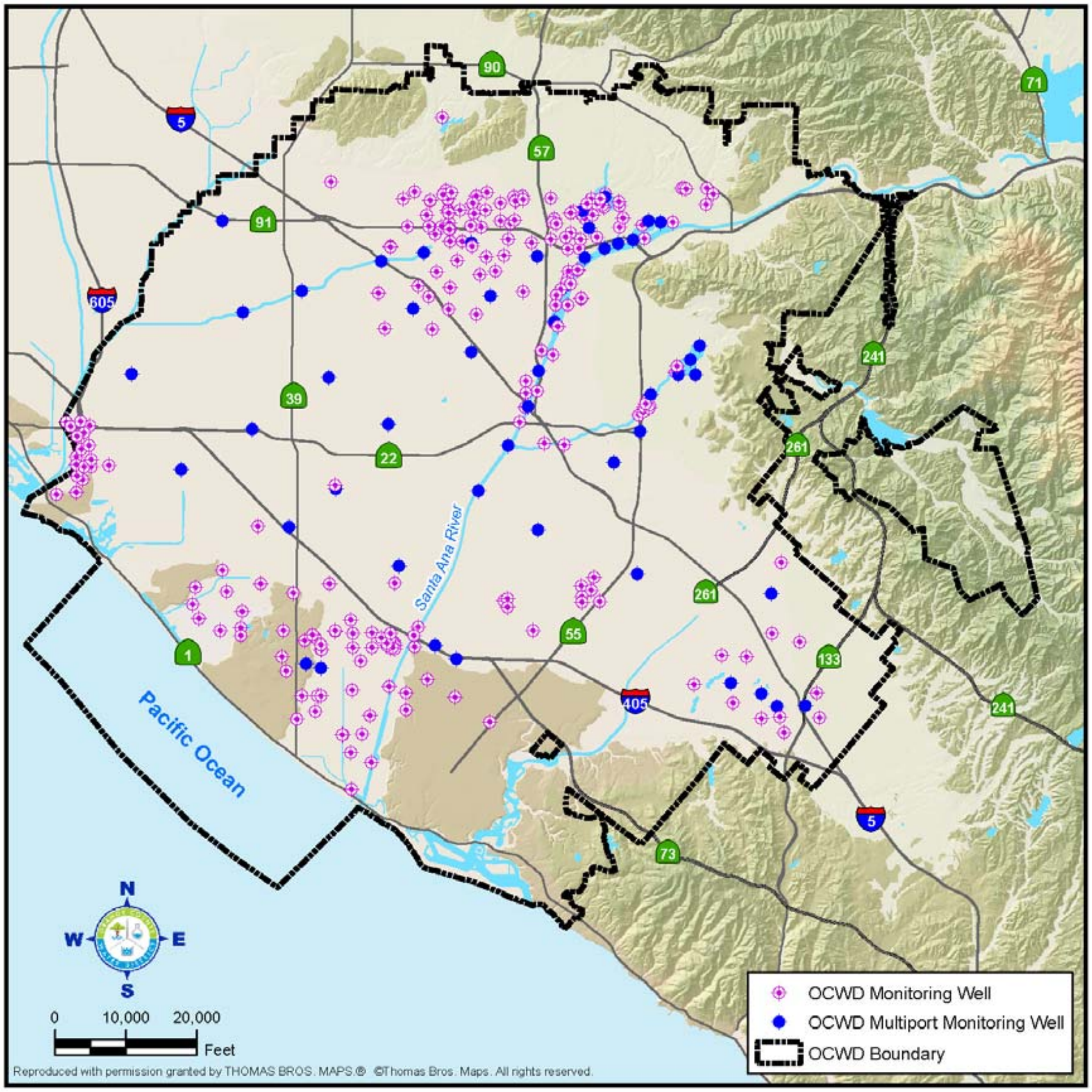


FIGURE 3-2
OCWD MONITORING WELL LOCATIONS



Note: Monitoring wells constructed and/or owned by other entities besides OCWD are not shown.

Data collected in OCWD's monitoring program are stored in the District's electronic database, the Water Resources Management System (WRMS). WRMS contains comprehensive well information, current and historical data, as well as information on sub-surface geology, groundwater modeling, and water quality. This database provides for subsequent retrieval and analysis of data or preparation of data reports and data submittals to other agencies.

3.3 Water Sample Collection and Analysis

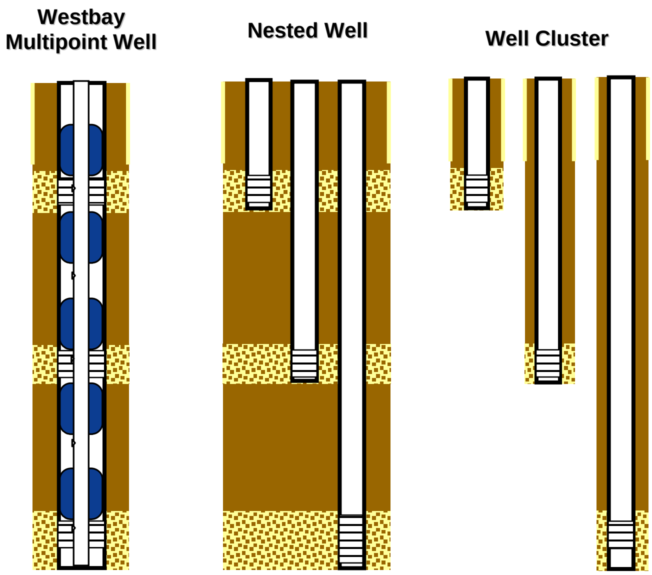
OCWD's laboratory is state-certified to perform bacteriological, inorganic, and organic analyses (see Figure 3-3). The District utilizes state-certified contractor laboratories to analyze asbestos, dioxin, and radiological samples. Analytical methods approved by the California Department of Public Health (CDPH) or U.S. Environmental Protection Agency (EPA) are used for analyzing water quality samples for the drinking water compliance program. As new chemicals are regulated, the OCWD laboratory develops the analytical capability and becomes certified in the approved method to process compliance samples. The amount of samples taken is dynamic, ranging from 600 to 1,700 samples in any given month.

Water quality samples are collected in the field in accordance with approved federal and state procedures and industry-recognized quality assurance and control protocols to ensure that sampled water is representative of ambient groundwater (or surface water) conditions.

Water samples are collected in method-specific containers, stored in coolers at approximately 4^{o}C, and delivered to state-certified laboratories, researchers, or contract laboratories for analysis. The majority of samples are delivered to the laboratory on the day of sample collection. When samples must be shipped, they are sent overnight for next-day delivery. Site conditions, field measurements of selected water quality parameters (temperature, pH, electrical conductivity, and dissolved oxygen), and other relevant sample observations are recorded in field notebooks at each sampling location, and a chain-of-custody form is completed for each sample collected per site. Sampling occurs in a variety of terrains and occasionally in inclement weather and outside normal business hours.

FIGURE 3-3
OCWD'S STATE CERTIFIED NEW LABORATORY

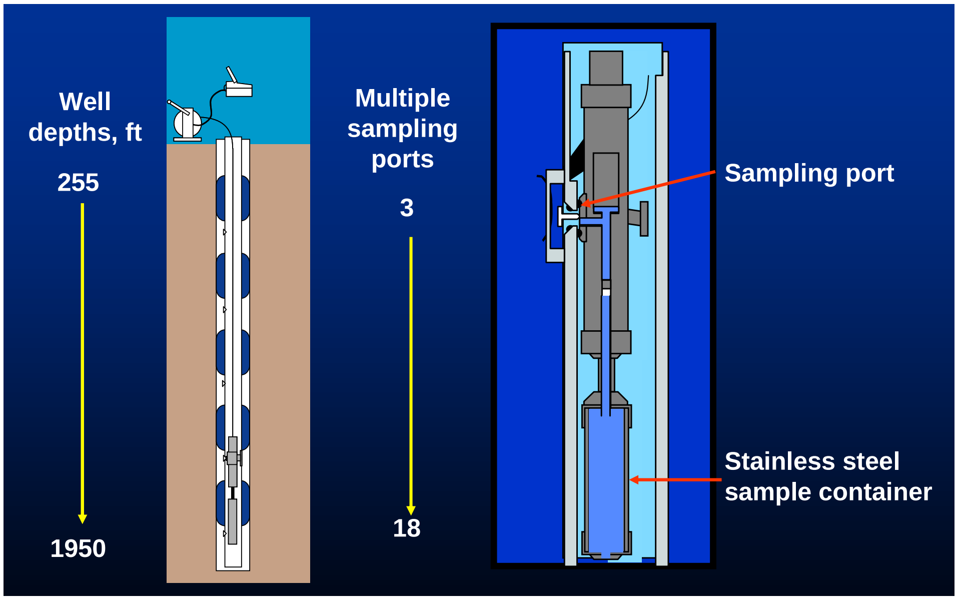
FIGURE 3-4
THREE COMMON MONITORING WELL DESIGNS



Production wells that provide water for drinking water, irrigation/agriculture, and industrial uses generally have well screens located in the permeable, water-bearing zones that may tap multiple aquifers. Therefore, water quality samples collected from these wells may represent water from one or more aquifers; some permeable zones may provide greater contribution than others to the overall water sample. In contrast, monitoring wells are designed and constructed with well screens placed at a specific depth and length to provide water quality at desired zones within an aquifer. Figure 3-4 illustrates the three monitoring well designs used for basinwide water quality monitoring activities: multi-point, nested, and cluster.

The multi-point well is a Westbay well design that contains a single casing with sampling ports located at specific depths in the underlying aquifers (Figure 3-5). Individual sampling points are hydraulically separated by packers. A computer-assisted sampling probe is used to collect a water sample at the desired depth. The sampling port has direct hydraulic connection between the port and the aquifer, allowing groundwater to flow into a detachable stainless steel sample container. OCWD has more than 50 multi-point wells ranging from a few hundred feet to over 2,000 feet in depth.

FIGURE 3-5
MULTIPORT WELL DESIGN DETAIL



A nested well design consists of a single borehole with individual monitoring wells screened at specific depths and completed in the borehole. A cluster is represented by individual monitoring wells completed with single casings at targeted depths within close proximity of each other. A “single point” monitoring well is one individual monitoring well that typically is screened over about 10 to 30 feet of sediments. The primary difference between the multi-point wells and the nested, cluster or single-point monitoring wells is the method of sample collection. Westbay multi-point wells do not require purging of groundwater prior to sample collection. In contrast, single point monitoring wells use a submersible pump to purge groundwater from the well and the surrounding formation until “ambient” or steady state conditions are obtained as determined by steady, continuous field measurements of pH, electrical conductivity, and temperature.

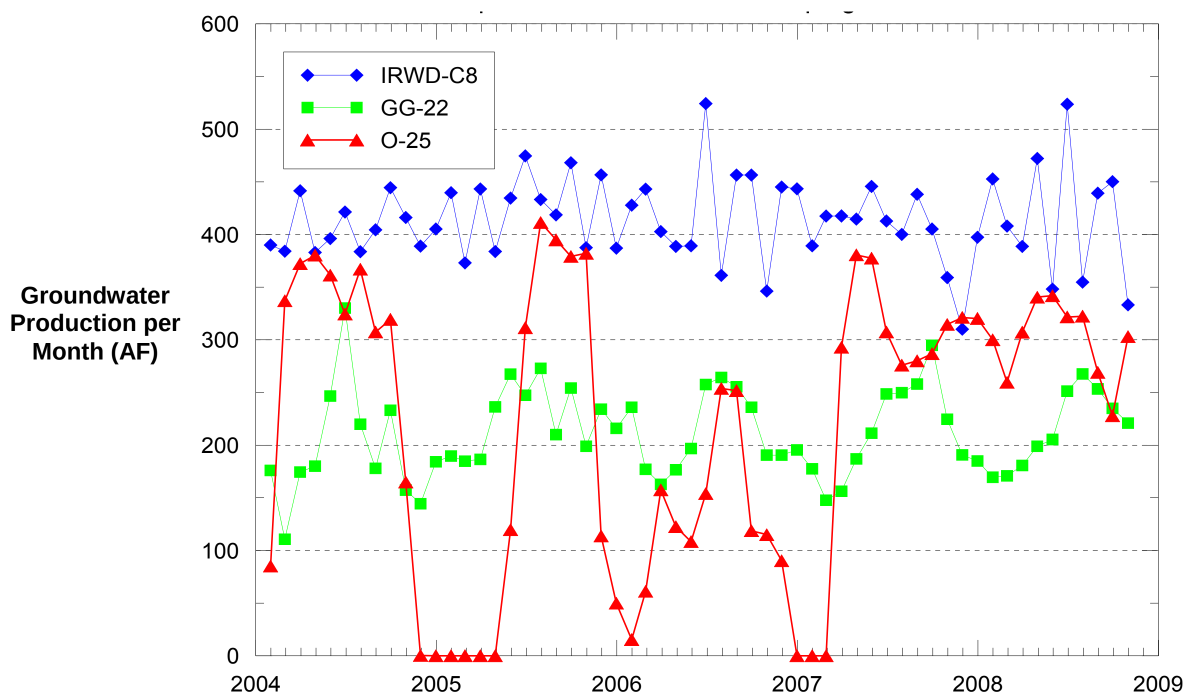
Between forty to nearly 2,000 gallons of groundwater may be purged from a monitoring well prior to sample collection. Generally, a truck equipped with one or more submersible pumps and a portable generator is used to purge and sample groundwater from single-point monitoring wells. Portable submersible pump and reel systems provide additional flexibility to increase the efficiency of sampling monitoring wells without dedicated pumps. One truck is outfitted with a dual system of submersible pumps and environmental hoses installed separately on hydraulic booms to sample two wells simultaneously (see Figure 3-6).

FIGURE 3-6
DUAL BOOM WATER QUALITY SAMPLING VEHICLE

3.4 Production and Groundwater Elevation Monitoring

Approximately 200 large-capacity municipal supply wells account for 97 percent of production. Large-capacity well owners, who are required by the District Act to report to OCWD every six months, voluntarily report monthly groundwater production for each of their wells. The production volumes are verified by OCWD field staff. Data are used to assess the Replenishment Assessment, quantify total basin pumping, calibrate the basin model described in Section 2.8, and to evaluate seasonal groundwater level fluctuations. As an example, Figure 3-7 illustrates seasonal groundwater production trends in three municipal wells.

FIGURE 3-7
EXAMPLES OF SEASONAL WELL PUMPING PATTERNS



Groundwater elevation (or level) data are measured at least semi-annually at nearly every production and monitoring well. Over 1,000 individual measurement points are monitored for water levels on a monthly or bi-monthly basis to evaluate short-term effects of pumping or recharge operations. More frequent water level measurements are collected at selected monitoring wells in the vicinity of OCWD's recharge facilities, seawater barriers, and areas of special investigation where drawdown, water quality impacts, or contamination are of concern. The number of municipal wells that are monitored varies from year to year depending on well maintenance, abandonment, new well construction, and related factors.

3.5 Water Quality Monitoring

In 2008, nearly 14,000 groundwater samples were collected and analyzed to comply with state and federal regulations and to enable OCWD to monitor the water quality of the basin. OCWD conducts the EPA/CDPH compliance sampling and reporting for Producers wells. The number of water quality samples varies each year in response to regulatory requirements and to gain a better understanding of the basin, as shown in Figure 3-8. A summary of the well types, the number of wells, and the number of sample points is presented in Table 3-1.

FIGURE 3-8
GROUNDWATER AND SURFACE SITE SAMPLES COLLECTED BY OCWD

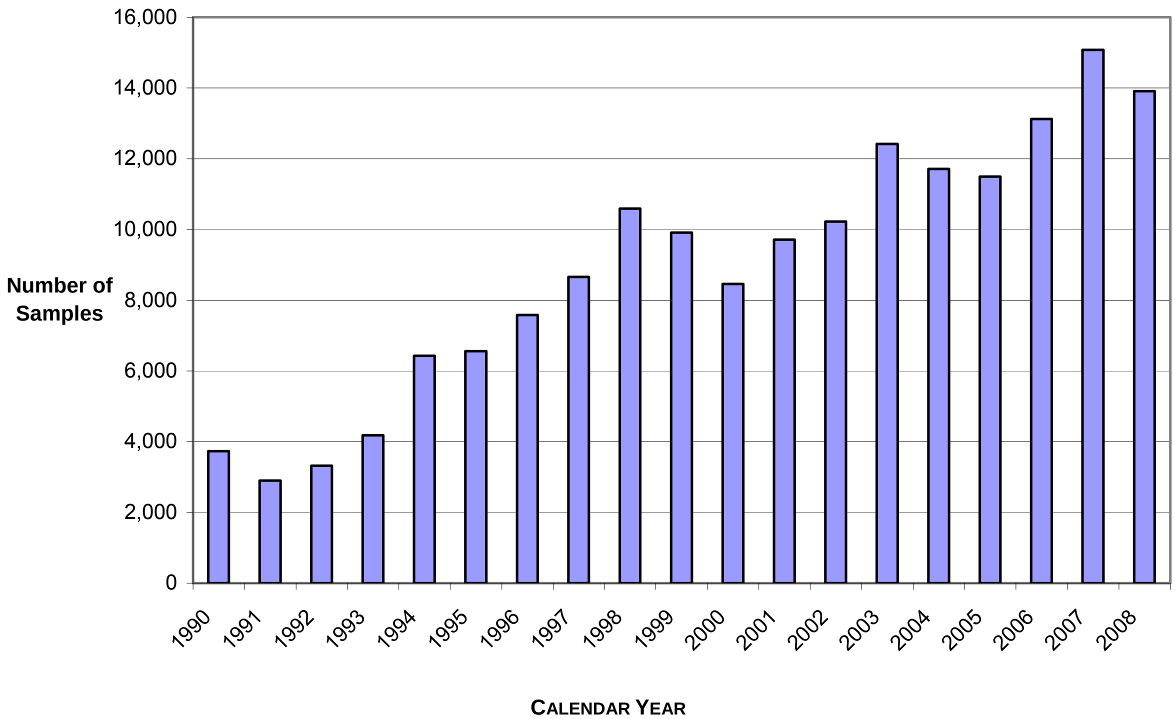


TABLE 3-1
DISTRIBUTION OF WELLS IN BASINWIDE MONITORING PROGRAM

Well Type	No. of Wells	No. of Individual Sample Points
Drinking Water Wells	228	228
Industrial And Irrigation wells	123	123
OCWD Monitoring Wells (excluding seawater monitoring)	254	728
OCWD Seawater Intrusion Monitoring Wells	93	244
Total	**698**	**1323**

Samples collected throughout the basin are used to monitor the impacts of basin extraction, determine the effectiveness of the seawater intrusion barriers, assess the impacts of historic and current land uses, and serve as a sentinel or early warning of emerging contaminants of concern. The District's comprehensive water quality monitoring programs fall roughly into three categories: (1) compliance with permits and drinking water regulations, (2) OCWD Board approved projects for research and other purposes, and (3) basin management.

3.5.1 DRINKING WATER REGULATIONS

The Federal Safe Drinking Water Act (SDWA) directs the EPA to set health-based standards (maximum contaminant levels or MCLs) for drinking water to protect public health against both naturally-occurring and man-made contaminants. EPA administers the SDWA at the federal level and establishes MCLs for bacteriological, inorganic, organic, and radiological constituents (U.S. Code Title 42, and Code of Federal Regulations Title 40). California administers and enforces the federal program and has adopted its own SDWA, which may contain more stringent state requirements (California Health and Safety Code, Section 116350 and related sections). The regulations implementing the California SDWA are referred to as the Title 22 Drinking Water Standards.

Since the 1970s, the number of chemicals regulated in groundwater sources has increased more than four-fold. OCWD monitors more than 100 regulated and unregulated chemicals at a specified monitoring frequency established by regulation as shown in Table 3-2.

Typically, about one-third of the drinking water wells are sampled every year for general minerals, metals, and secondary MCL constituents (color, odor, TDS, sodium, chloride, alkalinity, etc.). VOCs and nitrate are sampled annually at every well. Quarterly monitoring is required if VOCs are detected or if nitrate concentrations exceed 50 percent of the MCL. In addition, OCWD monitors wells routinely for selected chemicals on the unregulated lists, chemicals with Notification Levels, or new chemicals of concern.

Analyses for synthetic organic chemicals (SOCs) including tests for herbicides, pesticides, plasticizers, and other semi-volatile organics require use of twelve or more analytical methods. Newly-constructed wells are monitored for SOCs for four consecutive quarters to provide seasonal data for CDPH to assess the long-term monitoring frequency in their vulnerability assessment.

In addition to the regulated chemicals, both EPA and the CDPH require monitoring for unregulated chemicals. Unregulated chemicals do not have an established drinking water standard, but are new priority chemicals of concern. Monitoring provides information regarding their occurrence and levels detected in drinking water supply wells as the first assessment step to determine if the establishment of a standard (MCL) is necessary. Wells must be sampled twice within twelve months to comply with the unregulated chemical monitoring rules.

TABLE 3-2
MONITORING OF REGULATED AND UNREGULATED CHEMICALS

DPH Title 22 Drinking Water Monitoring Frequency -- Regulated Chemicals			Comments
Chemical Class	**Frequency**	**Monitoring Notes**	
Inorganic - General Minerals	Once every 3 years		
Inorganic - Trace Metals	Once every 3 years		
Nitrate and nitrite	Annually	New wells sampled quarterly for 1st year	
Detected ≥ 50% MCL	Quarterly		
Perchlorate		New wells sampled quarterly for 1st year	
Detected ≥ DLR	Quarterly	Detection limit = 4 ppb	
Non-detect at < DLR	Once every 3 years		OCWD will monitor at least annually
Volatile organic chemicals (VOC)	Annually	New wells sampled quarterly for 1st year	
Detected VOC	Quarterly		
Synthetic organic chemicals (SOC)		New wells sampled quarterly for 1st year; if non-detect, susceptibility waiver for 3 years	
Atrazine and simazine	Once every 3 years		
Radiological		New wells sampled quarterly for 1st year (initial screening) to determine reduced monitoring frequency for each radionuclide	
Detected at > 1/2 MCL ≤ MCL	Once every 3 years	Per radionuclide	Reduced monitoring after initial year
Detected at ≤ 1/2 MCL	Once every 6years	Per radionuclide	Reduced monitoring after initial year
Non-detect at < DLR	Once every 9 years	Per radionuclide	Reduced monitoring after initial year
EPA and DPH Unregulated Chemicals			
DHS : 4-Inorganic and 5-organic chemicals	Two required samples: (1) Vulnerable period: May-Jun-Jul-Aug-Sep (2) 5 to 7 months before or after the sample collected in the vulnerable period. No further testing after completing the two required sampling events	Monitoring completed for existing wells in 2001- 2003; new wells tested during 1st year	DHS UCMR - required testing for all new wells
EPA UCMR1 - List 1: 1-Inorganic and 10-organic chemicals			EPA UCMR1 - no longer required by EPA; sampling period was 2001-2003; received waiver April '08 from DPH of non vulnerable so no further testing required. New wells were being tested since 2001 to Apr. 08 (waiver granted by DPH)
EPA UCMR1 - List 2: 13-Organic chemicals			
EPA UCMR2 - List 1: 10 organic chemicals		All water utilities serving >10,000 people. Monitoring period: 2008- 2010	Current EPA program: Jan 2008 - Dec. 2010
EPA UCMR2 - List 2: 15 organic chemicals		All water utilities serving population >100,000 and EPA selected systems serving <100,000 population. Monitoring period: 2008- 2010	

3.5.2 MONITORING FOR CONTAMINANTS IN THE BASIN

OCWD has taken a proactive role in monitoring the basin for VOCs for over twenty years. This extensive monitoring program that tests agricultural, industrial, private, and domestic wells, led to the discovery of the El Toro MCAS solvent plume, discussed in Section 5.5. In response to the detection of VOCs in Anaheim and Fullerton over 100 monitoring wells, many in cluster well configuration were drilled to provide a broad range of monitoring points to define the areal extent of VOC contamination.

Monitoring wells are sampled as frequently as quarterly in areas of localized high concentrations of solvents and annually at other locations. Other chemicals are added to the monitoring program when concern arises. In the case of the North Basin

Groundwater Protection Project, described in Section 5.8, OCWD monitors for VOCs, 1,4-dioxane, and other constituents.

Monitoring gaps for regulated and unregulated chemicals occur in areas within Irvine where drinking water wells were not operating on a regular basis. OCWD's fills the data gaps with the non-potable well monitoring program. Monitoring wells and accessible agricultural wells are sampled for volatile organics, general minerals, and selected chemicals of concern to provide water quality information in this area of the basin.

3.6 Seawater Intrusion Monitoring and Prevention

Monitoring and preventing the encroachment of seawater into fresh groundwater zones along coastal Orange County is a major basin management issue. Seawater encroachment also represents a key factor in determining the basin operating range in terms of the maximum accumulated overdraft. Besides seawater intrusion, other identified sources of coastal groundwater salinity include connate water (water trapped in the pore spaces of sediments at the time of deposition) and brines disposed of at the ground surface during past oil production (Poland et al., 1956; DWR, 1961; DWR, 1968; J.M. Montgomery, 1974). The primary avenues for seawater intrusion into the basin are permeable sediments underlying topographic lowlands or "gaps" between the erosional remnants or "mesas" of the Newport-Inglewood Uplift, as shown in Figure 3-9. The susceptible locations are the Talbert, Bolsa, Sunset, and Alamitos Gaps.

Seawater intrusion through the Alamitos and Talbert Gaps is controlled via the operation of seawater barriers consisting of injection wells. The Alamitos Barrier has been operated since 1965 under a joint funding agreement between OCWD and Los Angeles County Department of Public Works (LACDPW) and a joint management committee consisting of OCWD, LACDPW, and other local stakeholders including the Water Replenishment District, City of Long Beach, and Golden State Water Company. OCWD has operated the Talbert Seawater Barrier since 1975. Flow and pressure readings are used to maximize total injection without over pressurizing the wells.

A coastal seawater monitoring program assesses the effectiveness of the Alamitos and Talbert Barriers and tracks salinity levels in the Bolsa and Sunset Gaps. Over 425 monitoring and production wells are sampled semi-annually to assess water quality conditions during periods of lowest production (winter) and peak demands (summer). Monthly water levels are measured in many of the coastal wells to evaluate seasonal effects of pumping and the operation of the injection barrier. A small subset of coastal wells is equipped with pressure transducers and data loggers for twice daily measurement and recording of water level conditions.

Key groundwater monitoring parameters used to determine the effectiveness of the barriers include water level elevations, chloride, TDS, electrical conductivity, and bromide. Groundwater elevation contours for the aquifers most susceptible to seawater intrusion are prepared to evaluate the freshwater mound developed by the barrier injection wells and to determine if it is sufficient to prevent the inland movement of saline water. The Talbert Gap chloride concentration contours shown in Figure 3-10 illustrate both the historical inland progression of groundwater salinity and its recent reversal due to injecting large volumes of water and basin management practices employed in the last four years.

FIGURE 3-9
SEAWATER BARRIER LOCATIONS

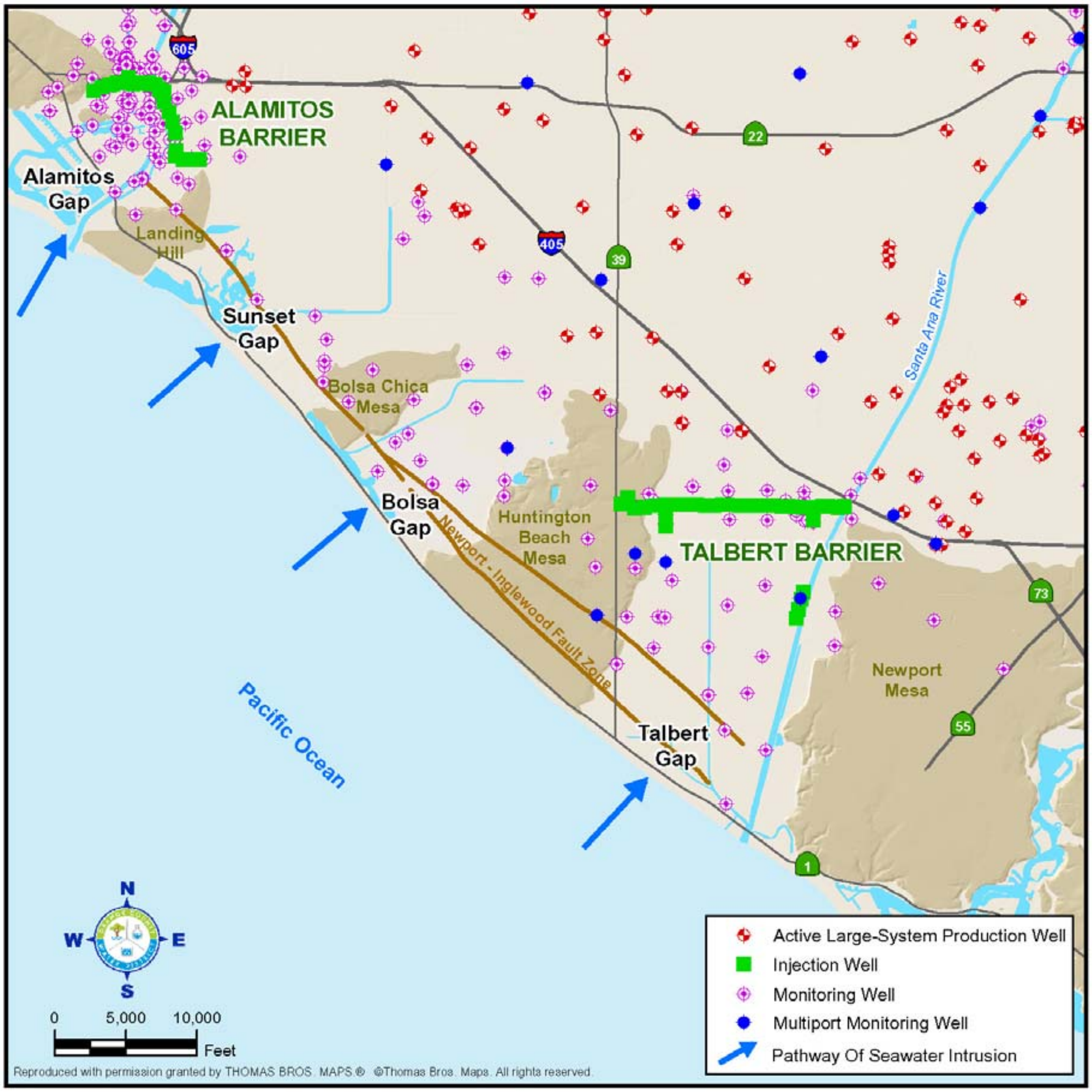
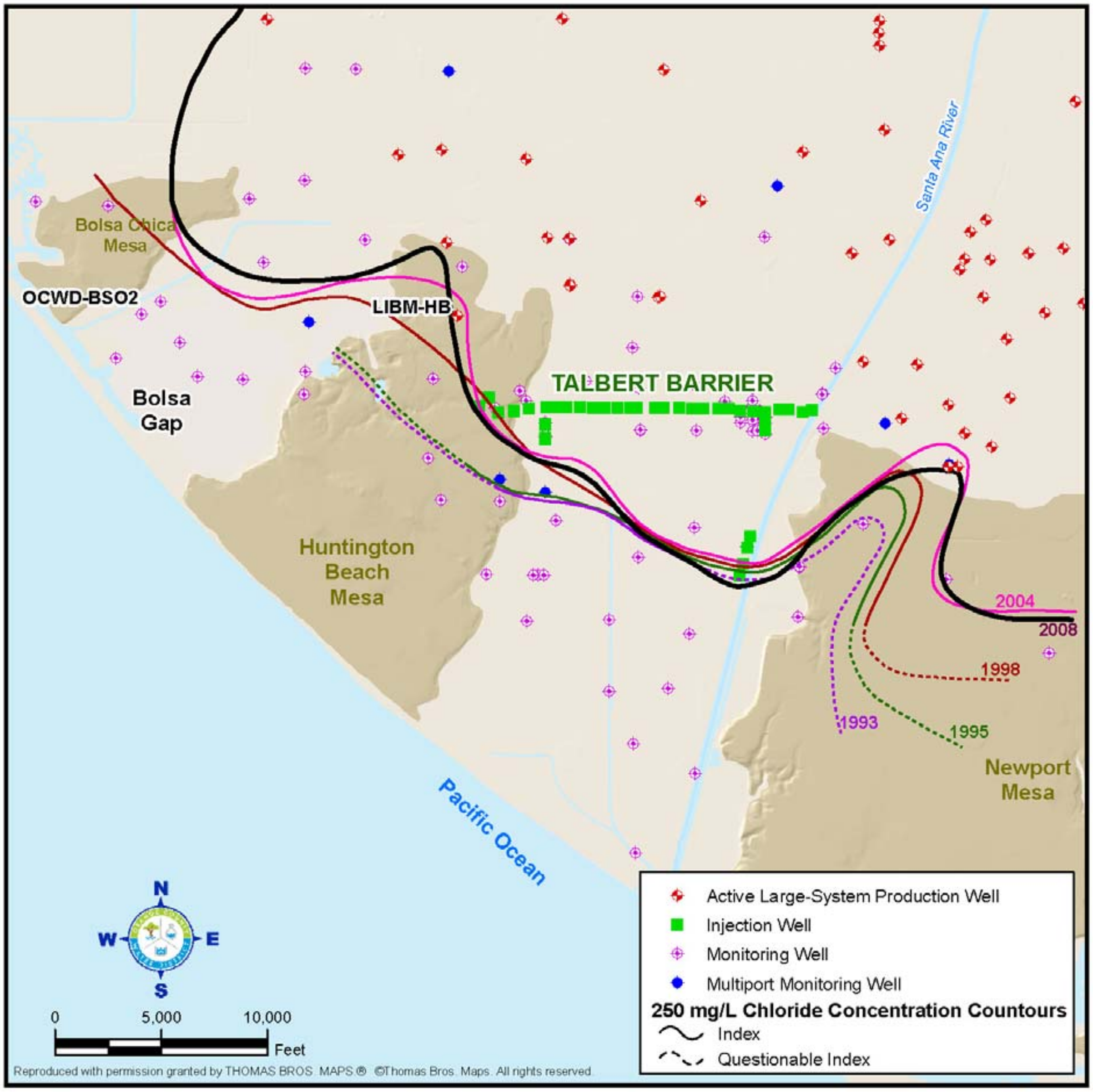
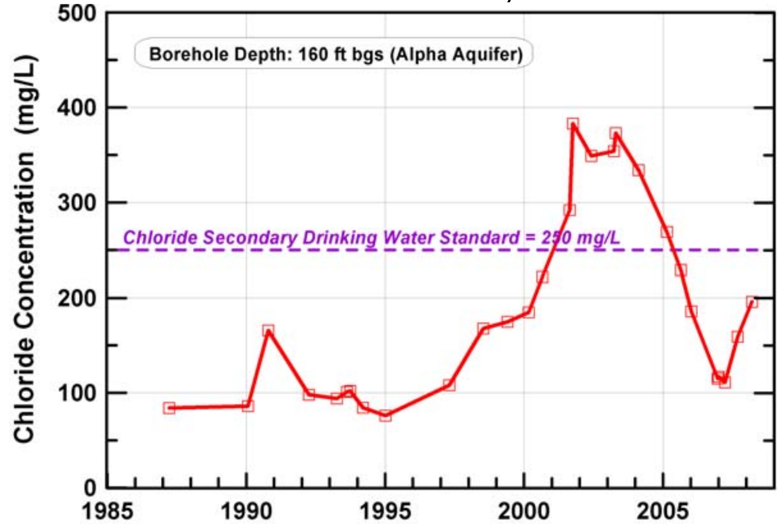


FIGURE 3-10
LANDWARD MOVEMENT OF 250 MG/L CHLORIDE CONCENTRATION CONTOUR



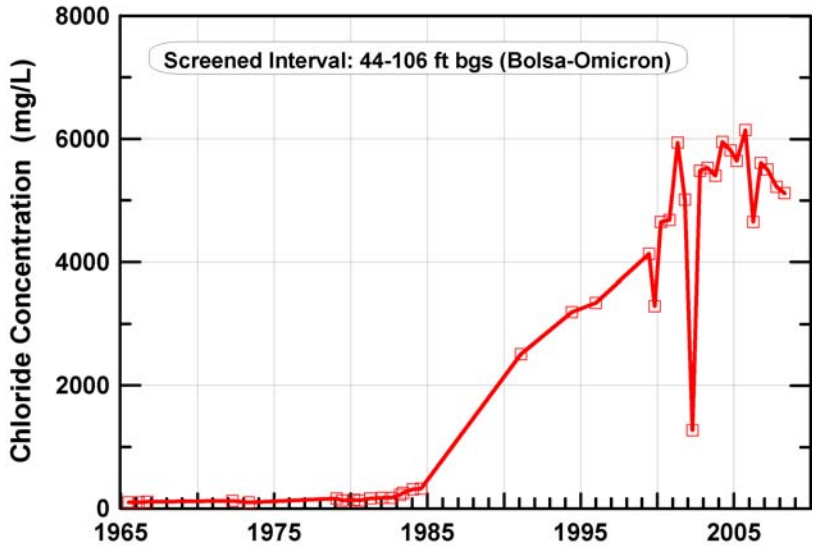
In addition to contour maps, OCWD staff prepares and reviews chloride concentration trends at individual wells to identify and evaluate intrusion in specific aquifer zones, Chloride concentration trend charts for two of those wells are shown in Figure 3-11 with their locations shown in Figure 3-10.

FIGURE 3-11
EXAMPLE CHLORIDE CONCENTRATION TREND CHARTS
DOMESTIC WELL LIBM-HB
NEAR BEACH BLVD. AND TALBERT AVE., HUNTINGTON BEACH



CALENDAR YEAR

MONITORING WELL OCWD BSO-2/1
BOLSA CHICA AREA, NEAR WINTERSBURG CHANNEL



CALENDAR YEAR

3.7 Monitoring Quality of Recharge Water

OCWD conducts an extensive program to monitor the quality of the water recharged into the groundwater basin. This includes monitoring of the Santa Ana River surface water and other recharge water supplies.

3.7.1 SANTA ANA RIVER WATER QUALITY

Since the quality of the surface water that is used for recharge may affect groundwater quality, a routine monitoring program is maintained to continually assess ambient river water quality conditions. Characterizing the quality of the Santa Ana River and its impact on the basin is necessary to verify the sustainability of continued use of river water for recharge and to safeguard a high-quality drinking water supply for Orange County.

On-going monthly surface water monitoring of the Santa Ana River is conducted at Imperial Highway near the diversion of the river to the off-river recharge basins and at a site below Prado Dam. Sampling frequencies for selected river sites and recharge basins are shown in Table 3-3.

TABLE 3-3
SURFACE WATER QUALITY SAMPLING FREQUENCY WITHIN ORANGE COUNTY

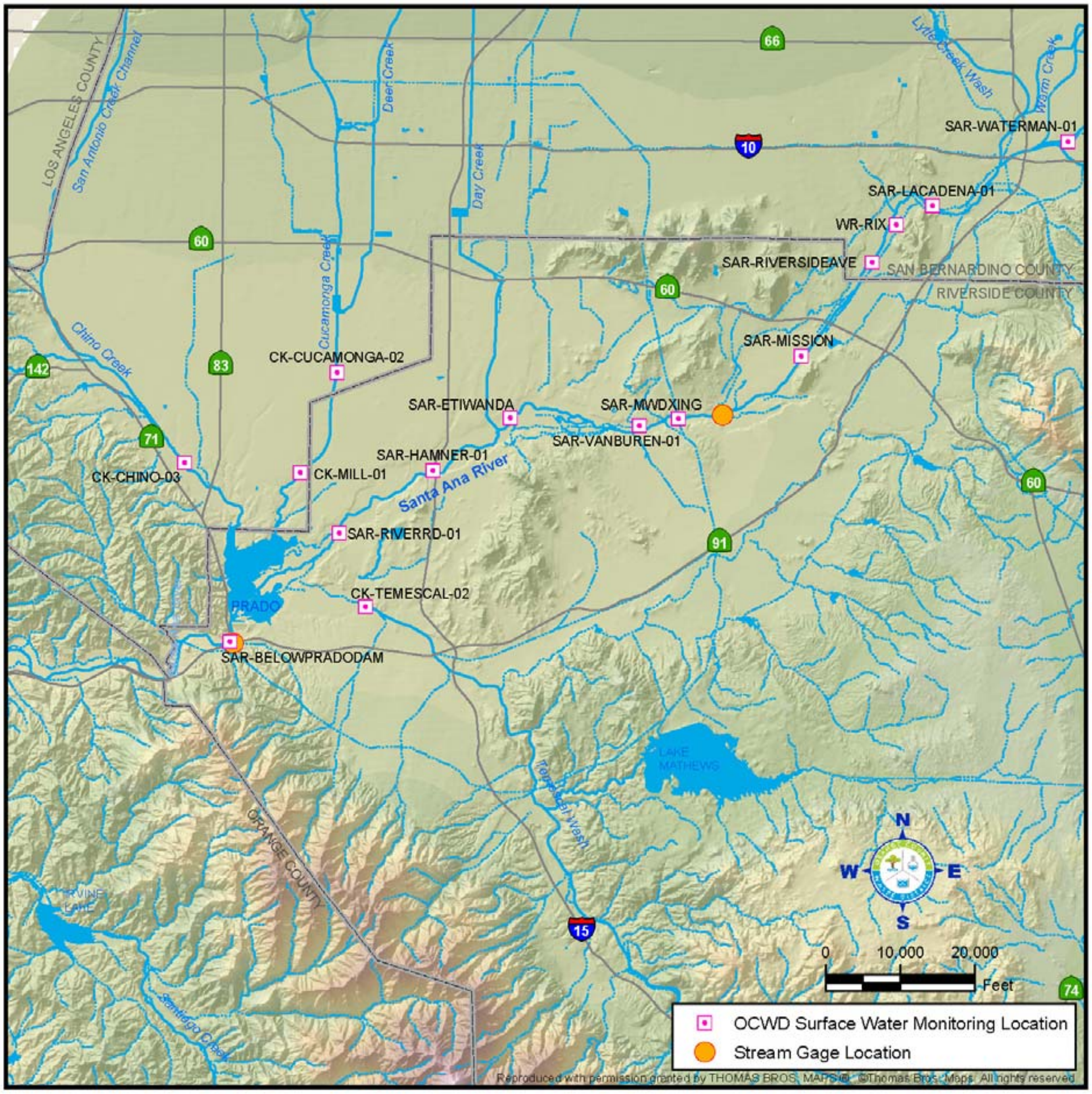
Category	SAR Below Dam	SAR Imperial Hwy	Anaheim Lake	Kraemer/ Miller Basin
General Minerals	M	M	M	Q
Nutrients	M	M	M	Q
Metals	Q	Q	Q	Q
Microbial	M	M	M	M
Volatile organic compounds (VOC)	M	M	M	Q
Semi-volatile organic compounds (SOC)	Q	Q	Q	Q
Total organic halides (TOX)	M	M	M	
Radioactivity	Q	Q	Q	Q
Perchlorate	M	M	M	Q
Chlorate	M	M	M	Q
Iodine		Q	Q	
NDMA Formation Potential (NDMA-FP)		Q	Q	

M = monthly, Q = quarterly

Note: NDMA-FP and iodine are focused testing initiated in late 2007 and will continue through 2009. Data will be reviewed to determine if monitoring should continue or incorporated into the long-term monitoring program.

General minerals, nutrients, and selected other constituents are monitored monthly, and radioactivity constituents, metals, volatile organics, and semi-volatile organics (e.g., pesticides and herbicides) are monitored quarterly. Several points on the river and key tributaries to the river above Prado Dam, as shown in Figure 3-12 are also monitored annually for general minerals and nutrients.

FIGURE 3-12
OCWD SURFACE WATER MONITORING LOCATIONS ABOVE PRADO DAM



3.7.1.1 Santa Ana River Water Quality and Health Study

In 2004, OCWD completed the Santa Ana River Water Quality and Health (SARWQH) study (OCWD, 2004). This voluntary study was conducted from 1994 to 2004 at a cost of $10 million. The study was initiated due to OCWD's concerns about the high percentage of treated wastewater discharges into the non-storm flows of the Santa Ana River.

The goal of the SARWQH Study was to apply advanced water quality characterization methods to assess the quality of Santa Ana River water and the groundwater after Santa Ana River water is used to recharge the groundwater basin. The multi-disciplinary study design included an examination of hydrogeology, microbiology, inorganic and organic water chemistry, toxicology and public health. The organic water chemistry component included an analysis of trace (low concentration) constituents and dissolved organic compound (DOC) characterization. Analyses and research in the SARWQH Study were conducted by scientists, researchers, and water quality experts from numerous organizations, including Stanford University, Lawrence Livermore National Laboratory, USGS, Oregon State University, and Metropolitan Water District.

The results of this extensive study confirmed that current recharge practices using Santa Ana River water are protective of public health. Findings from the SARWQH Study provided information necessary for the planning and permitting of other OCWD projects, such as the GWR System. Results are also helping to shape the CDPH proposed regulations for groundwater recharge.

At the request of OCWD, the National Water Research Institute (NWRI) conducted an independent review of the results from the SARWQH Study. NWRI assembled a group of experts in the fields of hydrogeology, water chemistry, microbiology, and the other requisite fields to form the Scientific Advisory Panel. This Panel met annually during the study to review the results and provide recommendations on future work. The panel also prepared a final report (NWRI, 2004) that concluded:

> "Based on the scientific data collected during the SARWQH Study, the Panel found that:
>
> - The SAR met all water-quality standards and guidelines that have been published for inorganic and organic contaminants in drinking water.
> - No chemicals of wastewater origin were identified at concentrations that are of public health concern in the SAR, in water in the infiltration basins, or in nearby groundwaters.
>
> The constituents that were considered included non-regulated chemicals (e.g., pharmaceutically active chemicals) and contaminants of concern that arose during the course of the SARWQH study (e.g., n-Nitrosodimethylamine [NDMA]).
>
> The unprecedented classification of the major components of DOC and the transformations that occur within these chemical classes as water moves downstream and into the aquifer provided significant new evidence to support the conclusion that the product water is suitable for potable

consumption and is also becoming comparable to other sources of drinking water, such as the Colorado River, in its organic profile."

3.7.2 REPLENISHMENT WATER FROM METROPOLITAN

When the District purchases replenishment water from Metropolitan and it is delivered at Anaheim Lake, the water is blended with Santa Ana River water. OCWD samples this blended water for general minerals, nutrients, and other selected constituents. The District may also sample for radioactive constituents, metals, volatile organics, and semi-volatile organics (e.g., pesticides and herbicides).

3.7.3 GROUNDWATER REPLENISHMENT SYSTEM

Recharge water produced by the GWR System is extensively monitored daily, weekly, and quarterly for general minerals, metals, organics, and microbiological constituents as shown in Table 3-4. Focused research-type testing has been conducted on organic contaminants and selected microbial species (i.e., protozoa, coliphage, etc.)

TABLE 3-4
GROUNDWATER REPLENISHMENT SYSTEM PRODUCT WATER QUALITY MONITORING

Category	Testing Frequency
General Minerals	M
Nitrogen Species (NO3, NO2, NH3, Org-N) and TDS	W
Metals	Q
Inorganic chemicals	Q
Microbial	D
Total Organic Carbon (TOC)	D
Non-volatile synthetic organic compounds (SOCs)	Q
Disinfection Byproducts	Q
Radioactivity	Q

D = Daily, W = twice weekly, M = monthly, Q = quarterly,

After the GWR System water is recharged, the water is monitored in the groundwater basin. The District uses an array of monitoring wells in the Talbert Gap and in Anaheim to monitor the water quality. As part of the construction of the GWR System, three new monitoring wells were constructed to complement the District's existing monitoring wells network.

3.7.4 INTEGRATED GROUNDWATER AND SURFACE WATER MONITORING

As part of its recharge water quality monitoring program, the District monitors groundwater quality at selected monitoring wells downgradient of the recharge facilities where the subsurface rate of travel of recharge water is known. These wells provide an indication of groundwater quality as recharge water flows away from the recharge basins. Recharge water samples are collected in coordination with these targeted groundwater samples so that the changes in water quality with time after recharge can be assessed. This allows for evaluations of water quality for parameters such as nitrate as the water is infiltrated and subsequently flows in the subsurface.

This integration of groundwater and surface water monitoring was established based on recharge water tracer studies conducted with water recharge at Anaheim Lake, Kraemer Basin, and the Santa Ana River (Clark et. al, 2004).

3.8 Publication of Data

In addition to collecting and managing data in the District's WRMS as described previously in this section, OCWD analyzes and reports data in a number of regular publications as shown in Table 3-5 below.

TABLE 3-5
DATA COLLECTION AND REPORTING

Report	Frequency of Publication	Contents
Engineer's Report on the Groundwater Conditions, Water Supply and Basin Utilization in the Orange County Water District	Annual	Basin hydrology, groundwater conditions, total groundwater production, groundwater levels, coastal groundwater conditions, calculation of basin accumulated overdraft, supplemental water purchases; required by the District Act
Santa Ana River Water Quality Monitoring Report	Annual	Surface water quality data for the Santa Ana River
Groundwater Replenishment System and Talbert Barrier Report	Annual	Data related to the operation of the Groundwater Replenishment System and the Talbert Seawater Intrusion Barrier; required by RWQCB permit
Santa Ana River Watermaster Report	Annual	Amounts of Santa Ana River flows at Prado Dam and Riverside Narrows; required by 1969 stipulated judgment
Managed Aquifer Recharge	Annual beginning 2009	Total amount of managed recharge, recharge data for each recharge basin, sources of and quantities of recharge water supplies

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4 RECHARGE WATER SUPPLY MANAGEMENT

OCWD manages the District's recharge facilities to maximize groundwater recharge. Efficiently operating existing groundwater recharge basins and facilities and expanding recharge operations where feasible are major District objectives. This section:

- **Describes the operations of the OCWD recharge facilities;**
- **Explains seawater intrusion barrier operations; and**
- **Discusses the sources of recharge water supplies.**

4.1 Recharge Operations

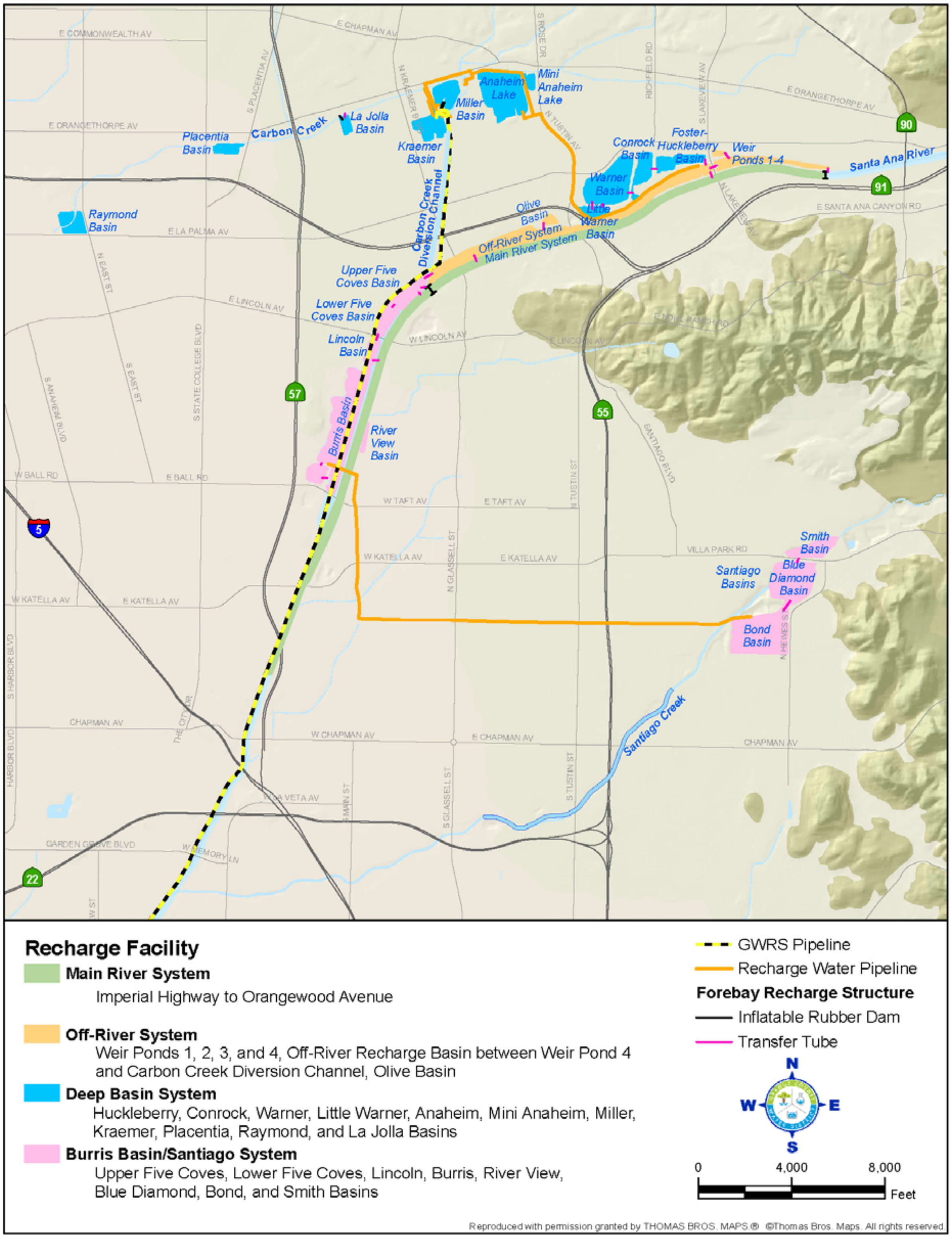
Recharging water into the basin, through natural and artificial means, is essential to support pumping from the basin. Although the amount of recharge and total pumping may not be the same each year, over the long-term the amount of recharge needs to be similar to total pumping. The basin's primary source of water for groundwater recharge is flow from the Santa Ana River. The Santa Ana River is the largest coastal stream in southern California with a length of 80 miles and a drainage area of 2,470 square miles (Blomquist, 1988). OCWD diverts river flows into recharge basins located in and adjacent to the Santa Ana River and its main Orange County tributary, Santiago Creek. Other sources of recharge water supplies include natural recharge, recycled water, and imported water.

OCWD currently operates 1,067 acres of recharge facilities located in and adjacent to the Santa Ana River and Santiago Creek. OCWD recharge facilities are shown in Figure 4-1. Active or managed recharge of groundwater began in 1949, in response to increasing drawdown of the basin and, consequently, the serious threat of seawater intrusion contaminating groundwater. The first imported water used to recharge the basin was Colorado River water purchased from Metropolitan.

In 1953, OCWD began making improvements in the Santa Ana River bed and areas adjacent to the river to increase recharge capacity. These improvements included modifying river channels and construction of off-channel recharge basins. Expansion of the recharge system has continued to the present time to the point where nearly all Santa Ana River non-stormflows are captured for recharge into the groundwater basin. Sources of recharge water have expanded to include water from Santiago Creek and purified water from the GWR System.

The recharge system consists of a series of recharge basins, also called percolation or spreading basins, whose sidewalls and bottoms allow for percolation into the underlying aquifer. The rate at which water enters from the surface into the ground is the percolation rate (or recharge or infiltration rate). The percolation rate and how it changes through time is the main factor in determining the effectiveness of the recharge facilities.

FIGURE 4-1
OCWD RECHARGE FACILITIES IN ANAHEIM AND ORANGE

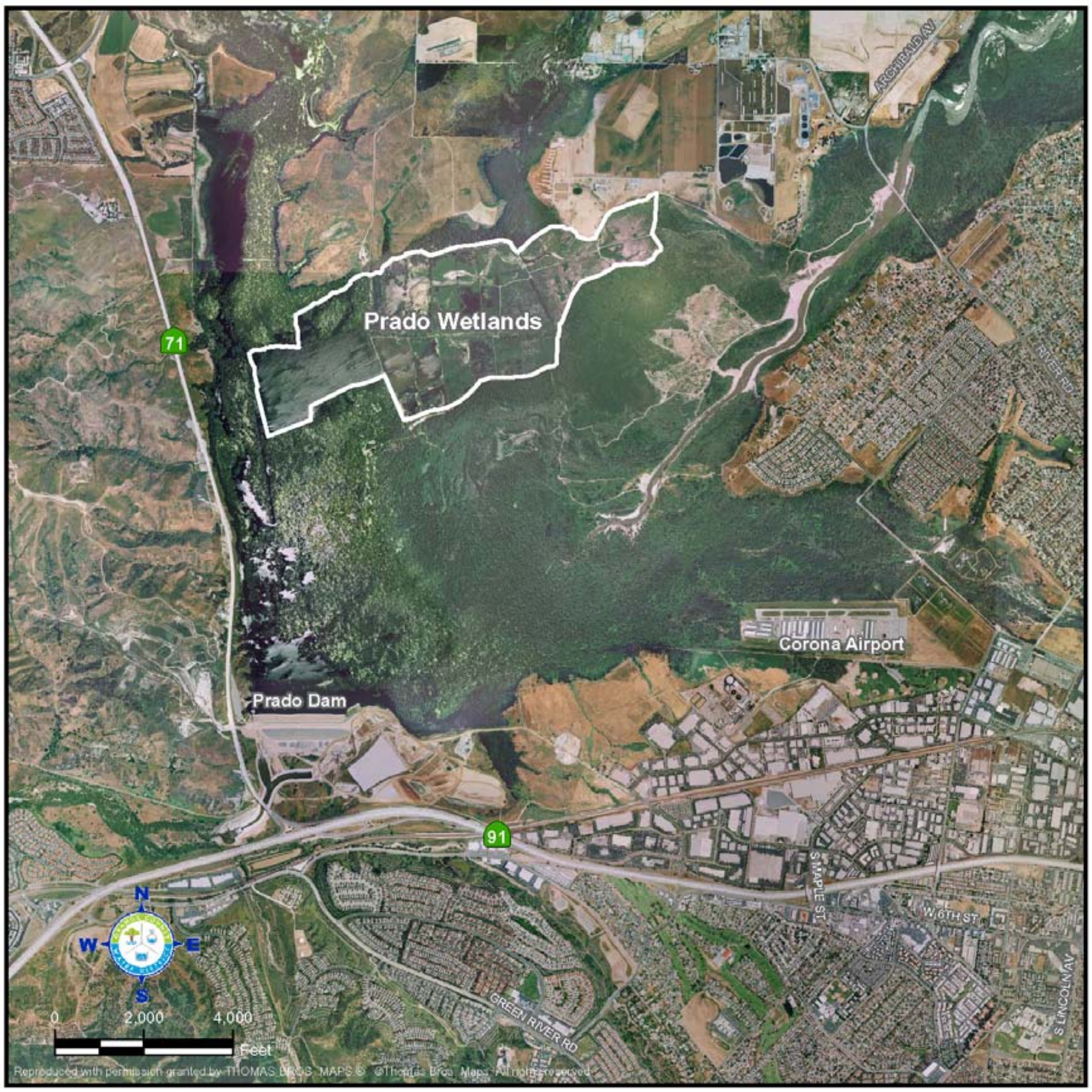


Higher percolation rates allow a greater quantity of water to infiltrate into the groundwater basin. Percolation rates tend to decrease with time as the percolation basins develop a thin clogging layer on the basin bottom. The clogging layer develops from fine grain sediment deposition and from biological growth. Percolation rates are restored by mechanical removal of the clogging layer from the basins. Mechanical removal methods that are employed utilize heavy equipment such as dozers, scrapers, and other equipment. Additionally, basin cleaning vehicles are employed in selected basins. These basin cleaning vehicles operate while the basin is in operation.

4.1.1 Prado Basin

The majority of water recharging the basin is Santa Ana River water that enters Orange County after flowing through the Prado Dam. The dam, shown in Figure 4-2, was built by the U.S. Army Corps of Engineers (ACOE) in 1941 “for flood control and other purposes.”

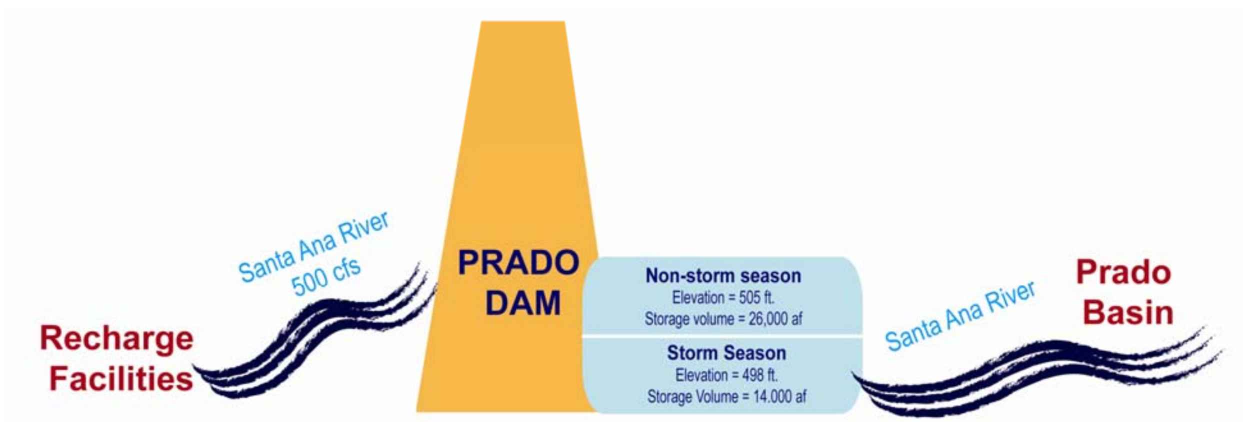
FIGURE 4-2
PRADO DAM AND OCWD PRADO WETLANDS



In the 1960s the ACOE began working with OCWD to conserve base and stormflows behind the dam in order to enable OCWD to divert flows into recharge facilities. In 1994, the ACOE adopted new dam operating procedures to increase water conservation (ACOE, 1994). During non-storm periods, the ACOE now releases water stored behind Prado Dam at rates compatible with OCWD's recharge capacity as long as the stored water does not compromise the use of the dam for flood control purposes.

Although the District's recharge system has the capacity to capture all Santa Ana River baseflows released through the Prado Dam, stormflows occasionally exceed the diversion capacity. OCWD continuously works with the ACOE to manage flow rates in order to maximize the recharge of stormflows. A new Memorandum of Agreement between OCWD and the ACOE, executed in 2006, authorized a four-foot increase in the maximum winter pool elevation. Water now can be stored temporarily behind Prado Dam up to an elevation of 498 feet mean sea level during the flood season, and up to an elevation of 505 feet during the non-flood season, as shown in Figure 4.3.

FIGURE 4-3
MAXIMUM CONSERVATION STORAGE ELEVATIONS ALLOWED BEHIND PRADO DAM



4.1.2 Recharge Facilities in Anaheim and Orange

The District operates 30 recharge facilities in the Cities of Anaheim and Orange and unincorporated areas of Orange County**.** These facilities, listed in Table 4-1, have a combined total storage volume of approximately 26,000 af. For descriptive purposes, they are grouped into four major components: the Main River System, the Off-River System, the Deep Basin System, and the Burris Basin/Santiago System.

TABLE 4-1
AREA AND STORAGE CAPACITIES OF RECHARGE FACILITIES

Facility	Wetted Area (acres)	Max. Storage Capacity (1) (af)
Anaheim Lake	72	2,260
Burris Basin	120	2,670
Conrock Basin	25	1,070
Five Coves Basin: Lower	16	182
Five Coves Basin: Upper	15	164
Foster-Huckleberry Basin	21	630
Kraemer Basin	31	1,170
La Jolla Basin	6.5	26
Lincoln Basin	10	60
Little Warner Basin	11	225
Miller Basin (2)	25	300
Mini-Anaheim Lake	5	13
Off-River Channel: Olive Basin-Carbon Creek Diversion	42	N/A
Off-River Channel: Weir Pond 4-Olive Basin	47	N/A
Olive Basin	5.8	122
Placentia Basin (2)	9	350
Raymond Basin (2)	19	370
River View Basin	3.6	11
Santa Ana River: Ball Road - Orangewood Ave.	59	N/A
Santa Ana River: Five Coves Dam-Ball Road	74	N/A
Santa Ana River: Imperial Hwy -Five Coves Dam	158	N/A
Santiago Basins: Bond Basin	86	8,380
Santiago Basins: Blue Diamond Basin	79	5,020
Santiago Basins: Smith Basin	22	320
Santiago Creek: Santiago Basins -Hart Park (3)	2.6	N/A
Warner Basin	70	2,620
Weir Pond 1	6	28
Weir Pond 2	9	42
Weir Pond 3	14	160
Weir Pond 4	4	22
Totals	**1,067**	**26,215**

Notes:

1. Maximum (Max.) storage capacity is typically not achieved for most facilities due to need to reserve buffer space for system flow and level fluctuations.
2. Owned by Orange County Flood Control District (OCFCD). Max. storage capacity shown is maximum flood control storage.
3. Various owners, including OCFCD, City of Orange, and Metropolitan.

4.1.2.1 Main River System

Water released at the Prado Dam naturally flows downstream and percolates through the river's 300-400 foot wide unlined channel bottom that consists of sandy, permeable sediment. The Main River System consists of approximately 291 acres along a six-mile reach of the Santa Ana River Channel, just west of Imperial Highway to Orangewood Avenue. Downstream of Orangewood Avenue shallow, low-permeability clay layers reduce the ability to recharge river water.

The upstream portion of the Main River System begins at the Imperial Inflatable Dam. The Imperial Inflatable Dam and Bypass Structure is one of the District's key control structures. It allows the District to divert Santa Ana River water from the Main River System into the Off-River System.

The Imperial Inflatable Dam, installed in 1993, is seven feet in diameter and 300 feet long, as shown in Figure 4-4. It is constructed of rubberized fabric that is inflated with air. When the stormflow rate exceeds approximately 1,500 cubic feet per second (cfs), the dam is deflated and only minimal water can be diverted for recharge. During some flow conditions, from 1,000-2,000 cfs, the dam is partially inflated, allowing some diversion for recharge and the remainder of the water to flow over the dam.

FIGURE 4-4
INFLATABLE DAM ON THE SANTA ANA RIVER

The pooled water behind the inflated dam flows through the bypass structure on the north side of the river. The bypass structure includes a series of steel gates leading to conduits that divert up to 550 cfs of water into the Off-River System. Water passes through trash racks to keep debris out and then flows into Weir Pond 1.

OCWD maximizes recharge in the Main River System by bulldozing a series of sand levees in the river, as shown in Figure 4-5. These levees allow greater percolation by increasing the residence time of water in the permeable section of the river and by spreading the water across the width of the river to maximize the wetted surface area. Typically, water flows at a velocity sufficient to prevent the accumulation of fine sediment and biological growth. The riverbed is also cleaned naturally, when winter and spring stormflows wash out the levees and scour the bottom. When necessary, heavy equipment is used to move sediments in order to restore the high percolation rate. Sand levees remain intact until flows exceed approximately 350 cfs, at which time they erode and water flows from bank to bank in the riverbed. Although percolation is believed to remain high during these high flow conditions, rates are difficult to measure.

FIGURE 4-5
SAND LEVEES IN THE SANTA ANA RIVER

The Santa Ana River bed percolation rate has been declining by approximately one percent per year for the last 20 years due to the coarsening of the river bed that is a common problem in river beds downstream of dams. This occurs because sand that would naturally flow down the river is trapped behind Prado Dam. The reduction in the amount of sand in the river bed causes sediments to become less conducive to percolation, particularly in the area closest to Imperial Highway.

4.1.2.2 Off-River System

The Imperial Inflatable Dam and Bypass Structure diverts Santa Ana River water flows from the Main River System into the Off-River System. This system includes four ponds called 'Weir Ponds' and a channel called the 'Off-River recharge basin'. Weir Ponds 1, 2, 3, and 4 are used to remove sediment from the Santa Ana River water diverted at the Imperial Inflatable Dam. The Weir Ponds have a surface storage of approximately 200 acre-feet. At the most downstream Weir Pond, Weir Pond 4, water can flow into the Off-River Recharge Basin, the Huckleberry Basin, or the Warner Bypass Pipeline. The Off-River Recharge Basin consists of a shallow, sandy bottom, 200-foot wide channel that runs parallel to the Main River System for approximately 2.3 miles from the Imperial Inflatable Dam down to the Carbon Creek Diversion Channel. The Off-River Recharge Basin is separated from the Main River System by a levee. Water in the Off-River Recharge Basin can be diverted into Olive Basin, which is located near Tustin Avenue.

4.1.2.3 Deep Basin System

The Deep Basin System consists of the Warner Basin Sub-system (Foster-Huckleberry, Conrock , Warner, and Little Warner Basins), along with Anaheim Lake, Mini Anaheim, and Miller, Kraemer, La Jolla, Placentia, and Raymond Basins. Up to 400 cfs of water can be diverted into Foster-Huckleberry and then into Conrock and Warner Basins. These recharge basins range in depth from 10 to 60 feet. Portions of their side-walls and bottoms are composed of natural, sandy, permeable materials that allow water to percolate into the aquifer. Percolation rates vary depending on the size and depths of the basins; rates slow significantly as fine-grained sediment particles accumulate on the basin bottoms. Most of the basins in this system can be drained and cleaned with equipment, shown in Figure 4-6, to remove this clogging layer, thereby restoring percolation rates and increasing recharge efficiency.

FIGURE 4-6
CLEANING OF RECHARGE BASINS

When the Warner Basin Sub-system is full, flows into the system are reduced to approximately 250 cfs. This maximizes percolation and allows the remainder of the water to be piped to the other downstream basins (Anaheim Lake, Mini Anaheim Lake, Miller, Kraemer, La Jolla, Placentia, and Raymond). Placentia and Raymond basins are owned by Orange County Public Works and can only be used during the non-flood season. Water is conveyed to these two basins using the Carbon Creek Channel.

The Five Coves Inflatable Dam is located on the Santa Ana River approximately three miles downstream of the Imperial Inflatable Dam. It was installed by OCWD in 1994 to divert flows into Five Coves, Lincoln, and Burris Basins. The dam is essentially the same size and construction as Imperial Inflatable Dam. Excess flows above 100 cfs and less than 500 cfs can be diverted at the dam; during storm events, flows over 500 cfs are lost to the ocean beyond this dam.

4.1.2.4 Burris Basin/Santiago System

The Burris Basin/Santiago System consists of 354 acres of shallow and deep recharge basins. The system begins at the confluence of the Santa Ana River and the Carbon Canyon Diversion Channel and ends at the Santiago Basins in Orange. It consists of Upper Five Coves, Lower Five Coves, Lincoln, Burris (shown in Figure 4-7) and River View Basins, the Santiago Basins (Blue Diamond Basin, Bond Basin, and Smith Basin), and Santiago Creek five miles east of the river.

The Five Coves Inflatable Rubber Dam diverts up to 500 cfs of flow from the Santa Ana River into Upper Five Coves Basin. This water can then flow sequentially into Lower

Five Coves Basin, Lincoln Basin, and Burris Basin. From there, the Burris Basin Pump Station can pump up to 230 cfs of water through the 66-inch diameter Santiago Pipeline to the Santiago Basins and Santiago Creek. Once Burris and the Santiago Basins are full, the flow must be reduced to match the Santiago Basins' percolation rate of approximately 125 cfs.

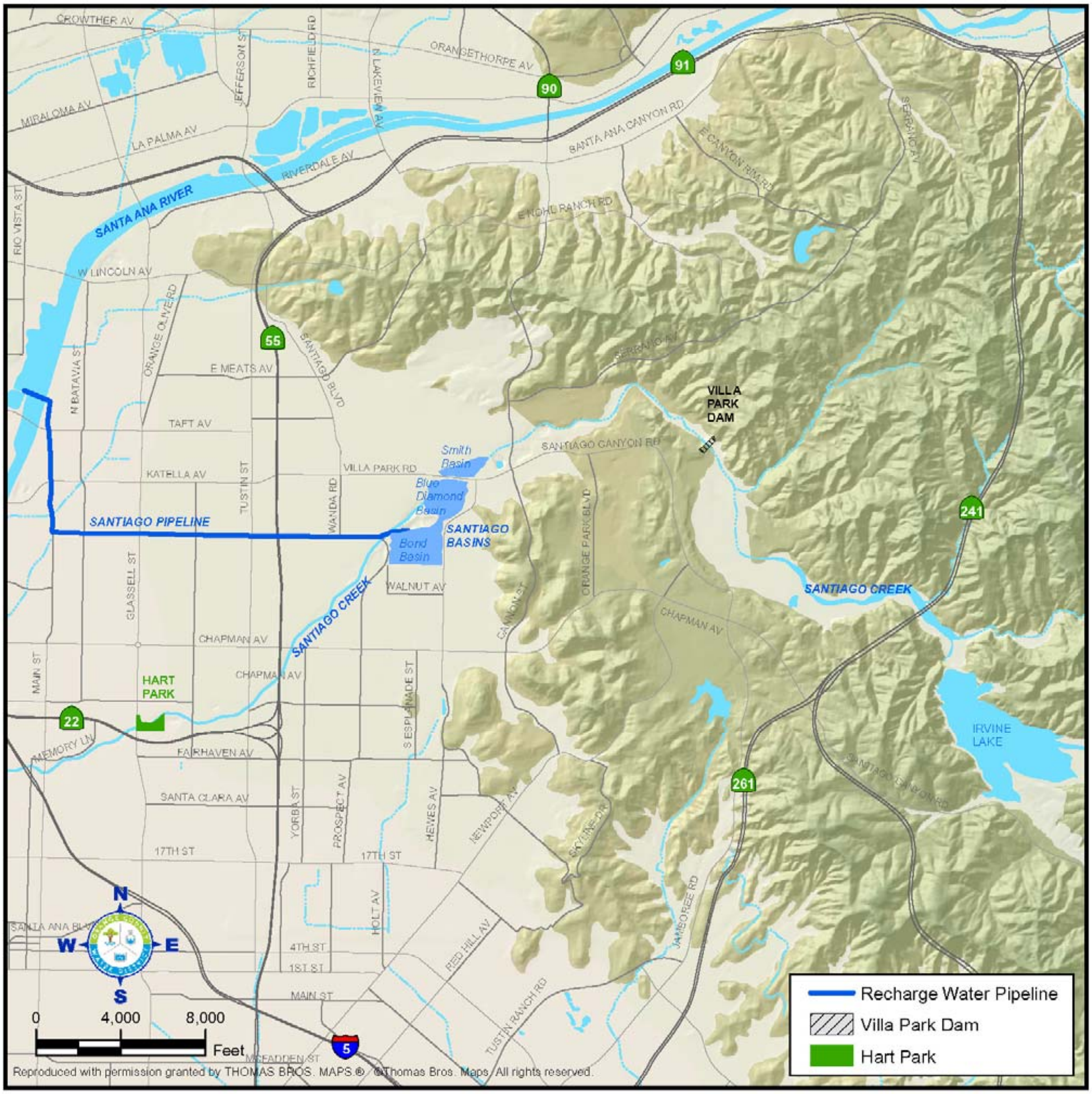
FIGURE 4-7
BURRIS BASIN

Santiago Creek, a tributary to the Santa Ana River, shown in Figure 4-8, is the primary drainage for the northwest portion of the Santa Ana Mountains. The creek extends from the mountains, through the City of Orange to its confluence with the Santa Ana River in the City of Santa Ana. Two dams along the river impound flows. Santiago Dam, which creates Irvine Lake, is owned by the Irvine Ranch and Serrano Water Districts. Villa Park Dam is primarily a flood control dam owned and operated by the Orange County Flood Control District.

OCWD's Santiago Basins are located downstream of Villa Park Dam. Here Santiago Creek flows are supplemented by water diverted from the Santa Ana River through the Santiago Pipeline. These former gravel pits recharge up to approximately 125 cfs when full. When the Santiago Basins are full, overflow from the basins flows down the sandy and rocky Santiago Creek bed. Natural percolation through the creek bottom into the groundwater basin occurs until water reaches Hart Park in the City of Orange.

The Santiago Basin Pump Station, completed in 2003, provides greater flexibility in managing recharge operations. Pumps placed in the bottom of Bond Basin move water out of the Santiago Basin into Santiago Creek or back down into the Santiago Pipeline where water can be discharged to the River View Basin or back to Burris Basin. River View Basin is located on the east side of the Santa Ana River adjacent to Burris Basin. Pumping water to and from the Santiago Basins increases the quantity of groundwater recharge and creates capacity in the Santiago Basins for storage of water from winter storms.

FIGURE 4-8
SANTIAGO CREEK STORAGE AND RECHARGE AREAS



4.2 Sources of Recharge Water

Water supplies used to recharge the groundwater basin are listed in Table 4-2.

TABLE 4-2
SOURCES OF RECHARGE WATER SUPPLIES

Water Supply		Source of Recharge Water Supply	Recharge location
Santa Ana River	Baseflow	Perennial flows from the upper watershed in Santa Ana River; predominately treated wastewater discharges	OCWD recharge basins and the Santa Ana River
	Stormflow	Precipitation from upper watershed flowing in Santa Ana River through Prado Dam	OCWD recharge basins and the Santa Ana River
Santiago Creek		Santiago Creek	OCWD recharge basins; natural percolation in Santiago Creek
Natural Recharge		Precipitation and flows from Orange County foothills	Throughout the basin
Purified Water	Groundwater Replenishment System	GWR System treatment facility	Injected into Talbert Barrier; Kraemer and Miller basins
	Water Replenishment District of Southern CA	Water purified at the Leo J. Vander Lans Treatment Facility	Injected into Alamitos Barrier
Imported Water and Supplemental Water	Metropolitan Water (untreated)	State Water Project and Colorado River Water	Various recharge basins
	Metropolitan Water (treated)	State Water Project and Colorado River Water through the Diemer Water Treatment Plant	Injected into Talbert and Alamitos Barriers
	Arlington Desalter	Purified water from Arlington Desalter released to Santa Ana River above Prado Dam	OCWD recharge basins
	San Bernardino Valley Municipal Water District	Surplus groundwater released into the Santa Ana River in San Bernardino	OCWD recharge basins
	Western Municipal Water	Surplus groundwater released into the Santa Ana River in Riverside	Released into the Santa Ana River above Prado Dam to OCWD recharge basins
In Lieu Replenishment Water	Metropolitan Water District of Southern California	Treated imported water used to replace pumping of groundwater, when available	Water is delivered directly to Producers

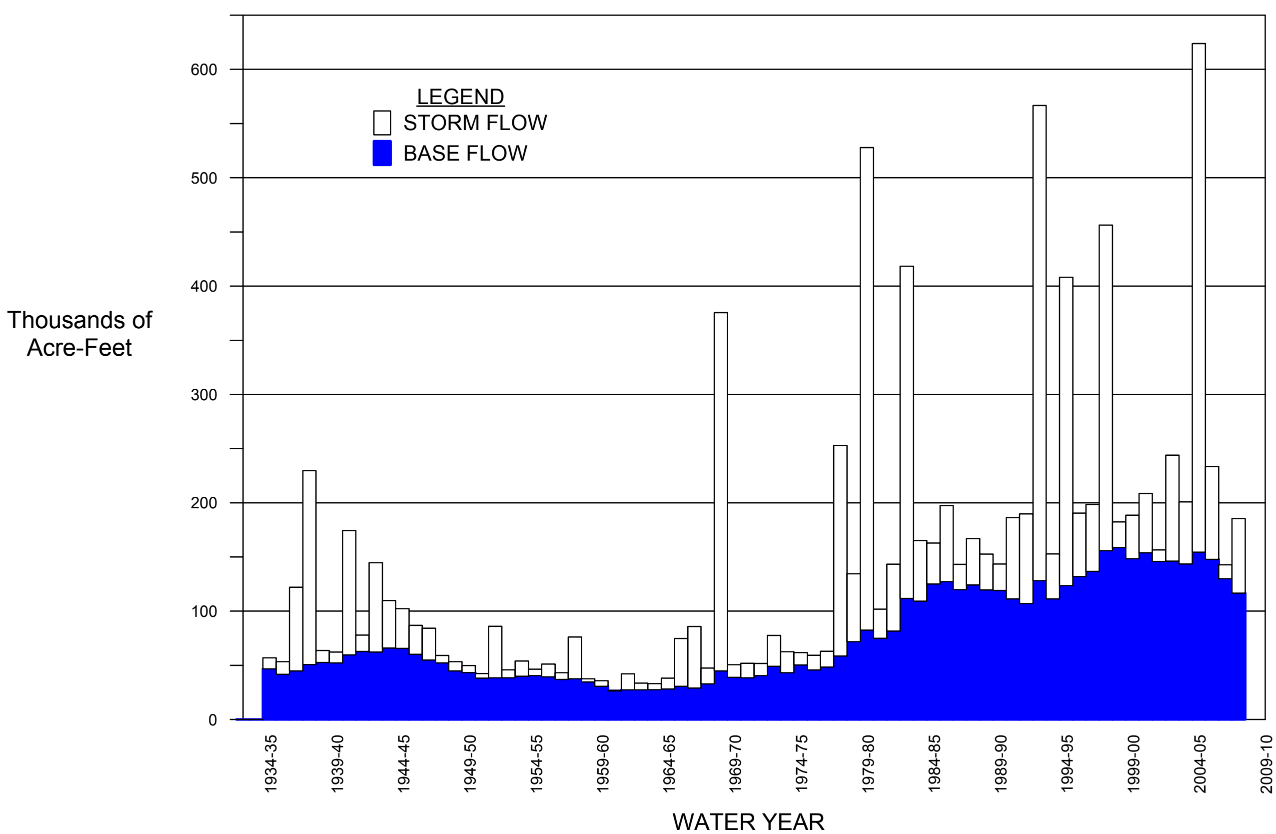
4.2.1 Santa Ana River

The primary source of water to recharge the basin is Santa Ana River flows. A large amount of the baseflow water, especially in the summer months, is composed of tertiary-treated wastewater discharges from wastewater treatment facilities upstream of Prado Dam.

OCWD has legal rights to a minimum of 42,000 afy of Santa Ana River baseflow. The minimum amount of Santa Ana River baseflow was established in a legal agreement entered into by OCWD and upstream water agencies in 1969. This agreement is commonly referred to as the '1969 Judgment.'

From the 1970s to the mid-1990s, the rate of Santa Ana River baseflow increased from approximately 50,000 afy to 150,000 afy. This is attributed primarily to population increases in the area above Prado Dam, which resulted in additional treated wastewater discharges from upstream communities. Figure 4-9 illustrates historic baseflow in the Santa Ana River at Prado Dam for the period from water year 1934-35 to 2006-07.

FIGURE 4-9
SANTA ANA RIVER FLOWS AT PRADO DAM



Source: Santa Ana River Watermaster 2009

In December 2008, the State Water Resources Control Board (SWRCB) approved the issuance of a permit to OCWD to appropriate 362,000 afy from the Santa Ana River. The SWRCB also agreed to hold an additional 143,000 afy in abeyance for OCWD for possible future projects. This provides an opportunity for OCWD to pursue long-term projects and complete environmental analysis and planning of those projects by 2023. Provided that this is completed by 2023, OCWD can seek the additional rights without the need to restart the water rights application process.

The volume of water recharged into the basin from Santa Ana River stormflows changes yearly due to variations in the amount of precipitation and the timing of precipitation and stormflow. Although stormflows average approximately thirty-three percent of the total Santa Ana River flows, only approximately half of that amount is recharged at OCWD's spreading facilities. This is primarily because the magnitude of stormflow releases from Prado Dam often greatly exceeds the District's diversion and recharge capacity. While the estimated maximum percolation capacity of the recharge basins is 500 cfs, the rate of Santa Ana River stormflow can reach up to 3,000 cfs or more, roughly six times the recharge capacity. The volume of water lost to the ocean can reach 5,000 af/day or more. Although it is common to have some loss to the ocean every year, during wet years losses can be great; in water year 1997-98, the District lost approximately 270,000 af of Santa Ana River stormflows to the ocean.

Figure 4-10 shows the precipitation at San Bernardino, indicating the variation of precipitation from year to year.

FIGURE 4-10
PRECIPITATION AT SAN BERNARDINO

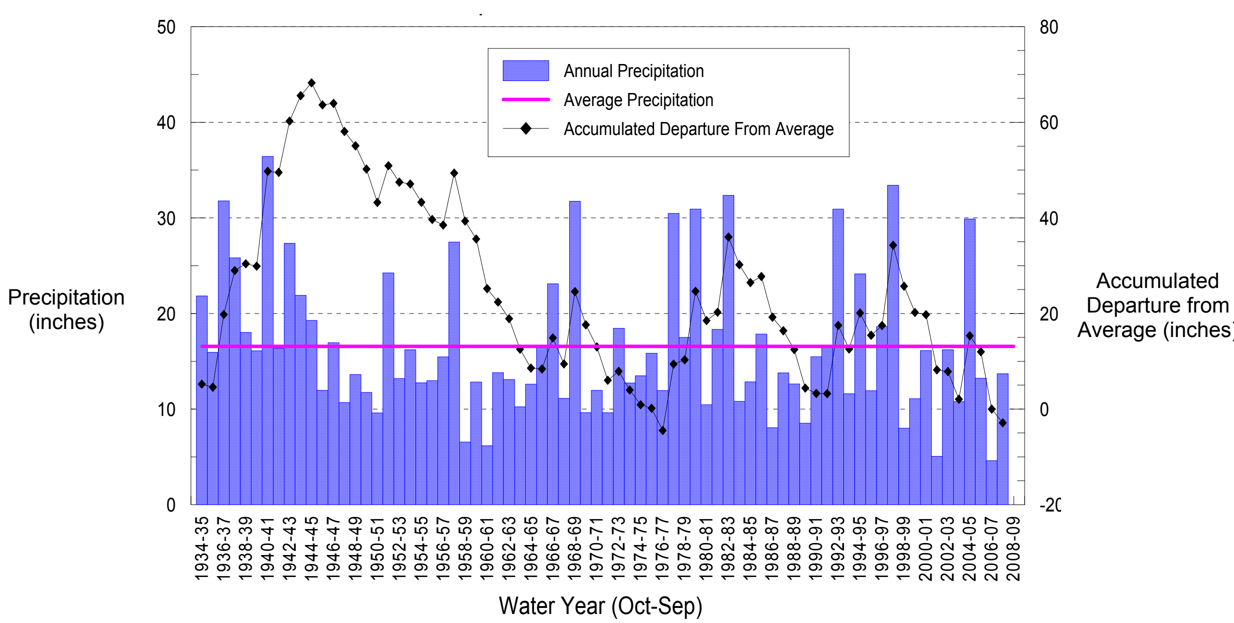
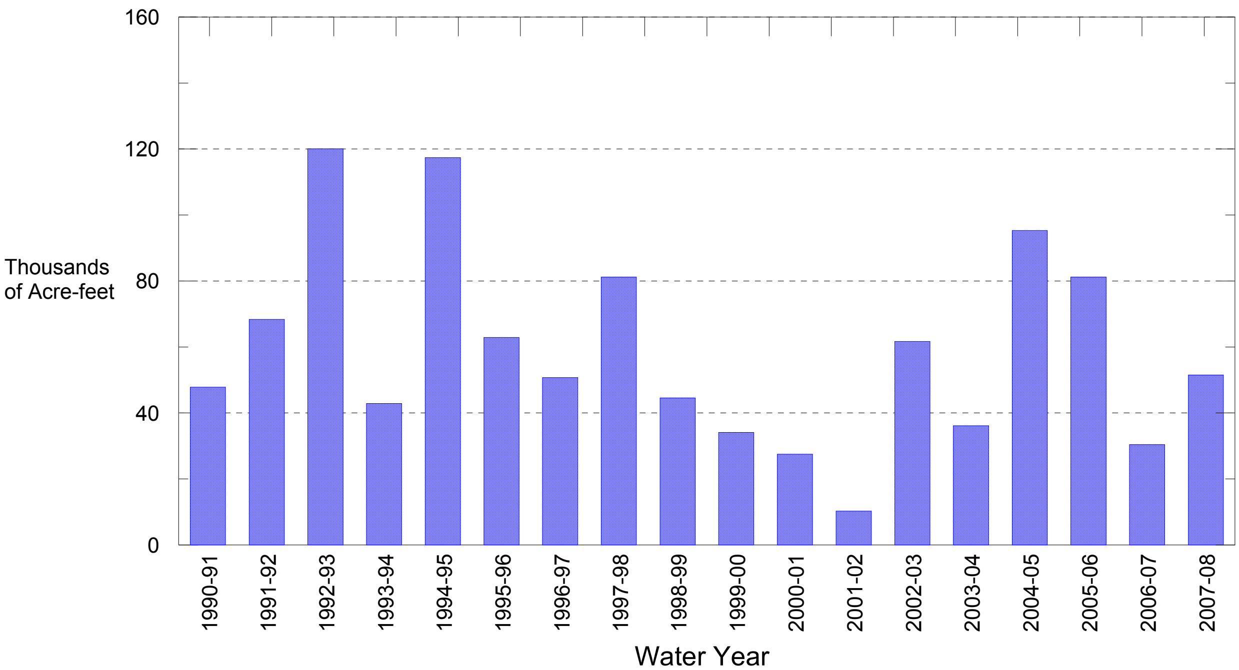


Figure 4-11 shows the amount of Santa Ana River stormflow recharged by the District for the past eighteen years. Based on the data in this figure, an average of 50,000 afy of stormflow has been captured and recharged. Precipitation in the form of snow accumulating in the upper watershed's mountains usually allows for greater recharge as snow melting over time provides a steady baseflow for recharge. Maximizing the capacity to store stormwater at Prado Dam for groundwater recharge also aids OCWD's efforts to maintain good water quality. Stormwater usually has lower total dissolved solids and nitrate concentrations than Santa Ana River baseflow, so blending stormwater with other sources of recharge water improves water quality.

FIGURE 4-11
STORMFLOW RECHARGED IN THE BASIN



4.2.2 Santiago Creek

Most of the natural flow of Santiago Creek is captured behind the impoundments described earlier. Water released into the creek flows downstream and recharges into the groundwater basin. Since 2000, OCWD has operated the Santiago Creek Recharge Project. A permit from the SWRCB (permit 19325) allows OCWD to collect and store up to 33,560 afy from Santiago Creek. Using controlled releases into the creek, up to approximately 15 cfs is recharged between the Santiago Basins and Hart Park in the City of Orange. In 2008, OCWD completed a project to grade the channel to smooth out the channel bottom. Over time the creek flows became confined to a relatively small notch in the channel. Removing this low-flow channel allowed water to spread out and cover a larger surface area, which increased the recharge rate.

In 2008-09, three monitoring wells were constructed to assess recharge conditions and water quality along Santiago Creek and the Santiago Basins. These wells will provide important information regarding recharge from the creek and the Santiago Basins.

4.2.2.1 Natural Recharge

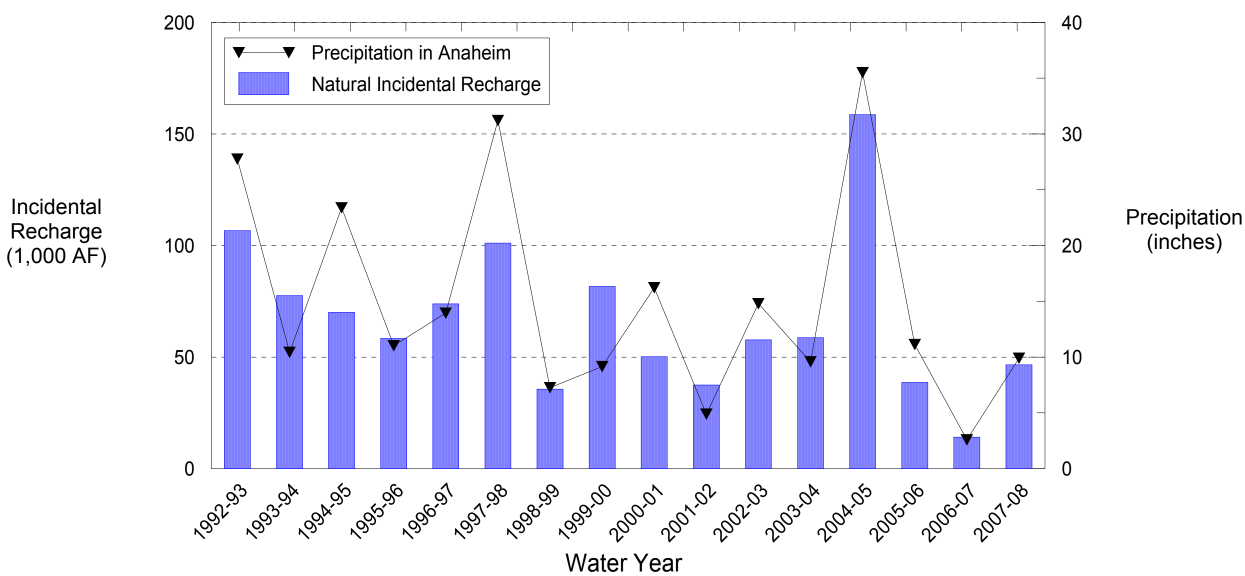
Natural infiltration of recharge, also referred to as incidental recharge, occurs from subsurface inflow from the local hills and mountains, infiltration of precipitation and irrigation water, unmeasured recharge from small flood control channels, and groundwater underflow to and from Los Angeles County and the ocean. Natural incidental recharge occurs outside the District's control.

Net incidental recharge refers to the net amount of incidental recharge that occurs after accounting for subsurface outflow to Los Angeles County. As described in Section 2, an increase in the accumulated overdraft in the basin decreases the estimated amount of outflow to Los Angeles County.

Estimated net incidental recharge and precipitation in Anaheim is shown in Figure 4-12. On average, approximately 60,000 af of net incidental recharge occurs each year. In very wet years such as 2004-2005, the amount of incidental recharge can be 100,000 afy or more.

The increase of impermeable surfaces reduces the amount of natural infiltration. New industrial, commercial, and residential developments may divert storm flows into channels that drain to the ocean instead of percolating into the ground. Decades of development with the emphasis on flood protection have encouraged rapid, efficient removal of stormwater. Concerns about the reduction in natural recharge as well as water quality impacts from landscape irrigation runoff and storm flow have increased interest in low-impact development (LID), the on-site capture and management of runoff. Utilization of LID, such as dry-wells, swales, wetlands, and other engineered systems can lead to an increase the rate of incidental recharge. Increasing infiltration, however, could have negative impacts if percolation of poor quality water would adversely impact the basin's water quality.

FIGURE 4-12
NET INCIDENTAL RECHARGE



4.2.3 Purified Water

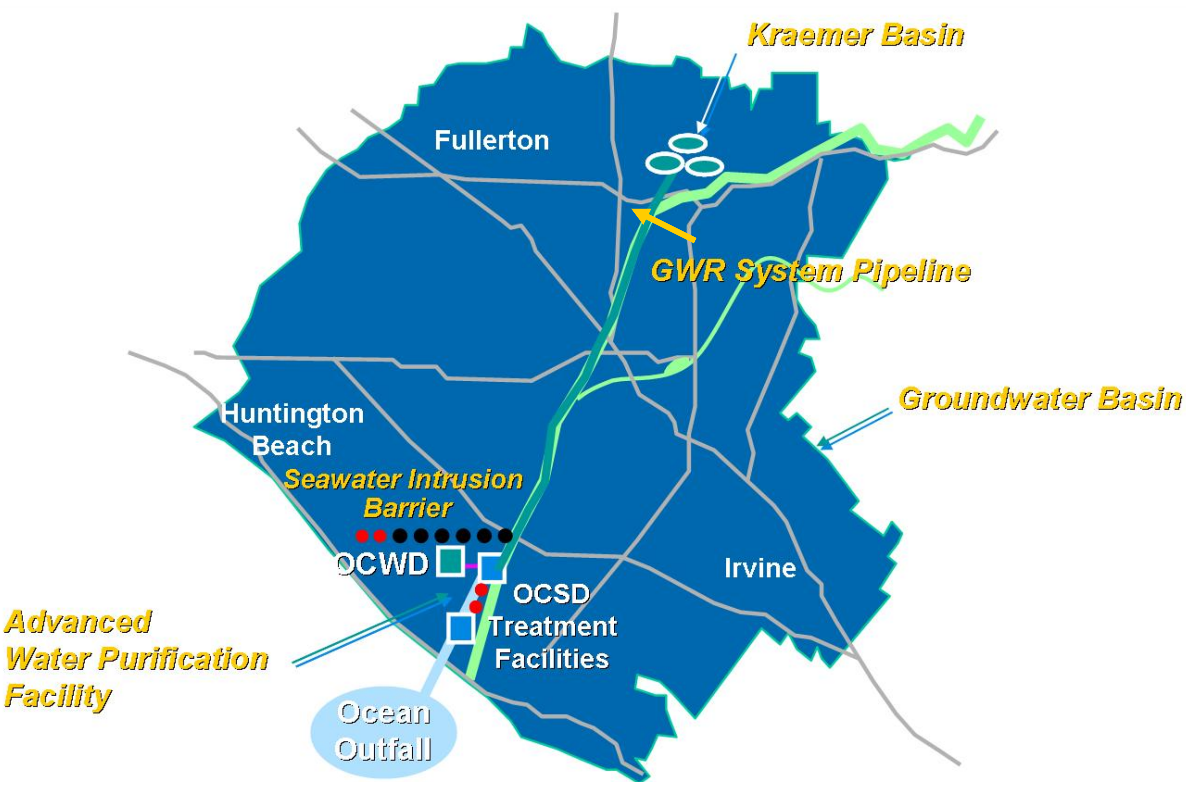
OCWD has been purifying wastewater to recharge the basin since 1975. Water Factory-21 (WF-21), in operation from 1975 to 2004, purified treated wastewater to provide a source for the Talbert Barrier. In 2008, the GWR System replaced WF-21 and began operation to provide water for groundwater recharge in Anaheim as well as for the Talbert seawater intrusion barrier.

4.2.3.1 Groundwater Replenishment System

The GWR System is a joint project of OCWD and the OCSD. The GWR System creates a new source of recharge water that will increase the reliability and sustainability of local groundwater supplies.

The GWR System augments existing groundwater supplies by producing up to 72,000 afy of purified water to recharge the basin and provide a reliable supply of water for the Talbert Seawater Barrier. As shown in Figure 4-13, the GWR System consists of three major components: (1) Advanced Water Treatment (AWT) facilities and pumping stations, (2) a pipeline connection from the treatment facilities to existing recharge basins, and (3) expansion of the Talbert Barrier.

FIGURE 4-13
GROUNDWATER REPLENISHMENT SYSTEM MAP



Secondary-treated effluent from the OCSD Wastewater Reclamation Plant No. 1 in Fountain Valley is pumped to the AWT facilities instead of to the ocean for disposal. The advanced water purification plant purifies the water with microfiltration (MF); reverse osmosis (RO); and advanced oxidation processes (AOP), which consist of ultraviolet (UV) and hydrogen peroxide (H_2O_2).

The first step in the tertiary treatment process is MF membrane treatment. MF is a low-pressure membrane process that removes small suspended particles, protozoa, bacteria and some viruses from the water. Sodium hypochlorite, a bleach solution, is added to the MF feedwater to minimize MF membrane fouling.

Next, the MF filtrate is fed to the RO treatment system. Dissolved contaminants and minerals, including dissolved organics, total dissolved solids, silica, and virus, are removed in the RO treatment process.

The water then undergoes UV and H_2O_2 treatments. UV light penetrates the cell walls of microorganisms, preventing replication and inducing cell death. This provides an additional barrier of protection against bacteria and viruses. More importantly, UV with H_2O_2 oxidizes organic compounds. At this point, the product water is so pure that it can not be moved in conventional pipes. Small amounts of minerals are added back into the water so that it is stable in the concrete pipes.

Although the GWR System is capable of producing 72,000 afy of water, the first year of operation actually produced less than 45,000 af of water. Operation of the system is limited by the supply of secondary-treated wastewater from OCSD. OCSD is in the process of constructing a pump station, scheduled to be completed before the end of 2009, which will help provide additional flow into the GWR System. When the pump station becomes operational, District staff expects to operate the GWR System to full capacity.

In addition, OCSD anticipates that construction of an expansion to their secondary treatment processes will be complete in late 2011. With this increase of available supply of wastewater, OCWD plans to expand the GWR System. The initial expansion will be designed to increase production by 17,000 to 20,000 afy of water.

4.2.3.2 Talbert and Alamitos Barriers

The GWR System is the primary source of water used for injection at the Talbert Barrier. An additional source of water for the barrier is treated potable water purchased from Metropolitan. Water for the Alamitos Barrier is supplied from two sources: imported water from Metropolitan and purified wastewater purchased from the Water Replenishment District of Southern California (WRD) under a joint cost sharing agreement with OCWD, as explained in Section 4.2.4.2.

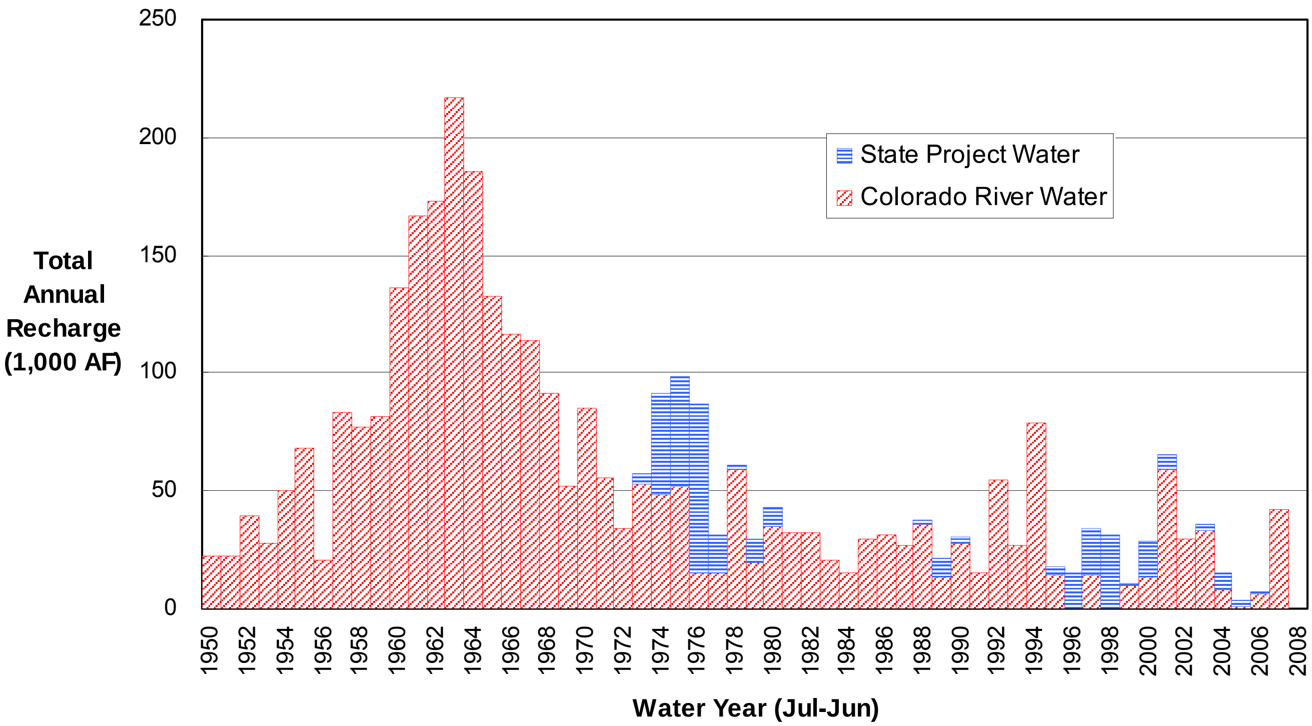
4.2.4 Imported Water

Water purchased by OCWD for recharge comes from a number of sources. This recharge water is also referred to as replenishment water, supplemental water or imported water. Total annual recharge of imported water from 1937 to 2008 is shown in Figure 4-14.

Metropolitan provides untreated replenishment water to the District when excess supplies are available. These supplemental supplies are an unreliable source of recharge water as they are typically unavailable to purchase during droughts. OCWD receives State Water Project (SWP) water from Northern California at a number of locations. Water released through a connection in Claremont flows down San Antonio Wash to Chino Creek, which drains into the Santa Ana River. Colorado River water can be delivered via the Santa Ana River upstream of OCWD's main recharge basins. A blend of SWP water and Colorado River waters can also be received directly into Anaheim Lake.

The District typically has recharge capacity available to receive this water during the summer/fall months. However, these supplies by nature are more frequently available during the winter season, which is when the District's recharge facilities are being used to capture and recharge Santa Ana River flows. The District can usually take between 50 cfs to 200 cfs (100 - 400 af/day) of direct replenishment water depending upon the operating condition of the recharge facilities.

FIGURE 4-14
ANNUAL RECHARGE OF IMPORTED WATER FROM METROPOLITAN, 1950-2008



4.2.4.1 Upper Watershed Imported Water

OCWD has historically entered into agreement with water agencies in the upper watershed to pay for excess upper watershed water that the agencies pump into the Santa Ana River that reaches Prado Dam. This water is captured for recharge in the OCWD facilities. The sources listed here are only available when the supplying water agency has excess supplies. During times of drought, these sources become less available.

- The Arlington Desalter. When potable consumption does not match the output of the Arlington Desalter in Riverside, the District may purchase the excess water for groundwater recharge.
- The Bunker Hill Basin groundwater pump out project in San Bernardino is a cooperative project with the San Bernardino Valley Municipal Water District. The project was constructed to mitigate the negative impacts of high groundwater levels. Groundwater is pumped from the Bunker Hill Basin into the Santa Ana River.
- Western Municipal Water District provides to OCWD up to 7,000 afy of recharge water when available. This water is discharged into the Santa Ana River and is recharged into the groundwater basin in the District's recharge system.

4.2.4.2 Alamitos Seawater Intrusion Barrier Source Water

The WRD manages groundwater for nearly four million residents in 43 cities of southern Los Angeles County. The City of Long Beach, under contract with WRD, operates the Leo J. Vander Lans Treatment Facility, an advanced water treatment facility that treats effluent water from the Sanitation District of Los Angeles County using MF, RO, and UV treatment. About 2.7 million gallons of purified water are blended with imported water and pumped into the Alamitos Seawater Barrier.

4.2.4.3 In Lieu Replenishment Water

When recharge capacity is unavailable, OCWD can also receive replenishment water via an In-lieu program. In-lieu recharge refers to the practice of increasing groundwater storage by providing interruptible potable water supplies to a user who relies on groundwater as a primary supply. This treated potable water is made available to Producers who, in turn, use the supply in place of pumping an equal supply of groundwater. This program is revenue neutral for Producers and helps recharge the groundwater basin in a targeted manner.

4.3 Recharge Studies and Evaluations

The District has an ongoing program to assess enhancements in existing recharge facilities, evaluate new recharge methods, and analyze potential new recharge facilities.

4.3.1 OCWD Recharge Enhancement Working Group (REWG)

The REWG is composed of staff from several departments that works to maximize the efficiency of existing recharge facilities and evaluate new concepts to increase recharge capacity. REWG, with staff from recharge operations, hydrogeology, engineering, research and development, regulatory affairs, and the planning departments, meets on a regular basis to review new data and evaluate potential new projects.

Proposed projects, such as reconfiguration of existing basins, operational improvements to increase flexibility in the management of the basins, alternative basin cleaning methods, potential sites for new basins, and control of sediment concentrations, are discussed and prioritized.

4.3.2 COMPUTER MODEL OF RECHARGE FACILITIES

OCWD is in the process of developing a computer model of the District's recharge system in Anaheim and Orange. The model will simulate Prado Dam operations, Santa Ana River flow, and each recharge facility in order to model how the recharge system operates in conjunction with storage of water behind Prado Dam and flows from the Santa Ana River. This planning tool will be used to evaluate various conditions including estimating recharge benefits if new recharge facilities are constructed, existing facilities are improved, increased storage is achieved at Prado Dam, or baseflow changes occur in the Santa Ana River.

Output from the model will include:

- Amount of water in storage at Prado Dam and storage and recharge rates at each recharge facility;
- Amount of water that could not be recharged and the frequency of water loss to the ocean;
- Optimal amount of cleaning operations; and
- Available (unused) recharge capacity.

The model will be constructed so that it can be operated by District staff from a desktop personal computer using a graphical user interface.

4.4 Improvements to Recharge Facilities

The District regularly evaluates potential projects to improve the existing recharge facilities and build new facilities. Changes to existing facilities may include:

- improving the ability to transfer water from one recharge basin to another;
- improving the ability to remove the clogging layer that forms on the bottom of the recharge basins;
- removing shallow low-permeability silt or clay layers that occur beneath recharge basins
- improving the shape or configuration of the basin to increase the infiltration rate or ability to clean the basin; and
- converting an existing underperforming recharge basin to a new type of recharge facility.

The District also regularly evaluates building new facilities. This effort includes:

- evaluating existing flood control facilities that could be utilized to increase recharge;

- evaluating potential sites for purchase and subsequent construction of new recharge facilities; and
- evaluating potential dual-use sites, where a subsurface recharge system could be built and remain compatible with the existing use, such as building a subsurface infiltration gallery under a parking lot.

4.4.1 RECHARGE FACILITIES IMPROVEMENTS 2004-2008

The following projects were completed between 2004 and 2008 by OCWD to improve recharge operations:

La Jolla Basin

OCWD purchased land along Carbon Creek east of Placentia Basin and west of Kraemer Basin and constructed a new 6-acre recharge basin. Water is diverted from Carbon Creek using a rubber dam. The six-foot deep basin can be easily drained by gravity flow back to Carbon Creek when necessary for maintenance. The basin was placed on line in 2008 and is expected to recharge as much as 9,000 afy.

Olive Basin Intake Structure Improvements

Prior to acquisition by OCWD, the Olive Basin was mined for sand and gravel. A corrugated metal transfer tube was installed to convey Santa Ana River water into the basin. However, this transfer tube was located mid-way up the side of the basin and the flow discharging into the basin eroded the sidewalls, causing sediment to rapidly clog the basin. Improvements that were completed in 2007 included the installation of a new transfer pipe and concrete box set at the bottom of the basin to allow water to flow into the basin from the bottom.

Mini-Anaheim Recharge Basin Modifications

Improvements to this small basin made in 2005 increased the efficiency of moving Santa Ana River water into the basin. A new pipeline also was constructed to allow discharge of imported water directly into the basin.

Kraemer-Miller Basins Pipeline Improvements

An existing 48-inch pipe in Kraemer Basin was replaced due to the potential for pipe failure that would have resulted in damage to adjacent property and a reduction in recharge capacity from loss of ability to fill the basin. An inlet pipe was installed in Miller basin.

Lincoln-Burris Exploratory Wells

Monitoring wells were constructed to characterize the ability of the natural sediments along the west walls of Lincoln and Burris Basins to percolate water. Data collected were used to support a feasibility study of re-contouring the Burris Basin to allow periodic cleaning of the western side wall in order to increase percolation rates.

Warner Basin Dam

In order to clean Warner Basin, staff would construct an earthen dike to allow the draining of the basin while simultaneously transferring water to Anaheim Lake, Miller Basin, and Kraemer Basin. In 2007, a rubber dam was installed within the finger channel of the Little Warner Basin to eliminate the need to build the earthen dike each time the basin needed cleaning.

Santiago Creek Recharge Enhancement

The recharge capacity of Santiago Creek was increased by grading the creek bed upstream of Hart Park in the City of Orange. Prior to grading, a low-flow channel developed in the channel bottom. Water flow was confined to this low-flow channel, limiting the amount of groundwater recharge. The grading project completed in 2008 created a flat cross-section allowing for flows to spread out over a larger surface area, thereby increasing groundwater recharge.

4.5 Potential Projects to Expand Recharge Operations

The District's *Long-Term Facilities Plan* (2009) contains a list of potential new projects to expand recharge operations. Projects that are included range from those in the conceptual phase to those in the process of construction to improve operations of recharge facilities and to increase the amount of water recharged into the groundwater basin are described in this section.

Desilting Improvement Program

The build up of sediment in recharge basins decreases infiltration rates and increases the need for basin cleanings. Approaches are being evaluated to remove sediment from Santa Ana River water in order to increase the performance of current recharge facilities. A feasibility study identified proposed treatment systems for pilot testing.

Mid-Basin Injection

As the GWR System is expanded an increased supply of recharge water will be available. In order to recharge this supply of water, a mid-basin injection project is being considered. This would involve using high quality GWR System water for direct injection into the Principal aquifer in the central portions of the Basin. By directly injecting water into the Principal aquifer where most of the pumping occurs, low groundwater levels due to pumping can be reduced. Also, mid-basin injection would reduce the recharge requirement in Anaheim and Orange area recharge basins, thus providing more capacity to recharge Santa Ana River water.

Santiago Creek Enhanced Recharge

Two improvements to Santiago Creek in the City of Orange are being considered to enhance recharge capacity. One project consists of cutting a water conveyance channel through a concrete-lined creek channel to deliver a flow of water downstream of Hart Park. The geology in this lower stretch of the creek is being studied to determine if the recharge would be beneficial to the groundwater basin. The second project would investigate the feasibility of constructing three small new recharge basins adjacent to Santiago Creek.

Subsurface Recharge

The subsurface recharge project would involve constructing horizontal recharge systems beneath areas with existing improvements, such as parks or school athletic fields. These infiltration galleries would allow percolation of recharge water through perforated pipes buried in gravel-filled trenches. Since there is no feasible way to clean the galleries, the source water would come from the GWR System, treated Metropolitan water, or filtered Santa Ana River water.

Recharge Basin Rehabilitation

All of the recharge basins are subject to clogging due to the accumulation of sediments contained in recharge water. To maintain recharge rates, the basins are periodically drained, allowed to dry, and then mechanically cleaned using heavy equipment. This process removes most of the clogging layer but also removes a portion of the underlying layer of clean sand from the basin bottom. Some of the fine-grained clogging material on the basin sides remains while the bottom of the basin progressively deepens. Although cleaning procedures have been improved to minimize the burial of fine-grained clogging material, previous cleaning practices have left an irregular mantle of fine-grained material in the upper one to two feet of some recharge basins. This may be remedied by over-excavating and replacing removed sediments with clean sand.

Burris and Lincoln Basins Reconfiguration

Modifications to Burris and Lincoln Basins will improve recharge capability. Plans include excavating low-permeability sediments from Lincoln Basin and the northern end of Burris Basin, reconfiguring the conveyance of water into Burris Basin, and expanding the size of Lincoln Basin. Also, a pilot transfer well will be drilled to transfer groundwater from the Shallow Aquifer to the Principal Aquifer at the southern end of Burris Basin.

Five Coves and Lincoln Basins Bypass Pipeline

Santa Ana River flows are diverted into the Upper Five Coves Basin by an inflatable dam. Transfer pipes convey surface flows from the Upper Five Coves to the Lower Five Coves Basin. Construction of a pipeline within the Lower and Upper Five Coves, Lincoln, and Burris basins would allow water transfers between the four basins. This would allow the Upper Five Coves, Lower Five Coves, and Lincoln Basins to be isolated and taken out of service to conduct cleaning operations, while maintaining flow of water to Burris and Santiago Basins. In the current system, inflow to Burris Basin has to be terminated to allow cleaning of the other four basins.

Santiago Basins Pump Station

A pump station was constructed to dewater the Santiago Basins to increase storm flow capture and percolation, to make storage available for winter season use, to provide water to the Santiago Creek for percolation, and to increase operational flexibility by pumping water back to Burris Basin when necessary. Two of the four installed pumps failed to operate so the pump station needs to be redesigned and rebuilt. Reconstructing a pump station for the basins will increase recharge capacity and allow for more flexible and efficient operations.

Placentia and Raymond Basins Improvements

Improvements to Placentia and Raymond Basins that would increase the amount of water recharged in these basins include construction of in-channel diversion structures, modification of inlets to increase flows, installation of submersible pumps, and addition of flow measuring devices, water level sensors, and equipment to remotely control and record water levels and flows.

Santiago Basins Intertie

Constructing a connection between the Bond and Blue Diamond Basins would allow greater flexibility in managing recharge water. Conveyance of water from Blue Diamond Basin to Bond Basin is limited by a dirt berm that separates the two basins. This berm traps approximately 1,500 af of water in Blue Diamond Basin. Improvement would involve either removing a portion of the dirt berm or installing a pipe within the berm between the two basins at the bottom elevation of Blue Diamond Basin.

Olive Basin Pump Station

Improvements to Olive Basin will allow the basin to be drained more rapidly for cleaning. Olive Basin does not have a dewatering pump. An intake structure with a 36-inch diameter fill pipe was constructed to allow water to flow from the Off-River System into the deepest part of the pit. This decreased the amount of sediment stirred up in the basin, thereby increasing the recharge performance. Installation of a pump station and drain pipe will allow for future draining of the basin so that the basin can be cleaned quickly and restored to service.

Prado-Recharge Facilities Model

This project would create a mathematical model of Prado storage, Santa Ana River flow, and each recharge facility. The model would simulate how the recharge system operates in conjunction with Prado storage and the river. It is anticipated that the model would have a time step of one day. The model would allow the evaluation of changes in recharge that would occur if the District were to construct improvements to existing facilities, build new recharge facilities, or achieve increased levels of storage at Prado Dam.

5 WATER QUALITY MANAGEMENT

Water quality protection is a basic tenet of OCWD. The District manages the groundwater basin to protect water quality. This section describes the range of programs conducted by OCWD throughout the watershed including:

- **Implementing OCWD's Groundwater Protection Policy;**
- **Participating in water quality management programs in the watershed;**
- **Managing levels of salinity and nitrate;**
- **Restoring contaminated water supplies;**
- **Developing programs to monitor constituents of emerging concern.**

5.1 Groundwater Quality Protection

The District conducts an extensive program aimed at protecting the quality of the water in the basin. These programs include groundwater monitoring, participating in and supporting voluntary watershed water quality studies and regulatory programs, working with groundwater producers, providing technical assistance, and conducting public education programs.

5.1.1 OCWD GROUNDWATER QUALITY PROTECTION POLICY

OCWD adopted the Groundwater Quality Protection Policy in May 1987, in recognition of the serious threat posed by groundwater contamination; passage was based on the statutory authority granted under Section 2 of the District Act. The objectives of the policy are to:

- Maintain groundwater quality suitable for all existing and potential beneficial uses;
- Prevent degradation of groundwater quality;
- Assist regulatory agencies in identifying the sources of contamination to assure cleanup by the responsible parties;
- Maintain or increase the basin's usable storage capacity; and
- Inform the general public, regulatory agencies and Producers of the condition of the groundwater basin and of water quality problems as they are discovered.

Eight specific programs established to achieve these objectives are:

- Water quality monitoring of surface and groundwater;
- Identification, interim containment, and cleanup of contamination;
- Coordinated operation with regulatory agencies;
- Control of toxic residuals;

- Hazardous waste management planning;
- Dissemination of technical information;
- Public disclosure; and
- Groundwater protection evaluation.

A key component of the policy describes circumstances under which the District will undertake contamination cleanup activities at District expense. This becomes necessary when contamination poses a significant threat and the party responsible for the contamination cannot be identified, is unable to cleanup the contamination, or is unwilling to cleanup the contamination. When appropriate to protect water quality in the basin, OCWD provides financial incentives for Producers to pump and treat groundwater that does not meet drinking water quality standards. These so-called "Basin Equity Assessment (BEA) Exemptions" are explained in Section 5.9.

5.1.2 WATER QUALITY TREATMENT GOALS FOR GROUNDWATER PROGRAMS

OCWD encourages clean up of groundwater to maximize beneficial use of contaminated water in areas with high concentrations of TDS, nitrates, selenium, color, organic compounds, and other constituents exceeding drinking water standards. Treatment goals include:

- State primary and secondary drinking water standards must be met when water is used for potable supplies.
- Treatment for irrigation water shall meet criteria necessary for the intended beneficial use.
- The District shall pursue payment or reimbursement of cleanup costs from the responsible party when contamination originates from a known source.

5.1.3 REGULATION AND MANAGEMENT OF CONTAMINANTS

A variety of federal, state, county and local agencies have jurisdiction over the regulation and management of hazardous substances and the remediation of contamination of groundwater and drinking water supplies. For example, the County of Orange Health Care Agency (OCHCA) regulates leaking underground fuel tanks except in cases where the city is the lead agency.

OCWD does not have regulatory authority to require responsible parties or potential responsible parties to clean up pollutants that have contaminated groundwater. In some cases, the District has pursued legal action against entities that have contaminated the groundwater basin to recover the District's remediation costs. In other cases, the District coordinates and cooperates with regulatory oversight agencies that investigate sources of contamination and assess the potential threat that the contamination poses to public health and the environment in the Santa Ana River watershed and within the County of Orange. Some of these efforts include:

- Reviewing on-going groundwater cleanup site investigations and commenting on the findings, conclusions, and technical merits of progress reports.
- Providing knowledge and expertise to assess contaminated sites and evaluating the merits of proposed remedial activities.

- Conducting third party groundwater split samples at contaminated sites to assist regulatory agencies in evaluating progress of groundwater cleanup and/or providing confirmation data of the areal extent of contamination.

5.1.4 LAND USE AND DEVELOPMENT

Protecting groundwater from contamination protects public health and prevents loss of valuable groundwater resources. Managing land use and planning for future development are key management activities essential for protecting water quality and reducing the risk of contamination.

OCWD monitors, reviews, and comments on environmental documents such as Environmental Impact Reports (EIR), Notices of Preparation, proposed zoning changes, and land development projects. District staff also review draft National Pollution Discharge Elimination System (NPDES) and waste discharge permits issued by the Santa Ana Regional Water Quality Control Board (RWQCB). The proposed projects and programs may have elements that could cause short or long term water quality impacts to source water used for groundwater replenishment or have the potential to degrade groundwater resources. Monitoring and reviewing waste discharge permits provides the District with insight on activities in the watershed that could affect water quality.

The majority of the basin's land area is located in a highly urbanized setting and requires tailored water supply protection strategies. Reviewing and commenting on stormwater permits adopted by the RWQCB for the portions of Orange, Riverside, and San Bernardino Counties that are within the Santa Ana River watershed are important. These permits can affect the quality of water in the Santa Ana River and other water bodies, thereby impacting groundwater quality in the basin.

OCWD works with local agencies having oversight responsibilities on the handling, use, and storage of hazardous materials; underground tank permitting; well abandonment programs; septic tank upgrades; and drainage issues. Participating in basin planning activities of the RWQCB and serving on technical advisory committees and task forces related to water quality are also valuable activities to protect water quality.

5.1.5 DRINKING WATER SOURCE ASSESSMENT AND PROTECTION PROGRAM

To comply with federal Safe Drinking Water Act requirements regarding the protection of drinking water sources, the California Department of Public Health (CDPH) created the Drinking Water Source Assessment and Protection (DWSAP) program. Water suppliers must submit a DWSAP report as part of the drinking water well permitting process and have it approved before providing a new source of water from a new well. OCWD provides technical support to Producers in the preparation of these reports.

This program requires all well owners to prepare a drinking water source assessment and establish a source water protection program for all new wells. The source water program must include: (1) a delineation of the land area to be protected, (2) the identification of all potential sources of contamination to the well, and (3) a description of management strategies aimed at preventing groundwater contamination. Managing land use and planning for future development are key management activities essential for protecting, preventing, and reducing contaminant risks to future drinking water supplies.

Developing management strategies to prevent, reduce, or eliminate risks of groundwater contamination is one component of the multiple barrier protection of source water. Contingency planning is an essential component of a complete DWSAP and includes developing alternate water supplies for unexpected loss of each drinking water source, by man-made or catastrophic events.

5.1.6 WELL CONSTRUCTION POLICIES

Wells constructed by the District are built to prevent the migration of surface contamination into the subsurface. This is achieved through the placement of annular well seals and surface seals during construction. Also, seals are placed within the borehole annulus between aquifers to minimize the potential for flow between aquifers.

Well construction ordinances adopted and implemented by the OCHCA and municipalities follow state well construction standards established to protect water quality under California Water Code Section 231. To provide guidance and policy recommendations on these ordinances, the County of Orange established the Well Standards Advisory Board in the early 1970s. The five-member appointed Board includes the District's Hydrogeologist. Recommendations of the Board are used by the OCHCA and municipalities to enforce well construction ordinances within their jurisdictions.

5.1.7 WELL CLOSURE PROGRAM FOR ABANDONED WELLS

A well is considered abandoned when either the owner has permanently discontinued its use or it is in such a condition that it can no longer be used for its intended purpose. This often occurs when wells have been forgotten by the owner, were not disclosed to a new property owner, or when the owner is unknown. Past research conducted by OCWD identified approximately 1,400 abandoned wells which were not properly closed. Many of these wells may not be able to be properly closed due to overlying structures, landscaping, or pavement. Some of them may pose a threat to water quality because they can be conduits for contaminant movement as well as physical hazards to humans and/or animals.

OCWD supports and encourages efforts to properly close abandoned wells. As part of routine monitoring of the groundwater basin, OCWD will investigate on a case-by-case basis any location where data suggests that an abandoned well may be present and may be threatening water quality. When an abandoned well is found to be a significant threat to the quality of groundwater, OCWD will work with the well owner to properly close the well.

The City of Anaheim has a well destruction policy and has an annual budget to destroy one or two wells per year. The funds are used when an abandoned well is determined to be a public nuisance or needs to be destroyed to allow development of the site. The city's well permit program requires all well owners to destroy their wells when they are no longer needed. When grant funding becomes available, the city uses the funds to destroy wells where a responsible party has not been determined and where the well was previously owned by a defunct water consortium.

5.2 Salinity Management

Increasing salinity is a significant water quality problem in many parts of the southwestern United States and Southern California, including Orange County. Elevated salinity levels can contaminate groundwater supplies, constrain implementation of water recycling projects and cause other negative economic impacts such as the need for increased water treatment by residential, industrial, commercial users, and water utilities. Often a component of salinity, elevated levels of nitrates pose a risk to human health.

5.2.1 SOURCES OF SALINITY

Salinity is a measure of the dissolved minerals in water. Also referred to as salts or TDS, salinity is measured in the laboratory by evaporating a known volume of water to dryness and measuring the remaining salts.

Dissolved minerals are composed of positively charged cations and negatively charged anions. Principal cations include sodium, calcium, potassium, and magnesium. Key anions are chloride, sulfate, carbonate, and bicarbonate. Water's hardness, related to TDS, refers to the measure of divalent metallic cations, principally calcium and magnesium.

High salinity and hardness limit the beneficial uses of water for domestic, industrial, and agricultural applications. Hard water causes scale formation in boilers, pipes, and heat-exchange equipment as well as soap scum and an increase in detergent use. This can result in the need to replace plumbing and appliances and require increased water treatment. Some industrial processes, such as computer microchip manufacturers, must have low TDS in the process water and often must treat the municipal supply prior to use. High salinity water may reduce plant growth and crop yield, and clog drip irrigation lines.

In coastal areas, seawater intrusion can be a major source of increased salinity in groundwater. Other identified sources of coastal groundwater salinity include connate water (water trapped in the pores of the sediment at the time the sediments were deposited) and brines disposed from past oil production.

5.2.2 REGULATION OF SALINITY

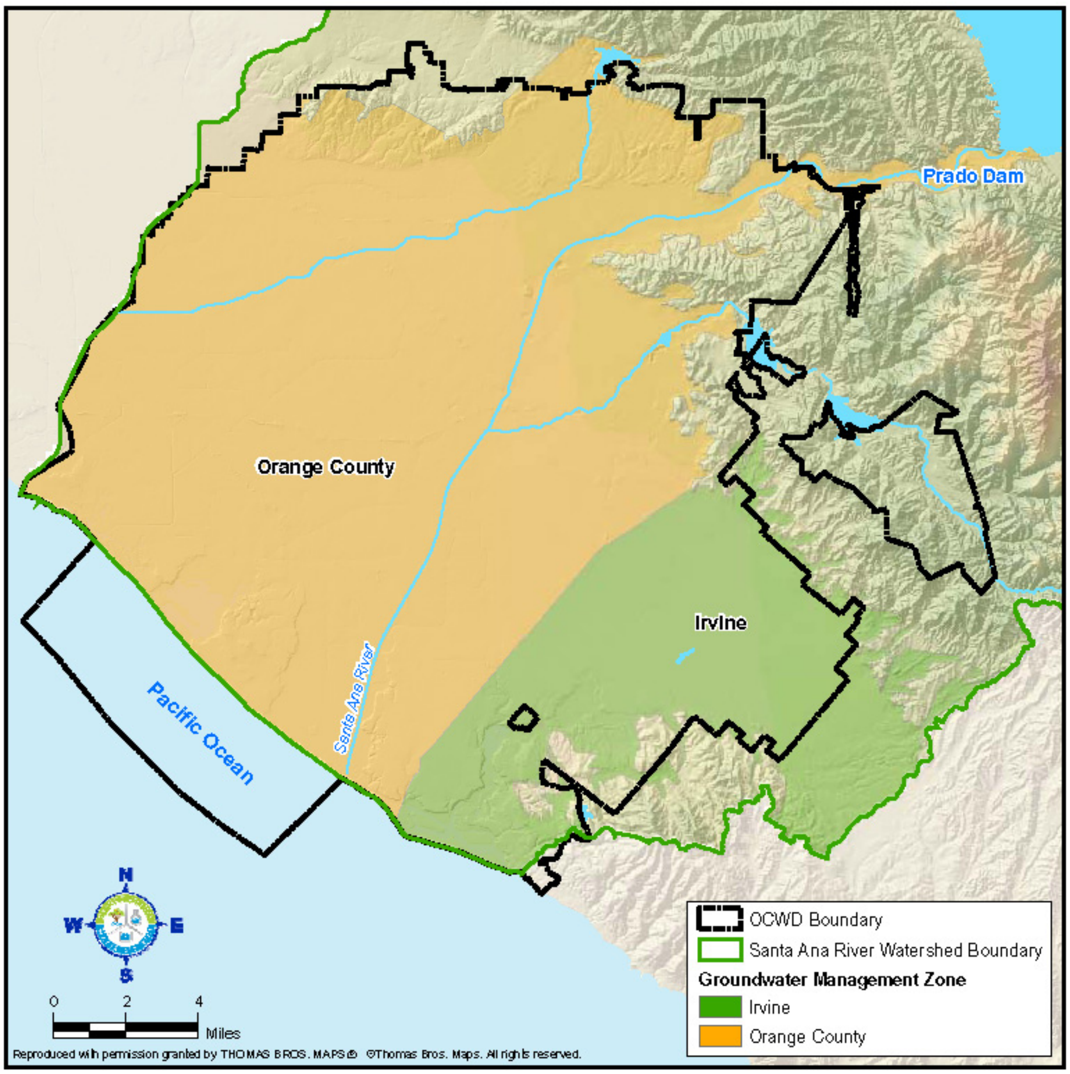
TDS is regulated by the EPA and the CDPH as a constituent that affects the aesthetic quality of water – notably, taste. The recommended secondary MCLs for key constituents comprising TDS are listed in Table 5-1.

At the state level, TDS levels in groundwater are managed by the SWRCB which delegates this authority to the regional boards. The Santa Ana RWQCB salinity management program was developed with extensive stakeholder input. The Santa Ana Watershed is divided into management zones and allowable TDS levels are determined for each of those zones. The Orange County groundwater basin is divided into two management zones as shown in Figure 5-1.

TABLE 5-1
SECONDARY DRINKING WATER STANDARDS FOR SELECTED CONSTITUENTS

Constituent	Recommended Secondary MCL, mg/L
Total Dissolved Solids (salts)	500
Chloride	250
Sulfate	250

FIGURE 5-1
Groundwater Management Zones



To set the allowable levels of TDS for each management zone, historical ambient or baseline conditions were determined. These were used by the RWQCB to set 'Water Quality Objectives" for each management zone, which were officially adopted as part of the Water Quality Control Plan for the Santa Ana River Basin, also referred to as "the Basin Plan." The levels of TDS in each groundwater management zone are measured periodically and compared to the adopted objectives.

When a newly determined ambient level is equal to or greater than the established objective, that management zone does not have an "assimilative capacity." This means that the quality of the groundwater in that zone is determined to be incapable of successfully assimilating increased loads of TDS without degrading the water quality. Conversely, when an updated ambient level is lower than the established objective, that management zone has an assimilative capacity and is determined to be capable of receiving modest inputs of TDS without exceeding the Water Quality Objective.

The Water Quality Objectives and ambient quality levels for the two Orange County management zones are shown in Table 5-2. Comparing the ambient water quality to the TDS objectives indicates that neither one of these zones have assimilative capacity for TDS.

TABLE 5-2
TDS WATER QUALITY OBJECTIVES FOR LOWER SANTA ANA RIVER BASIN MANAGEMENT ZONES

Management Zone	Water Quality Objective (mg/L)	Ambient Quality (mg/L)
Orange County	580	590
Irvine	910	920

(Wildermuth, 2008)

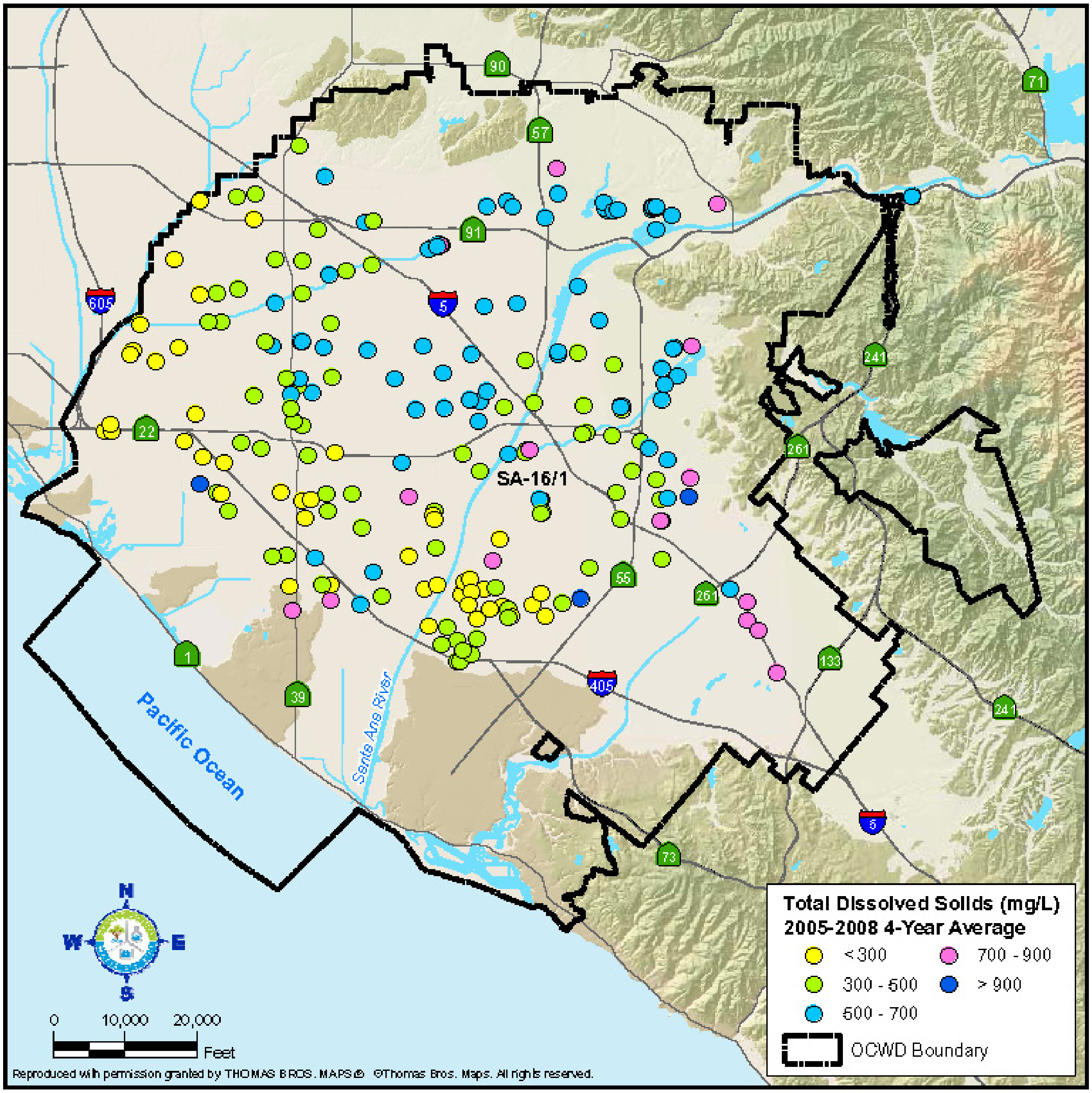
5.2.3 SALINITY IN THE GROUNDWATER BASIN

As explained in Section 3, OCWD monitors the levels of TDS in wells throughout the groundwater basin. Figure 5-2 shows the average TDS at production wells in the basin for the period of 2004 to 2008. In general, the portions of the basin with the highest TDS levels are located in areas of Irvine, Tustin, Yorba Linda, Anaheim and Fullerton. In addition, there is a broad area in the middle portion of the basin where the TDS generally ranges from 500 to 700 mg/L. Localized areas near the coast, where water production does not occur, contain relatively higher TDS concentrations.

Managing salinity levels in the basin and in recharge water is an important objective for the District. As explained in Section 4, water that recharges the Orange County groundwater basin includes:

- Santa Ana River baseflow and stormflow,
- Groundwater Replenishment System water, and
- Incidental recharge, including precipitation and irrigation return flows.

FIGURE 5-2
TDS IN GROUNDWATER PRODUCTION WELLS



Understanding the sources of salt and measuring the concentrations of TDS in each of the recharge sources is an important aspect in managing salinity. Table 5-3 presents the estimated salt inflows for the basin using average recharge volumes.

The inflows used here are the same as those used in calculating the basin water budget as explained in Section 2.3 and displayed in Table 2-2. TDS concentrations for the inflows were based on flow and water quality data collected by the District and the USGS. The Talbert injection barrier was calculated with the assumption that barrier water is from the GWR System and the Alamitos injection barrier was calculated using the assumption that injection water is a 50:50 blend of recycled water and imported water.

The flow-weighted TDS of local incidental recharge of 1,100 mg/L was calculated using estimates of the TDS concentration of each component listed in Table 2-2. For subsurface inflow and recharge from the foothills, the TDS concentration was estimated using data from the closest nearby wells.

As shown in Table 5-3, the District estimates that the flow-weighted average inflow TDS concentration is 536 mg/L. It is important to note that the TDS concentration of GWR System water is 60 mg/L. OCWD anticipates that over time the use of GWR System water for Talbert Barrier operations and groundwater recharge will have a positive impact on the salt balance of the groundwater basin.

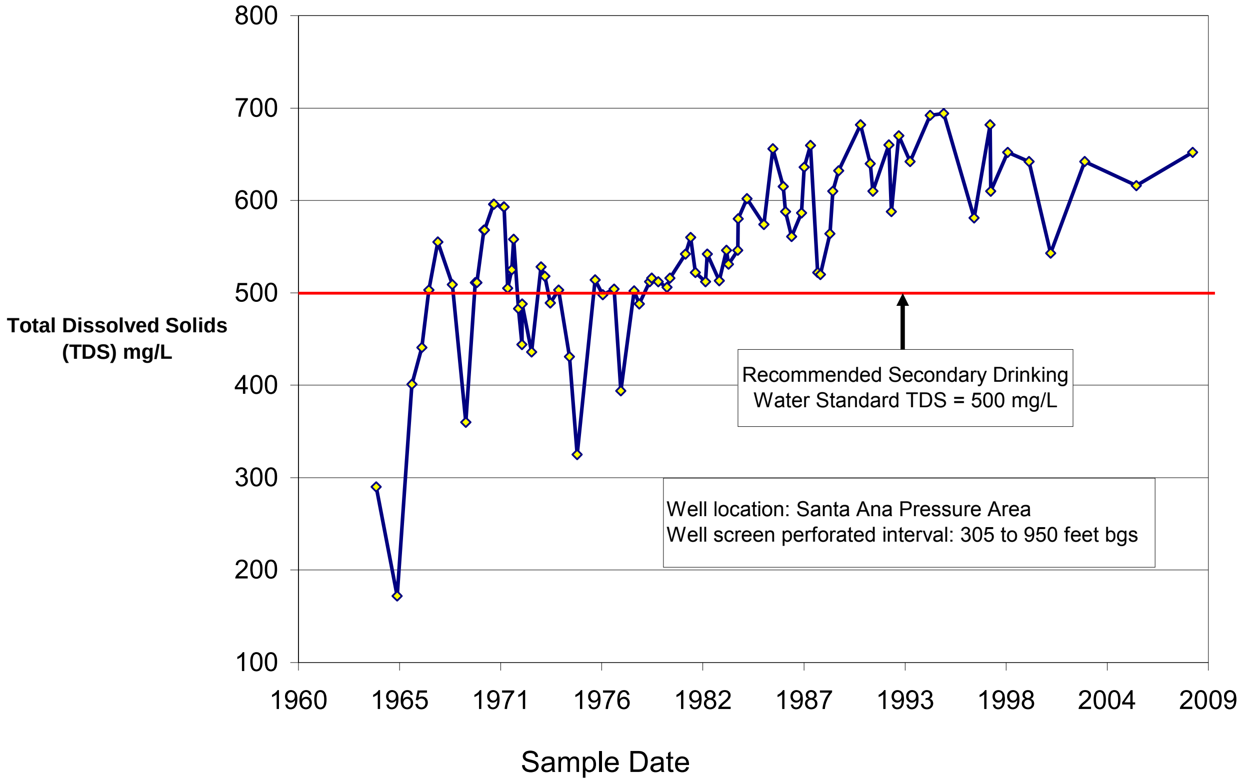
TABLE 5-3
SALT INFLOWS FOR ORANGE COUNTY AND IRVINE MANAGEMENT ZONES

	Inflow (afy)	TDS (mg/L)	Salt (tons/yr)
Recharged SAR Baseflow	148,000	620	125,000
Recharged SAR Stormflow	50,000	200	14,000
GWR System water recharge in Anaheim	37,000	60	3,000
Unmeasured Recharge (Incidental)	69,000	1,100	104,000
Injection Barriers			
Talbert	35,000	60	2,900
Alamitos	2,500	350	1,200
Total:	341,500	536*	250,100

* Flow weighted

Figure 5-3 illustrates TDS concentrations through time at a well in Santa Ana. The location of well SA-16 is shown on Figure 5-2. The TDS concentration at well SA-16 increased from approximately 200 to 300 mg/L in the mid-1960s to approximately 600 mg/L by the mid-1980s. From the mid-1980s to 2008, the TDS concentration varied between 500 to 700 mg/L.

FIGURE 5-3
TDS IN A POTABLE SUPPLY WELL (SA-16/1)



5.2.4 ECONOMIC IMPACTS OF INCREASING SALINITY

Increasing salinity of water supplies directly impacts consumer costs. A technical investigation of salinity impacts on water supplies of Southern California was published in 1999 by the United States Department of Interior, U.S. Bureau of Reclamation and the Metropolitan Water District of Southern California. The *Salinity Management Study* assessed economic impacts of salinity increases in Colorado River water and State Water Project water. The model was developed to account for regional differences in water deliveries, demographics, TDS concentrations, and average water use per household or by agriculture or industry.

The study estimated a regional economic benefit of $95 million per year (calculated in 1998 dollars) for a 100 mg/L decrease in imported water supply TDS in the Metropolitan region. Conversely, a 100 mg/L increase in TDS would increase consumer costs by $95 million annually as shown in Figure 5-4. Approximately $18 million annually would be realized in cost savings for groundwater supplies. Residential cost savings were estimated at $35 million per year. Figure 5-5 shows $64 million of benefits if most local groundwater (about 90 percent) and wastewater (about 80 percent) were to experience a 100 mg/L decrease in salinity.

FIGURE 5-4
ANNUAL ECONOMIC BENEFITS OF 100 MG/L SALINITY DECREASE IMPORTED WATER SUPPLIES
Source: MWD and Bureau of Reclamation Salinity Management Study (1999)

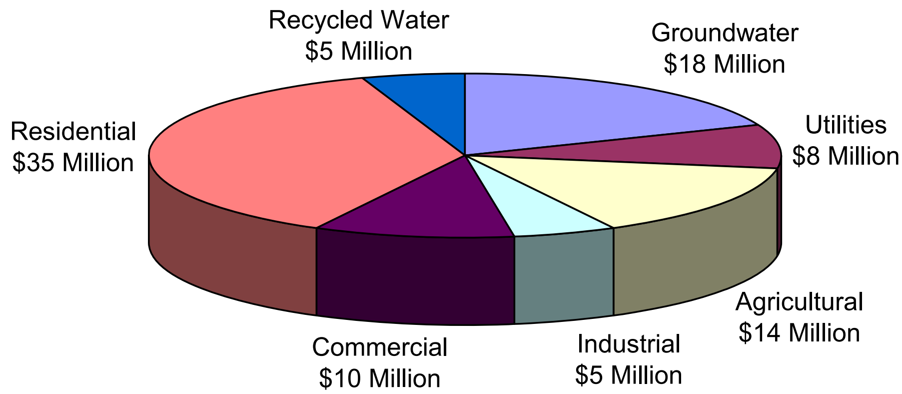
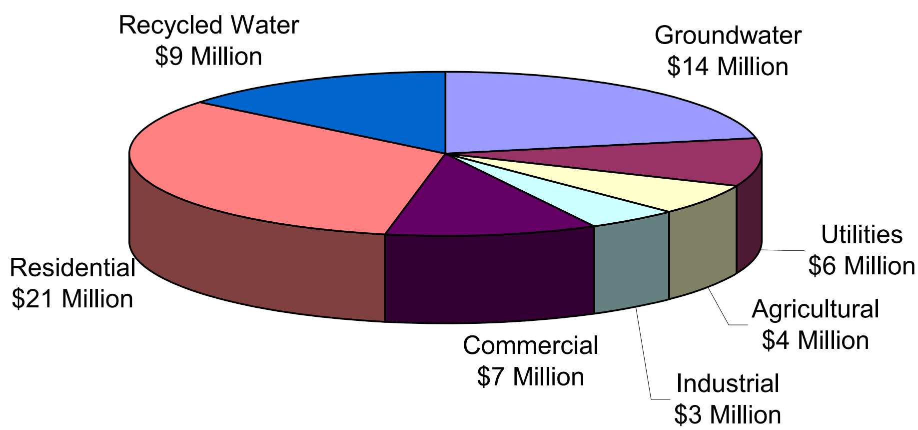


FIGURE 5-5
ANNUAL ECONOMIC BENEFITS OF 100 MG/L SALINITY DECREASE GROUNDWATER AND WASTEWATER



Source: MWD and Bureau of Reclamation Salinity Management Study (1999)

Table 5-4 summarizes the economic benefits to water users from salinity reduction. Cost savings include reduced need to construct desalting facilities and greater compliance of wastewater discharges with permit requirements. Residential consumer cost savings would be realized in longer lifespan for appliances and plumbing as well as the reduced need for water softening devices.

TABLE 5-4
SUMMARY OF ECONOMIC BENEFITS OF REDUCED SALINITY

User	Economic Benefit
Residential	Increased life of plumbing system and appliances
	Reduced use of bottled water and water softeners
Commercial	Decreased cost of water softening
	Decreased use of water for cooling
	Increased equipment service life
Industrial	Decreased cost of water treatment
	Decreased water usage
	Decreased sewer fees
Agricultural	Increased crop yield
	Decreased water usage for leaching purposes
Utilities	Increased life of treatment facilities and pipelines
Groundwater	Improved wastewater discharge requirements for permit compliance
	Decreased desalination and brine disposal costs
Recycled Water	Decreased use of imported water for salt management
	Decreased desalination and brine disposal costs

MWD/USBR 1999 Salinity Management Study

5.2.5 SALINITY MANAGEMENT PROJECTS IN THE UPPER WATERSHED

The District has a long-standing commitment to management of salinity in groundwater supplies, avoiding the loss of water supplies due to increased salinity, and developing projects to reduce salinity are District priorities. Since the Santa Ana River is the primary source of recharge water for the basin, salt management programs in the upper watershed are vital to protect the water quality in Orange County; success in this regard requires participation and cooperation of upper Santa Ana watershed stakeholders.

Several desalters, which are water treatment plants designed to remove salts, have been built in Riverside and San Bernardino Counties. These plants are effectively reducing the amount of salt buildup in the watershed. The Santa Ana Regional Interceptor (SARI), built by the Santa Ana Watershed Project Authority (SAWPA), began operation in 1975 to remove salt from the watershed by transporting industrial wastewater and brine produced by desalter operations directly to the OCSD for treatment. Approximately 75,000 tons of salt were removed by the SARI line in FY 2006-07.

The other "brine line" in the upper watershed, the Non-reclaimable Waste Line in the Chino Basin operated by the Inland Empire Utilities Agency (IEUA), segregates high TDS industrial wastewater.

5.2.6 OCWD SALINITY MANAGEMENT AND REMEDIATION PROGRAMS

Within Orange County, operations of the GWR System and several local and regional groundwater desalters are working to reduce salt levels.

The GWR System, described in Section 4.2, purifies wastewater that is used for groundwater recharge and for injection into the Talbert Barrier to prevent seawater intrusion. The GWR System provides a dependable supply of low salinity water, whose quantity and quality will not be impacted by future drought conditions. The GWR System is expected to reduce the basin salt load by approximately 48,000 tons/year, based on the difference between recharging 72,000 afy of GWR System water at 60 mg/L and an equal amount of imported blended Colorado River and SPW water at 550 mg/L.

High salinity groundwater areas located in Tustin and Irvine are being treated through the operation of desalter plants; these projects are described in Section 5.8.

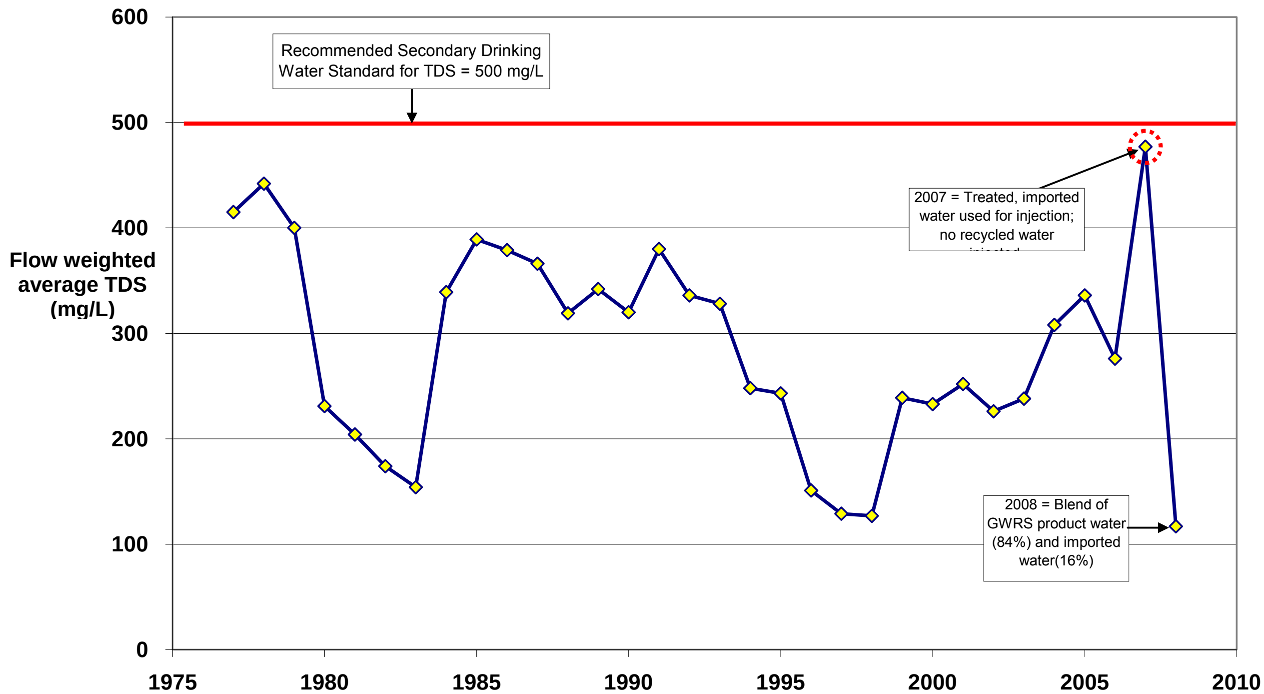
5.2.7 SEAWATER INTRUSION BARRIERS

OCWD's Talbert Barrier is composed of a series of injection wells that span the 2.5-mile-wide Talbert Gap between the Newport and Huntington mesas (see Figure 3-9). From 1975 until 2004, a blend of purified water from OCWD's WF-21, deep aquifer water, and imported potable water was injected into the barrier. The Talbert Barrier wells were used to inject an average of 12 mgd of water into four aquifer zones to form a hydraulic barrier to seawater that would otherwise migrate inland toward areas of groundwater production.

The GWR System began operations in January 2008 to better control seawater intrusion as well as to recharge the coastal aquifers. Twelve new wells enable injection of up to 35 mgd of purified water into the expanded injection barrier.

Figure 5-6 shows the total flow-weighted average of TDS levels of the Talbert Barrier Injection Water. Prior to 2004, injection water was a blend of imported water, WF-21 purified water, and deep aquifer water. During the time that WF-21 was decommissioned and the GWR System was in construction, a blend of imported water, potable water, and deep aquifer water was injected into the barrier. In 2007, only treated, imported water was used resulting in a flow weighted average TDS of Talbert Barrier injection water of 477 mg/L. With 84 percent of injection water supplied by the GWR System, the flow weighted average for 2008 dropped to 117 mg/L.

FIGURE 5-6
TALBERT BARRIER INJECTION WATER - TOTAL DISSOLVED SOLIDS (TDS)
Total Flow Weighted Average TDS of All Source Waters



The Alamitos seawater intrusion barrier is composed of a series of injection wells that span the Los Angeles/Orange County line in the Seal Beach-Long Beach area. It is operated by the LACDPW in cooperation with OCWD and the WRD. The source of this water is a blend of purified water from WRD and potable supplies from Metropolitan.

5.3 Nitrate Management

Nitrate is one of the most common and widespread contaminants in groundwater supplies. OCWD conducts an extensive program to protect the basin from nitrate contamination. The District regularly monitors nitrate levels in groundwater, operates 465 acres of wetlands in the Prado Basin to remove nitrates in Santa Ana River water, and works with Producers to treat individual wells when nitrate levels exceed safe levels.

5.3.1 SOURCES OF NITRATES

Nitrogen is an element essential for plant growth; in the environment it naturally converts to nitrate. Nitrate is a nitrogen-oxygen ion (NO_3^-) that is very soluble and mobile in water. Elevated levels of nitrate in soil and water supplies originate from fertilizer use, animal feedlots, wastewater disposal systems, and other sources. Plants and bacteria break down nitrate but excess amounts can leach into groundwater; once in the groundwater, nitrate can remain relatively stable for years.

The primary concern for human health is not nitrate but its conversion to nitrite (NO_2^-) in the body. Nitrite oxidizes iron in the hemoglobin of red blood cells to form methemoglobin, depriving the blood of oxygen. This is hazardous to infants as they do not yet have enzymes in their blood to counteract this process. They can suffer oxygen deficiency called methemoglobinemia, commonly known as “blue baby syndrome” named for its most noticeable symptom of bluish skin coloring.

5.3.2 REGULATION OF NITRATE

Both federal and state agencies regulate nitrate levels in water. The EPA and CDPH set the MCL in drinking water at 10 mg/L for nitrate-nitrogen. The Santa Ana Watershed is divided into management zones with nitrate-nitrogen water quality objectives set for each of those zones. These levels are determined after considering historical ambient or baseline conditions. Water quality objectives and ambient quality levels for Orange County’s management zones are shown in Table 5-5. The main Orange County basin has a minor amount of assimilative capacity but the Irvine subbasin has none. Efforts to reduce nitrate levels in the Irvine subbasin are described in Section 5.8.

TABLE 5-5
NITRATE-NITROGEN WATER QUALITY OBJECTIVE FOR LOWER SANTA ANA RIVER BASIN MANAGEMENT ZONES

Management Zone	Water Quality Objective	Ambient Quality
Orange County	3.4 mg/L	3.0 mg/L
Irvine	5.9 mg/L	6.5 mg/L

Source: Recomputation of Ambient Water Quality for the Period 1987 to 2006 prepared by Wildermuth Environmental, August 2008.

5.3.3 OCWD NITRATE MANAGEMENT AND REMEDIATION PROGRAMS

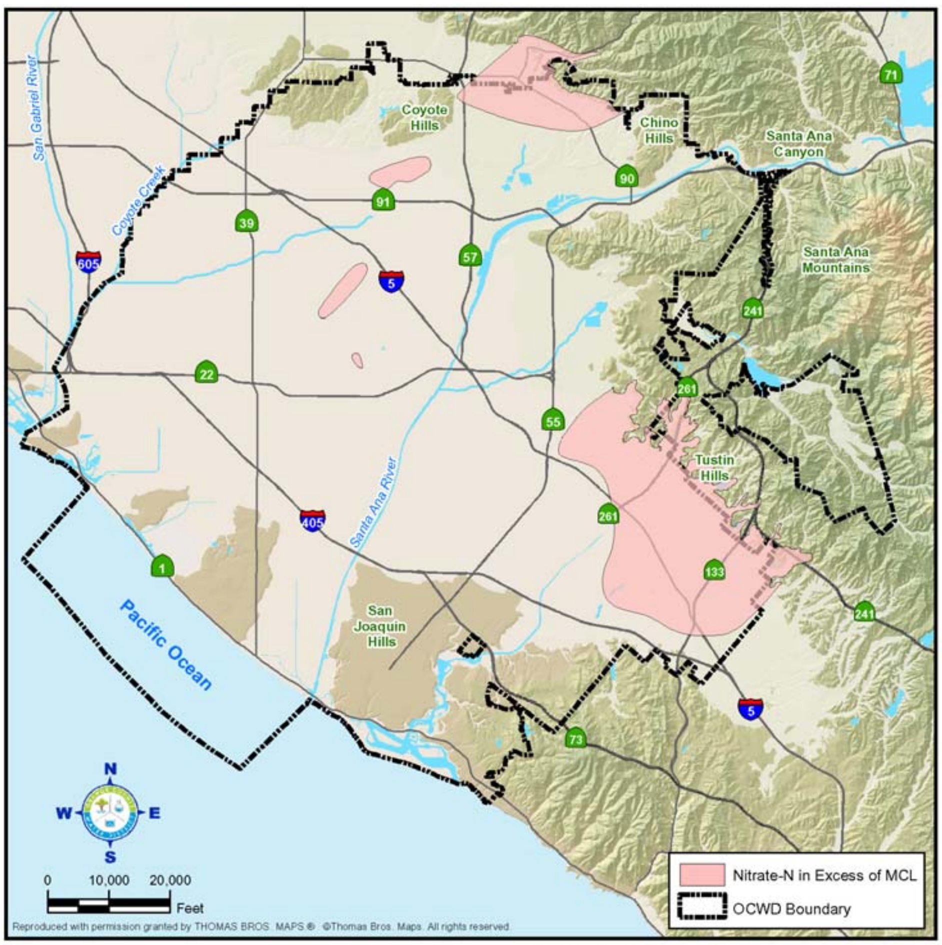
One of the District’s programs to reduce nitrate levels in the groundwater basin is managing the nitrate concentration of water recharged by the District’s facilities. This includes managing the quality of surface water flowing to Orange County through Prado Dam. As explained in Section 4, the primary source of recharge water for the groundwater basin is the Santa Ana River. To reduce the level of nitrate entering Orange County from the Santa Ana River, OCWD operates an extensive system of wetlands in the Prado Basin as shown in Figure 4-3.

OCWD diverts river flows through a 465-acre system of constructed wetlands, shown in Figure 5-7, where nitrates are naturally removed from the water. The wetlands provide a natural treatment system that removes approximately 15 to 40 tons of nitrates a month depending on the season. The wetlands are more effective from May through October when the water temperatures are warmer. During summer months the wetlands reduce nitrate from nearly 10 mg/L to 1 to 2 mg/L. In 2004-05, the wetlands were damaged by flooding. The wetlands were reconstructed and placed back in service in 2008.

All production wells are tested annually for nitrate; wells with concentrations equal to or greater than 50 percent of the MCL are monitored on a quarterly basis. Areas where nitrate concentrations exceed the MCL are shown in Figure 5-8.

FIGURE 5-7
PRADO WETLANDS

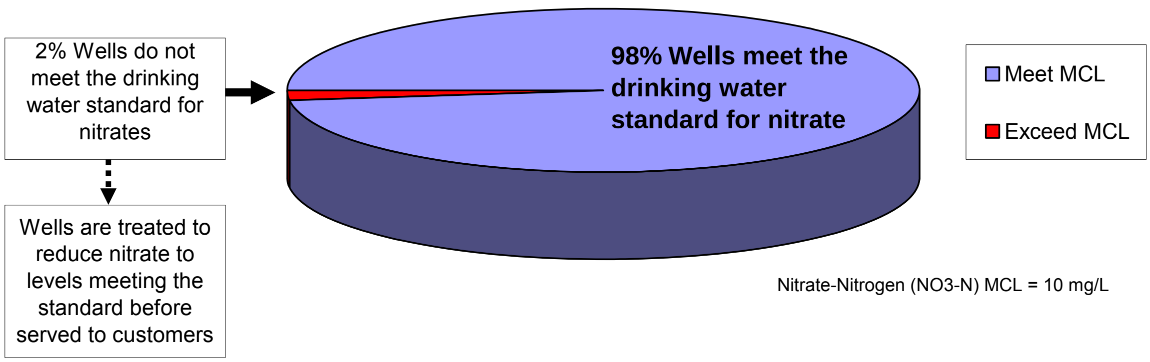
FIGURE 5-8
AREAS WITH ELEVATED NITRATE LEVELS



Within Orange County, nitrate-nitrogen levels in groundwater generally range from 4 to 7 mg/L in the Forebay area and from 1 to 4 mg/L in the Pressure area. Ninety-eight percent of the drinking water wells meet drinking water standards for nitrate-nitrogen as shown in Figure 5-9. The two percent above MCL are treated to reduce nitrate levels prior to being served to customers. Areas in the basin where nitrate levels exceed the MCL are suspected to be impacted by historical fertilizer use.

OCWD works with the Producers to address areas of high nitrate levels. The Tustin Main Street Treatment Plant, described in Section 5.8, is an example of such an effort.

FIGURE 5-9
PERCENT OF WELLS MEETING THE DRINKING WATER STANDARD (MCL)
2007 AVERAGE NITRATE DATA



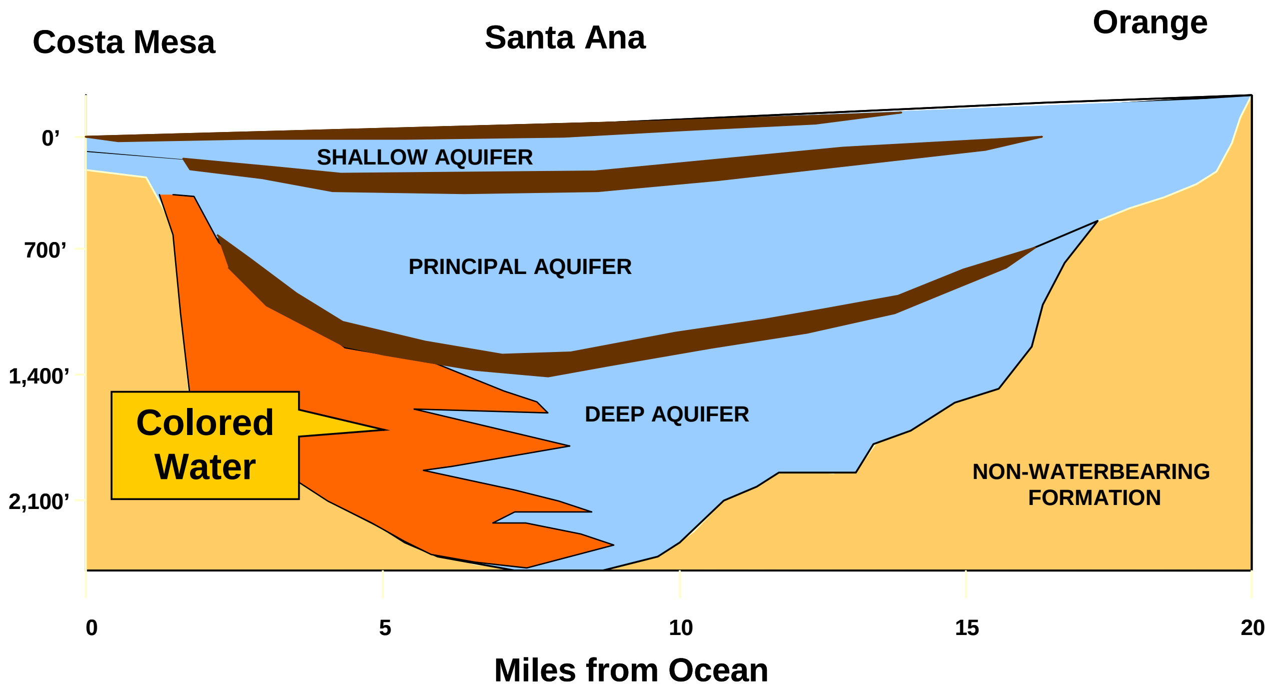
5.4 *Colored Groundwater Management*

This section discusses the occurrence of colored groundwater, the challenges of developing colored water sources, and production processes used to treat colored water.

5.4.1 OCCURRENCE OF COLORED WATER IN THE BASIN

Colored water is found in deep aquifers (600-2000 feet) over a broad region in the Lower Main aquifer, as shown in Figures 5-10 and 5-11. Natural organic material from ancient redwood forests and peat bogs gives the water an amber tint and a sulfur odor. Although colored water is of very high quality, negative aesthetic qualities, its color and odor, require treatment before use as drinking water.

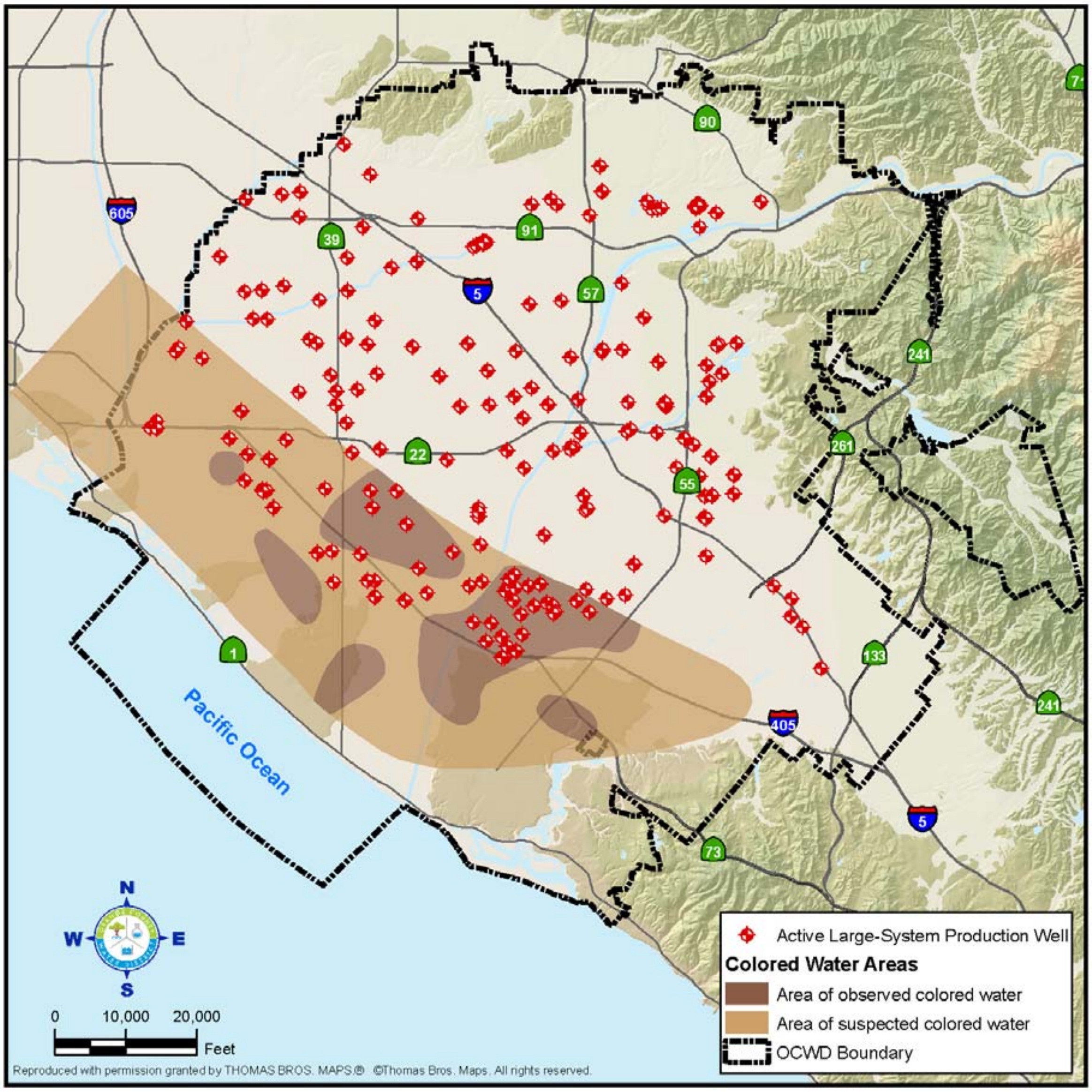
FIGURE 5-10
CROSS-SECTION OF AQUIFERS SHOWING COLORED WATER AREAS



The total amount of colored groundwater is estimated to be over one million acre feet, perhaps as much as several million acre feet. Economic constraints pose challenges to developing colored water supplies as the water needs to be treated to remove the color and odor. Costs depend on the water quality (color and other parameters) and the type and extent of required treatment.

An additional factor that must be considered is the impact of water levels in the clear zone compared to water levels in the deeper aquifers with colored water. Monitoring wells reveal a correlation of clear/colored zone water level fluctuations, indicating a fairly strong hydrologic connection between the two zones in some areas of the basin. Three facilities currently treat colored groundwater in Orange County. Mesa Consolidated Water District (MCWD) has operated an ozone oxidation treatment facility since 1985 at its Well No. 4 site. In 2001, MCWD opened its Colored Water Treatment Facility (CWTF) using ozone treatment to produce 4,000 gallons per minute. The third facility is the Deep Aquifer Treatment System (DATS), a treatment facility using nano-filtration membranes operated by IRWD since 2002. This facility purifies 7.4 mgd of colored water.

FIGURE 5-11
EXTENT OF COLORED WATER



5.5 Synthetic Organic Contaminants

Ninety-five percent of the basin's groundwater used for drinking water supplies is pumped from the main aquifer. Water from this aquifer continues to be of high quality. This section describes areas of the basin that are experiencing contamination threats, most of which occur in the shallow aquifer.

5.5.1 METHYL TERTIARY BUTYL ETHER (MTBE)

During the 1980s, gasoline hydrocarbons of greatest risk to drinking water were benzene, toluene, ethylbenzene, and xylenes, collectively known as BTEX chemicals.

Although leaking underground fuel tanks were identified throughout the basin, these chemicals typically were degraded by naturally-occurring microbes that allowed clean up by natural attenuation or passive bioremediation.

Unfortunately, a new additive to gasoline aimed at reducing air pollution has become a widespread contaminant in groundwater supplies. Methyl tertiary butyl ether (MTBE) is a synthetic, organic chemical that was added to gasoline to increase octane ratings during the phase-out of leaded gasoline. In the mid-1990s, the percentage of MTBE added to gasoline increased significantly to reduce air emissions. MTBE is a serious threat to groundwater quality; it sorbs weakly to soil and does not readily biodegrade. The greatest source of contamination comes from releases from underground fuel tanks.

The State of California banned the use of the additive in 2004 in response to its widespread detection in groundwater throughout the state. The CDPH set the primary MCL for MTBE in drinking water at 13 µg/L. The secondary MCL for MTBE is 5 µg/L.

Drinking water wells in the basin are tested annually for VOC analytes including MTBE. The District continues to work with local water agencies to monitor for MTBE and other fuel-related contaminants to identify areas that may have potential underground storage tank problems and releases resulting in groundwater contamination.

5.5.2 VOLATILE ORGANIC COMPOUNDS

VOCs in groundwater come from a number of sources. From the late 1950s through early 1980s, VOCs were used for industrial degreasing in metals and electronics manufacturing. Other common sources include paint thinners and dry cleaning solvents.

VOC contamination is found in several locations in the basin. In 1985, a contamination site was discovered beneath the former El Toro MCAS. Monitoring wells at the El Toro site installed by the U.S. Navy and OCWD delineated a one-mile wide by three-mile long VOC plume, comprised primarily of trichloroethylene (TCE). Beneath the former Air Station, VOC contamination was primarily found in the shallow groundwater up to 150 feet below the ground surface. Off-base, to the west, the VOC plume is in deeper aquifers from 200 to 600 feet deep.

Another VOC contamination site was found in portions of the shallow aquifer in the northern portion of the Orange County in the cities of Fullerton and Anaheim. Although not directly used for drinking water supplies, groundwater in the shallow aquifer eventually flows into the deeper principal aquifer, which is used for potable water supplies. To date, two city of Fullerton production wells have been removed from service and destroyed due to VOC contamination in that area. Currently, there are no production wells in that area that extract water from the shallow aquifer. The North Basin Groundwater Protection Project, described in Section 5.8, was initiated in 2005 to clean up the groundwater in this portion of the basin.

Elevated concentrations of perchloroethylene (PCE), TCE, and perchlorate were detected in IRWD's well No. 3, located in Santa Ana. OCWD is currently working with the Regional Board and the California Department of Toxic Substances Control to require aggressive cleanup actions at nearby sites that are potential sources of the contamination. OCWD has initiated the South Basin Groundwater Protection Project described in Section 5.8 to address this contamination.

5.5.3 N-NITROSODIMETHYLAMINE (NDMA)

NDMA is a low molecular weight compound that can form in influent water entering wastewater treatment plants and after chlorine disinfection of wastewater. It is also found in food products such as cured meat, fish, beer, milk, and tobacco smoke. OCWD is monitoring NDMA levels in the groundwater basin. The California Notification Level for NDMA is 10 nanograms per liter (ng/L). The concentration of NDMA is typically less than 2 ng/L in the Santa Ana River at Imperial Highway. At OCWD's GWR System in Fountain Valley, NDMA concentrations are maintained below California's Notification Level through a combination of source control measures, reverse osmosis treatment, and advanced oxidation treatment using ultraviolet light and hydrogen peroxide.

5.5.4 1,4-DIOXANE

A suspected human carcinogen, 1,4-dioxane, is used as a solvent in various industrial processes such as the manufacture of adhesive products and membranes and may occur in consumer products such as detergents, cosmetics, pharmaceuticals, and food products.

In 2002, OCWD detected elevated levels of 1,4-dioxane in nine production wells exceeding the California Action Level. These wells were temporarily shutdown with a loss of 34 mgd of water supply. Further investigation traced the contaminant to one industrial discharger that was discharging 1,4-dioxane into wastewater collected by OCSD. This discharge was affecting water that was treated by WF-21 and injected into the Talbert Seawater Barrier. The discharger voluntarily ceased discharge of 1,4-dioxane and concentrations declined. Additional monitoring data showed low concentrations, the CDPH determined that the water was not a significant risk to health, and the wells were returned to service.

5.6 Perchlorate

Perchlorate has been detected at wells distributed over a large area of the groundwater basin. Based on data from 217 active production wells over the last three years and a detection limit of 2.5 micrograms per liter, perchlorate was not detected at 83 percent of the wells. Seventeen percent of the wells had detectable concentrations of perchlorate. For those wells with detectable amounts of perchlorate, 89 percent of the wells have detected perchlorate concentrations below the California primary drinking water standard of 6 micrograms per liter. Four of the 217 active production wells had perchlorate concentrations greater than 6 micrograms per liter. It is important to note that water delivered for municipal purposes meets the primary drinking water standard. Groundwater from production wells that have perchlorate concentrations over the primary drinking water standard is treated to reduce the perchlorate concentration below the primary drinking water standard prior to delivery for municipal usage.

Sources of perchlorate in the groundwater basin may include:

- Fertilizer application;

- Water imported from the Colorado River (through the use of Colorado River water for groundwater recharge, irrigation, or water supplies that impact the groundwater basin through onsite wastewater disposal systems);
- Industrial or military sites that used, disposed of, or stored perchlorate. Perchlorate has historically been used as an ingredient in rocket propellant, explosives, fireworks, and road flares; and
- Naturally occurring perchlorate (e.g., perchlorate in rainfall).

The occurrence of perchlorate in Chilean fertilizer applied for agricultural purposes has been documented in various studies (see for example, the discussion in the December 1, 2006 publication of the journal Analytical Chemistry (Foubister, 2006); see also Urbansky et al (2001)).

The occurrence of perchlorate in historic supplies of Colorado River water has been documented in published studies (see for example, the report published by the National Research Council in 2005 titled "Health Implications of Perchlorate Ingestion" (National Research Council, 2006); see also Urbansky et al (2001)). Due to source remediation efforts near Henderson, Nevada, the concentration of perchlorate in Colorado River water has decreased (Nevada Division of Environmental Protection, 2009).

Perchlorate has been detected in groundwater at various sites in California in association with industrial or military sites (Interstate Technology & Regulatory Council, 2005). Perchlorate has been detected in rainfall (see for example, the report published by the Interstate Technology & Regulatory Council, 2005 and Dasgupta et al (2005)).

The District's ongoing monitoring program is continuing to assess the distribution of perchlorate in the groundwater basin and how concentrations change through time. The District regularly reviews this information and will continue to work with the stakeholders to address this issue.

5.7 Constituents of Emerging Concern

Constituents of emerging concern are synthetic or naturally occurring substances (chemicals and microorganisms) that are not regulated but may have negative impacts on the environment and/or human health. The newest group of constituents of emerging concern includes pharmaceuticals, personal care products, and endocrine disruptors.

Pharmaceuticals and personal care products (PPCPs) include thousands of chemicals contained in consumer and health related products such as drugs (prescription and over-the-counter), food supplements, fragrances, sun-screen agents, deodorants, flavoring agents, insect repellants, and inert ingredients. Important classes of high use prescription drugs include antibiotics, hormones, beta-blockers (blood pressure medicine), analgesics (pain-killers), steroids, antiepileptic, sedatives, and lipid regulators.

Endocrine Disrupting Compounds (EDCs) are compounds that can disrupt the endocrine system. They can occur in a wide variety of products such as pesticides and pharmaceuticals. Research investigations have documented that EDCs can interfere with the normal function of hormones that affect growth and reproduction in animals and humans. Findings of secondary sex changes, poor hatching, decreased fertility, and altered behavior have been observed in fish following exposure to EDCs.

In general, these substances have been identified as a pollution threat or were previously detected in the environment. As new laboratory methods are developed, substances can be detected at much lower concentrations. When such detection occurs before regulatory limits are established and potential human health effects are still unknown, water suppliers and health officials face new challenges. In some cases, public awareness and concern is high because the compounds are detected but scientific-based information on potential health impacts of such low concentrations is not available.

Water quality concerns arise from the widespread use of PPCPs and EDCs. In most cases, the impacts on human health from exposure to low concentrations of these substances are not known. European studies in the 1990s confirmed the presence of some of these chemicals in the less than one microgram per liter range (ppb) in surface waters and groundwater and at low concentrations in wastewater treatment plant effluents.

A USGS report found detectable concentrations of hormones and PPCPs in many vulnerable waterways throughout the United States (Kolpin 2002). Due to the potential impact of EDCs on future water reclamation projects, the District prioritizes monitoring of these chemicals.

OCWD's state-certified laboratory is one of a few in the state that has a program to continuously develop capabilities to analyze for new compounds. Recognizing that the state CDPH has limited resources to focus on methods development, OCWD works on developing low detection levels for chemicals likely to be targeted for future regulation or monitoring.

OCWD advocates the following general principles as water suppliers and regulators develop programs to protect public health and the environmental from adverse effects of these emerging contaminants:

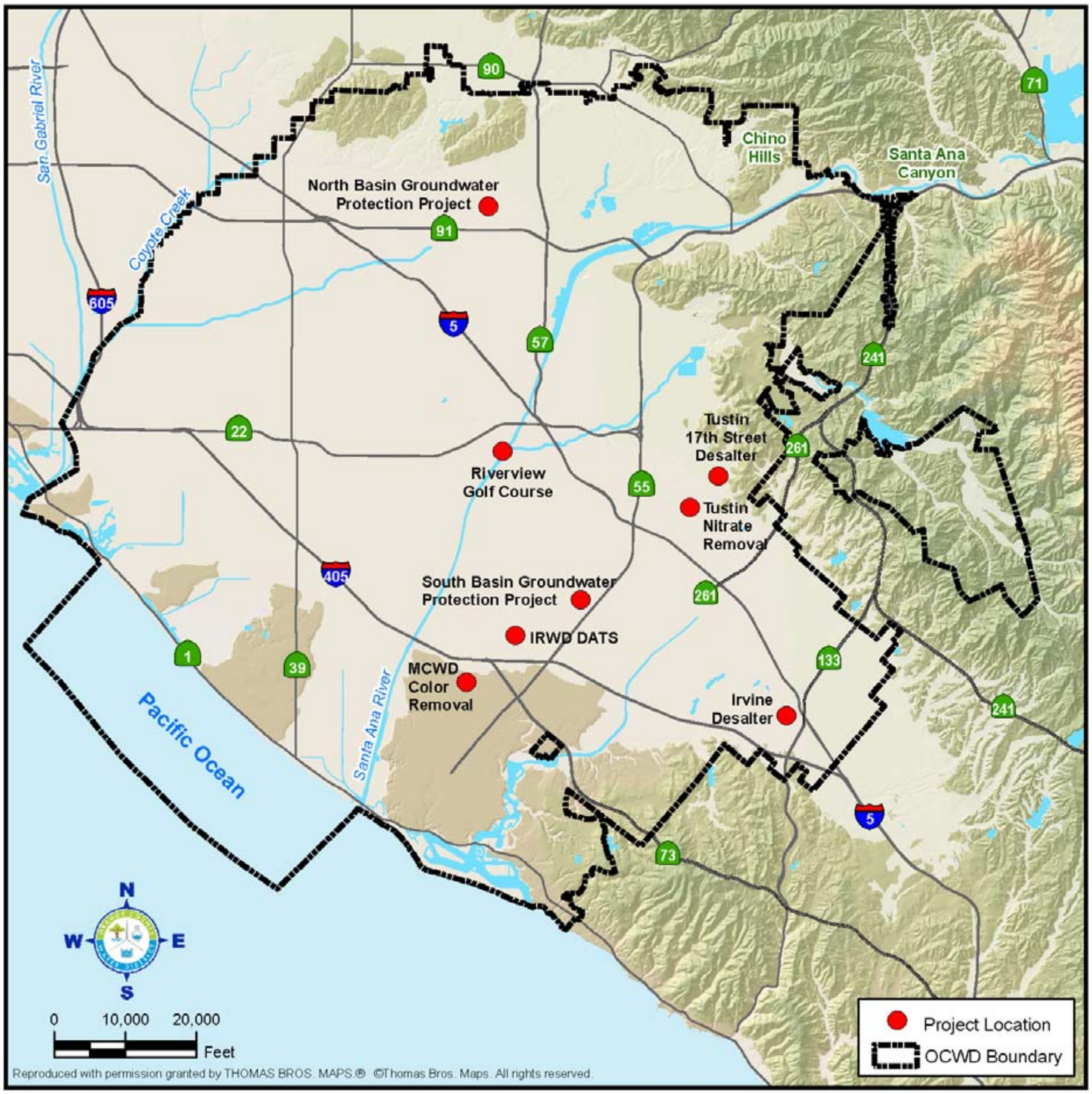
- Monitoring should focus on constituents that pose the greatest risk.
- Constituents that are prevalent, persistent in the environment, and may occur in unsafe concentrations should be prioritized.
- Analytical methods to detect these constituents should be approved by the state or federal government.
- Studies to evaluate the potential risk to human health and the environment should be funded by the state or federal government.
- The state and federal government should encourage programs to educate the public on waste minimization and proper disposal of unused pharmaceuticals.

OCWD is committed to (1) track new compounds of concern; (2) research chemical occurrence and treatment; (3) communicate closely with CDPH on prioritizing investigation and guidance; (4) coordinate with OCSD, upper watershed wastewater dischargers, and regulatory agencies to identify sources and reduce contaminant releases; and (5) inform the Producers on emerging issues.

5.8 Groundwater Quality Improvement Projects

This section describes specific projects that improve groundwater quality by removing TDS, nitrate, VOCs and other constituents as shown in Figure 5-12. Two water quality improvement projects discussed in the 2004 *Groundwater Management Plan* are no longer in operation. The Fullerton Iron and Manganese Removal Project was determined to be ineffective due to well capacity limitations. The Orange TCE project operated only on a temporary basis and has been permanently shut down.

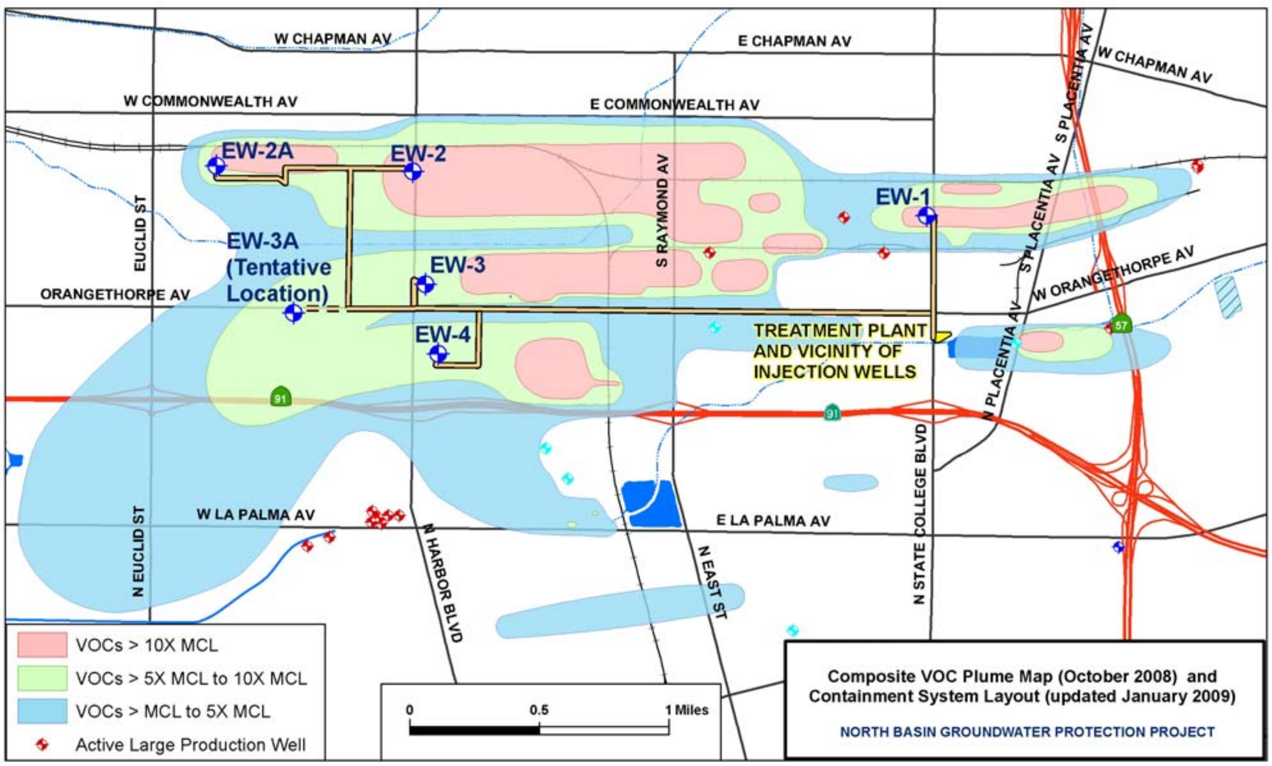
FIGURE 5-12
WATER QUALITY IMPROVEMENT PROJECTS



5.8.1 NORTH BASIN GROUNDWATER PROTECTION PROJECT (NBGPP)

In accordance with OCWD's groundwater cleanup policy, the District is implementing the NBGPP to protect drinking water supplies and the beneficial use of groundwater. OCWD has constructed five wells specifically to remove and contain contaminated groundwater in the shallow aquifer. Additional extraction wells may be needed. OCWD will also construct pipelines to bring the contaminated groundwater to a centralized treatment plant where the contaminants will be removed. The purified water will then be re-injected back into the shallow aquifer. An overview of the VOC plumes and the NBGPP is shown in Figure 5-13. OCWD has initiated legal action against the parties responsible for contamination to seek cost recovery so that the public does not have to pay for this project.

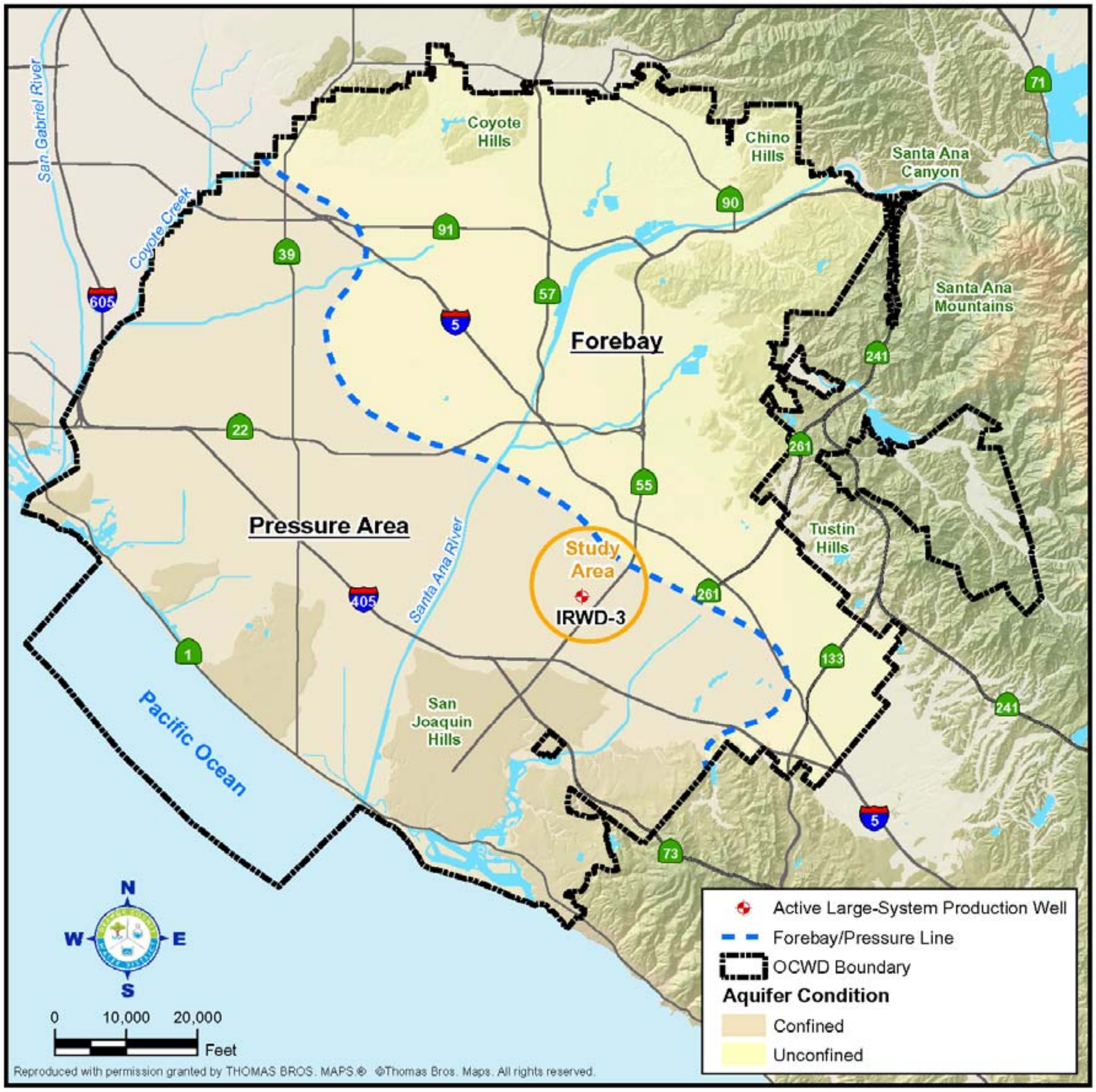
FIGURE 5-13
NORTH BASIN GROUNDWATER PROTECTION PROJECT



5.8.2 SOUTH BASIN GROUNDWATER PROTECTION PROJECT (SBGPP)

The District has initiated the SBGPP, a project similar to the NBGPP, to protect drinking water supplies in the south part of the Orange County groundwater basin. OCWD constructed six tri-nested monitoring wells to investigate the extent of VOC-contaminated groundwater in the Shallow Aquifer. Delineation of the contaminated groundwater will likely involve more than one phase of investigation. If "hot spots" or contaminated plumes are identified, the SBGPP may include comprehensive remediation systems to contain and remove the contamination similar to the NBGPP or localized interim remedial measures. The study area for the SBGPP is shown in Figure 5-14.

FIGURE 5-14
SOUTH BASIN GROUNDWATER PROTECTION PROJECT



5.8.3 MTBE REMEDIATION

In 2003, OCWD filed suit against numerous oil and petroleum-related companies that produce, refine, distribute, market, and sell MTBE and other oxygenates. The suit seeks funding from these responsible parties to pay for the investigation, monitoring, and removal of oxygenates from the basin.

Treatment technologies used to remove MTBE from groundwater include granular activated carbon (GAC) or advanced oxidation. Depending upon site-specific requirements, a treatment train of two or more technologies in series may be appropriate (i.e., use one technology to remove the bulk of MTBE and a follow-up technology to polish the effluent water stream). If other contaminants (e.g., excessive nitrates or TDS) are also found in groundwater with MTBE, additional treatment processes (ion exchange membranes) would also need to be included in the process train.

5.8.4 IRVINE DESALTER

The Irvine Desalter was built in response to the discovery in 1985 of VOCs beneath the former El Toro MCAS and the central area of Irvine. The plume of improperly disposed cleaning solvents migrated off base and threatened the main basin. IRWD and OCWD cooperated in building production wells, pipelines, and two treatment plants, both of which are now owned and managed by IRWD. One plant removes VOCs by air-stripping and vapor-phase carbon adsorption with the treated water used for irrigation and recycled water purposes. A second plant treats groundwater outside the plume to remove excess nitrate and TDS concentrations using RO membranes for drinking water purposes. Combined production of the Irvine Desalter wells is approximately 8,000 afy.

5.8.5 TUSTIN DESALTERS

Tustin's Main Street Treatment Plant has operated since 1989 to reduce nitrate levels from the groundwater produced by Tustin's Main Street Wells Nos. 3 and 4. The untreated groundwater can undergo either RO or ion exchange treatment. The RO membranes and ion exchange unit operate in a parallel treatment train. Approximately 1 mgd is bypassed and blended with the treatment plant product water to produce up to 2 mgd or 2,000 afy. During fiscal year 2007-08, 55,700 pounds of nitrate were removed at this treatment plant.

The Tustin Seventeenth Street Desalter began operation in 1996 to reduce high nitrate and TDS concentrations from the groundwater pumped by Tustin's Seventeenth Street Wells Nos. 2 and 4 and Tustin's Newport well. The desalter utilizes two RO membrane trains to treat the groundwater. The treatment capacity of each RO train is 1 mgd. Approximately 1 mgd is bypassed and blended with the RO product water to produce up to 3 mgd or 3,000 afy. During fiscal year 2007-08, 154,800 pounds of nitrate were removed at this treatment facility.

5.8.6 GARDEN GROVE NITRATE REMOVAL

The Garden Grove Nitrate Removal Project was a blending project utilizing two wells in order to meet the MCL for nitrate. Garden Grove Well No. 28, containing high nitrate concentrations, was blended with water from Well No. 23. The blending project operated from 1990 to 2005. The city took the well off line and is considering construction of upgraded treatment facilities to expand the pumping of groundwater in this area.

5.8.7 RIVER VIEW GOLF COURSE

VOC contamination, originating from an upgradient source, was discovered in a well owned by River View Golf Course, located in the City of Santa Ana. The well was used for drinking water but was converted into a supply for golf course irrigation due to the contamination. Continued operation of the well helps to remove VOC contamination from the basin.

5.8.8 COLORED WATER TREATMENT

The 5-mgd MCWD ozone oxidation treatment plant removes the color from groundwater pumped from Well No. 6 and Well No. 11. One of the ozone by-products is assimiable organic carbon (AOC), which increases the microbiological regrowth potential within the distribution system. Pressurized biologically-active filtration is employed immediately after ozone oxidation in order to remove AOC and produce microbiologically stable water. In order to meet the stringent disinfection by-products MCLs, chloramination (a combination of chlorine and ammonia) is used to disinfect the product water prior to delivery to distribution system.

IRWD's DATS removes color from deep aquifer groundwater. A total of 8 mgd of colored groundwater is pumped from two wells (IRWD C8 and C9) to the DATS plant. Nanofiltration (NF) membranes remove color and organics. Three NF trains each produce 2.44 mgd at a recovery rate of 92 percent. The high quality NF product water is degasified, disinfected, and pumped into the Dyer Road Wellfield pipeline for potable use resulting in 7.4 mgd added to the drinking water system. The highly colored NF concentrate is sent to disposal by OCSD.

The colored water treatment projects operated by MCWD and IRWD provide benefit beyond the production of water supply. The aquifers with colored water are generally deeper than the primary clear water production zones, and upward vertical migration of the colored water into the clear water aquifers has been observed. Upward migration can impair water quality in the clear water zones. A large groundwater level difference between the colored water aquifer and clear water aquifers exacerbates this situation. By pumping from the colored water aquifer, the MCWD and IRWD projects reduce the groundwater level in the colored water aquifer, thus reducing the vertical migration of colored water into the clear water aquifers.

5.9 BEA Exemption for Improvement Projects

In some cases, the District encourages the pumping of groundwater that does not meet drinking water standards in order to protect water quality. This is achieved by using a financial incentive called the BEA Exemption. The benefits to the basin include removing and beneficially using poor-quality groundwater and reducing or preventing the spread of poor-quality groundwater into non-degraded aquifer zones.

As explained in detail in Section 6, OCWD uses financial incentives to manage the level of pumping from the groundwater basin. Producers pay a Replenishment Assessment (RA) for water pumped from the basin. Each year the District sets an allowable amount of pumping and assesses an additional charge, called the BEA, on all water pumped above that limit.

A BEA Exemption is used to encourage pumping of groundwater that does not meet drinking water standards in order to clean up and contain the spread of poor quality water. Section 38.1 of the District Act provides specific criteria for exemption of the BEA:

"If the board of directors finds and determines that the water produced from the facility or facilities or any of them has or will have a beneficial effect upon the quality of water supplies of the district, the board of directors may make an order that water produced from the water-producing facility or facilities shall be exempted from either or both of the following:

(A) The payment of all or any portion of the basin equity assessment…

(B) The production requirements and limitations as provided in this act."

OCWD uses a partial or total exemption of the BEA to compensate a qualified participating agency or Producer for the costs of treating poor-quality groundwater. These costs typically include capital, interest, and operations and maintenance (O&M) costs for the treatment facilities.

Under this provision, the District has exempted all or a portion of the BEA for pumping and treating groundwater for removal of nitrates, TDS, VOCs, and other contaminants. Water quality improvement projects that have received a BEA exemption are listed in Table 5-6.

When the District authorizes a BEA exemption for a project, OCWD is obligated to provide the replenishment water for the production above the BPP and forgoes the BEA revenue that OCWD would otherwise receive from the producer.

TABLE 5-6
SUMMARY OF IMPROVEMENT PROJECTS AND REPLENISHMENT OBLIGATIONS

Project Name	Project Description	BEA Exemption Approval Date	Groundwater Production above BPP (afy)	OCWD Subsidy
Irvine Desalter	Removal of nitrates, TDS, and VOCs	2001	10,000	BEA Exemption
Tustin Desalter	Removal of nitrates and TDS	1998	3,500	BEA Exemption
Garden Grove Nitrate	Blending two Garden Grove wells to meet nitrate MCL	1998	4,000	BEA Exemption
Tustin Nitrate Removal	Removal of nitrates	1998	1,000	BEA Exemption
River View Golf Course	Removal of VOCs	1998	350	$50/af reduction in BEA
MCWD Colored Water Removal	Color removal	2000	8,700	BEA Exemption
IRWD DATS	Color removal	1999	8,000	BEA Exemption

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6 INTEGRATED MANAGEMENT OF PRODUCTION AND RECHARGE

The District operates the groundwater basin in order to protect and increase the basin's sustainable yield in a cost effective manner. Accomplishing this goal requires careful management of recharge and water production. This section describes the methods and programs utilized by OCWD to maintain the long-term sustainability of the basin's groundwater supplies.

6.1 General Management Approach

OCWD is internationally known for its unique, proactive, supply-side management approach. This is a major factor that has enabled the District to develop one of the most advanced and progressive groundwater management systems in the world. The District seeks to expand the basin's yield by maximizing the amount of water recharged into the basin, developing new sources of water to recharge the basin, and increasing the effectiveness of the District's recharge facilities.

OCWD provides access to basin supplies at a uniform cost to all entities within the District without regard to the length of time they have been producing from the basin. After initiating this policy in 1954 with the establishment of the Replenishment Assessment (RA), OCWD witnessed a substantial growth in municipal and industrial water usage. This growth has not occurred without its accompanying challenges to OCWD: the need to augment recharge water supplies, establish methods to effectively manage demands on the basin, and balance the amount of total recharge and total pumping to protect the basin from being overdrafted.

The District's participation in a wide range of cooperative efforts with other water and waste water agencies as well as stakeholder organizations plays an important part in the management of the groundwater basin.

6.2 Cooperative Efforts to Protect Water Supplies and Water Quality

OCWD participates in cooperative efforts with state and federal regulatory agencies and stakeholders within the District boundaries, in Orange County, and in the Santa Ana River Watershed.

6.2.1 SANTA ANA WATERSHED PROJECT AUTHORITY (SAWPA)

SAWPA is a Joint Powers Authority whose mission is to develop and maintain regional plans, programs, and projects that will protect the Santa Ana River basin water resources. OCWD, one of SAWPA's five member agencies, actively participates on a number of work groups that meet on a regular basis to discuss, plan, and make joint decisions on management of water resources in the Santa Ana Watershed. OCWD actively participates in the following SAWPA work groups:

SAWPA Commission:
The commission, composed of Board members from SAWPA's five member agencies including OCWD, meets on a monthly basis to set policy and oversee the management of SAWPA.

Storm Water Quality Standards Task Force:
The Task Force is evaluating water quality standards as they relate to stormwater and dry weather flows. Particular emphasis is being given to the water quality that is needed to protect recreational beneficial uses.

Basin Monitoring Program Task Force:
The Basin Monitoring Program Task Force was formed in 1995 to determine the extent of and evaluate the impact of increasing concentrations of Total Inorganic Nitrogen (TIN) and TDS in groundwater in the watershed. Formation of the Task Force was in response to concerns by the Regional Board that water quality objectives for nitrogen and TDS were being exceeded in some groundwater basins in the watershed.

The over 20 water and waste water agencies and local governments on the Task Force worked with RWQCB staff to develop an amendment to the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) that was adopted in 2004. This nearly ten-year effort involved collecting and analyzing data in twenty-five groundwater management zones in the watershed to recalculate nitrogen and TDS levels and to establish new Water Quality Objectives to protect Beneficial Uses.

An important component in this effort was the recognition by stakeholders that groundwater basins are interconnected and that water quality in one basin impacts other basins and the quality of the water in the Santa Ana River.

The Basin Plan amendment charges the Task Force with implementing a watershed-wide TDS/Nitrogen groundwater monitoring program. Task Force members agreed to fund and participate in a process to recalculate ambient water quality every three years in each of the twenty-five groundwater management zones and to compare water quality to the water quality objectives in order to measure compliance with the Basin Plan. The latest recalculation, the second since adoption of the amendment, was published in August 2008 (Wildermuth, 2008).

Salinity Management and Imported Water Recharge Plenary Workgroup:
This workgroup, in cooperation with the Regional Board, implements a Cooperative Agreement signed by water agencies that use imported water for groundwater recharge. The workgroup is analyzing water quality data and estimating future conditions to evaluate the impact of recharging imported water.

Emerging Constituents Workgroup:

This workgroup is developing a monitoring program for emerging constituents in water that is intentionally recharged to local aquifers. The group will develop a water quality monitoring program aimed at protecting surface water quality and groundwater supplies.

Santa Ana Sucker Conservation Team:

Meeting monthly since 1998, a group of concerned public agencies from throughout the Santa Ana River watershed have been working to determine the reasons for the decline of the Santa Ana Sucker (Catostomus santaanae) and to devise strategies for recovering the species. The U.S. Fish & Wildlife Service (USFWS) and the California Department of Fish & Game (CDFG) are part of this effort.

One Water One Watershed Initiative:

A large and diverse group of interested citizens and organizations is participating in developing an updated Santa Ana Watershed Integrated Regional Water Management Plan.

6.2.2 WATER QUALITY AND NATURAL RESOURCE PROTECTION IN THE PRADO BASIN

The water quality of the Santa Ana River and its tributary creeks has a direct impact on the quality of water that flows into Orange County. The operation of the Prado Wetlands, as described in Section 5.3.3, improves water quality through the removal of nitrates and other pollutants before the water reaches OCWD's groundwater recharge basins.

The Prado Basin contains the single largest stand of forested riparian habitat remaining in coastal southern California. The basin provides a variety of fish and bird habitats including several rare and endangered species. OCWD manages a large portion of this property and has undertaken numerous habitat restoration and species recovery projects.

As part of a cooperative agreement with the ACOE and the USFWS, OCWD has created more than 800 acres of habitat for the endangered least Bell's vireo and southwestern willow flycatcher and has funded more than $3 million in mitigation and monitoring measures for the vireo program. Through these restoration activities, OCWD has made significant contributions towards the recovery of vireo. In the mid-eighties, the vireo population had dropped to less than 20 breeding pairs. A 2007 survey identified 420 vireo territories, 237 of which contained pairs. Plans are underway to create additional river edge habitat, the preferred habitat of the flycatcher, in order to increase the population of this endangered bird.

A significant amount of the Prado Basin is infested with exotic vegetation, including the Giant Reed (*Arundo donax*), shown in Figure 6-1. Arundo grows rapidly, obstructs flood flows, has no value for wildlife habitat, and consumes nearly three times the water of native vegetation. Arundo consumes an estimated 56,200 af of water annually from the Santa Ana River.

OCWD has invested over $3 million in Arundo removal efforts. These efforts are coordinated by the Santa Ana Watershed Association (SAWA). The SAWA, of which OCWD is a founding member, is dedicated to improving environmental quality and habitat within the watershed. Other members of SAWA include the CDFG, Riverside

County Flood Control District, Riverside County Parks and Recreation, San Bernardino County Flood Control District, SAWPA, the RWQCB, the ACOE, the USFWS, and the U.S. Forest Service.

Approximately 3,100 acres of river bottom lands formerly infested by Arundo and other invasive weeds are now under management. It is estimated that by 2025, an annual minimum of 36,000 af of additional water will be available in the Santa Ana River as a result of removing Arundo (based on a minimum of 3.6 af of additional water per acre of Arundo removed).

FIGURE 6-1
ARUNDO REMOVAL

Arundo Control Begins with Removal by Hand or Machine Followed by Treatment of Re-growth with a Systemic Herbicide

6.2.3 CHINO BASIN INTEGRATED PLANNING

Chino Creek and Mill Creek are major tributaries that flow into the Santa Ana River in the Prado Basin. OCWD staff attends monthly meetings of stakeholders from this region to discuss and act upon issues of common concern. In 2006, the group, led by the IEUA and OCWD produced the *Chino Creek Integrated Plan: Guidance for Working Together to Protect, Improve, and Enhance the Lower Chino Creek Watershed*.

6.2.4 COOPERATIVE EFFORTS IN ORANGE COUNTY

OCWD supports the watershed planning efforts of the County of Orange. The county created three watershed management areas in order to localize the development and implementation of integrated regional watershed plans. Two of the management areas are within the OCWD service area. The North Orange County Management Area covers the areas within the county that are located within the Santa Ana River Watershed and the coastal watersheds west of the Santa Ana River. The Central Orange County Management Area covers the Newport Bay Watershed and the Newport Coast area. OCWD participates in the development and implementation of the North Orange County and Central Orange County watershed plans.

6.2.5 COOPERATIVE EFFORTS IN OCWD SERVICE AREA

OCWD participates in a variety of cooperative efforts with water retailers and cities within the OCWD service area as well as wastewater and flood control agencies, as described below.

Groundwater Producers

The Producers, the retail water agencies that produce the majority of the groundwater from the basin, meet with OCWD staff on a monthly basis to discuss issues related to management of the groundwater basin.

Municipal Water District of Orange County (MWDOC)

MWDOC, a member agency of the Metropolitan Water District of Southern California, provides imported water to 28 retail water agencies and cities in Orange County. MWDOC also supplies untreated imported water to OCWD when it is available for use as a supplemental source of water to recharge the groundwater basin. OCWD and MWDOC meet on a monthly basis and jointly plan for the maximum flexibility in the overall water supply, including:

- Coordinating mutual water resources planning, supply availability, and water use efficiency (conservation) programs for the benefit of the basin area in Orange County.
- Conducting and developing an Orange County Water Reliability Program to improve the overall water and emergency supply to Orange County.
- Evaluating ocean water desalination, water recycling, and other means to increase the supply and system reliability for the basin area.
- Evaluating water transfers and exchanges that would make surplus supplies from other areas available to the District.

Water Advisory Committee of Orange County (WACO)

WACO is a group of elected officials and water managers who meet on a monthly basis to provide advice to OCWD and MWDOC on water supply issues.

Groundwater Replenishment System Steering Committee

The GWR System is a joint project of the OCWD and the Orange County Sanitation District. Directors of the two districts meet on a monthly basis to coordinate joint operations.

Orange County Flood Control District

Three of the recharge basins used by OCWD for groundwater recharge are owned by the Orange County Flood Control District. OCWD also owns a six-mile section of the Santa Ana River that is used for conveyance of flood water. Quarterly meetings are held to discuss joint operations and planning.

6.3 Supply Management Strategies

One of OCWD's management objectives is to maximize the amount of water recharged into the basin. This is achieved through maximizing the efficiency of and expanding the District's recharge facilities and increasing the supply of recharge water. The District constructed the GWR System to increase the supply of water available to recharge the basin. Additional District supply management programs include encouraging and using recycled water for irrigation and other non-potable uses, participating in water conservation efforts, participating in efforts to manage water and other natural resources in the upper watershed, and working with MWDOC in developing and conducting other supply augmentation projects and strategies.

6.3.1 USE OF RECYCLED WATER

OCWD's Green Acres Project is a non-potable water supply project that utilizes a dedicated set of pipelines to deliver irrigation and industrial water to users. Most of the recycled water is used on golf courses, greenbelts, cemeteries, and nurseries. The Green Acres Project, in operation since 1991, reduces demands on the basin by providing non-potable water for non-potable uses. Secondary wastewater effluent from the OCSD is filtered and disinfected with chlorine to produce approximately seven mgd of irrigation and industrial water.

6.3.2 WATER CONSERVATION PROGRAMS

Water conservation plays an important role in meeting future water demands. By implementing conservation programs, future water demand can be reduced, and less imported water will be necessary to meet the area's water requirements.

The District cooperated with MWDOC, OCSD, and other agencies in a low-flush toilet program that subsidized the replacement of old high-volume toilets with modern low-flow toilets. The District also supports MWDOC and Metropolitan in a Hotel/Motel Water Conservation Program to save water through minimizing water use at hotels. This program, active in over 30,000 hotel/motel rooms, offers free laminated towel rack hangers or bed cards that encourage guests to consider using their towels and bed linens more than once during their stay.

OCWD supports MWDOC and other local agencies in a similar program aimed at restaurant water conservation. Free laminated cards are provided for restaurants to place on their tables. The cards inform patrons that water will be served only upon request. This encourages environmental awareness and water and energy conservation.

6.3.3 CONJUNCTIVE USE AND WATER TRANSFERS

The existing Metropolitan storage program provides for Metropolitan to store 66,000 af of water in the basin in exchange for Metropolitan's contribution to improvements in basin management facilities. This water can be withdrawn over a three-year time period. The improvements contributed by Metropolitan included the construction of eight new extraction wells and new injection wells for the Talbert Barrier Expansion.

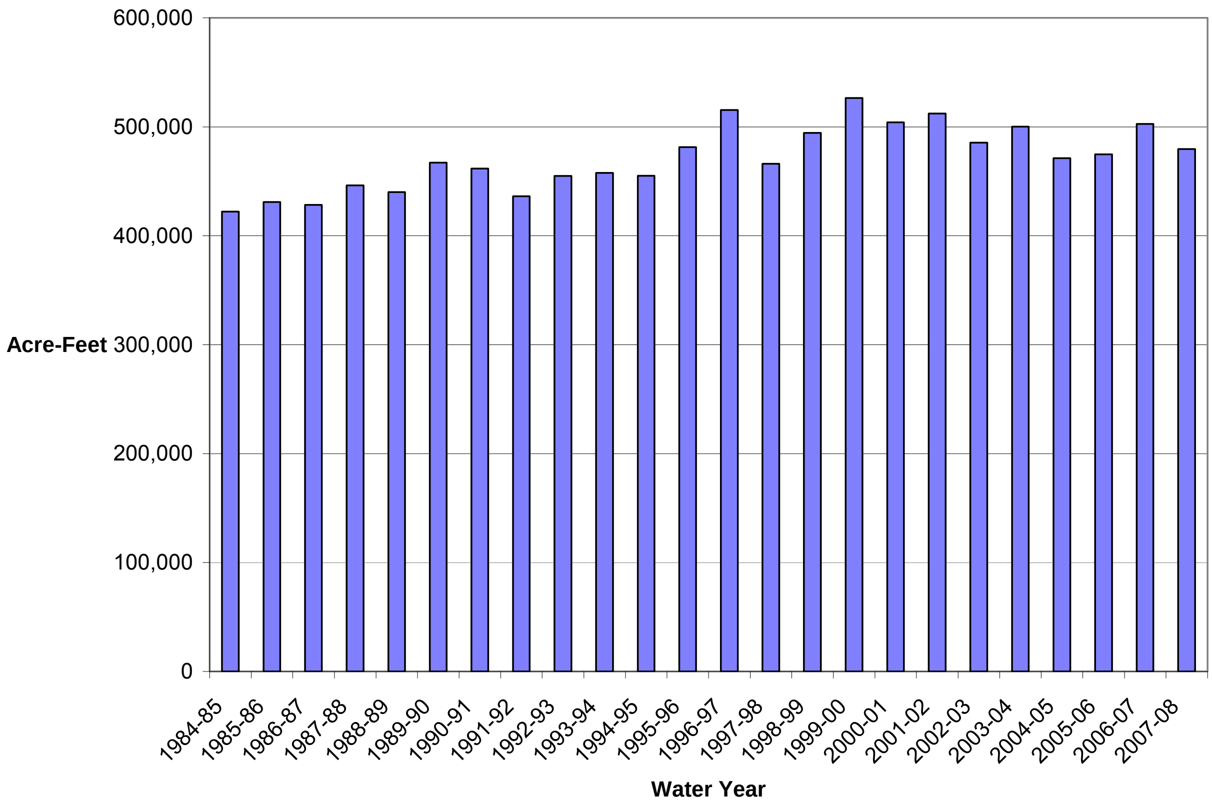
The District reviews opportunities for additional conjunctive use projects that would store water in the basin and could potentially store water in other groundwater basins. Additionally, the District reviews opportunities for water transfers that could provide additional sources of recharge water. Such projects are evaluated carefully with respect to their impact on available storage and their reliability and cost effectiveness.

6.4 Water Demands

Numerous factors influence water demands such as population growth, economic conditions, conservation programs, and hydrologic conditions. Estimates of future demands are therefore subject to some uncertainty and are updated on a periodic basis.

Total water demand within the District's boundary for water year 2007-08 (July 1-June 30) was 480,303 af. Total demand is met with a combination of groundwater, imported water, local surface water in Irvine Lake and Santiago Creek, and recycled water used for irrigation and industrial purposes. Figure 6-2 provides historical water demands in the District.

FIGURE 6-2
HISTORICAL TOTAL DISTRICT WATER DEMANDS



Demand estimates are based on a number of factors including projected population increases. Population within OCWD's service area is expected to increase from 2.5 million currently to 2.7 million by the year 2035 as shown in Table 6-1. This population growth is expected to increase water demands from the current approximately 480,000 afy to 558,000 afy in 2035 as shown in Table 6-2. Future annual water demands will fluctuate, primarily due to factors such as the effectiveness of future water conservations programs, economic conditions, and hydrologic conditions.

TABLE 6-1
ESTIMATED POPULATION WITHIN OCWD BOUNDARY

2010	2015	2020	2025	2030	2035
2,550,000	2,620,000	2,659,000	2,685,000	2,703,000	2,722,000

Source: MWDOC and Center for Demographics Research (2008)

TABLE 6-2
ESTIMATED FUTURE WATER DEMANDS IN OCWD BOUNDARY (AFY)

2009	2010	2015	2020	2025	2030	2035
490,000	500,000	519,000	538,000	548,000	553,000	558,000

Projections based on annual MWDOC survey completed by each Producer - Spring 2008

Expansion of the District's boundary through annexing additional land into the District has been a major factor in the growth of OCWD. From 1933 to now, the District's area has grown from 162,676 acres to over 229,000 acres (OCWD, 2006). Annexation requests by the City of Anaheim, Irvine Ranch Water District, and Yorba Linda Water District, if approved, could expand the District's boundary and increase water demands by approximately 48,000 afy.

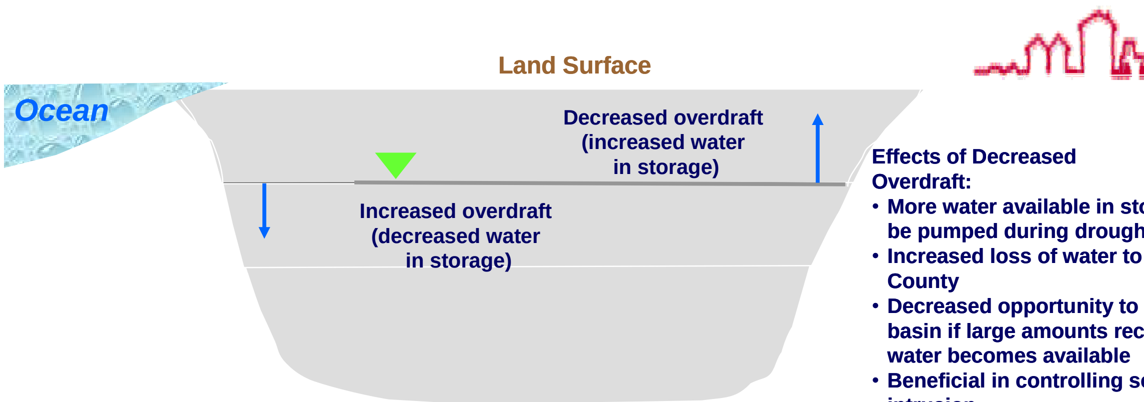
6.5 Basin Operating Range

OCWD does not regulate pumping from the groundwater basin. Instead, total pumping is managed by a process that uses financial incentives to encourage Producers to pump an aggregate amount of water that is sustainable over the long term. The process that determines a sustainable level of pumping considers the basin's safe operating range and the amount of recharge water available to the District.

The basin operating range refers to the upper and lower levels of groundwater storage in the basin that can be reached without causing negative or adverse impacts. The basin is in the upper (higher) end of the operating range when groundwater levels are high. Conversely, the basin is near the low end of the operating range when groundwater levels are lower. Figure 6-3 schematically illustrates the impacts of changing the amount of groundwater in storage.

The storage level is quantified based on a benchmark defined as the full basin condition. The groundwater basin rarely, if ever, reaches the full basin condition. The degree to which the storage is below the full basin condition is defined as "accumulated overdraft." Based on this definition of accumulated overdraft, it is anticipated that the accumulated overdraft would increase or decrease from year to year in response to hydrological variations. Provided that the accumulated overdraft is within the safe operating range, this approach is sustainable.

FIGURE 6-3
SCHEMATIC ILLUSTRATION OF IMPACTS OF CHANGING THE AMOUNT OF GROUNDWATER IN STORAGE



Effects of Decreased Overdraft:
- More water available in storage to be pumped during drought
- Increased loss of water to LA County
- Decreased opportunity to recharge basin if large amounts recharge water becomes available
- Beneficial in controlling seawater intrusion
- Decreased pumping costs

Effects of Increased Overdraft:
- Less water available in storage to be pumped during drought
- Decreased loss of water to LA County
- Increased available storage capacity if large amounts recharge water becomes available
- Increased potential for seawater intrusion (if exceed barrier threshold)
- Increased pumping costs
- Increased potential for inflow of colored water into clear water aquifers
- Increased potential for land subsidence (if exceed threshold)
- May need to increase budget for replenishment water to reduce overdraft
- Some shallow production wells may become inoperable due to low groundwater levels

Each year the District determines the optimum level of storage for the following year. For example, at small amounts of overdraft (greater total amount of water in storage), the amount of energy required to pump groundwater is less and groundwater outflow to Los Angeles County is greater. On the other hand, larger amounts of overdraft increase the potential for seawater intrusion. Factors that are considered in determining the optimum level of storage are shown in Table 6-3.

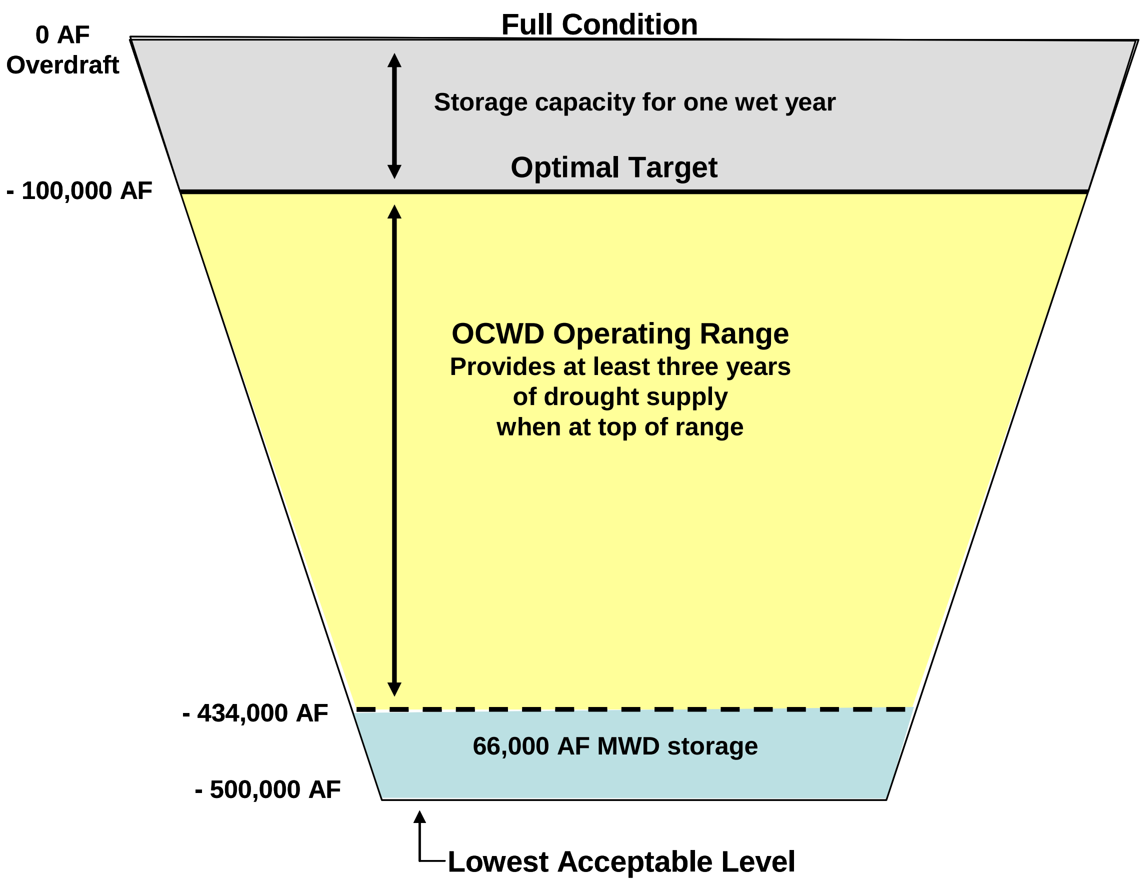
The accumulated overdraft is calculated and published in the annual District's Engineer's Report. Since 2007, the determination of accumulated overdraft is based on a full basin benchmark defined for each of the three aquifer layers as described in Section 2.

The shallow aquifer, the principal aquifer, and the aquitard between the shallow and principal aquifer stores approximately 66,000,000 af of water at the full condition. When the accumulated overdraft is 200,000 af, the Basin is approximately 99.7 percent full. When the overdraft increases from 200,000 to 400,000 af, the basin changes from 99.7 to 99.4 percent full. From a classical surface water reservoir perspective, the basin is almost always nearly "full." In spite of the large amount of water stored in the basin, there is a narrow operating range within which the Basin can safely operate, as illustrated in Figure 6-4, which is largely dictated by water quality issues and the need to prevent land subsidence.

TABLE 6-3
BENEFITS AND DETRIMENTS OF DIFFERENT STORAGE LEVELS

ACCUMULATED OVERDRAFT (AF)	BENEFITS	DETRIMENTS
Less than 200,000	• Beneficial to controlling seawater intrusion • Lower pumping energy costs for producers • Easier to maintain stable BPP • Water available to be pumped from storage in shortage condition • Potential to temporarily increase BPP • Decreased potential for vertical migration of poor quality water • Opportunity to operate Basin to build reserves	• Increased loss of groundwater to Los Angeles County • Possible localized high groundwater levels if near full condition • Decreased opportunity to recharge Basin if large amount of low cost recharge water becomes available • Possible decrease in recharge capacity due to high groundwater levels (not observed at current recharge rates, but may be an issue with higher rates in future)
200,000 to 350,000	• Minimal to no problems with high groundwater levels • Increased available storage capacity if large amount of recharge water becomes available • Decreased groundwater outflow to Los Angeles County	• Limited amount of water in storage that can be pumped during drought or other shortage condition • Risk of seawater intrusion increases as overdraft increases from 200,000 to 350,000 af • Option for Metropolitan to call 20,000 afy from storage would further increase overdraft
350,000 to 500,000	• Minimal to no problems with high groundwater levels • Increased available storage capacity if large amount of recharge water becomes available • Further decrease in groundwater outflow to Los Angeles County	• Little to no water in storage that can be pumped during drought or other shortage condition • Increased pumping energy costs • Further increased risk of seawater intrusion • Coastal pumping reductions potentially needed • Option for Metropolitan to call 20,000 afy from storage further worsens overdraft • Increased number of production wells inoperable due to low groundwater levels below 400,000 af overdraft • Potential risk of increased land subsidence • Potential increased risk of vertical migration of poor quality water. • Need to increase budget for replenishment water to reduce overdraft • More difficult to maintain stable BPP

FIGURE 6-4
STRATEGIC BASIN OPERATING LEVELS AND OPTIMAL TARGET



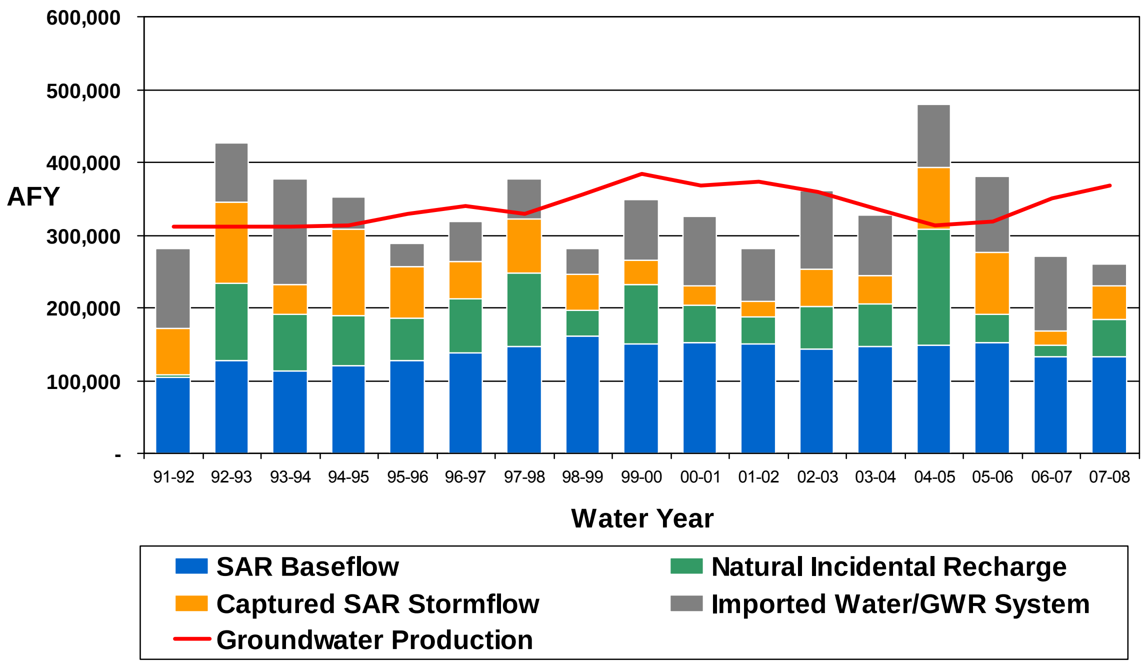
Groundwater levels must be carefully managed to properly control seawater intrusion. With the water available for injection from the GWR System, seawater intrusion may be controlled in the Talbert Gap with a maximum overdraft of 500,000 af. Improvements to the Talbert Barrier may allow greater overdraft but the impact of greater withdrawals on the other gaps, Bolsa, Sunset and Alamitos, must also be evaluated.

Additional issues that would need to be evaluated prior to increasing the amount of overdraft, assuming an effective seawater barrier was operating, would include the risk of land subsidence, inflow of colored water or poor quality groundwater into the principal aquifer from underlying or overlying aquifers, and the number of shallow production wells that would become inoperable due to lower groundwater levels.

6.6 Balancing Production and Recharge

Over the long term, the basin must be maintained in an approximate balance to ensure the long-term viability of basin water supplies. In one particular year, water withdrawals may exceed water recharged as long as over the course of a number of years this is balanced by years where water recharged exceeds withdrawals. Levels of basin production and water recharged since water year 1991-92 are shown in Figure 6-5.

FIGURE 6-5
BASIN PRODUCTION AND RECHARGE SOURCES



Water Year	SAR Baseflow	Natural Incidental Recharge	Captured SAR Stormflow	Imported Water/ GWR System	Groundwater Production
91-92	105,000	2,000	65,000	109,000	311,000
92-93	127,000	107,000	111,000	82,000	312,000
93-94	114,000	78,000	41,000	144,000	312,000
94-95	120,000	70,000	117,000	44,000	314,000
95-96	128,000	58,000	70,000	32,000	329,000
96-97	138,000	74,000	51,000	56,000	339,000
97-98	146,000	101,000	74,000	55,000	329,000
98-99	161,000	36,000	50,000	35,000	356,000
99-00	150,000	82,000	33,000	84,000	384,000
00-01	153,000	50,000	27,000	95,000	369,000
01-02	150,000	38,000	21,000	73,000	374,000
02-03	143,000	58,000	52,000	109,000	359,000
03-04	146,000	59,000	39,000	84,000	337,000
04-05	149,000	159,000	85,000	87,000	314,000
05-06	153,000	39,000	84,000	104,000	318,000
06-07	133,000	15,000	19,000	103,000	350,000
07-08	132,000	52,000	46,000	30,000	368,000

6.7 Managing Basin Pumping

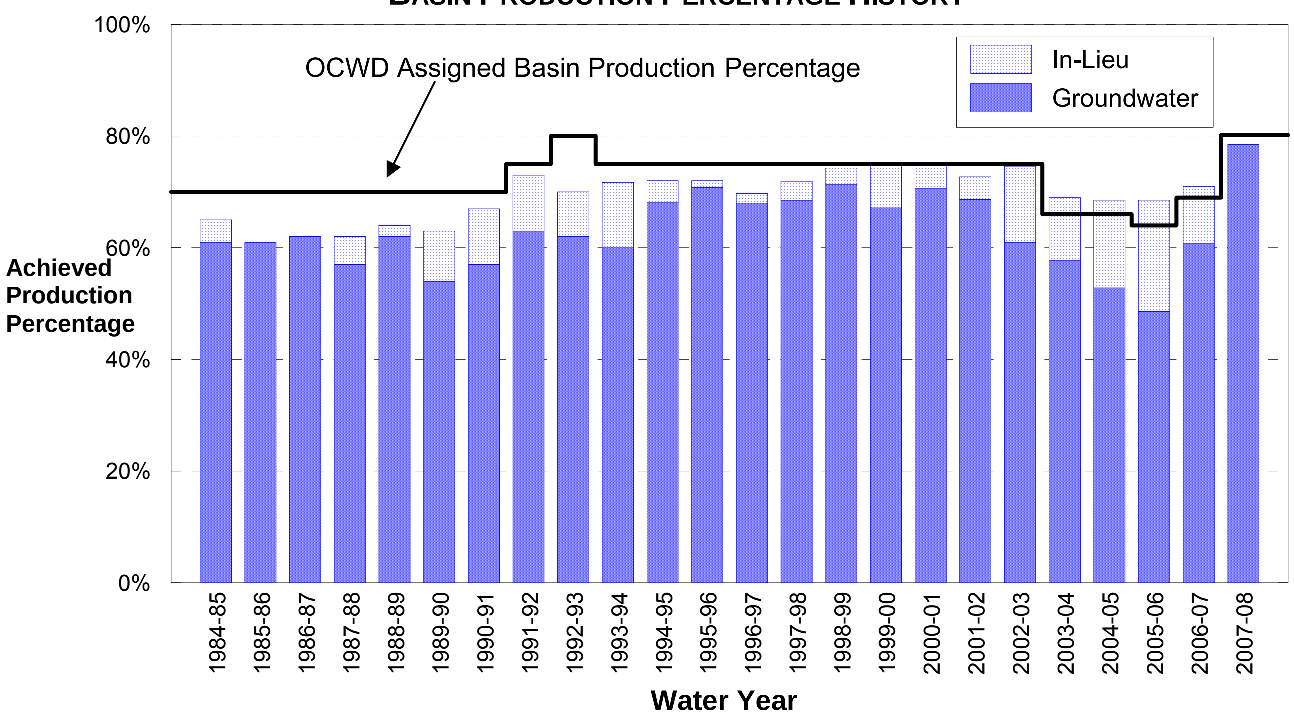
The primary mechanism used by OCWD to manage pumping is the Basin Production Percentage (BPP). Section 31.5 of the District Act empowers the Board to annually establish the BPP, defined as:

> "the ratio that all water to be produced from groundwater supplies with the district bears to all water to be produced by persons and operators within the District from supplemental sources as well as from groundwater within the District. "

In other words, the BPP is a percentage of each Producer's water supply that comes from groundwater pumped from the basin. The BPP is set uniformly for all Producers. Groundwater production at or below the BPP is assessed the RA. Any production above the BPP is charged the RA plus the BEA. The BEA is calculated so that the cost of groundwater production above the BPP is higher than purchasing imported potable supplies. This approach serves to discourage, but not eliminate, production above the BPP. The BEA can be increased as needed to discourage production above the BPP.

In simplified terms, the BPP is calculated by dividing groundwater production by total water demands. The BPP is set after evaluating groundwater conditions, availability of recharge water supplies, and basin management objectives. The BPP is also a major factor in determining the cost of groundwater production for that year. OCWD's goal is to set the BPP as high as possible to allow Producers to maximize pumping and reduce their overall water supply cost. Figure 6-6 shows the history of the BPP along with the actual BPP that was achieved by the Producers.

FIGURE 6-6
BASIN PRODUCTION PERCENTAGE HISTORY



Raising or lowering the BPP allows the District to manage the amount of pumping from the basin. The BPP is lowered when basin conditions necessitate a decrease in pumping. A lower BPP results in the need for Producers to purchase additional, more expensive imported water from Metropolitan.

One example of a condition that could require a lowering of the BPP is to protect the basin from seawater intrusion. In this case, reduced pumping would allow groundwater levels to recover and seawater intrusion to be reduced. A change in the BPP affects the District's budget as less pumping reduces collected revenues.

6.7.1 METHODOLOGY FOR SETTING THE BASIN PRODUCTION PERCENTAGE

The formula used to estimate the BPP is shown in Figure 6-7. The formula is used as a guideline and the District's Board of Directors sets the BPP after considering the relevant information and input from the Producers and the public. To determine the BPP for a given year the amount of water available for basin recharge must be estimated. The supplies of recharge water that are estimated are:

- Santa Ana River stormflow
- Natural incidental recharge
- Santa Ana River baseflow
- GWR System supplies
- Other supplies such as Metropolitan and recycled water purchased for the Alamitos Barrier.

FIGURE 6-7
BPP CALCULATION

$$\frac{\begin{array}{c}\text{SAR Stormflows using Rainfall Probability} + \text{Natural Incidental Recharge using Rainfall Probability} + \text{SAR Baseflows (5-yr Avg)} + \text{Expected GWR System Supplies} \\ + \text{Other expected supplies such as Alamitos Barrier and Arlington Desalter} + \text{Expected MWD Replenishment Water} - \text{Expected WQ pumping above BPP} - \text{Planned Basin Refill (from table)}\end{array}}{\text{Total Water Demands (5-yr Avg.)} - \text{Expected Reclaimed \& Local Supplies}} = \text{BPP}$$

MWD = Metropolitan Water District of Southern California

Probability factors are used to estimate recharge into the groundwater basin from Santa Ana River stormflow and natural incidental recharge. The probability percentages are based on over 100 years of rainfall data and represent the probability that the upcoming year will not be drier than the predicted rainfall amount. As the accumulated overdraft increases, a higher level of certainty or probability is used in the BPP calculation to ensure that the basin recharge estimates are attained or exceeded.

For example, if the accumulated overdraft is 500,000 af, then a 90 percent rainfall probability would be used to conservatively estimate that the upcoming year's rainfall will only be nine inches even though there is a 90 percent chance that it will be greater. With this methodology, there is 90 percent likelihood that the upcoming year's estimate of rainfall will be exceeded.

When the basin is nearly full, the ten percent probability of expected rainfall would be used. In other words, it would be determined that there is only a ten percent chance of having an upcoming year that is wetter than assumed, or conversely, a 90 percent chance that the upcoming year will be drier. For the San Bernardino rainfall station, the ten percent rainfall exceedance probability is 27 inches of rainfall. Therefore, assuming 27 inches of rainfall for the upcoming year's BPP calculation would ensure with 90 percent likelihood that it would actually be *drier*, less water would be recharged into the basin, and the accumulated overdraft would be *increased* so as to prevent overfilling the basin and losing water to the ocean.

When the basin is within the optimal range of 100,000 to 150,000 af of accumulated overdraft, the 50 percent probability of rainfall is suggested to be used. In other words, there would be an equal chance (50/50) of having either a wetter or drier year than assumed. In this case, the 50 percent rainfall exceedance probability is very similar to assuming average hydrology for the upcoming year.

This methodology provides a guideline for the upcoming year's recommended amount of basin refill, dependent of the level of accumulated overdraft. For each increasing level of accumulated overdraft, an increasing amount of basin refill is suggested, ranging from approximately five to ten percent of the accumulated overdraft. For example, at an accumulated overdraft level of 400,000 af, the suggested amount of basin refill or overdraft reduction for the upcoming year would range from 20,000 to 40,000 af. Therefore, at this assumed basin refill rate, it would take approximately 10 to 20 years to completely fill the basin and eliminate the overdraft.

Table 6-4 shows the established amount or range for the planned basin refill water (reduction to the basin's accumulated overdraft) that is used in the formula based upon the basin's accumulated overdraft. The range is based upon provisions in the District Act which call for refilling the groundwater basin in not less than 10 years and not greater than 20 years. For example; if the accumulated overdraft is 400,000 af, refilling the basin over a 20-year period would yield a value of 20,000 afy while refilling the basin over a 10-year period yields a value of 40,000 afy.

TABLE 6-4
ACCUMULATED OVERDRAFT, BASIN REFILL, PROBABILITY FACTOR & RAINFALL AMOUNT

Accumulated Overdraft (af)	Planned Basin Refill Amount (af)	San Bernardino Rainfall Projection (inches)	Probability Factor
0	-20,000	27	10%
100,000	0	15	50%
200,000	10,000 to 20,000	14	60%
300,000	15,000 to 30,000	13	70%
400,000	20,000 to 40,000	11	80%
500,000	25,000 to 50,000	9	90%

For the 2008-09 water year, the estimated supply of recharge water is summarized in Table 6-5.

TABLE 6-5
RECHARGE WATER SUPPLIES ESTIMATED FOR 2008-09

Source	Amount (afy)
Santa Ana River Baseflows	146,300
Captured Santa Ana River Stormflows	50,000
Natural Net Incidental Recharge	60,000
Expected Groundwater Replenishment Supplies	61,000
Other Expected Supplies	11,000
Total	328,300

6.7.2 BASIN PRODUCTION LIMITATION

Another management tool that enables OCWD to sustainably manage the basin is the Basin Production Limitation. Section 31.5(g) (7) of the District Act authorizes limitations on production and the setting of surcharges when those limits are exceeded. This provision can be used when it is necessary to shift pumping from one area of the basin to another. An example of this was the Temporary Coastal Pumping Transfer Program, which shifted approximately 20,000 afy of pumping from the coastal area to inland to minimize seawater intrusion.

6.8 Drought Management

Drought is an extended period of below-average precipitation. There is no single, official definition of the time period associated with a drought. The magnitude of a drought depends on the extent of the deviation from average precipitation, the areal extent of the below-average precipitation, and other factors.

During a drought, flexibility to increase pumping from the basin becomes increasingly important. To the extent that the basin has water in storage that can be pumped out, the basin provides a valuable water supply asset during drought conditions. Ensuring that the basin can provide a buffer against drought conditions requires:

- Maintaining sufficient water in storage that can be pumped out in time of need;
- Operating the basin at the lower water storage in a safe manner; and
- Possessing a plan to refill the basin.

The San Bernardino precipitation station data, shown in Figure 4-11, is used to evaluate the extent of droughts in the Santa Ana River watershed. This station is selected because it is used in the Santa Ana River Watermaster reports (Santa Ana River Watermaster Report, 2008) and has a relatively long period of record.

During drought conditions, the District experiences a decline in the supply of recharge water. Replenishment water from Metropolitan is only available to OCWD when Metropolitan has excess supplies. In addition, the local supply of Santa Ana River recharge water and net incidental recharge water could decline up to 55,000 afy or more during drought years as shown in Table 6-6.

TABLE 6-6
IMPACT OF DROUGHTS ON RECHARGE WATER SUPPLIES

RECHARGE WATER SUPPLY	ESTIMATED DECREASE IN SUPPLY DUE TO DROUGHT (AF/YR)
Santa Ana River Baseflow	15,000
Santa Ana River Stormflow	20,000 or more
Net Incidental Recharge	20,000 or more
Total	55,000 or more

Note: does not include potential decline in Metropolitan replenishment supplies

6.8.1 MAINTAINING WATER IN STORAGE FOR DROUGHT CONDITIONS

For the basin to serve as a safe, reliable buffer, sufficient groundwater must be stored before a drought occurs. As an example, assume the basin has an accumulated overdraft of 150,000 af and can be drawn down to 500,000 af without irreparable seawater intrusion. The basin has 350,000 af of water in storage. In a hypothetical five-year drought, recharge water supplies can decrease 55,000 afy without jeopardizing the long-term health of the basin. Since recharge water supplies are likely to decline during drought years, the water stored at the beginning of the drought is critical. If water is stored in Metropolitan's conjunctive use storage program, this stored water must also be accounted for.

6.8.2 BASIN OPERATION DURING DROUGHT

When the basin overdraft is intentionally increased, the basin must be operated in a safe manner, considering the potential for land subsidence and seawater intrusion, the availability of sufficient excess recharge capacity to eventually refill the basin, the impact of low groundwater levels on shallow production wells, and a potential for colored water to flow into clear water aquifers. Approaches for refilling the Basin are described in Table 6-7.

TABLE 6-7
APPROACHES TO REFILLING THE BASIN

APPROACH	DISCUSSION
Decrease Total Water Demands	• Increase water conservation measures (note this does not result in a 1:1 decrease in groundwater pumping because some of the increased conservation reduces Metropolitan demands); this decreases pumping from the basin if the BPP is held constant and all other factors remain the same.
Decrease BPP	• Allows groundwater levels to recover rapidly • Decreases revenue to the District • Increases water cost for producers • Does not require additional recharge facilities • Dependent upon other sources of water (e.g., water from Metropolitan) being available to substitute for reduced groundwater pumping
Increase Recharge	• Dependent on increased supply of recharge water • Water transfers and exchanges could be utilized to provide the increased supply of recharge water • Dependent on building and maintaining excess recharge capacity (which would be under-utilized in non-drought years)
Combination of the Above	• A combination of the approaches provides flexibility and a range of options for refilling the basin

7 FINANCIAL MANAGEMENT

OCWD strives to improve the efficiency of all aspects of its operations in its continuing efforts to increase the water quality and reliability of Orange County's local water resources at the lowest possible cost. The District manages its finances to provide long-term fiscal stability. To achieve this objective OCWD:

- **Manages finances to maintain high credit ratings.**
- **Manages District operations efficiently and effectively.**
- **Maintains reserves for purchase of supplemental water supplies when available.**
- **Recovers contamination clean up costs from responsible parties when possible.**
- **Sets the Basin Production Percentage to optimize sustainable use of groundwater.**

7.1 Background Financial Information

The District's fiscal year (FY) begins on July 1 and ends on June 30. The annual operating budget for 2008-09 was approximately $116.3 million; District revenues are expected to be approximately $116.3 million. A significant increase in the budget to fund the operation of the GWR System was approved by the Board in 2007.

7.2 Operating Expenses

The District's budgeted operating expenses for FY 2008-09 are summarized in Table 7-1 and described below.

TABLE 7-1
FY 2008-09 BUDGETED OPERATING EXPENSES

EXPENSES	AMOUNT (in millions)
General Fund	$57.2
Total Debt Service	28.3
Water Purchases	19.1
New Equipment/ Small Projects	2.2
Increase to Reserves	0.9
Refurbishment and Replacement Expenditures	8.6
Total	**$116.3**

7.2.1 GENERAL FUND

The District's general fund account primarily allows the District to operate the recharge facilities in the cities of Anaheim and Orange, GWR System, the Talbert and Alamitos Injection Barriers, the Green Acres Project, and the Prado Wetlands. In addition, the District's Water Quality Laboratory, groundwater monitoring programs, watershed management, planning, and other miscellaneous activities are funded by this account.

7.2.2 DEBT SERVICE

The debt service budget provides for repayment of the District's debt from issues of previous bonds. OCWD has a comprehensive long-range debt program, which provides for the funding of projects necessary to increase basin production and protect water quality, while providing predictable impacts to the RA. The annual project-related debt expense is approximately $28.3 million.

The District holds very high credit ratings of AAA credit from Standard & Poor's, AAA from Fitch, along with an Aa2 rating from Moody's. Because of these excellent credit ratings, OCWD is able to borrow money at a substantially reduced cost.

7.2.3 WATER PURCHASES

The District Act authorizes OCWD to purchase supplemental water for groundwater recharge to reduce overdraft of the basin. As described in Section 4, replenishment water is primarily purchased from Metropolitan, either as direct or in-lieu replenishment. This fund provides the flexibility to take advantage of surplus Metropolitan replenishment water or other surplus supplies when such supplies are available. During times of drought when replenishment water is unavailable for purchase, OCWD may budget funds for placement in reserve for future years. The District anticipates that surplus imported water will not be available for the next few years. A significant portion of the $19.1 million in the FY 2008-09 budget to purchase replenishment water will be placed in reserve. Funds in this account are also used to purchase treated full service supplies from MWDOC to blend with GWR System purified water for injection into the seawater barrier.

7.2.4 NEW CAPITAL EQUIPMENT

This category includes equipment items such as laboratory equipment, vehicles, fax machines, tools, computers, and software. These items are expensed and funded using current revenues.

7.2.5 REFURBISHMENT AND REPLACEMENT FUND

OCWD has over $700 million in existing plant and fixed assets. These facilities were constructed to provide a safe and reliable water supply. The Replacement and Refurbishment Fund was established to ensure that sufficient funds are available to repair and replace existing District infrastructure, such as pumps, heavy equipment, wells and water recycling facilities.

7.3 Operating Revenues

Expected operating revenues for FY 2008-09 are shown in Table 7-2 and described below.

Table 7-2
FY 2008-09 Operating Revenues

REVENUES	AMOUNT (in millions)
Replenishment Assessments	$84.5
Basin Equity Assessment	1.0
Property Taxes	18.1
Other Miscellaneous Revenue	12.7
Total	**$116.3**

7.3.1 REPLENISHMENT ASSESSMENTS

RAs are paid for all water pumped out of the basin. The District invoices Producers for their production in July and January. The amount of revenue generated by the RA is directly related to the amount of groundwater production. The RA is anticipated to generate $84.5 million in FY 2008-09 based on 341,058 af of total anticipated basin production. The BEA is assessed annually for all groundwater production above the BPP. The BEA rate is calculated for each agency and is currently approximately $381/af**.** Anticipated BEA revenues are budgeted at $1.0 million for FY 2008-09.

7.3.2 PROPERTY TAXES

The District receives a small percentage of the property taxes, also referred to as ad valorem taxes, collected in the service area. For 2008-09, the District expects to receive approximately $18.1 million from property taxes. The County of Orange assesses and collects the property taxes and transmits them to the District at various times during the year. This revenue source has been dedicated to the District's annual debt service expense.

7.3.3 OTHER MISCELLANEOUS REVENUE

Cash reserves generate interest revenues. The majority of cash reserves are invested in short-term securities. Yields on cash reserves are anticipated to be low and have been estimated at three percent for 2008-09, for anticipated revenue of $4.2 million.

Miscellaneous revenues are primarily comprised of water sales from the Green Acres Project and loan repayments. The loan repayments originate from the Conjunctive Use Well Program in which the District loaned Producers money at low interest rates for construction of new production wells and related facilities. In addition, numerous small items such as rents, subsidies, and minor fees are grouped in this account. Approximately $8.7 million is expected to be received in 2008-09.

7.4 Reserves

The District maintains cash reserves to ensure its financial integrity so that the basin can be successfully managed and protected. Cash reserves ensure that:

- OCWD has sufficient funds for cash flow purposes;
- Funds are available for unexpected events such as contamination issues;
- Funds are available to make necessary replacements and repairs to infrastructure;
- OCWD has access to debt programs with low interest cost;
- A financial hedge is available to manage variable rate debt; and
- Funds are available to purchase Metropolitan replenishment water when available.

7.4.1 RESERVE POLICIES

The District has reserve policies, which establish reserves in the following categories:

- Operating reserves
- The Replacement and Refurbishment Program
- The Toxic Cleanup Reserve
- Contingencies required by the District Act
- Bond reserve covenants

7.4.1.1 Operating Reserves

This reserve category helps the District maintain sufficient funds for cash flow purposes and helps sustain the District's excellent credit rating. Maintaining this reserve, which is set at 15 percent of the operating budget, is particularly important because the principal source of revenue, the RA, is only collected twice a year. Payments for significant activities, such as replenishment water purchases, are typically required on a monthly basis. The reserve provides the financial "bridge" to meet the District's financial obligations on a monthly basis.

7.4.1.2 Replacement and Refurbishment Program

The District maintains a Replacement and Refurbishment Fund to provide the financial resources for replacement and/or repair of the District capital assets. These assets include treatment facilities, monitoring and injection wells, and treatment facilities. The fund balance at the end of FY 2008-09 was projected to be approximately $41.2 million.

7.4.1.3 Toxic Cleanup Reserve

Funds are reserved in this account to be used in the event that a portion of the basin becomes threatened by contamination. Over two million residents in the District rely on the basin as their primary source of water. Approximately $7 million is projected to be available in this reserve fund at the end of FY 2008-09 to allow the District to respond immediately to contamination threats in the basin.

7.4.1.4 General Contingencies

Section 17.1 of the District Act requires the allocation of funds to cover annual expenditures that have not been provided for or that have been insufficiently provided for and for unappropriated requirements. This reserve amount is $3 million.

7.4.2 DEBT SERVICE ACCOUNT

Restricted funds in this account have been set aside by the bonding institutions as a requirement to ensure financial solvency and to help guarantee repayment of any debt issuances. These funds cannot be used for any other purpose. The requirement varies from year to year depending on the District's debt issuance and outstanding state loans. The account currently has approximately $5.5 million.

7.5 Capital Improvement Projects

The District prepares a Capital Improvements Project budget to support basin production by increasing recharge capacity and operational flexibility, protect the coastal portion of the basin, and provide water quality improvements. The FY 2008-09 budget includes $20.5 million for this account.

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8 RECOMMENDATIONS

This section provides recommendations for the District to consider as part of ongoing management of the basin.

The District's programs to protect and increase the basin's sustainable yield in a cost-effective manner continue to evolve due to increasing water demands and changes in the availability of recharge water supplies. The occurrence of wet and dry periods, the future availability and cost of imported water for groundwater recharge, and changing water management practices of agencies in the watershed will continue to affect the District's management of the basin. The District's programs to protect and enhance water quality will also continue to change due to new regulations and requirements.

Recommendations for the District to continue its proactive management of the basin are summarized in Table 8-1. The table organizes these recommendations by general program area and also links the recommendations to the three management objectives of protecting and enhancing water quality, protecting and increasing the basin's sustainable yield, and increasing the efficiency of OCWD's operations.

Specific projects that may be developed as a result of these recommendations would be reviewed and approved by the District's Board of Directors and processed for environmental review prior to project implementation.

TABLE 8-1
RECOMMENDATIONS

PROGRAM/ACTIVITY	PROTECT AND ENHANCE WATER QUALITY	PROTECT AND INCREASE SUSTAINABLE YIELD	INCREASE EFFICIENCY
REPORTING AND MONITORING			
Continue to monitor groundwater elevations and the amount of water in storage to provide information to manage pumping in the basin within safe and sustainable levels	✓	✓	
Continue to monitor groundwater quality and the quality of recharge water sources	✓		
Update the *Groundwater Management Plan* periodically	✓	✓	✓
Update the *Long Term Facilities Plan* periodically	✓	✓	✓

PROGRAM/ACTIVITY	PROTECT AND ENHANCE WATER QUALITY	PROTECT AND INCREASE SUSTAINABLE YIELD	INCREASE EFFICIENCY
Continue annual publication of the *Santa Ana River Water Quality Report*; the *Engineer's Report on the Groundwater Conditions, Water Supply and Basin Utilization;* the *Santa Ana River Watermaster Report;* and the *Groundwater Replenishment System Operations Annual Report*	✓	✓	✓
Begin in 2009 periodic publication of the *Report on Managed Aquifer Recharge in the Orange County Groundwater Basin*		✓	
RECHARGE WATER SUPPLY MANAGEMENT			
Increase storage of storm flows behind Prado Dam through cooperative efforts with the ACOE		✓	✓
Monitor water management and recycling plans in the watershed for their potential impact upon OCWD recharge operations	✓	✓	
Complete a feasibility study on reducing sediment loads in recharge water	✓		✓
Complete construction of the Initial Expansion of the GWR System	✓	✓	
Increase drought preparedness through utilization of the full capacity of the GWR System		✓	
Develop improved tools to evaluate the efficiency of potential new recharge basins and proposed changes to existing recharge operations		✓	✓
Evaluate new approaches to groundwater recharge and approaches to increasing the efficiency of the District's recharge facilities		✓	✓
Maintain and expand efforts to remove non-native vegetation and plant native vegetation in the watershed.	✓	✓	
Promote incidental recharge to the extent feasible without negatively impacting groundwater quality		✓	

PROGRAM/ACTIVITY	PROTECT AND ENHANCE WATER QUALITY	PROTECT AND INCREASE SUSTAINABLE YIELD	INCREASE EFFICIENCY
WATER QUALITY MANAGEMENT			
Manage recharge water supplies so that water recharged through District facilities meets or is better than Department of Public Health MCLs and Notification Levels	✓		
Continue operation of Prado Wetlands in order to reduce nitrogen loads in Santa Ana River water	✓		
Complete and publish, in cooperation with Metropolitan and the NWRI, a research study on emerging constituents.	✓		
Prevent future contamination through coordinated efforts with regulatory agencies and watershed stakeholders	✓		
Complete construction and begin operation of the North Basin Groundwater Protection Project	✓		
Complete remedial investigation and begin construction of the South Basin Groundwater Protection Project	✓		
Address MTBE contamination	✓		
Open and begin operations of a new water quality laboratory in Fountain Valley	✓		
Maintain control of seawater intrusion in the Talbert Gap	✓	✓	
Improve the performance of the Alamitos Seawater Barrier through evaluating need for additional injection wells and to construct necessary facilities	✓	✓	
INTEGRATED MANAGEMENT OF PRODUCTION AND RECHARGE			
Continue to participate in cooperative efforts with watershed stakeholders	✓	✓	
Operate the basin within a safe and sustainable operating range		✓	

PROGRAM/ACTIVITY	PROTECT AND ENHANCE WATER QUALITY	PROTECT AND INCREASE SUSTAINABLE YIELD	INCREASE EFFICIENCY
FINANCIAL MANAGEMENT			
Set the Basin Production Percentage to optimize sustainable use of the groundwater			✓
Manage finances to maintain high credit ratings			✓
Maintain reserves for purchase of supplemental water supplies when available			✓

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APPENDICES

APPENDIX A

DOCUMENTS REGARDING PUBLIC PARTICIPATION

APPENDIX A
TABLE OF CONTENTS

MINUTES
GROUNDWATER PRODUCERS MEETING
Sponsored by the
ORANGE COUNTY WATER DISTRICT
Field Headquarters, Anaheim

Wednesday, January 14, 2009, 10 AM

1. **MTBE Sampling Update**

   Roy Herndon informed the group that the latest round of sampling and low level testing had been completed with the lab hired by the District. And that low levels of MTBE had been detected in about 1/3 of the major production wells in the basin. The Producers were told to contact Roy if they wanted specific information on their individual wells.

2. **Long-Term Facilities Plan Report**

   The Producers were asked to get any comment letters they may have on the final draft report to OCWD by January 21, 2009. OCWD will then respond to those letters. The LTFP final review will occur at the next Producers meeting on February 11, 2009 and could then go to the OCWD Board on February 18, 2009. The recent Golden State Water Company letter on the LTFP was distributed.

3. **Groundwater Management Plan – 5 Year Update**

   Greg Woodside informed everyone of the need to update the GWMP to comply with state guidelines. The District is working to provide a draft of the updated document in late February and to take it to the OCWD Board in April. Greg reviewed potential basin management goals for the document.

4. **Santiago Pump Station Project**

   The same presentation on this project provided to the Water Issues Committee was given to the Producers. It was suggested that OCWD should show the financial savings and the additional recharge created by the project.

5. **FY09-10 Budget process update**

   John Kennedy provided an update on several budget related issues including:

   - OCWD is working to provide FY09-10 RA and BPP projections by January 21.
   - The District will also provide the draft FY09-10 Work Plans for each of the cost centers on January 21.

   OCWD Staff was also asked to provide a BEA estimate and an estimate of what the Accumulated Overdraft would be at the end of FY09-10

6. **Follow-up on Producer letter regarding modeling for the Talbert Barrier and Basin Storage**

   OCWD's response letter to the Producers regarding this issue was provided. Bob McVicker provided comments on the need to better understand color water upwelling in their part of the groundwater basin.

7. **Other**

AGENDA ITEM SUBMITTAL

Meeting Date: May 13, 2009

To: Water Issues Committee
Board of Directors

From: Mike Markus

Staff Contact: G. Woodside/C. Miller

Budgeted: N/A
Budgeted Amount: N/A
Cost Estimate: N/A
Funding Source: N/A
Program/Line Item No.: N/A

General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: Exemption to be filed upon Board receipt of final plan

Subject: REVIEW OF UPDATED GROUNDWATER MANAGEMENT PLAN

SUMMARY

Staff has prepared a draft updated Groundwater Management Plan (Plan). The Plan was last updated in 2004. Staff will distribute the draft updated Plan for review by the Board and Producers. The Plan will also be posted on the District's web site.

RECOMMENDATION

Informational

BACKGROUND/ANALYSIS

The District prepared its first Groundwater Management Plan in 1989. The Plan was last updated in 2004. The Plan needs to be updated to remain consistent with guidelines established by the California Department of Water Resources.

The California Water Code sets forth the process for adopting and updating a Groundwater Management Plan. The Water Code lists components that must be included and requires the completion of plans in order for the state to grant public funds for construction of certain groundwater projects.

The 2009 Draft Update proposes the District's overall goals in managing the basin as follows:

- To protect and enhance groundwater quality,
- To protect and increase the sustainable yield of the basin in a cost-effective manner, and
- To increase the efficiency of OCWD's operations.

The updated Plan will be made available for public review. Staff will respond to comments from the Board, Producers, and the public and will prepare a revised version that addresses the comments received. Staff will then recommend that the Plan be adopted by the Board. The proposed schedule is:

May 13, 2009	Post Draft Updated Plan on OCWD website
May 14, 2009	Post public notice in Orange County Register
June 10, 2009	Workshop at Water Issues Committee and Producers Meeting
June 17, 2009	Public Hearing at OCWD Board meeting
June 24, 2009	Deadline for public comment
July 15, 2009	Consideration of adoption by Board of Directors

According to the Department of Water Resources, plan updates should provide a historical record of progress, including projects completed and how those projects improved resource management. The 2009 Update explains how OCWD manages the groundwater basin in order to accomplish the stated management objectives.

Major accomplishments since the adoption of the 2004 plan are listed and completed projects are described, examples of which are listed below:

- Analysis of 14,000 water quality samples in 2008.
- Completion of the Groundwater Replenishment System in 2008.
- Development of the three-layer method of determining maximum accumulated overdraft and publication of the *Report on Evaluation of Orange County Groundwater Basin Storage and Operational Strategy* in 2007.
- Improvements to recharge operations such as completion of the La Jolla Recharge Basin, the Kraemer-Miller pipeline improvements, and the Santiago Creek Recharge Enhancement Project.
- Completion of water quality improvement projects such as the Irvine Desalter and the initiation of the North and South Basin Groundwater Protection Projects.

PRIOR RELEVANT BOARD ACTION(S)

None

Minutes

GROUNDWATER PRODUCERS MEETING

Sponsored by the

ORANGE COUNTY WATER DISTRICT

18700 Ward Street, Fountain Valley (714) 378-3200

Wednesday, May 13, 2009, 10 AM

1. **Groundwater Management Plan Update**

   Greg Woodside gave an overview of the updated GWMP and how it would be processed this summer. A draft report was distributed. Greg reviewed the report recommendations.

2. **Review FY09-10 BPP/BEA/Pumping Limitation and Surcharge**

   John Kennedy reviewed the new rates and charges for FY09-10

3. **Annexation Update**

   John Kennedy provided a summary of how the District plans to terminate the 2004 annexation MOU with IRWD and the City of Anaheim. After responses are provided on the draft January 2006 Program EIR the District will formally inform IRWD and Anaheim of the termination as allowed for in Section 7 of the MOU. Future annexations could still be considered but under a different process from what was provided for in the 2004 MOU. Other comments included that Producers interested in annexing may be required to submit new applications. Additionally if annexations are considered individually, there is still a need to review the cumulative potential annexations.

With the MOU terminated the District can receive and file the Long-Term Facilities Plan Report. The LTFP will be reviewed with the Producers in June and taken to the OCWD Board in July.

4. **GWR System Update**

   a. **Expansion**

      Mike Markus gave an update on the process to select a design consultant for the expansion and some of the issues that need to be resolved. It was mentioned that OCWD should reassess the projects viability at key milestones prior to 100% design.

   b. **Existing plant water supply unit cost for FY08-09**

      A handout was provided which shows the existing unit cost at $582/af after the first nine months of FY08-09

5. **Other**

   Bob McVicker asked that OCWD provide BPP projections for future years. Discussion on AB1100 also incurred regarding legislation that would allow OCWD to bottle a small amount of GWR System water.

Information: OCWD May 20, 2009 Board meeting moved to May 27th.

Orange County Water District
Orange County's Groundwater Authority

EMPLOYMENT • SITE MAP • CONTACT • SEARCH Keyword(s) GO

ABOUT BOARD & AGENDAS CONSERVATION & EDUCATION ENVIRONMENT PROGRAMS & PROJECTS GOVERNMENT AFFAIRS NEWS

OCWD Public Notices

May 13, 2009 - June 24, 2009

The Orange County Water District Draft Groundwater Management Plan 2009 Update is available for public review at www.ocwd.com under "News & Publications." Written comments will be accepted until June 24, 2009 at:
Orange County Water District
Attn: Marsha Westropp
P.O. Box 8300
Fountain Valley, CA 92728-8300

Or via e-mail at mwestropp@ocwd.com

A copy of the draft plan may be obtained by submitting a written request to OCWD at the above post office or e-mail address.

The public is invited to comment on the plan at the public hearing to be held at the regularly scheduled meeting of the Board of Directors at 5 p.m., June 17, 2009 in the Boardroom at OCWD's office at 18700 Ward Street, Fountain Valley, CA 92708. The Groundwater Management Plan 2009 Update is scheduled to be considered for adoption at the regularly scheduled meeting of the Board of Directors at 5 p.m., July 15, 2009. Any change to the schedule for the Board of Directors to adopt the updated plan will be posted on www.ocwd.com under "Board Agendas."

18700 Ward Street, Fountain Valley, California 92708 • Ph: (714) 378-3200 • Fx: (714) 378-3373 • info@ocwd.com
Check your OCWD e-mail HERE • Directions & Map

Publications & Newsletters

For easy viewing of our publications in the manner in which they were intended, we have converted our publications into **Adobe® Acrobat PDF** documents. If you do not already have the FREE **Adobe Reader**, please click the following button to get the latest version of **Adobe® Reader** from **Adobe®** before you attempt to download the files listed below.

Get ADOBE® READER®

OCWD Draft Groundwater Management Plan 2009 Update (11.5 MB)

The Orange County Water District Draft Groundwater Management Plan 2009 Update is available for public review by downloading the linked document above. Written comments will be accepted until June 24, 2009 at OCWD, Attn: Marsha Westropp, P.O. Box 8300, Fountain Valley, CA 92728-8300, or via e-mail at mwestropp@ocwd.com. A copy of the draft plan may also be obtained by submitting a written request to OCWD at the above post office or email address.

The public is invited to comment on the plan at the public hearing held at the regularly scheduled meeting of the OCWD Board of Directors at 5 p.m., June 17, 2009. The Groundwater Management Plan 2009 Update is scheduled to be considered for adoption at the regularly scheduled meeting of the OCWD Board of Directors at 5 p.m., July 15, 2009. Any change to the schedule for the Board of Directors to adopt the updated plan will be posted on www.ocwd.com under "Board Agendas."

Notice of Basin Equity Assesment.July 1 2009 to June 30 2010
Notice of Levy of Replenishment Assesments.July 1 2009 to June 30 2010
Board Resolution to Adopt Ticket Distribution Policy
Board Resolution Authorizing Payment for Meals
Comprehensive Annual Financial Report FY Ended 6-30-2008
OCWD 2006-2007 Engineer's Report; Groundwater Conditions, Water Supply and Basin Utilization
OCWD 2005-2006 Engineer's Report; Groundwater Conditions, Water Supply and Basin Utilization (5.43 MB)
OCWD Budget Report for Fiscal Year 07-08 (3.47 MB)
2004 - Santa Ana River Water Quality and Health Study (25.6 MB)
2004 - Santa Ana River Quality Health Study Final Report Appendices (2.64 MB)
2006 - 07 Fiscal Year Final Budget Report (3.33 MB)
2004 Groundwater Management Plan (7.87 MB)
OCWD Fact Sheet -May 2008
The 1933 OCWD District Act (223 kb)

OCWD 75th Anniversary Supplement

Newsletters:

NEW-- Hydrospectives - Monthly E-Newsletter

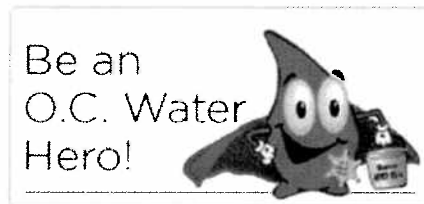
2008 Year In Review
November 2008 E-Hydrospectives
October 2008 E-Hydrospectives
September 2008 E-Hydrospectives
August 2008 E-Hydrospectives
July 2008 E-Hydrospectives
June 2008 E-Hydrospectives

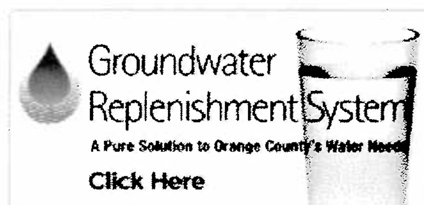
Hydrospectives - Quarterly Groundwater News

- Vol. V, Issue 2 - Fall 2007
- Vol. V, Issue 1 - Spring 2007
- Vol. IV, Issue 3 - Winter 2006
- Vol. IV, Issue 1 - Summer 2005
- Vol. III, Issue 3 - Fall 2004

Directions + Map

Cover your spa or swimming pool to reduce evaporation.





AFFIDAVIT OF PUBLICATION

STATE OF CALIFORNIA,)
) ss.
County of Orange)

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of **The Orange County Register**, a newspaper of general circulation, published in the city of Santa Ana, County of Orange, and which newspaper has been adjudged to be a newspaper of general circulation by the Superior Court of the County of Orange, State of California, under the date of 1/18/52, Case No. A-21046, that the notice, of which the annexed is a true printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

May 19, 26, 2009

"I certify (or declare) under the penalty of perjury under the laws of the State of California that the foregoing is true and correct":

Executed at Santa Ana, Orange County, California, on

Date: May 26, 2009

Adolfo Pro

Signature

The Orange County Register
625 N. Grand Ave.
Santa Ana, CA 92701
(714) 796-7000 ext. 2209

PROOF OF PUBLICATION

Proof of Publication of

Notice of Public Hearing
For the Purpose of Updating the Orange County Water District
Groundwater Management Plan 2009

Notice is hereby given that the Orange County Water District ("District") will hold a public hearing on Wednesday, June 17, 2009 at 5 p.m., or as soon thereafter as the matter may heard, in the Boardroom at the office of said District, 18700 Ward Street, Fountain Valley, California 92708.

The hearing is for the purpose of notifying the public of the intention of the District to update the District's Groundwater Management Plan and for soliciting public comments on the draft Groundwater Management Plan 2009 Update prior to adoption of the plan.

The draft plan may be viewed on the District's website, www.ocwd.com. Copies may be obtained by submitting a written request to Orange County Water District, P.O. Box 8300, Fountain Valley, CA 92728-8300 Attn: Marsha Westropp. Copies will be available at the public hearing.

The public is invited to attend the public hearing and comment on the draft plan. Written comments must be submitted by June 24, 2009. Comments can be submitted to the above post office box address, Attn: Marsha Westropp or via email at mwestropp@ocwd.com . For additional information call 714-378-8248.

The Groundwater Management Plan 2009 Update is scheduled to be considered for adoption by the District's Board of Directors at the regularly scheduled meeting of the Board of Directors to be held on July 15, 2009 at 5 pm. Any change to the schedule for the Board of Directors to adopt the Groundwater Management Plan 2009 Update will be posted on the District's website, www.ocwd.com.

Publish: Orange County Register May 19, 26, 2009 R-915

AGENDA ITEM SUBMITTAL

Meeting Date: June 10, 2009

To: Water Issues Committee
Board of Directors

From: Mike Markus

Staff Contact: G. Woodside/C. Miller

Budgeted: N/A
Budgeted Amount: N/A
Cost Estimate: N/A
Funding Source: N/A
Program/Line Item No.: N/A

General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: Exemption to be filed upon Board adoption of updated plan

Subject: UPDATE: 2009 GROUNDWATER MANAGEMENT PLAN, PUBLIC COMMENT PERIOD AND PUBLIC HEARING

SUMMARY

Staff distributed draft copies of the updated Groundwater Management Plan (Plan) to the Board and Producers on May 13, 2009. Public notices were published in the Orange County Register and the draft plan was posted on the District's web site. A public hearing on the draft Plan will be held at the June 17 Board of Directors Meeting.

RECOMMENDATION

Informational

BACKGROUND/ANALYSIS

The District prepared its first Groundwater Management Plan in 1989. The Plan has been updated periodically to incorporate new information, and was last updated in 2004. The Plan needs to be periodically updated to remain consistent with guidelines established by the California Department of Water Resources.

The California Water Code lists components that must be included and requires the completion of plans in order for the state to grant public funds for construction of certain groundwater projects.

The 2009 Plan discusses the District's overall goals in managing the basin as follows:

- To protect and enhance groundwater quality,
- To protect and increase the sustainable yield of the basin in a cost-effective manner, and
- To increase the efficiency of OCWD's operations.

The comment period for the Plan is now open. Staff will respond to comments from the Board, Producers, and the public and will prepare a revised version that addresses comments received. The proposed schedule for adopting the plan is as follows:

June 10, 2009	Workshop at Water Issues Committee and Producers Meeting
June 17, 2009	Public Hearing at OCWD Board meeting
June 24, 2009	Deadline for public comment
July 15, 2009	Consideration of Plan adoption by Board of Directors

According to the Department of Water Resources, plan updates should provide a historical record of progress, including projects completed and how those projects improved resource management. The 2009 Update explains how OCWD manages the groundwater basin in order to accomplish the stated management objectives.

Major accomplishments since the adoption of the 2004 Plan are listed and completed projects are described, examples of which are listed below:

- Analysis of 14,000 water quality samples in 2008.
- Completion of the Groundwater Replenishment System in 2008.
- Development of the three-layer method of determining maximum accumulated overdraft and publication of the *Report on Evaluation of Orange County Groundwater Basin Storage and Operational Strategy* in 2007.
- Improvements to recharge operations such as completion of the La Jolla Recharge Basin, the Kraemer-Miller pipeline improvements, and the Santiago Creek Recharge Enhancement Project.
- Completion of water quality improvement projects such as the Irvine Desalter and the initiation of the North and South Basin Groundwater Protection Projects.

PRIOR RELEVANT BOARD ACTION(S)

None

Minutes

GROUNDWATER PRODUCERS MEETING

Sponsored by the

ORANGE COUNTY WATER DISTRICT

18700 Ward Street, Fountain Valley (714) 378-3200

Wednesday, June 10, 2009, 10 AM

1. **Water Quality Issues**

   None

2. **Review Groundwater Management Plan**

   Greg Woodside updated everyone on the processing of the GWMP. The Producers were provided a copy of the GWMP last month.

3. **Review Long-Term Facilities Plan**

   Greg Woodside reviewed the LTFP and the schedule for completing the document. The document will be mailed and emailed to everyone this week.

4. **Update on Warner Basin Hopkins Development Study**

   Mike Markus updated the group on the preliminary development work occurring with the Hopkins group and the District's likely plans to continuing exploring this idea for the next six months. Hopkins is looking at ideas to place retail development around Warner Basin but would need to compensate OCWD for any lost percolation.

5. **FY10-11 BPP Projections**

   John Kennedy distributed some preliminary FY10-11 BPP projections for planning purposes. OCWD was asked to provide an RA projection also at next months meeting.

6. **Potential loss of Ad Valorem property tax – Prop 1A**

   The District is closely monitoring the Sacramento budget discussions and the potential loss of a portion of our $19 million in property tax income. We are unsure if the state plans to take or borrow some of these revenues. Eleanor Torres informed everyone that the District may have discussions with some local City Councils on this issue and would coordinate such with the Producers.

7. **OCWD Long-Term Variable Rate Debt Program**

   Mike Markus explained how the District's variable rate debt cost has increased due to a downgrading of the German Landesbank (who provides the letter of credit for the deal). OCWD may convert the debt to fixed rate debt.

8. **Garden Grove Well 28 & Laguna Beach potential program**

   The Producers were informed that the District, Garden Grove and Laguna Beach have met to discuss a possible option to pump and treat the GG Well 28 which has high nitrates. The potential deal would incorporate an agreement the District has with LB to pump 2,025 afy of ground water. When additional details are developed they will be brought back to a future Producers meeting.

9. **Select a Vice Chair for the Producers Group in FY09-10**

   Rick Shintaku of Anaheim was elected to be the Vice Chairman

10. **Other**

   Mike Markus updated everyone on the GWR System flows and the plans to hire a design consultant to expand the plant from 70 mgd to 100 mgd.

Agenda Item # 1

AGENDA ITEM SUBMITTAL

Meeting Date: June 17, 2009

To: Board of Directors

From: Mike Markus

Staff Contact: G. Woodside/C. Miller

Budgeted: N/A
Budgeted Amount: N/A
Cost Estimate: N/A
Funding Source: N/A
Program/Line Item No.: N/A

General Counsel Approval: N/A
Engineers/Feasibility Report:N/A
CEQA Compliance: N/A

Subject: **PUBLIC HEARING TO CONSIDER DRAFT UPDATED GROUNDWATER MANAGEMENT PLAN**

SUMMARY

The draft updated Groundwater Management Plan has been provided on the District's website and also to the Board and the Groundwater Producers. A Public Hearing has been noticed for 5 pm on June 17, 2009 to provide an opportunity for public input on the draft updated Plan.

RECOMMENDATION

Open Public Hearing and receive comments.

DISCUSSION

The District prepared its first Groundwater Management Plan in 1989. The Plan has been updated periodically to incorporate new information, and was last updated in 2004. The Plan needs to be periodically updated to remain consistent with guidelines established by the California Department of Water Resources.

The California Water Code lists components that must be included and requires the completion of plans in order for the state to grant public funds for construction of certain groundwater projects.

The 2009 Plan discusses the District's overall goals in managing the basin as follows:

- To protect and enhance groundwater quality,
- To protect and increase the sustainable yield of the basin in a cost-effective manner, and
- To increase the efficiency of OCWD's operations.

The comment period for the draft updated Plan is now open. After the public comment period is closed, staff will respond to comments from the Board, Producers, and the public and will prepare a revised version that addresses comments received. The proposed schedule for adopting the plan is as follows:

June 17, 2009	Public Hearing at OCWD Board meeting
June 24, 2009	Deadline for public comment
July 15, 2009	Consideration of Plan Adoption by Board of Directors

According to the Department of Water Resources, plan updates should provide a historical record of progress, including projects completed and how those projects improved resource management. The 2009 Update Groundwater Management Plan explains how OCWD manages the groundwater basin in order to accomplish the stated management objectives.

Major accomplishments since the adoption of the 2004 Plan are listed and completed projects are described, examples of which are listed below:

- Analysis of 14,000 water quality samples in 2008.
- Completion of the Groundwater Replenishment System in 2008.
- Development of the three-layer method of determining maximum accumulated overdraft and publication of the *Report on Evaluation of Orange County Groundwater Basin Storage and Operational Strategy* in 2007.
- Improvements to recharge operations such as completion of the La Jolla Recharge Basin, the Kraemer-Miller pipeline improvements, and the Santiago Creek Recharge Enhancement Project.
- Completion of water quality improvement projects such as the Irvine Desalter and the initiation of the North and South Basin Groundwater Protection Projects.

PRIOR RELEVANT BOARD ACTION(S) N/A

From: Dick Wilson [mailto:DWilson@anaheim.net]
Sent: Friday, June 26, 2009 11:40 AM
To: Woodside, Greg
Cc: Rick Shintaku; Don Calkins
Subject: Draft Groundwater Mgmt Plan

Greg, here are my comments on the Draft GWMP:

1. I would like to see an objective such as, "Promote incidental recharge to the extent feasible without impacting groundwater quality." This could be added to Section 1.8.2 and Section 8 and generally included throughout the document.
2. Section 4 should include a discussion of ways to increase incidental recharge. According to the document, incidental recharge accounts for about 20% of the total recharge, and this is with the vast majority of storm flows escaping over streets and into concrete storm drains. There's a huge volume of water that could be captured for future use via "dry wells," swales, wetlands, etc. If we are to sustain our groundwater basin, we will need to take advantage of this resource.
3. Section 5 should include a discussion of perchlorate contamination including where it came from, how its dispersing in the groundwater basin and how long before it is "gone."
4. Several of the figures are too small of scale. For example, on Figure ES-5, you cannot distinguish between monitoring wells and production wells. The figures should be larger, or less information provided on them. I concur that we should not disclose exact locations of production wells, but it's very important to know exactly where the monitoring wells are located.
5. In several cases it may be better to provide data in tables rather than graphs. For example, Figure ES-10 would be much easier to comprehend if the data were provided in a table. It is very difficult to assess trends for data in stacked bar graphs.
6. Overall, it's an excellent document and will be a valuable resource. OCWD should recognize that all water producers in the Basin will need to include this document in State and Federal grant applications and the Plan should include a broad spectrum of concepts for improving groundwater sustainability.

If you'd like to talk about any of these issues, please feel free to contact me.

Dick Wilson
Environmental Services Manager
Anaheim Public Utilities Department
714-765-4277
dwilson@anaheim.net

Response to Comments received June 26, 2009 from Dick Wilson, Environmental Services Manager, Anaheim Public Utilities Department

No.	Comment	Response to Comment
1	Add objective related to promoting incidental recharge such as "Promote incidental recharge to the extent feasible without impacting groundwater quality."	A new objective promoting incidental recharge has been added to Section 1.8.2. This new objective was added to Section 8.
2	Discuss ways to increase incidental recharge.	A discussion of incidental recharge was added in Section 4.2.2.1.
3	Add a discussion of perchlorate contamination to Section 5.	A new section on perchlorate, Section 5.6, was added.
4	The scale of several figures is too small. In Figure ES-5, it is difficult to distinguish between monitoring and production wells.	Several of the figures throughout the document were enlarged for improved readability. The clarity of Figure ES-5 was improved to enable the reader to distinguish between the production and monitoring wells. Please note that in Section 3, the production wells and monitoring wells appear in separate figures (Figures 3-1 and 3-2).
5	In some cases, data should be provided in tables rather than graphs. Figure ES-10 would be easier to comprehend if data were provided in a table. It is difficult to assess trends for data in stacked bar graphs.	Figure ES-10 appears also as Figure 6-5 in Section 6. A table with the data used to create Figure 6-5 was added in Section 6.6.
6	Since water producers will need to include this document in state and federal grant applications, the plan should include a broad spectrum of concepts for improving groundwater sustainability.	Comment noted.

Orange County Water District
18700 Ward Street
Fountain Valley, CA 92708
(714) 378-3200

Recorded in Official Records, Orange County
Tom Daly, Clerk-Recorder
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NOTICE OF EXEMPTION

From the Requirements of the California Environmental Quality Act (CEQA)

TO: COUNTY CLERK/County of Orange
P.O. Box 238
Santa Ana, CA 92702

FROM: Orange County Water District
Planning & Watershed Management
18700 Ward Street
Fountain Valley, CA 92708

FILED
AUG 10 2009
TOM DALY, CLERK-RECORDER
By RV DEPUTY

PROJECT TITLE: Orange County Water District Groundwater Management Plan

APPROVAL DATE: July 15, 2009

PROJECT LOCATION: Orange County Groundwater Basin

CITY: Various **COUNTY:** Orange

DESCRIPTION OF THE PROJECT: The OCWD Groundwater Management Plan discusses the groundwater basin's physical features, OCWD facilities and monitoring and operating programs.

NAME & ADDRESS OF APPLICANT: Orange County Water District, 18700 Ward Street, Fountain Valley CA 92708

NAME OF PUBLIC AGENCY APPROVING PROJECT: Orange County Water District

POSTED
AUG 10 2009
TOM DALY, CLERK-RECORDER
By RV DEPUTY

EXEMPT STATUS:

- ☐ Ministerial (Sec. 15268)
- ☐ Declared Emergency (Sec. 15269 (a))
- ☐ Emergency Project (Sec. 15269(a)&(b))
- ☐ General Rule (Sec. 15061(b)(3))
- X Statutory Exemption: Section 15262
- X Categorical Exemption: Class 6 Section 15306, Class 7 Section 15307 Class 8 Section 15308

REASON(S) WHY PROJECT IS EXEMPT FROM CEQA:
The Groundwater Management Plan is an information document that discusses the Orange County Groundwater Basin and OCWD facilities and programs. The Groundwater Management Plan does not bind, commit or predispose OCWD to further consideration, approval or implementation of any potential project. Approval of the Groundwater Management Plan would not cause either a direct physical change to the environment or a reasonably foreseeable indirect physical change to the environment.

CONTACT PERSON: Greg Woodside

TELEPHONE No: 714 378-3275

SIGNITURE Dan Bott

DATE 8/6/09

TITLE Principal Planner

377417

W

CERTIFICATION OF BOARD ACTION

I do hereby certify that at its meeting held July 15, 2009, the Orange County Water District Board of Directors approved the following action:

MOTION NO. 09-80
APPROVING GROUNDWATER MANAGEMENT PLAN 2009 UPDATE AND AUTHORIZING FILING OF NOTICE OF EXEMPTION

The Groundwater Management Plan 2009 Update is approved and filing of Notice of Exemption is authorized.

IN WITNESS WHEREOF, I have executed this Certificate on August 20, 2009.

ORANGE COUNTY WATER DISTRICT

Judy-Rae Karlsen
Assistant District Secretary

APPENDIX B

REQUIRED AND RECOMMENDED COMPONENTS FOR GROUNDWATER MANAGEMENT PLANS

Appendix B
Mandatory and Recommended Components of a Groundwater Management Plan

No.	Mandatory Components of a GWMP	Water Code Section	OCWD Plan Section
1.	Basin management objectives for the groundwater basin that is subject to the plan	10753.7(a)(1)	1.8, 5.1.1, 5.1.2, 5.2.3, 6.3
2.	Monitoring and management of groundwater levels within the groundwater basin	10753.7(a)(1)	1.8.2, 2.2, 2.3, 2.4, 2.6, 2.7
3.	Monitoring protocols that are designed to detect changes in groundwater levels	10753.7(a)(4)	2.3, 2.4, 2.8, 3.1, 3.2, 3.4,
4.	Groundwater quality degradation	10753.7(a)(1)	1.8.1, 3.5, 5
5.	Monitoring protocols that are designed to detect groundwater quality	10753.7(a)(4)	3.1, 3.2, 3.3, 3.5, 3.6, 5
6.	Inelastic land surface subsidence	10753.7(a)(1)	2.7
7.	Monitoring protocols that are designed to detect inelastic land surface subsidence for basins for which subsidence has been identified as a potential problem	10753.7(a)(4)	2.7
8.	Changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin	10753.7(a)(1)	3.7, 4, 6.7
9.	Monitoring protocols that are designed to detect flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater pumping at the basin	10753.7(a)(4)	3.7, 4, .6.5, 6.7
10.	A plan to involve other agencies that enables the local agency to work cooperatively with other public entities whose service area or boundary overlies the groundwater basin	10753.7(a)(2)	1.2, 6.2
11.	A map that details the area of the groundwater basin, as defined in the department's Bulletin No. 118, and the area of the local agency, that will be subject to the plan, as well as the boundaries of other local agencies that overlie the basin in which the agency is developing a groundwater management plan	10753.7(a)(3)	Figures 1-1, 1-5, 2-1

Appendix B
Mandatory and Recommended Components of a
Groundwater Management Plan

Item	Optional Components of a GWMP	Water Code Section	OCWD Plan Section
12.	The control of saline water intrusion	10753.8(a)	3.6, 5.2
13.	Identification and management of wellhead protection areas and recharge areas	10753.8(b)	4, 5.1.5, 6.2
14.	Regulation of the migration of contaminated groundwater	10753.8(c)	5
15.	The administration of a well abandonment and well destruction program	10753.8(d)	5.1.6, 5.1.7
16.	Mitigation of conditions of overdraft	10753.8(e)	2.5, 6.5, 6.7, 6.8, 7.2.3
17.	Replenishment of groundwater extracted by water producers	10753.8(f)	4, 6
18.	Monitoring of groundwater levels and storage	10753.8(g)	1.8.2, 2.2, 2.3, 2.4, 2.6, 2.7, 2.8, 3.1, 3.2, 3.4, 6.5, 6.7, 6.8
19.	Facilitating conjunctive use operations	10753.8(h)	3.7.4, 6.3.3, 6.7, 6.8
20.	Identification of well construction policies	10753.8(i)	Figures 3-4, 3-5, 5.1.5, 5.1.6
21.	The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling and extraction projects	10753.8(j)	4, 5.2.5, 5.3.3, 5.8,5.9, 6
22.	The development of relationships with state and federal regulatory agencies	10753.8(k)	5.1.3, 6.2
23.	The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination	10753.8(l)	5.1.4, 5.1.5

APPENDIX C

GOALS AND BASIN MANAGEMENT OBJECTIVES DESCRIPTION AND LOCATION

Appendix C
Goals and Basin Management Objectives Description and Location

Basin Management Objective (BMO)	How Meeting BMO will Contribute to More Reliable Supply of Groundwater	Location of Description of Planned Management Actions
General Basin Management Objectives to Accomplish All Goals		
Update the *Groundwater Management Plan* periodically	Regular publication of reports enables the District to plan for and manage the groundwater basin responsibly and efficiently, assure the timely construction of necessary projects to accomplish stated basin management objectives, and monitor the water quality of the basin and recharge water supplies.	Sections 1.4, 3.8
Update *the Long-Term Facilities Plan* periodically		Sections 1.4 and 4.5
Continue annual publication of the *Santa Ana River Water Quality Report*; the *Engineer's Report on the Groundwater Conditions, Water Supply and Basin Utilization*; the *Santa Ana River Watermaster Report*; and the *Groundwater Replenishment System Operations Annual Report*.		Sections 1.5, 2.8, 3.8, and 6.5
Goal: Protect and Enhance Groundwater Quality		
Conduct monitoring programs	Comprehensive monitoring of ground and surface water quality enables OCWD to discover contamination at an early stage and begin remediation efforts at the earliest feasible time and assures that operations are in compliance with federal, state, and local laws and regulations.	Section 3
Monitor and manage quality of recharge water supplies so that water recharged through District facilities meets or is better than primary drinking water levels and notification levels		Section 4 and 5
Monitor quality of Santa Ana River water		Section 3.7

Appendix C

Goals and Basin Management Objectives Description and Location

Basin Management Objective (BMO)	How Meeting BMO will Contribute to More Reliable Supply of Groundwater	Location of Description of Planned Management Actions
Implement the District's Groundwater Protection Policy	The Groundwater Protection Policy proactively protects the water quality of the basin and enables the District to work to clean up contaminated areas.	Section 5
Construct and manage water quality treatment projects	Water quality treatment projects clean up contamination in order to protect the long-term quality of groundwater in the basin.	Section 5.8
Operate seawater intrusion barriers	Barriers prevent intrusion of high salinity water into the basin.	Section 3.6
Support natural resource programs in the watershed	Improvement of natural resources in the watershed contributes to higher quality source water for OCWD recharge operations.	Section 6.2.2
Participate in cooperative efforts with regulators and stakeholders within the Santa Ana River Watershed	Working with stakeholders in the watershed helps to protect the quality of source water used to recharge the groundwater basin.	Section 3.7, 5.2.5, and 6.2

Appendix C
Goals and Basin Management Objectives
Description and Location

Basin Management Objective (BMO)	How Meeting BMO will Contribute to More Reliable Supply of Groundwater	Location of Description of Planned Management Actions
Goal: Protect and Increase the Basin's Sustainable Yield in a Cost Effective Manner		
Monitor groundwater levels, recharge rates, and production rates Operate the basin in accordance with the *Groundwater Basin Storage and Operational Strategy*	Proper monitoring and operation of the groundwater basin improves groundwater management by establishing safe and sustainable levels of groundwater production, determines that extent of seawater intrusion so improvements to seawater barriers can be made, and allows for management of the basin for maximum pumping of groundwater at levels that assure sustainable supplies over the long-term.	Section 2 and 3
Manage recharge operations to maximize recharge of the groundwater basin	Proper and efficient management of recharge operations sustains maximum pumping of groundwater supplies.	Section 4
Research and implement new strategies and programs to increase recharge capacity	New strategies and programs increase the amount of groundwater available for pumping from the basin.	Section 4.3 and 4.4
Promote incidental recharge to the extent feasible without negatively impacting groundwater quality.	Increasing incidental recharge increases the amount of water naturally percolating into the groundwater basin, which increases the amount of water available for pumping from the basin.	Section 4.2.2.1
Plan and conduct programs that maximize the capacity of the basin to respond to and recover from droughts	Increases the amount of water the basin can provide during a drought.	Section 6.8

Appendix C
Goals and Basin Management Objectives Description and Location

Basin Management Objective (BMO)	How Meeting BMO will Contribute to More Reliable Supply of Groundwater	Location of Description of Planned Management Actions
Support natural resource programs in the watershed	Natural resource programs, such as removal of Arundo, augment available supplies of recharge water.	Sections 5.3.3 and 6.2.2
Goal: Increase Operational Efficiency		
Manage the District's finances to provide long-term fiscal stability and to maintain financial resources to implement District programs	Fiscal stability is essential for the District to effectively manage the groundwater basin. Maintenance of reserves allows for the purchase of supplemental water supplies when they are available.	Section 7
Operate District programs in a cost-effective and efficient manner.		
Manage natural resource programs in the Santa Ana River watershed in an efficient manner.	Removal of excessive nitrate levels through the operation of Prado Wetlands saves the cost of more expensive treatment plan construction and operation. Removal of Arundo increases water supply availability.	Sections 5.3.3 and 6.2.2
Implement efficient environmental management programs, such as use of solar power where feasible.	Replacing a portion of the District's use of electricity with generation of solar power will reduce costs in the long run.	Section 4.5

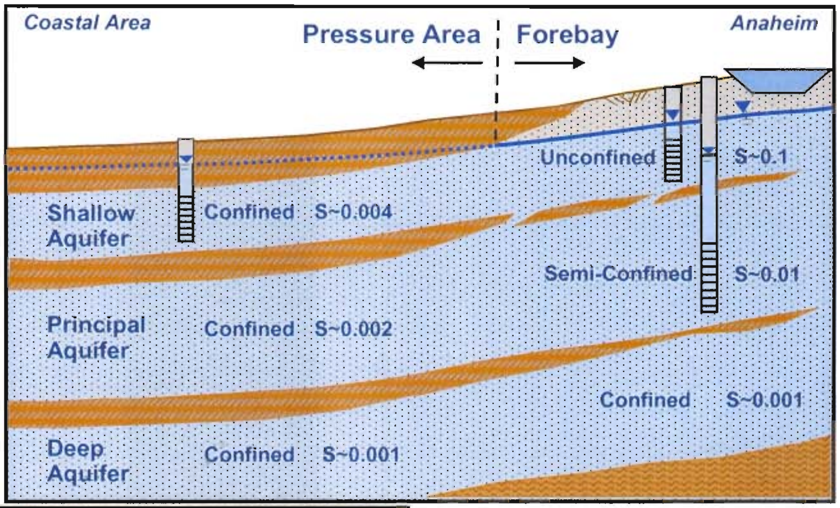
APPENDIX D

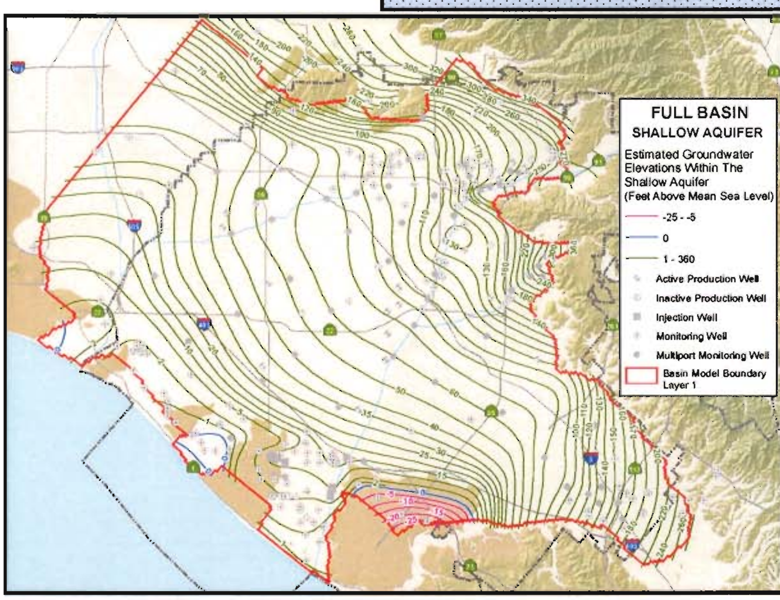
REPORT ON EVALUATION OF ORANGE COUNTY GROUNDWATER BASIN STORAGE AND OPERATIONAL STRATEGY, OCWD, FEBRUARY 2007

ORANGE COUNTY WATER DISTRICT

REPORT ON

EVALUATION OF ORANGE COUNTY GROUNDWATER BASIN STORAGE AND OPERATIONAL STRATEGY





REGISTERED PROFESSIONAL ENGINEER
TIMOTHY J. SOVICH
NO. C056145
EXP. 12/31/08
CIVIL
STATE OF CALIFORNIA

Prepared By:

Timothy J. Sovich, PE – Principal Engineer
Roy L. Herndon, PG, CHg – Chief Hydrogeologist

FEBRUARY, 2007

PROFESSIONAL GEOLOGIST
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P.G. No. 4617
CERTIFIED HYDROGEOLOGIST
No. 113
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STATE OF CALIFORNIA

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Acknowledgment

Much assistance was provided by District GIS staff Dan Lee and Linda Koki, specifically with implementation and automation of the new three-layer storage change algorithm, GIS programming, mapping, and graphical support.

EXECUTIVE SUMMARY

The need for this study was largely driven by the record-setting wet year of 2004-05, in which an unprecedented storage increase of 170,000 af was estimated by OCWD staff. This led to a preliminary reassessment of the traditional storage calculation which, due to cumulative uncertainty over tens of years, could not be sufficiently rectified back to the traditional full-basin benchmark of 1969.

A new methodology has been developed, tested, and documented herein for calculating accumulated overdraft and storage change based on a three aquifer layer approach, as opposed to the previous single-layer method. Also, for calculating accumulated overdraft, a new full-basin benchmark was developed for each of the three aquifer layers, thereby replacing the traditional single-layer full benchmark of 1969. Also in this report, a basin management operational strategy is proposed that sets guidelines for planned refill or storage decrease amounts based on the level of accumulated overdraft.

The new three-layer storage change approach utilizes aquifer storage parameters supported by calibration of the District's basin-wide groundwater model ("basin model") along with actual measured water level data for each of the three aquifer systems that correspond to the three aquifer layers in the basin model: the Shallow, Principal, and Deep (colored water) aquifer systems. Traditionally, the storage change calculation was based solely on groundwater levels for the Principal aquifer, from which approximately 90 percent of basin pumping occurs.

The findings of this study are enumerated below.

1. The new three-layer storage change approach is technically feasible and provides a more accurate assessment than the traditional single-layer storage change method.

2. Using the new three-layer method, the majority of the storage change occurs in the Forebay area of the basin within the unconfined Shallow aquifer where rising or falling of the water table fills or drains empty pore space.

3. Accuracy of the storage change and accumulated overdraft estimates is dependent upon good spatial distribution of water level measurements as well as the storage coefficient values used in the calculations. Water level data for the Shallow aquifer were relatively sparse in outlying Forebay areas of the basin, leading to some uncertainty in preparing groundwater elevation contours in those areas.

4. 1969 no longer represents a truly full-basin benchmark. A new full-basin water level condition was developed based on the following prescribed conditions:

   - Observed historical high water levels
   - Present-day pumping and recharge conditions
   - Protective of seawater intrusion
   - Minimal potential for mounding at or near recharge basins

The new full-basin water levels in the Forebay area are essentially at or very near the bottom of the District's deep percolation basins (e.g., Anaheim Lake). Historical water level data from 1994 have shown that this condition is achievable without detrimental effects. Water levels slightly higher than this new full condition may be physically achievable in the Forebay area but not recommended due to the likelihood of groundwater mounding and reduced percolation in recharge basins.

5. Using the new three-layer storage change calculation in conjunction with the new full benchmark and June 2006 water levels, an accumulated overdraft of 135,000 af was calculated representing June 30, 2006. Similarly, using the new three-layer method to compare the new full water levels to those of June 2005, an accumulated overdraft of 201,000 af was calculated representing June 30, 2005. Subtracting the June 2006 accumulated overdraft from that of June 2005 yielded an annual storage increase of 66,000 af for WY 2005-06.

6. Comparing the current year's water level conditions to the full basin benchmark each successive year for calculating the basin storage will eliminate the potential for cumulative discrepancies over several years.

7. An accumulated overdraft of 500,000 af represents the lowest acceptable limit of the basin's operating range. This lower limit of 500,000 af assumes that stored MWD water (CUP and Super In-Lieu) has already been removed and is only acceptable for short durations due to drought conditions. It is not recommended to manage the basin for sustained periods at this lower limit for the following reasons:

   - Seawater intrusion likely
   - Drought supply depleted
   - Pumping levels detrimental to a handful of wells
   - Increased pumping lifts and electrical costs
   - Increased potential for color upwelling from the Deep aquifer

8. An optimal basin management target of 100,000 af of accumulated overdraft provides sufficient storage space to accommodate increased supplies from one wet year while also providing enough water in storage to offset decreased supplies during a two- to three-year drought.

9. The proposed operational strategy provides a flexible guideline to assist in determining the amount of basin refill or storage decrease for the coming water year based on using the BPP formula and considering storage goals based on current basin conditions and other factors such as water availability. This strategy is not intended to dictate a specific basin refill or storage decrease amount for a given storage condition but to provide a general guideline for the District's Board of Directors.

Based on the above findings, recommendations stemming from this study are as follows:

1. Adopt the new three-layer storage change methodology along with the associated new full-basin condition that will serve as a benchmark for calculating the basin accumulated overdraft.

2. Adopt the proposed basin operating strategy including a basin operating range spanning the new full condition to an accumulated overdraft of 500,000 af, and an optimal overdraft target of 100,000 af.

3. Include in the 2007-08 CIP budget the installation of six Shallow aquifer monitoring wells to increase accuracy of the three-layer storage change calculation.

1. INTRODUCTION

This report documents the methodology, findings, and recommendations of the basin storage and overdraft evaluation completed by District staff between May 2006 and January 2007.

Prior to this study, an unusually large annual increase in basin storage of 170,000 af was estimated for WY 2004-05, which was a record-setting wet year. During that year, water levels throughout the basin rose approximately 30 feet overall, and as much as 60 feet in the Santiago recharge area which receives significant storm runoff from Villa Park Dam releases during extremely wet years.

The estimated storage increase for WY 2004-05 was so large that it caused staff to re-examine the storage calculation. Also, the large water level rise during that year raised concern that the basin could be approaching a near-full condition, leading staff to compare 2005 water levels throughout the basin to 1969 in which the basin was historically considered full. This analysis showed that the basin may have had only 40,000 af less groundwater in storage in November 2005 as compared to the 1969 benchmark. However, the traditional method of cumulatively adding the annual storage change each year to the previous year's accumulated overdraft led to an accumulated overdraft of approximately 190,000 af for November 2005.

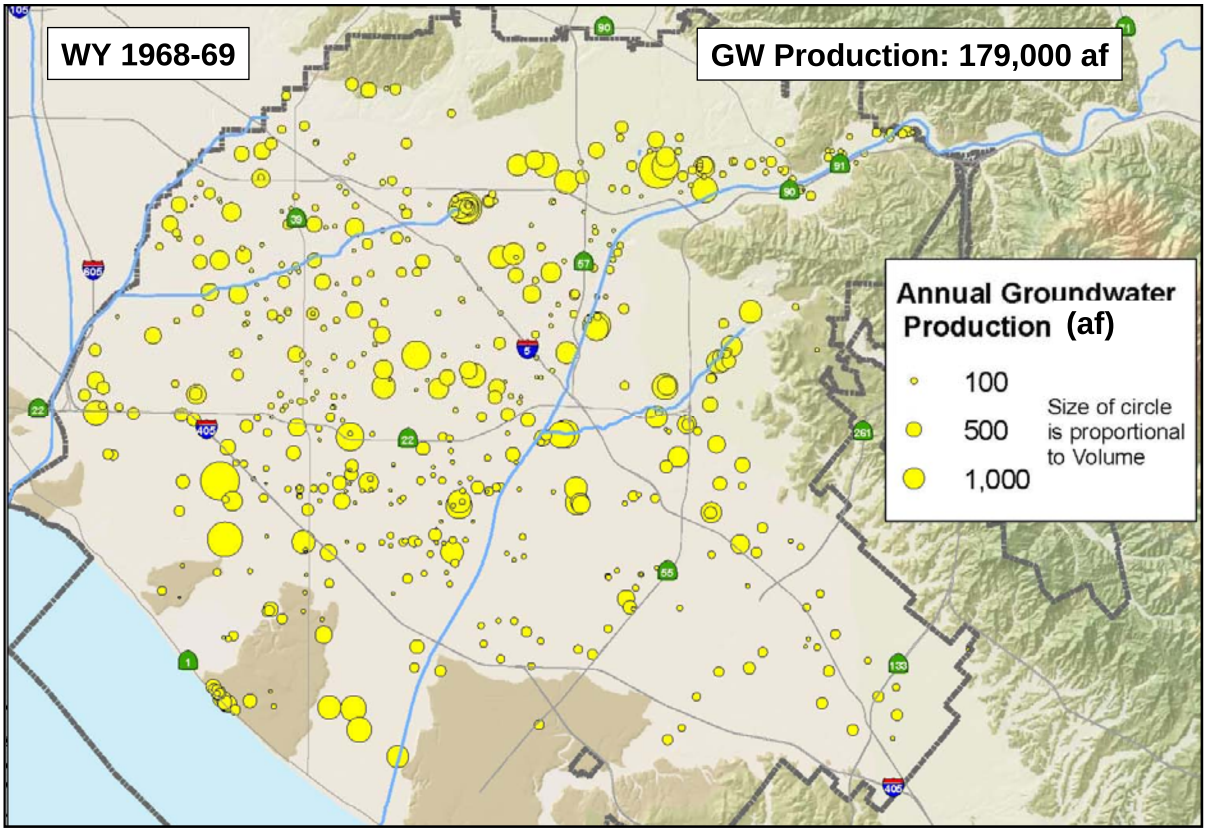
The discrepancy of 150,000 af in the two different 2005 overdraft calculations indicated that the current condition could not be properly rectified back to the 1969 benchmark. This dilemma provided the main impetus for the study documented herein and brought to light two important discoveries:

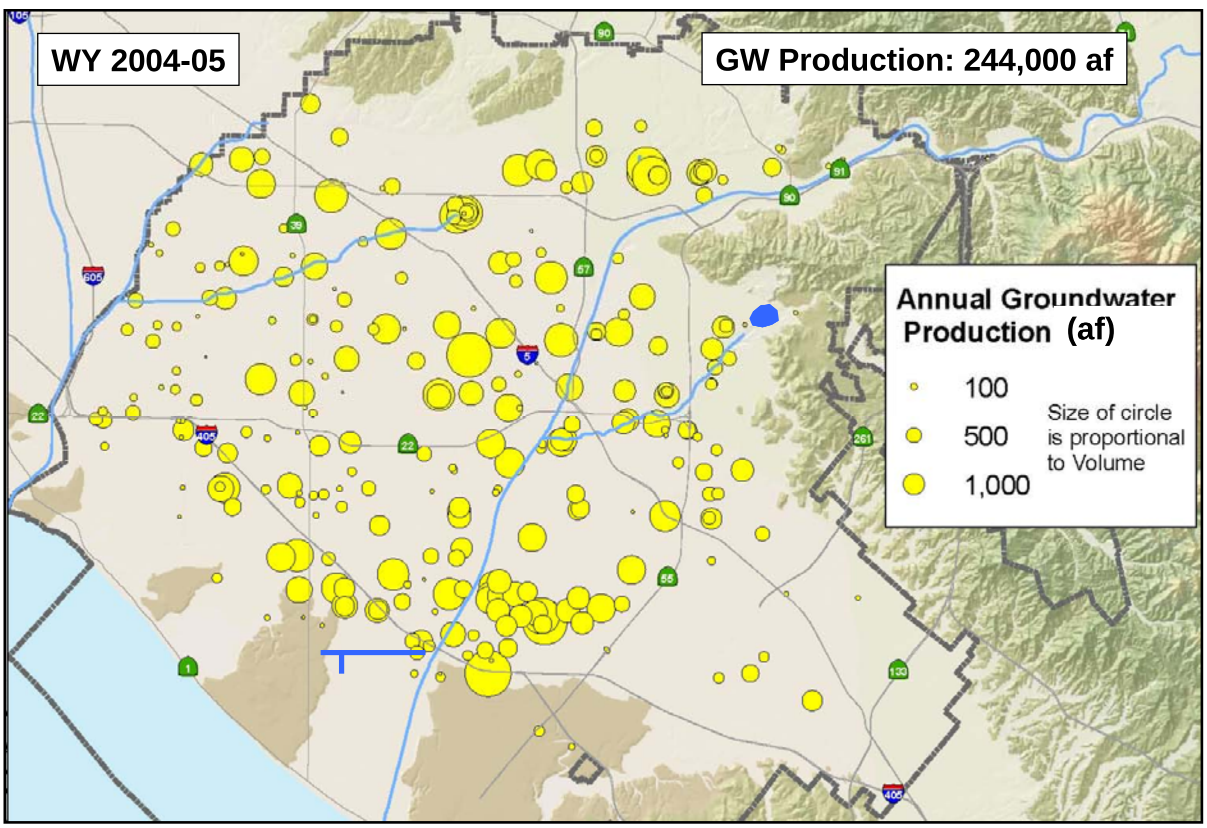
- The traditional storage change calculation contains considerable uncertainty that, when cumulatively added over tens of years, led to a large discrepancy in the accumulated overdraft relative to 1969.

- 1969 water level conditions no longer represent a full basin, primarily because of the different pumping and recharge conditions that exist today.

Figure 1-1 shows the distribution of groundwater production for WY 1968-69 (upper map) and WY 2004-05 (lower map). Each circle or "dot" represents an active production well for that year, with the size of each dot being proportional to each well's annual production. Total basin production for WY 2004-05 was only 179,000 af, whereas by WY 2004-05 it had increased to 244,000 af and would have been 70,000 af greater if not for supplemental imported water taken in-lieu of groundwater. By comparing the two production dot maps, heavy increases in pumping are evident in the coastal area since 1969, primarily due to MCWD and IRWD's Dyer Road Well Field (DRWF).

Figure 1-1. Groundwater Pumping Distribution: WY 1968-69 and WY 2004-05





In addition to changes in the amount and distribution of pumping since 1969, OCWD managed recharge operations have increased substantially such that much more water is recharged today as compared to 1969. In addition to increased Santa Ana River flows and new recharge basins being put into service in the Anaheim and Orange Forebay areas, new and improved cleaning methods have been implemented to enhance percolation rates, thus increasing the annual volume of water that is recharged annually.

Table 1-1 below summarizes the major pumping and recharge differences between WY 1968-69 and WY 2004-05.

Table 1-1. Pumping and Recharge Conditions: WY 1968-69 vs. WY 2004-05

	WY 1968-69	WY 2004-05
Pumping	Total Pumping: 179,000 af	Total Pumping: 244,000 af
	Agricultural Pumping: 34,000 af	Agricultural Pumping: 3,400 af
	No DRWF	In-Lieu: 70,000 af
	No MCWD municipal wells	Increased coastal pumping
	No Newport Beach wells	Less Irvine pumping
Recharge	No Talbert Barrier	Enhanced Talbert Barrier
	No Santiago Pits or Creek	Enhanced percolation rates
	No Kraemer or Miller Basins	Basin Cleaning Vehicle
	No Burris Pit or Five Coves	Riverview Basin

Since 1969, the largest pumping increases have been in the coastal area while the largest recharge increases have been in the inland Forebay area. Therefore, this redistribution along with increased utilization of the groundwater basin has led to a steeper groundwater gradient or “tilt” from the inland Forebay down to the coast. Because of this increased basin tilt under present conditions, water levels higher than 1969 can be maintained in the Forebay area without exceeding 1969 water levels in the coastal area. Because higher Forebay water levels translate into more basin storage, 1969 no longer represents a full basin condition by today’s standards. In other words, a modern-day full condition could likely accommodate higher water levels than 1969 in the Forebay area, as schematically illustrated in Figure 1-2.

A review of historical water level data indicates that many wells in the Anaheim area experienced higher water levels in 1994 than in 1969. Figure 1-3 shows historical water levels for City of Anaheim Well A-27, indicating that in 1994 water levels at that location (adjacent to the south side of Anaheim Lake) were 5-10 feet higher than in 1969.

Figure 1-2. Schematic of Groundwater Level Profiles Across the Basin

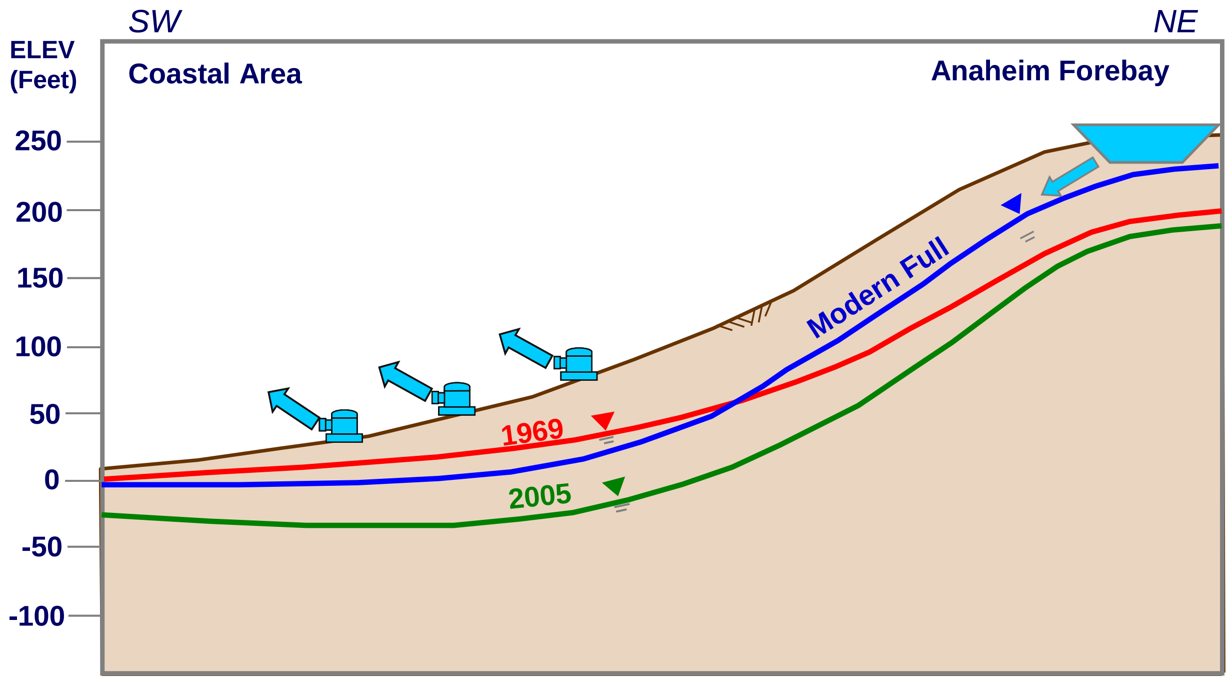
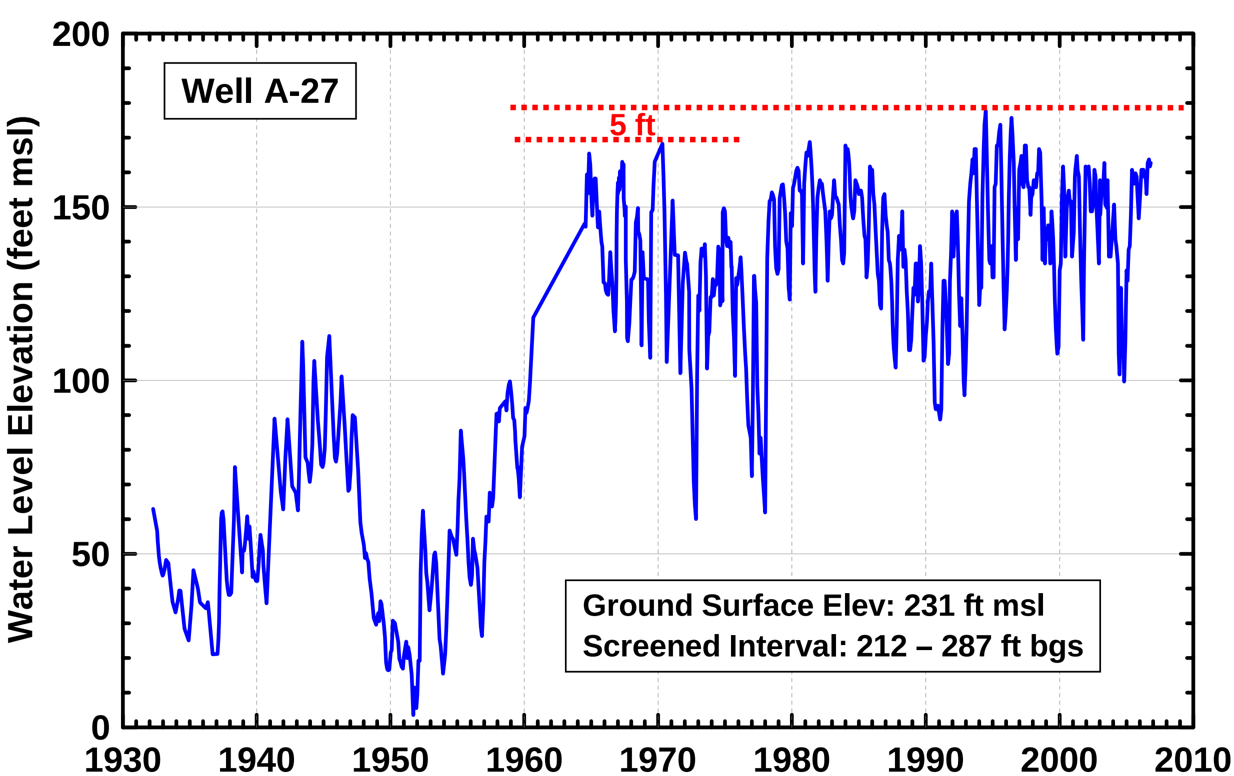


Figure 1-3. Water Level Hydrograph for City of Anaheim Well 27



2. STUDY OBJECTIVES AND WORK PLAN

Objectives of this study were three-fold:

1. Reassess and recommend modifications as necessary to staff's traditional method for calculating the annual storage change and the accumulated overdraft.

2. Develop a technically-sound full basin water level condition that takes into account current basin management practices. This new full condition would replace 1969 and become the new full benchmark used to calculate the accumulated overdraft or available storage in current and upcoming years.

3. Determine an appropriate basin storage operating range and management goal for long-term basin management purposes.

The District Board of Directors approved staff's work plan in April 2006, and work commenced shortly thereafter. All work was completed by the District's Hydrogeology Department, with oversight, direction, and review provided by District management. At the request of the Board, monthly project updates were given at the Water Issues Committee meetings as well as the monthly groundwater producers meetings to facilitate the producers' involvement in the process.

The scope of work laid out in the work plan was generally followed. Initially, it was considered that conducting basin model simulations may be beneficial in validating project results. However, after making significant progress in developing a new storage change methodology and new full basin benchmark, it became evident that it was more appropriate to use aquifer parameters and specific knowledge gained from development of the basin model rather than running new model simulations per se. As such, findings enumerated in this report were based on actual water levels observed in the field coupled with a methodology based on aquifer structure and hydraulic parameters defined during development of the basin model.

3. STORAGE CHANGE CALCULATION METHODOLOGY

In this section, the District's traditional storage change calculation is described along with its inherent limitations, followed by a discussion of the development of a new storage change calculation approach and comparison with the traditional method. But first, a conceptual explanation of aquifer storage is explained below.

3.1 Aquifer Storage Concept

Aquifers not only transmit groundwater but also provide storage volume, sometimes being referred to as "underground reservoirs." However, unlike surface water reservoirs, approximately 70 to 80 percent of the aquifer's volume is occupied by the porous medium, typically consisting of various gradations of sand and gravel as well as silts and clays. This leaves only 20 to 30 percent of the aquifer's total volume remaining as void space that groundwater can occupy. This percentage of void or pore space is referred to as *porosity*.

Over large areas and depths, the void space within aquifers can occupy huge amounts of water. Within the Orange County groundwater basin, which spans over 300 square miles and is over 2,000 feet deep in some areas, District staff have estimated that approximately 66 million acre-feet of water lies in storage. Unfortunately, the vast majority of this water cannot be feasibly drained from the basin without incurring detrimental impacts.

Excessive long-term pumping of basin aquifers without continual replenishment would lead to a lowering of water levels and a reduction in pore pressure, which would lead to seawater intrusion and irreversible compaction of the aquifer, resulting in subsidence of the land surface. The recommended "drainable" storage volume of the basin (without requiring concurrent replenishment) is 500,000 af acre-feet as discussed in Section 6.

The parameter used to define the storage capacity of an aquifer is known as the *storage coefficient (S)*. Unlike the porosity which is a measure of the entire void space regardless of whether or not it contains water, the storage coefficient is a measure of how much water can effectively be drained or squeezed out of the saturated pore space. The storage coefficient is defined as the volume of water yielded per unit horizontal area and per unit drop of water table (unconfined aquifers) or piezometric surface (confined aquifers).

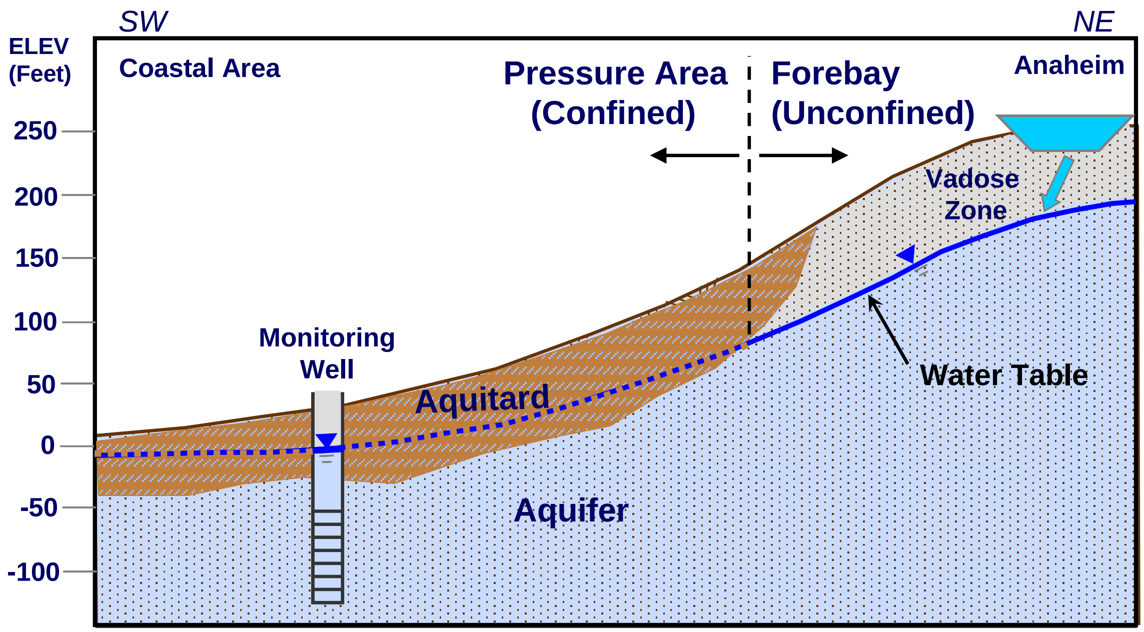
3.2 Confined and Unconfined Aquifers

A confined aquifer is an aquifer that is confined between two aquitards, which are typically clay or silt layers with low permeability. The water in a confined aquifer cannot freely rise above the overlying clay layer and is under confining pressure. When a well is drilled through the overlying clay layer down into the aquifer, the pressure in the confined aquifer causes the water to rise inside the well (see Figure 3-1) to a level higher than the overlying aquitard. Therefore, water levels measured in wells within confined aquifers – referred to as piezometric levels – may rise and fall but the confined aquifer remains saturated. In a confined aquifer, water is added to or removed from storage primarily through the rearrangement of the unconsolidated sediments via compression or decompression; the compressibility of water contributes significantly less to the storage process. A relatively large piezometric level change in a confined aquifer represents very little change in storage within that aquifer. Storage coefficients for a confined aquifer typically range from 0.01 to as low as 0.00005.

An unconfined aquifer is an aquifer in which the water table forms the upper boundary and there is no confining layer above it (see Figure 3-1). That is, the water table can freely rise or fall. Pore space is either filled or drained when the water table rises or falls. Therefore, a unit rise or decline in the water table in an unconfined aquifer represents a relatively large storage volume. For an equivalent water level rise, an unconfined aquifer would exhibit at least 100 times greater storage increase than a confined aquifer. Storage coefficients for unconfined aquifers typically range from 0.01 to 0.3, also referred to as *specific yield*.

In the Orange County groundwater basin, the Shallow aquifer is confined in the coastal and mid-basin areas, commonly referred to as the Pressure Area. The overlying aquitard in the Pressure area thins further inland until it is generally gone. This inland area is referred to as the Forebay area. Since few continuous aquitards exist between the water table and ground surface, it is the "intake" area of the basin where surface water can percolate down to the water table and recharge the aquifers (see Figure 3-1).

Figure 3-1. Forebay and Pressure Area Schematic Profile



3.3 Traditional Storage Change Calculation Method

<u>Water Level Change Method</u>

Traditionally, the storage change calculation was based solely on the water level changes occurring in the Principal aquifer, which is the main production zone in the basin from which approximately 90 percent of basin pumping occurs. Dating back to the 1940s, District staff have prepared a November groundwater contour map of Principal aquifer water levels. By comparing the November contour map to that of the previous year, the annual water level change was then determined. The water level change was then multiplied by a set of storage coefficient values and by the area of the basin to obtain the resulting groundwater storage change for that year. Then, the annual storage change was added to the accumulated overdraft from the previous year to obtain the current accumulated overdraft.

Over the years, the overall approach has remained relatively the same, but several refinements were made along the way. In the 1970s, a FORTRAN computer program was developed, referred to as the “Randall Model,” which partially automated the storage change calculation by subdividing the basin into quarter-mile grid cells. The Randall Model computed the storage change calculation grid cell by grid cell. Although this process was somewhat automated, the water level maps had to be manually interpolated to obtain the average water level change for each quarter-mile grid cell. The storage coefficient values for each quarter-mile grid cell were referred to as “Randall” coefficients and are shown in Appendix 1. No documentation exists as to how these storage coefficient values were developed, but they were likely based on review of old well logs throughout the basin.

In the early 1990s, with improvements in computer hardware and software, District staff were able to further automate the traditional storage change calculation by using geographical information system (GIS) software to subdivide the basin into smaller, more refined grid cells. By digitizing the hand-drawn water level contour maps into the computer, the water level change at each refined grid cell could be computed without any manual interpolation. However, the overall approach remained the same and still used the same Randall storage coefficient values.

Over the last two years, an additional refinement included preparing an end-of-June water level contour map in addition to the annual November contour map. Although the November maps provide a good midpoint between the summer-high and winter-low water level conditions, the June maps coincided better with the District’s water year and fiscal year (July 1 through June 30) for the annual storage change calculation.

<u>Water Budget Method</u>

For the past 10 to 15 years, the annual storage change calculated using the traditional water level method has been checked using a water budget method (inflows minus outflows equal the change in storage). Therefore, the water budget method uses measured groundwater production and recharge data along with a rainfall-based estimate of incidental recharge (unmeasured recharge less underflow to LA County).

The water budget method provides a good check of the storage change estimate from the water level method but is based on an assumed (unmeasured) amount of incidental recharge. In most years, the two methods agree rather closely, and the storage change value from the water level method is generally used. The incidental recharge is then adjusted in the water budget method to exactly match the chosen storage change.

<u>Limitations of the Traditional Storage Change Method</u>

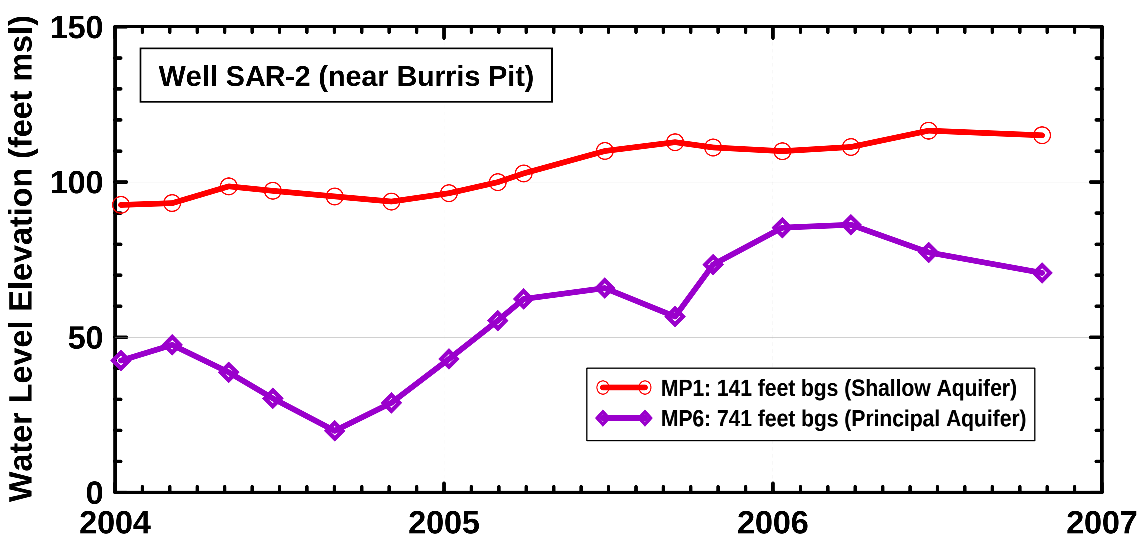
Although the traditional water level and water budget methods yield similar storage change results in most years, there are some anomalous years in which the two estimates are significantly different. In such years, typically very wet or very dry years, professional judgment must be exercised in determining the official change in storage. This can introduce significant uncertainty into the annual storage change estimate for those years, causing a cumulative effect after several years, which is why the current accumulated overdraft cannot be rectified back to 1969 as discussed in Section 1.

The biggest limitation of the traditional method is that it only uses the water level change in the Principal aquifer. Although most groundwater production is from the Principal aquifer, most of the storage change occurs in the Shallow aquifer where it is unconfined in the Forebay area of the basin. Where the Shallow aquifer is unconfined, large storage changes can occur due to the rising or falling of the water table which respectively fills or drains empty pore space, as was discussed in Section 3.2.

The Randall storage coefficients used in the traditional method are consistent with those of an unconfined aquifer in the Forebay area and thus are considered as being representative of the Shallow aquifer. Therefore, the traditional method uses Principal aquifer water levels as a surrogate for the Shallow aquifer, assuming that these two aquifers behave identically in the Forebay area. This is largely true in the Anaheim Lake area near the District's facilities, but in other portions of the Forebay, the Shallow and Principal aquifers often behave differently from one another, as shown in Figure 3-2. This indicates that these two aquifers are partially hydraulically separated by aquitards in portions of the Forebay and behave differently rather than as a single unconfined aquifer as the traditional method had assumed.

It should be pointed out that in earlier years, depth-specific water level data such as that presented in Figure 3-2 was simply not available to discern hydraulic differences between various aquifer zones, and in some areas of the Forebay, there are no noticeable vertical hydraulic differences. It has only been in the last few years through the use of the District's monitoring well network and development of the basin model that a better understanding of the basin has been gained.

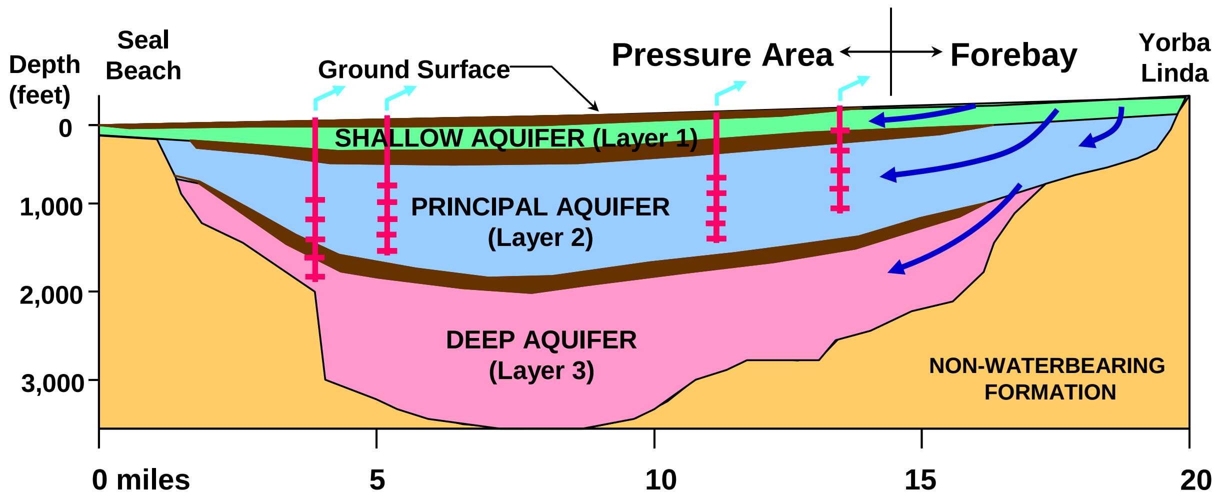
Figure 3-2. Water Level Hydrograph for OCWD Monitoring Well SAR-2



3.4 New Three-Layer Storage Change Approach

The new three-layer storage change approach uses all three aquifer systems of the basin: the Shallow, Principal, and Deep aquifer systems (see Figure 3-3). The Shallow aquifer generally ranges no deeper than approximately 250 feet below ground surface and overlies the Principal aquifer, which is generally over 1,000 feet thick throughout much of the basin and supports over 90 percent of basin pumping. The Deep aquifer contains colored water in the coastal area and is more than 2,000 feet deep throughout much of the basin. These three aquifer systems, from shallow to deep, are also referred to as aquifer layers 1, 2, and 3.

Figure 3-3. Schematic Cross-Section of the Basin Showing Three Aquifer Layers



Methodology

The new three-layer storage change approach is based largely on the aquifer configuration, structure, and storage coefficient parameter values defined during development of the basin model. Unlike the traditional method, all three of the basin's aquifer systems are included in this new methodology. Furthermore, the storage coefficient values used in this new method are specific to each aquifer layer and were refined during dynamic or transient calibration of the basin model until the resulting model-generated water levels achieved a close match with observed water level data throughout the basin.

The basic formula used to calculate the change in storage is very similar to the traditional method, but now must be carried out for each of the three aquifer layers. The storage change equation is defined as

Storage Change = (Water Level Change) x (storage coefficient) x (horizontal area)

The storage change for each of the three aquifer layers is thereby calculated and the results of all three summed to get the total storage change in the basin.

Figure 3-4 shows a schematic cross-section illustrating the three aquifer layers of the basin and how they differ in terms of their respective storage coefficient (S) values. Whereas the traditional method had presumed that the Forebay area behaved entirely as one large unconfined aquifer without any intervening clay layers, our current understanding of the basin is that only the Shallow aquifer in the Forebay area is truly unconfined. As was discussed in Sections 3.1 and 3.2, the majority of the storage change in the basin occurs specifically in the Shallow aquifer within the Forebay area where the rising or falling unconfined water table respectively fills or drains empty pore space. Shallow aquifer storage coefficient values in the Forebay area are approximately 0.1, but in some specific Forebay locations can be as high as 0.25, which is approximately equivalent to the porosity of the sediments at the water table/vadose zone interface.

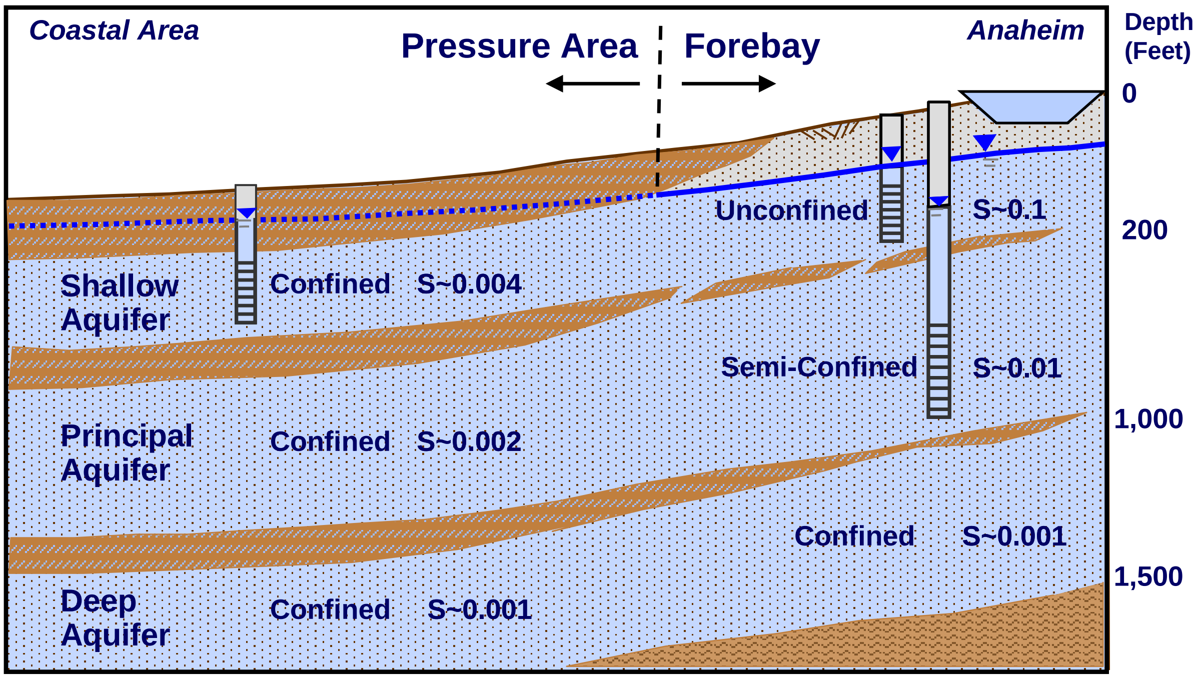
Figure 3-4 illustrates how the Shallow aquifer is confined in the Pressure area of the basin. By definition, the Pressure area ends where the water level drops below the elevation of the overlying aquitard and/or where the aquitard no longer exists. In the Pressure area, the Shallow aquifer storage coefficient values are approximately 0.004, or approximately 25 times smaller than in the unconfined Forebay area. This means that for a given water level change in the Pressure area, the resulting change in storage would be 25 times less than for that same water level change observed in the unconfined Forebay area.

As shown in Figure 3-4, the Principal aquifer is largely separated from the overlying Shallow aquifer by an extensive aquitard in the coastal and mid-basin areas. In the inland Forebay area, this intervening aquitard becomes intermittent but does not vanish completely, causing some hydraulic separation from the Shallow aquifer while still allowing large amounts of water to migrate downward into the Principal aquifer. As schematically shown in Figure 3-4, Principal aquifer water levels frequently differ from those in the Shallow aquifer due to the hydraulic separation, as was also shown in Figure 3-2 for multi-depth monitoring well SAR-2 near Burris Basin, where observed water levels in the Principal aquifer are noticeably lower than in the Shallow aquifer. The Principal aquifer is thus considered to be semi-confined in the Forebay area, with storage coefficient values of approximately 0.01, which is at least 10 times less than in the unconfined Shallow aquifer.

The Deep aquifer is generally confined throughout the entire basin and is separated from the overlying Principal aquifer by an extensive aquitard that thins somewhat in the Forebay area but remains laterally extensive. Therefore, since water level changes in the Deep aquifer represent pressure responses and thus do not involve filling or draining of pore space, storage coefficient values are typically small at approximately 0.001 throughout the entire basin.

The storage coefficient values shown in Figure 3-4 and discussed above are typical values for each of the three aquifer layers. The actual storage coefficients used in the storage change calculation not only vary for each aquifer layer but also vary spatially across the basin in both the Pressure and Forebay areas. From the basin model calibration, the different storage coefficient values within each aquifer layer are subdivided into detailed zones. For reference, these zonal storage coefficient maps are included in Appendix 2. These storage coefficient values in the Forebay area of the Shallow aquifer are generally consistent with the Randall coefficients traditionally used.

Figure 3-4. Schematic cross-section showing storage coefficients (S) values



The other component of the storage change formula not yet discussed is the water level change. To obtain the water level change involves constructing water level contour maps for each of the three aquifer layers, both for the previous and current year.

Preparation of the water level contour maps for each aquifer layer requires a considerable level of interpretation of the actual data points as well as interpolation between data points. The reported water level data is not always 100 percent accurate and must be reviewed on a well-by-well basis as the contour map is being constructed. Reasons for disqualifying or adjusting observed water level data during the contouring process may include:

- A static water level from a production well may have been measured only minutes after shutting off the well pump;
- Erroneous water level field measurement (e.g., bad equipment);

- Water level measurement taken too early or too late (for the June and November contour maps, attempt to measure all water levels within a two-week window);
- Wells are screened at different depths and some wells are screened across multiple aquifers such that water level data not entirely representative of any one aquifer layer being contoured.

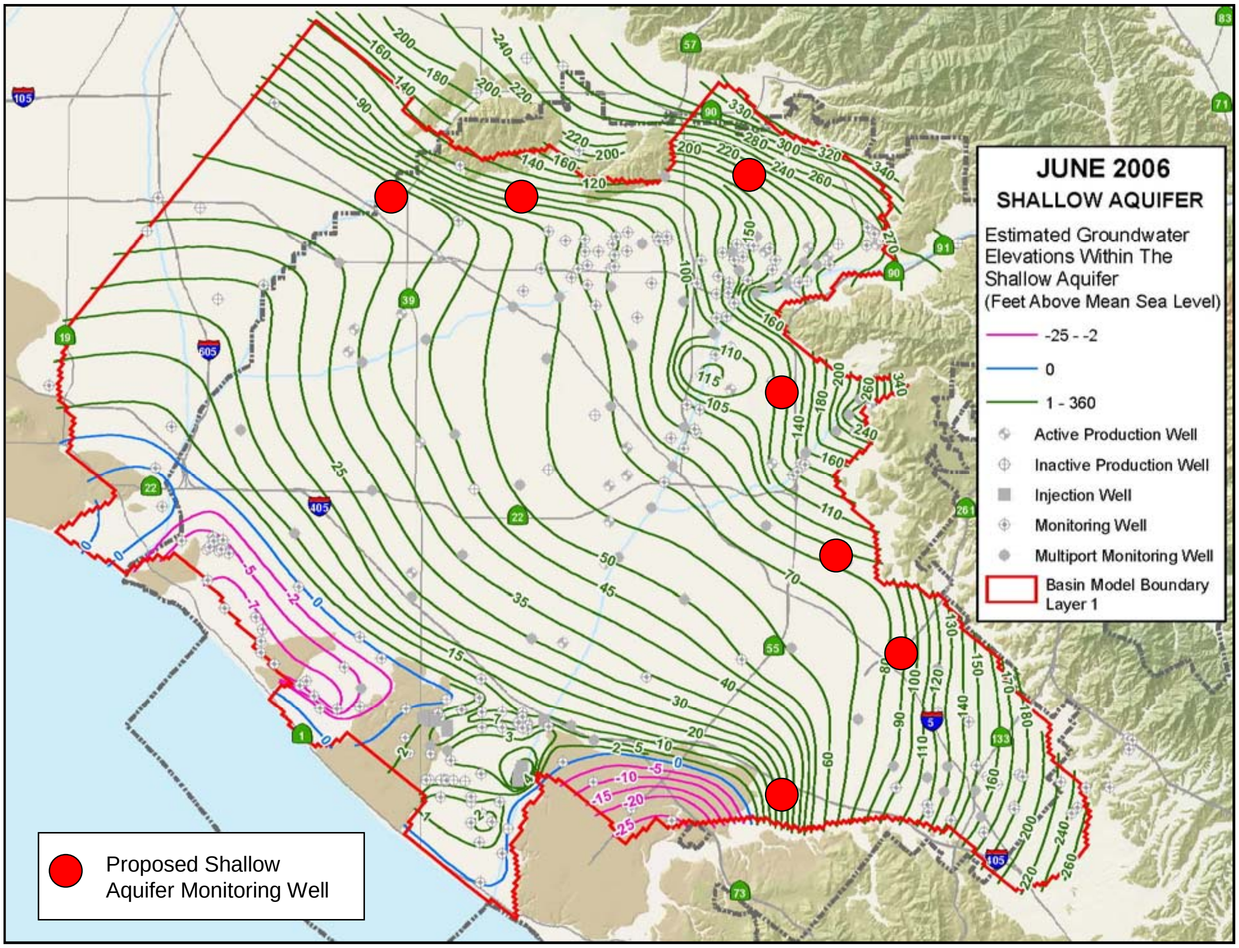
In addition to the above reasons for screening the observed water level data points, extreme care and consistency must be exercised from one year to the next when contouring and interpolating between data points, especially in sparse areas lacking sufficient data to definitively define the shape of the contours. Barring any new wells or data, water levels should be similarly interpreted in these areas from year to year so that false storage changes are not artificially created. Knowledge of the aquifer's characteristics, presence of geologic faults, regional flow regime, and vertical relationship with the other aquifers have proven useful in determining the contour patterns in a given area.

Of the three aquifer layers, the Principal aquifer has the best water level data coverage thanks to more than 200 large system production wells monitored by each respective groundwater producer, as well as District monitoring wells throughout the basin. Historically, this predominance of available water level data for the Principal aquifer and lack thereof for the Shallow and Deep aquifers is a likely reason that the traditional storage change method only considered the water level change in the Principal aquifer.

Much more water level data exists today for the Shallow aquifer than in the past, primarily due to the District's network of monitoring wells, many of which monitor multiple aquifer zones at one well site, helping to decipher the vertical relationship between the Shallow and deeper aquifers and their degree of hydraulic connection. Since the majority of the storage change in the basin occurs in the unconfined portion of the Shallow aquifer within the Forebay area, the constructed water level contours are of utmost importance in those inland areas. Unfortunately, data is sparse in a few of these outlying areas of the basin. Therefore, to increase the accuracy of the Shallow aquifer contour maps and thus the accuracy of the storage calculation, approximately six new shallow monitoring wells are recommended to fill data gaps in the areas of Buena Park, Costa Mesa, Fullerton, Orange, Irvine, and Yorba Linda. Figure 3-5 shows the approximate desired locations for these six proposed wells.

Figure 3-5 also shows the water level contours for the Shallow aquifer for June 2006. Just as for the other two aquifer layers, these contours where hand drawn based on observed water level data from wells screened in the Shallow aquifer (shown in light gray in Figure 3-5). The hand-drawn contours were then digitized into the computer for calculation purposes. Note that the contours were drawn out to the boundary of the basin model layer 1 which extends into LA County, but during the storage calculation process the LA County portion is excluded.

Figure 3-5. June 2006 Shallow Aquifer Groundwater Elevations and Proposed Wells



GIS Application for Three-Layer Storage Change Calculation

A new GIS application was developed and programmed to automate the new three-layer storage change calculation utilizing the digitized water level contour maps for each aquifer layer as well as the storage coefficient values from the basin model.

The new GIS application consists of a series of steps governed by programs written in the AML scripting language within the Arc/Info environment. A detailed description of these steps, along with all the AML codes written for this application, is included in Appendix 4.

The digitized water level contours are converted into GIS compatible files (grids) at the same refined resolution as the basin model input parameters, essentially subdividing the entire basin into 500-foot square grid cells. The GIS application then carries out the storage change formula one grid cell at a time for each aquifer layer, calculating the water level change between the two years in question and multiplying by the storage coefficient and horizontal area of the grid cell. Then, the storage change of all grid cells is summed for each layer. The total change in storage is then the corresponding sum of all three aquifer layers.

When calculating the storage change at each grid cell, the GIS application must check to determine if the conditions are confined or unconfined. Generally, the Principal and Deep aquifers are typically confined, but the Shallow aquifer is confined in the Pressure area and unconfined in the Forebay area, with the dividing line between these two areas being dependent upon the actual water level elevations at that time. If the water level is above the top of the aquifer layer (per the basin model layer elevations), then a confined storage coefficient is used for that grid cell; otherwise, if the water level is below the top of that aquifer layer, then a larger unconfined storage coefficient is used. To further complicate matters, the water level change in question from Year 1 to Year 2 may cause a given grid cell in the Shallow aquifer to switch from confined under Year 1 conditions to unconfined under the Year 2 conditions, or vice versa. The GIS application handles this type of condition by subdividing the water level change into two components: a confined portion and an unconfined portion. This is illustrated in the sketch and “pseudo-code” algorithm that was written for this application prior to formal programming of the GIS application (Appendix 4).

The new GIS application for the three-layer storage change calculation was thoroughly tested and necessary refinements were made to the AML codes. Water level change and storage change calculations were hand checked and verified at individual grid cells having both confined and unconfined conditions. Also, the storage change results for each aquifer layer were verified to be identical in magnitude but opposite in sign if switching the order of what is predefined as Year 1 or Year 2. For example, if the storage change from Year 1 to Year 2 was calculated to be 10,000 af, then the storage change from Year 2 to Year 1 calculates to be exactly -10,000 af.

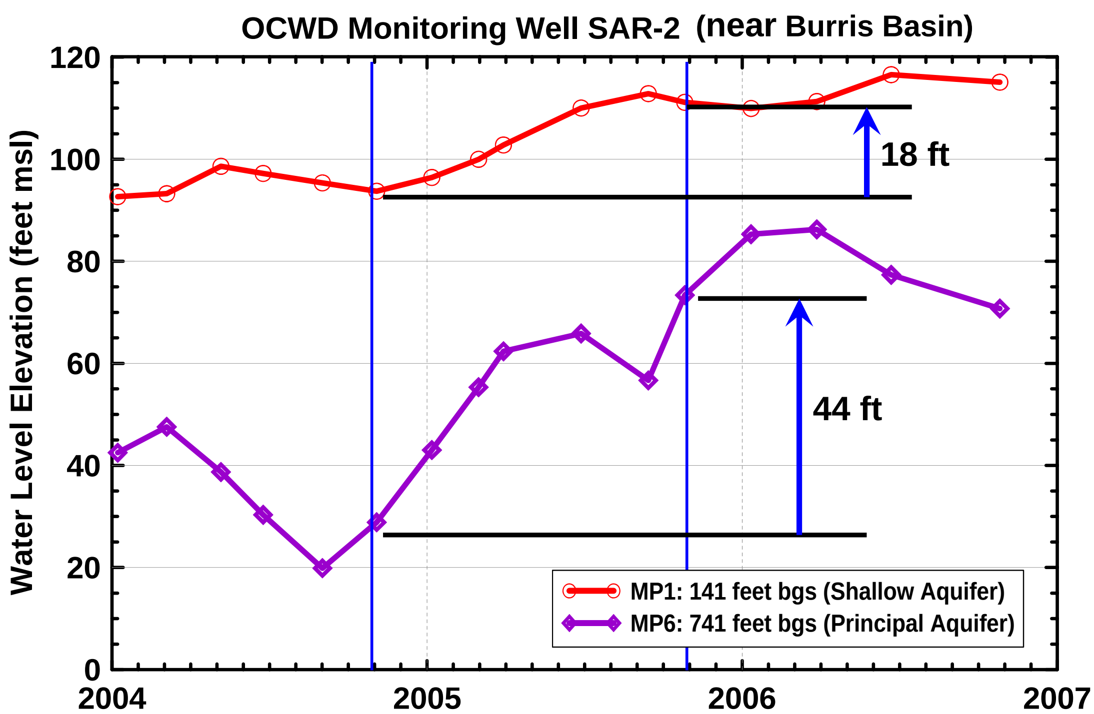
Testing the Three-Layer Method vs. the Traditional Method

Test Case 1 compared the new three-layer storage change calculation to the traditional method using the annual period November 2004 to November 2005. This first test case represented an extremely wet year with record-setting rainfall and a huge storage change of +187,000 af using the traditional method with the existing November contour maps of the Principal aquifer. Using the new three-layer approach led to a storage change of +147,000 af for the same period.

The rather large discrepancy of 40,000 af in Test Case 1 is primarily due to the inaccuracy of the traditional method presumption that Principal aquifer water levels behave identically to Shallow aquifer water levels in the Forebay area. As was shown in previous sections, this is not always the case and was especially not the case during 2004-05 when the Principal aquifer rose much more than the Shallow aquifer in most Forebay locations.

Figure 3-6 shows water levels for multi-depth monitoring well SAR-2 near Burris Basin in the Anaheim Forebay area. Notice that the water level change from November 2004 to November 2005 in the Principal aquifer zone was more than double that for the Shallow aquifer zone at that location. Since this was the case throughout much of the Forebay area, the traditional method overestimated the storage change by using Principal aquifer water levels as a surrogate for the Shallow aquifer.

Figure 3-6. November 2004-05 Water Level Change at Monitoring Well SAR-2

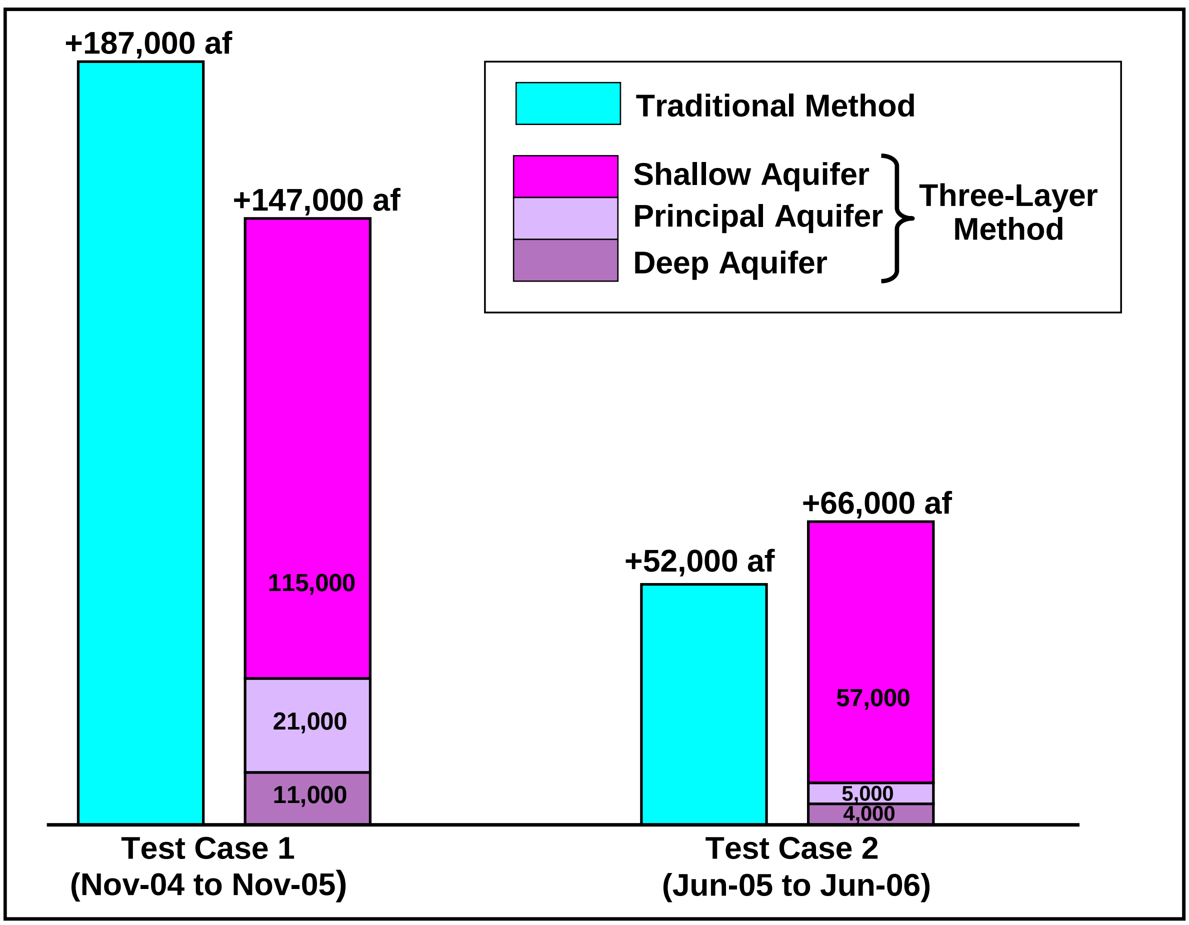


Test Case 2 compared the new three-layer method to the traditional method for the most recent water year, June 2005 through June 2006. This water year was chosen because it not only represented the most recent conditions but it was also an approximately average rainfall year in contrast to the extremely wet year in Test Case 1. As was mentioned in previous sections, care was exercised to maintain consistency of how the water level data was interpreted and hand contoured for both of these years to prevent any false or "manufactured" water level changes between the two conditions.

For Test Case 2, the traditional method yielded a storage change of +52,000 af, whereas the new three-layer method yielded a slightly higher storage change of +66,000 af. The two methods yielded much closer results for this average hydrology year, indicating that the traditional method is at least "in the ballpark" during more typical years when water levels are not as drastically rising or falling. In these closer-to-average years, the traditional method presumption that Principal aquifer water levels behave similarly to the Shallow aquifer is not grossly inaccurate. However, since the new three-layer approach is more comprehensive and utilizes all three aquifer layers, it represents a technical improvement upon the traditional method and is the preferred approach.

Figure 3-7 summarizes the results from both test cases 1 and 2 and schematically shows the storage change per aquifer layer for the three-layer method. As expected and as was discussed in earlier sections, the majority of the storage change occurred in the Shallow aquifer. The majority of basin pumping (over 200,000 afy) occurs from the Principal aquifer, which is continuously being fed by the Shallow aquifer, which in turn is being fed by the District's recharge activities (typically over 200,000 afy). If basin pumping exceeds total recharge over a given year, then the Principal aquifer draws more water out of the Shallow aquifer than what is coming in from recharge, resulting in an annual storage decrease in the Shallow aquifer. Conversely, if recharge exceeds basin pumping over the course of a year (especially in a wet year), then more recharge is entering the Shallow aquifer than what is flowing down into the Principal aquifer, causing Shallow aquifer water levels to rise and a resulting storage increase.

Figure 3-7. Summary of Traditional vs. Three-Layer Storage Change Results

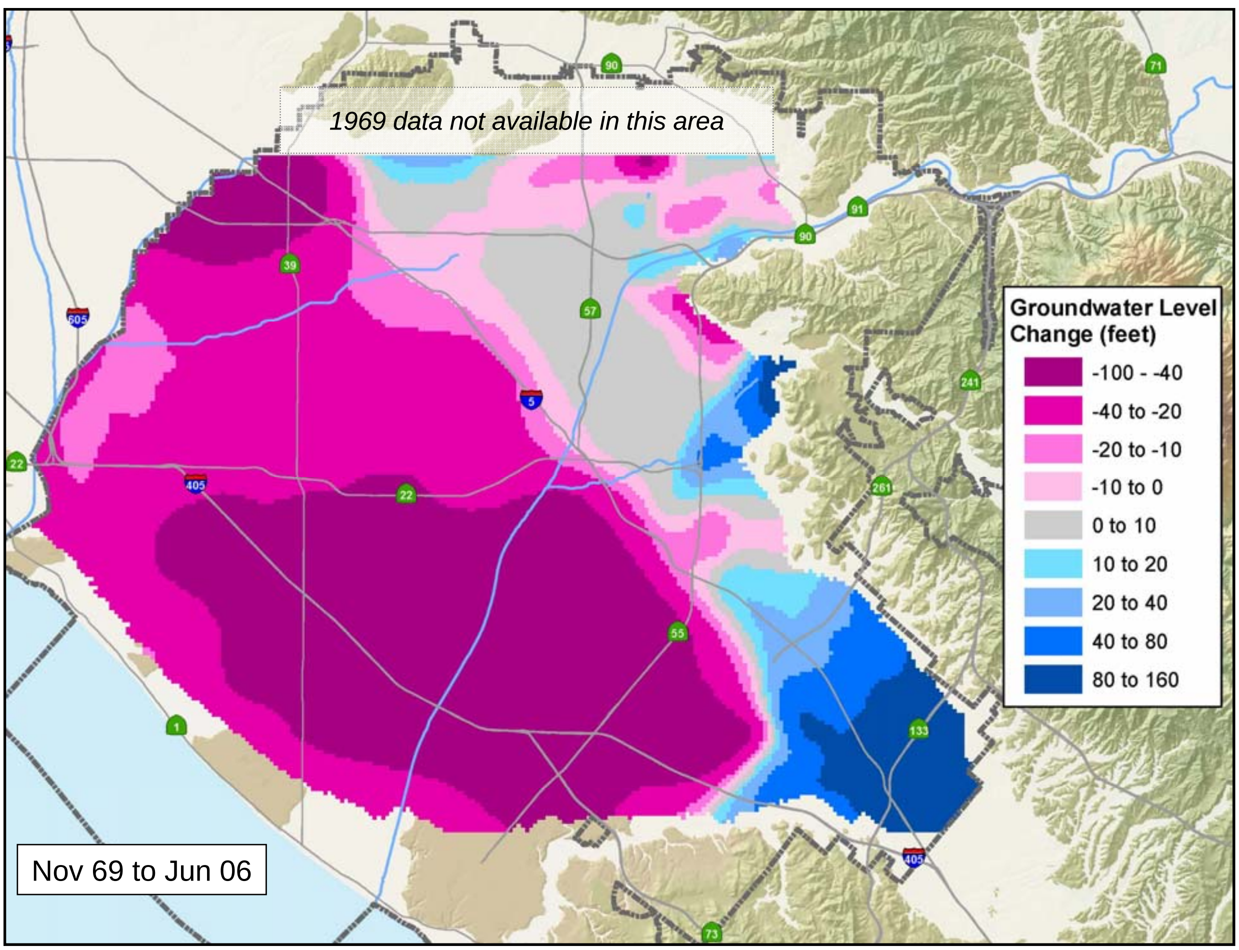


4. NEW FULL BASIN BENCHMARK

Since a new three-layer method was developed and tested for calculating the change in storage, a new full basin benchmark must be defined for all three aquifer layers so that the accumulated overdraft can ultimately be calculated.

In Section 1, it was shown that 1969 water levels no longer represented a full basin given the significantly different pumping and recharge conditions that exist today. In fact comparing the November 1969 water level contour map to the recent June 2006 Principal aquifer contour map shows that in much of the Forebay area, Principal aquifer water levels are already higher in June 2006 than they were in November 1969 when the basin had historically been considered full (see Figure 4-1). The Irvine Forebay area was over 80 feet higher in June 2006 than 1969 due to reduced agricultural pumping over the years. As was discussed in Section 1, because of increased utilization of the groundwater basin, i.e., increased pumping and recharge, higher Forebay water levels can be achieved while coastal water levels remain lower, resulting in a steeper basin gradient.

Figure 4-1. Principal Aquifer Water Level Change: November 1969 to June 2006



4.1 Assumptions and Methodology

A water level contour map representing a reasonable full condition was developed for the Shallow, Principal, and Deep aquifers. The resulting full water levels represent a “snapshot” of a peak high water level condition throughout the basin that could possibly be exceeded but with potentially detrimental impacts.

Defining how high basin water levels can rise before being considered full was largely based on a comprehensive review of relatively recent historical high basin conditions that occurred approximately in 1994 and 2006. The high basin conditions that occurred in 1969 and 1983 were briefly reviewed but were deemed of less direct value since basin pumping and recharge patterns were significantly different then.

Much of the groundwater basin achieved historical highs during 1994, with the coastal area peaking in the winter and the Forebay area in late spring or early summer. A similar lag in the seasonal timing of the coastal and Forebay area water level peak was observed during the recent high condition of 2006. Typically after a very wet winter, surplus storm runoff impounded behind Prado Dam is still being released for OCWD recharge operations well into the summer months, thus increasing Forebay recharge amounts, which in turn raise Forebay water levels at a time when coastal water levels are already beginning to decline in response to summer pumping. However, also during wet years, MWD has surplus water; thus, taking additional imported water in-lieu of groundwater pumping can extend into the summer months, which would prevent or delay coastal water levels from declining. Therefore, for the purposes here of defining a basin-wide full condition, it is assumed that water levels can concurrently peak to a full condition throughout the basin.

The full condition that was developed for all three aquifer layers represents the highest achievable water levels throughout the basin under realistic present-day operating conditions without incurring any regional-scale detrimental impacts. In general, coastal water levels were assumed to be at or very near the 1994 and 2006 winter highs, whereas the Forebay area was assumed to be at or slightly above the 1994 and June 2006 highs. In so doing, the full basin coastal water levels were high enough to be protective against seawater intrusion but not unnecessarily high to where shallow groundwater seepage could become an issue. In the Forebay area, full basin water levels were generally well below ground surface and at or near the bottom of deep recharge basins (as occurred in June 1994). Therefore, in the Forebay area, water levels any higher than this full condition may be physically possible but would likely impact recharge operations and lead to considerable mounding problems.

Other assumptions that define the new full basin condition are enumerated below.

1. Full basin flow patterns (shape of the water level contours) are representative of present-day pumping and recharge conditions (except where specifically noted) and thus are largely based on and consistent with actual water level contour maps constructed for the recent high conditions of January 2006 and June 2006.

2. Water levels in the Irvine Sub-basin were at historical highs during 2006 because of the extremely wet year 2004-05 and reduced Irvine Company agricultural pumping. The new full condition in the Irvine Sub-basin is thus based on this recent high condition, which inherently then excludes the Irvine Desalter Project (IDP). The IDP will significantly lower Irvine area water levels for many years to come, but the regional drawdown and resulting water levels in that area are uncertain and may take several years to stabilize. Previous basin model scenarios including IDP pumping estimated that approximately 50,000 af of storage decline in the Irvine Sub-basin could occur after 20 years of full-scale IDP pumping. With this in mind, the new full condition will not likely be achievable in the Irvine Sub-basin after the IDP goes on-line.

3. Based on the earlier assumption that this new full condition is protective against seawater intrusion, full basin water levels in the MCWD area were based on the historical high of 1994 rather than the somewhat lower water levels during the 2006 high condition. The 1994 water levels in the MCWD area were higher than in 2006 because the MCWD colored water project was not yet active in 1994. Therefore, the new full basin water levels in that immediate area inherently assume no MCWD colored water project (i.e., no pumping from Well MCWD-6) in order to define a condition sufficiently protective against seawater intrusion.

4. Full basin water levels in the immediate area of the Talbert Barrier were adjusted slightly higher than recent high conditions to account for the GWR Phase 1 barrier expansion soon to be on-line. Some of these new injection wells, including the four wells along the Santa Ana River just north of Adams Avenue, are already on-line and thus the observed water level rise due to these wells was used in the full basin condition.

5. Full basin water levels were raised slightly higher than either of the historical highs of 1994 or 2006 in areas where other near-term recharge projects are already planned, including La Jolla Basin and Santiago Creek recharge enhancements. However, especially in the case of Santiago Creek, full basin water levels were kept sufficiently below ground surface and known landfill elevations.

4.2 Shallow Aquifer Full Basin Water Level Map

Full basin water levels for the Shallow aquifer were based largely on the historical high water levels observed in 1994 and 2006. Only wells with a screened interval generally in the range from 100 to 250 feet below ground surface (depending on the specific area) were used to ensure that these wells were representative of the Shallow aquifer. This depth restriction excludes most large system production wells. Therefore, the majority of wells used to construct the Shallow aquifer full basin water level map were District monitoring wells, along with some small system and domestic wells having sufficient water level histories. Fortunately, the majority of the District's monitoring wells were constructed early enough so as to catch the 1994 high-basin condition.

Prior to this study, Shallow aquifer water levels were not regularly contoured, but Shallow aquifer contour maps (basin model layer 1) had been constructed during basin model development and much was learned about the hydraulic characteristics and flow patterns of the Shallow aquifer. Subsequently for testing the new three-layer storage change method described in Section 3, water level contour maps were constructed for all three aquifer layers using observed data for both June 2005 and June 2006. Fortunately, June 2006 also represented a high-basin condition from which to use as a base for making adjustments up to the new full condition.

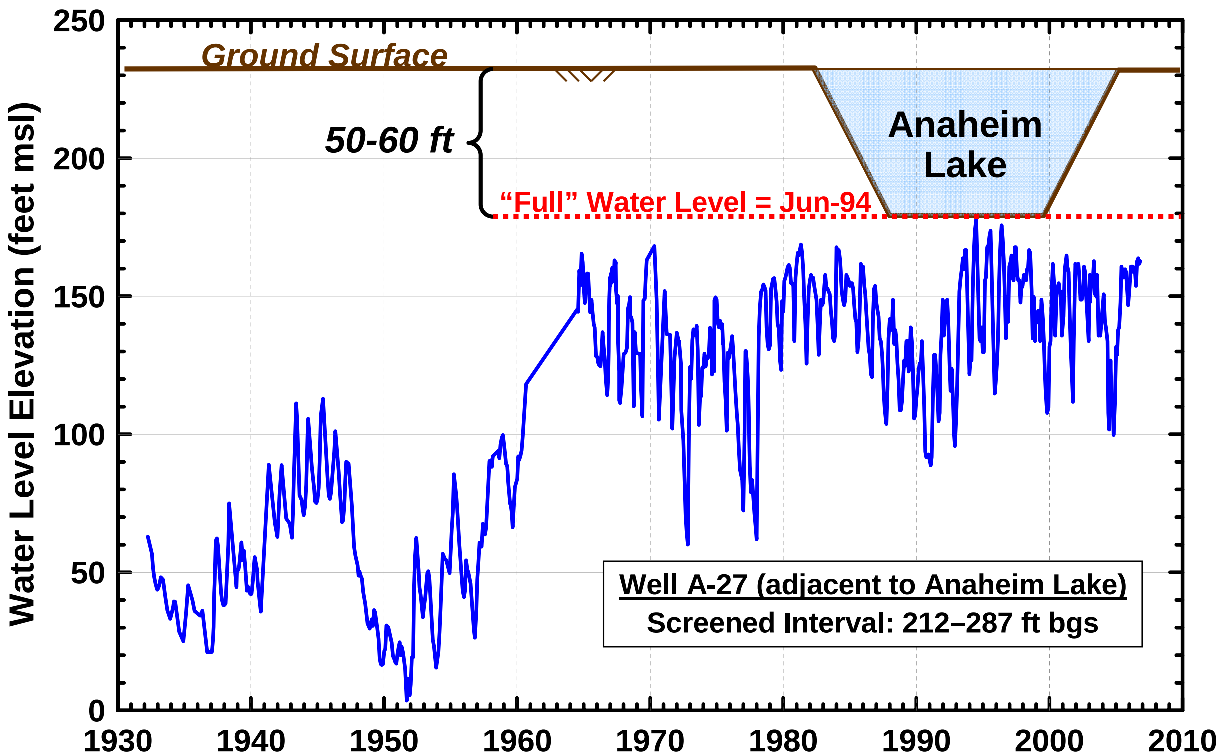
In the coastal and mid-basin areas, high water levels that peaked in January 2006 were generally adhered to and used for the full condition in those areas. This represented a condition high enough to be protective of seawater intrusion, but anything appreciably higher could potentially result in shallow groundwater seepage problems in low-lying areas. In the immediate area surrounding portions of the Talbert Barrier, the observed January 2006 water levels were adjusted upward approximately 5 feet to account for increased injection from new GWRS Phase 1 injection wells. In the area surrounding the GWRS treatment plant site where considerable construction dewatering was occurring during January 2006, full water levels were based on earlier historical highs that were nearly 15 feet higher than January 2006 in this immediate area.

In the Forebay area, full basin water levels were generally set from 0 to 15 feet above the higher of the two historical peaks that occurred in June 1994 and June 2006. The magnitude of the upward adjustment between 0 and 15 feet depended on conditions at each well location and was most significantly influenced by the relative depth of the water table from ground surface. Since relatively little pumping occurs from the Shallow aquifer, the unconfined water table in the Forebay area is largely considered to be a subdued reflection of topography, with the exception of directly beneath recharge basins where the Shallow aquifer water table tends to rise in response to percolation. From analysis of the Forebay historical highs (June 1994 and/or June 2006), Shallow aquifer water levels generally peak at an elevation that corresponds to a depth of approximately 50 to 60 feet below ground surface. Therefore, when setting the full basin water level elevations at various well points and especially in areas where little or no data existed, the 50- to 60-foot depth to water rule of thumb was generally maintained.

Since the majority of the storage change in the basin occurs in the Shallow aquifer within the Forebay area, the full basin water level condition in this area is crucial. A discussion of the full basin Shallow aquifer water level adjustments for specific regions of the Forebay is described below.

At Anaheim Lake and Kraemer Basin, full basin water levels were set at June 1994 observed levels with no upward adjustment since these levels were essentially at or even a couple feet above the deepest portion of Anaheim Lake, which is approximately 50 to 60 feet deep (see Figure 4-2), which is consistent with the depth to water rule of thumb mentioned above. Water levels any higher at this location, if even achievable, would likely impede percolation from these basins and thus would not be desirable.

Figure 4-2. Full Basin Water Level at Anaheim Well 27



At Santiago Pits, full basin water levels were set at the historical high of March 1993 (just slightly higher than June 1994) with no upward adjustment. This same identical high was reached but not exceeded more recently in June 2005 after the extremely wet winter of 2004-05. Having the observed water levels peak at the same exact same level in 1993 and 2005 may likely indicate that this repeatable historical high may represent the highest physically achievable water level for this area.

In the Anaheim/Fullerton area west of the District's spreading grounds, full basin water levels were set 10 to 15 feet higher than the new historical high of June 2006. Water levels in June 2006 exceeded the previous historical high of June 1994 and appear to still be on an upward trend. The upward adjustment of 10 to 15 feet from the June 2006 observed condition once again brought the water table up to approximately 50-60 feet from ground surface.

Along the Santa Ana River downstream of Lincoln Avenue, full basin water levels were set 5 to 10 feet higher than the new historical high of June 2006, which exceeded the previous high of June 1994 in this area as well. The upward adjustment of 5 to 10 feet above the historical high once again brought the full condition up as shallow as 40-50 feet from ground surface, likely being influenced by the recharge from the Santa Ana River and Burris Basin. This full level also corresponds approximately to the bottom elevation of Burris Basin, analogous to the full level adjacent to Anaheim Lake.

In the Irvine Forebay area, full basin water levels were set within 5 feet of the historical high, which either occurred in 1994, 1999, or 2006 depending on the exact location within this general area. Recall from the previous section that this new full condition is prior to full-scale IDP pumping. Although the majority of IDP pumping will be from the Principal aquifer, Shallow aquifer water levels will likely also decline.

Finally, in the mid-basin Pressure area, full condition water levels were modestly adjusted upward 5 to 10 feet from the new historical high of June 2006, which again significantly exceeded the previous high of June 1994. This slight upward adjustment maintains a reasonable gradient from the coast to the upwardly adjusted full water levels in the Anaheim Forebay area.

After making all the full condition water level adjustments at monitoring well points in the various areas described, the resulting full water levels were plotted on a map and hand contoured similarly to the observed water levels of June 2006. In fact, the June 2006 contour map was used as a guide or backdrop on the light table while contouring the full condition to ensure consistency, especially in outlying areas lacking data.

Figure 4-3 shows the resulting full water level contour map constructed for the Shallow aquifer. Also shown for reference is the June 2006 Shallow aquifer contour map directly below it. Note the similarity in the shape of the contours between the two maps. The various well points screened in the Shallow aquifer that were used for constructing these contour maps are shown in light gray. The red boundary represents the basin model layer 1 boundary which represents the extent of the Shallow aquifer along the mountain fronts where the aquifer terminates and on the western boundary represents an arbitrary cutoff 5 miles into LA County. Contouring the water levels slightly into LA County adds confidence to the shape of the contours in west Orange County and at least qualitatively indicates the direction of flow across the county line.

Figure 4-4 shows the same two Shallow aquifer water level conditions (Full and June 2006), but in units of depth to water below ground surface rather than elevation. As was discussed above, notice that much of the Forebay area is within the 40 feet below ground surface or greater range since the Shallow aquifer water levels generally follow ground surface topography where the aquifer is unconfined (Forebay), except near recharge facilities where the depth to water is more shallow due to percolation raising the water table.

The depth to water also becomes shallower in the Pressure area of the basin where the Shallow aquifer is confined. However, these “water levels” are actually pressure or piezometric levels since the water is confined or trapped below the overlying aquitard. Water can only rise to this elevation if a well is drilled through the aquitard down into this aquifer or if the aquitard is thin or discontinuous. Notice that there is a large area in Irvine where the piezometric level is actually above ground surface in both the observed June 2006 and Full condition. This area has historically experienced artesian conditions when basin levels are relatively high.

Figure 4-3. Shallow Aquifer Groundwater Contours: Full Basin and June 2006

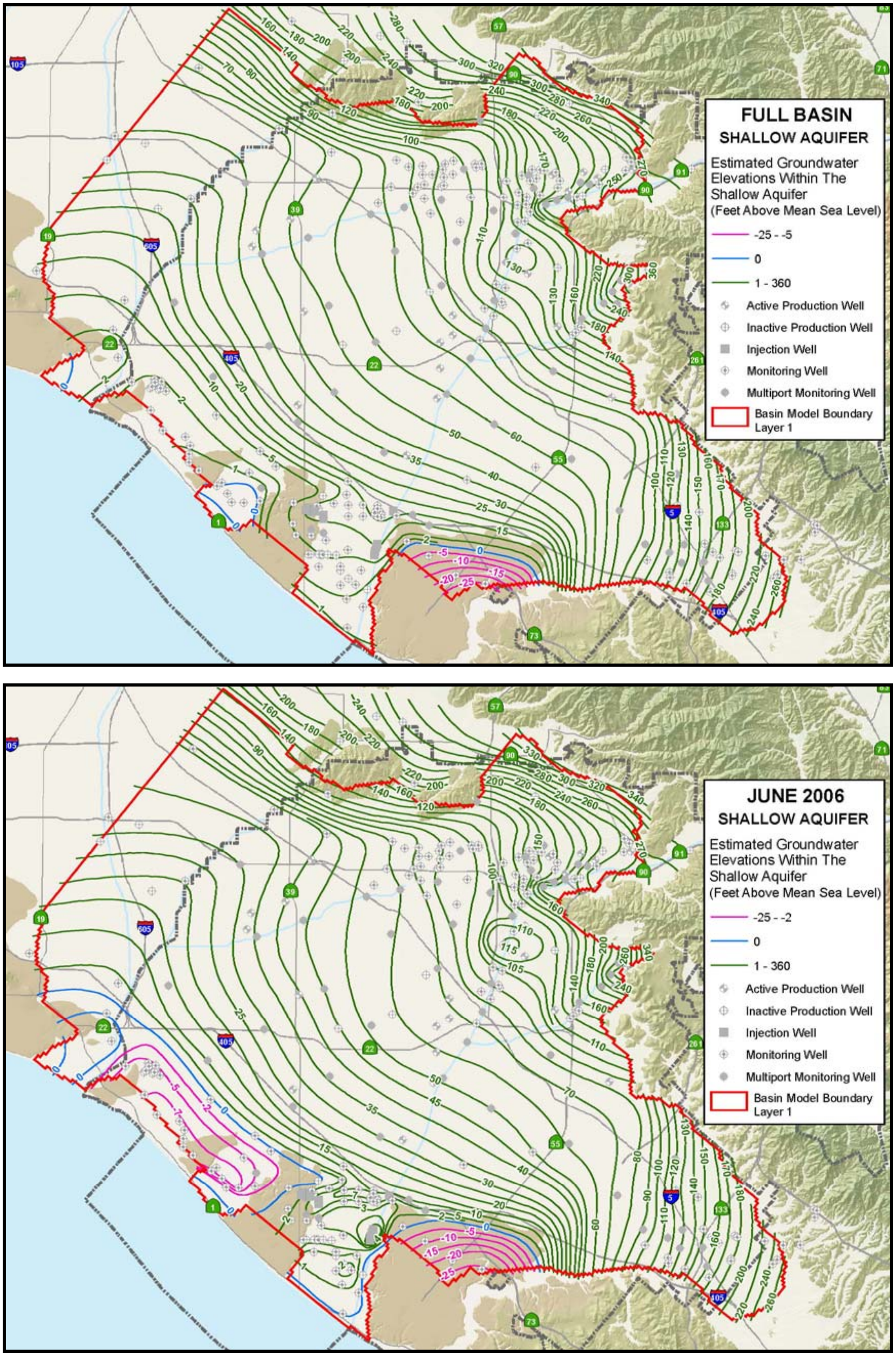
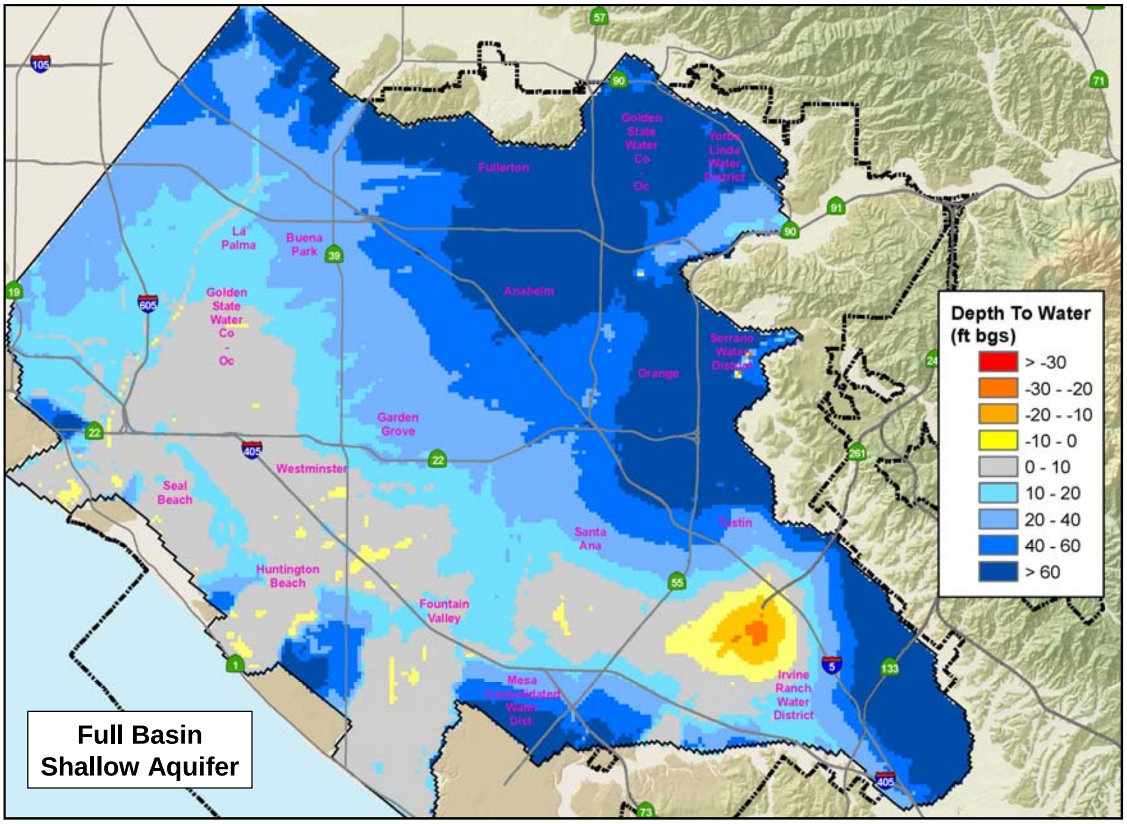
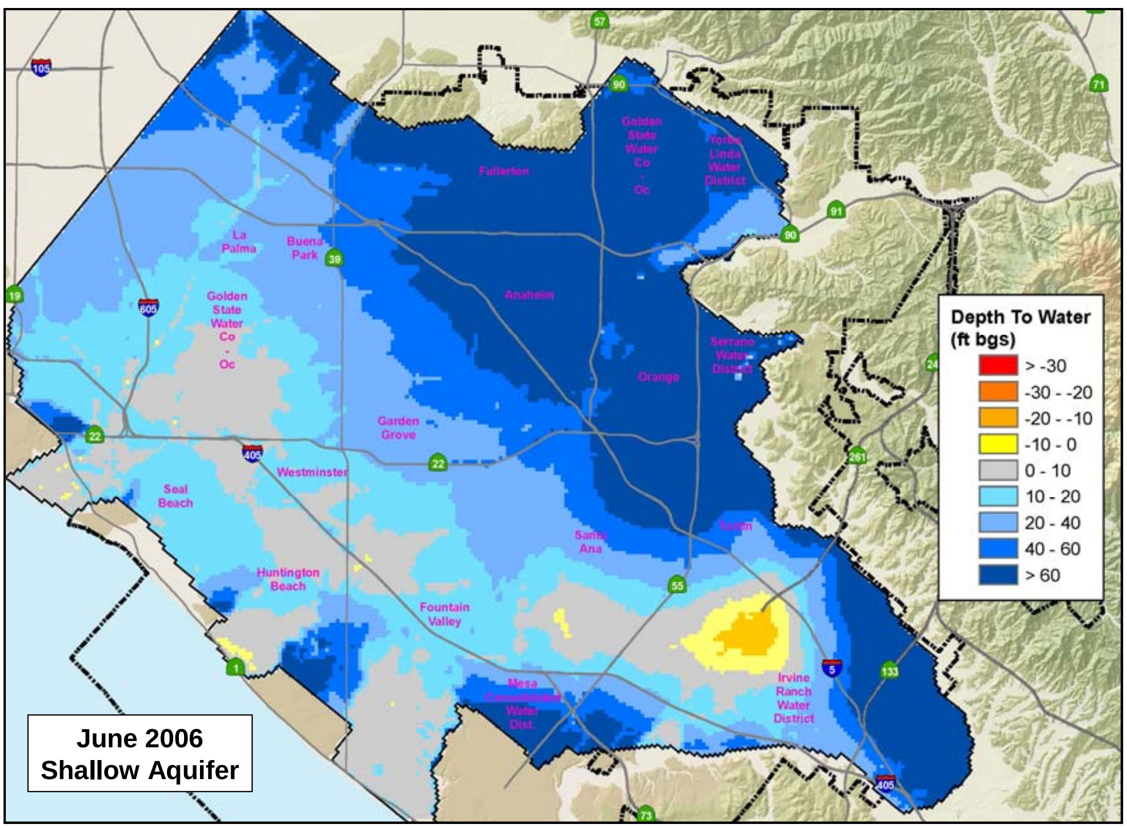


Figure 4-4. Shallow Aquifer Depth to Water: Full Basin and June 2006





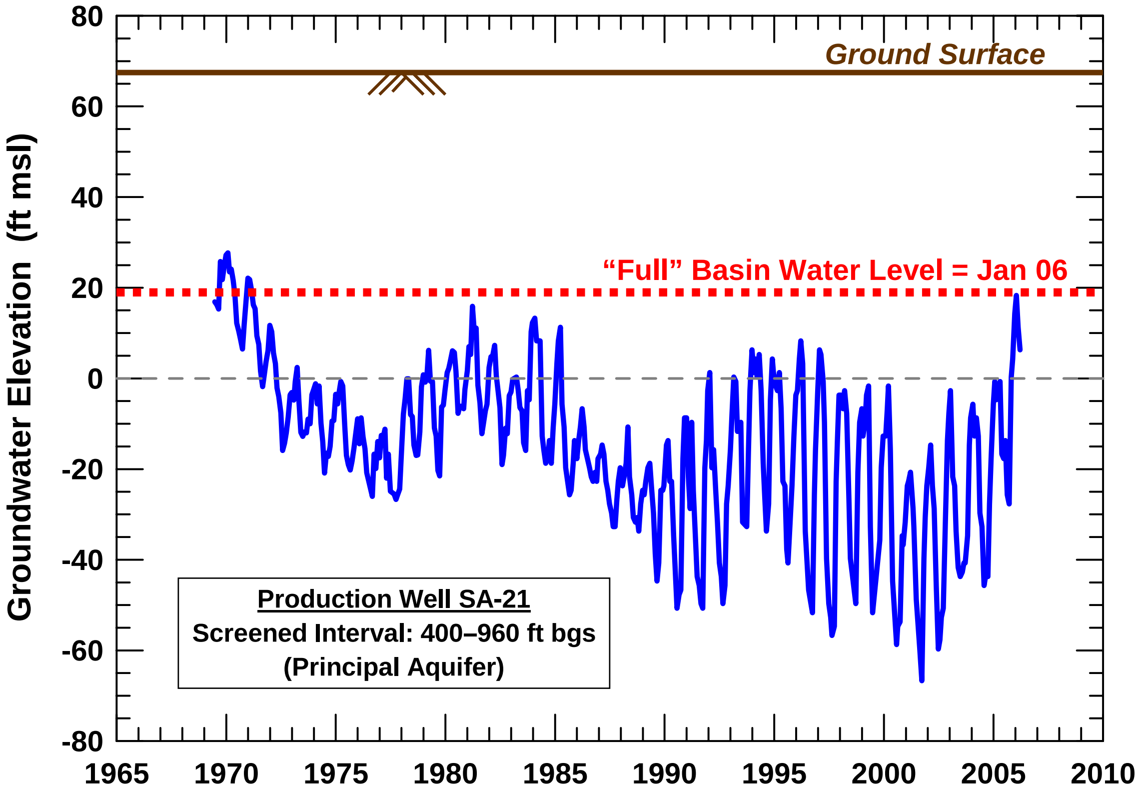
4.3 Principal Aquifer Full Basin Water Level Map

As with the Shallow aquifer, full basin water levels for the Principal aquifer were also based on the historical high water levels observed in 1994 and 2006. Wells with a screened interval generally within a range between 300 to 1,000 feet below ground surface (depending on the specific area) were used to represent the Principal aquifer. This depth interval includes most large system production wells, which along with District monitoring wells, were used to construct the Principal aquifer full basin water level map.

Prior to developing the full basin condition for the Principal aquifer, the high-basin water level condition of January 2006 was analyzed and contoured to determine the flow patterns and contour shapes for a most recent, near-full, actual condition. In subsequent months, observed water levels in the Forebay area increased further to a new historical high in June 2006, whereas in the coastal area January 2006 remained a historical high.

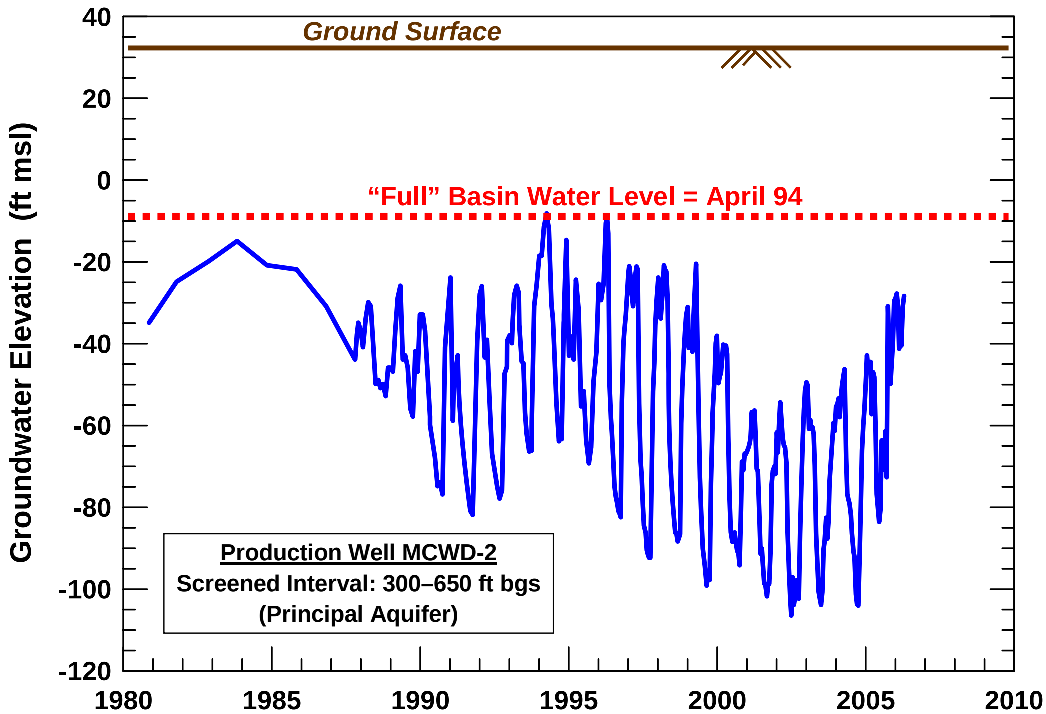
In the coastal area, full basin water levels were generally set at or within 5 feet of the observed peak January 2006 water levels, as was also done for the Shallow aquifer. In fact, this was the case for the majority of the Pressure area, where January 2006 water levels were noticeably higher than the previous high of 1994 (see Figure 4-5).

Figure 4-5. Full Basin Water Level at Santa Ana Well 21



The exception to using January 2006 water levels for the full condition in the Pressure area was in the MCWD area where the high condition of April 1994 was used. At this location, January 2006 water levels were 15 to 20 feet lower than April 1994 because of current pumping from the MCWD colored water project that did not exist in 1994. As was mentioned in the Section 4.1 assumptions, since the full condition must be sufficiently high in the coastal area to be protective of seawater intrusion, the older but higher April 1994 water levels were used in this area for the full condition even though it is not representative of present-day pumping in this immediate area (see Figure 4-6).

Figure 4-6. Full Basin Water Level at Mesa Consolidated Water District Well 2

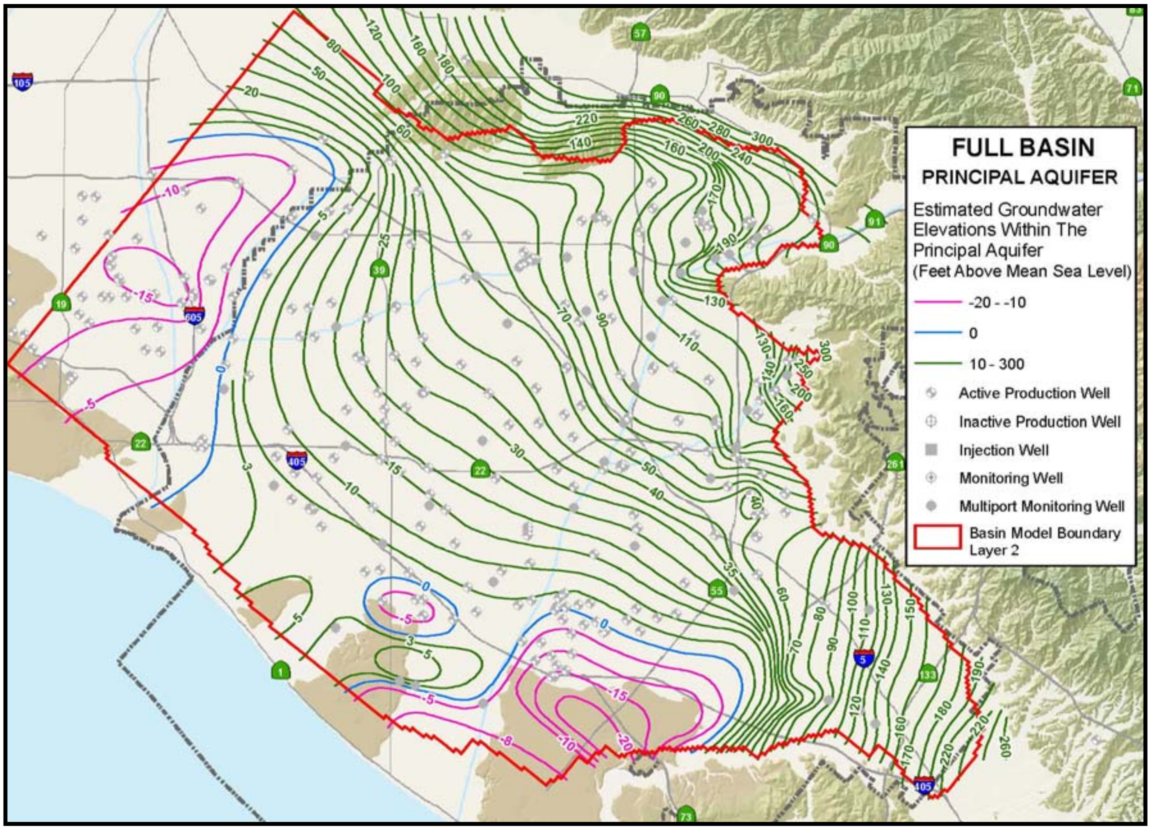


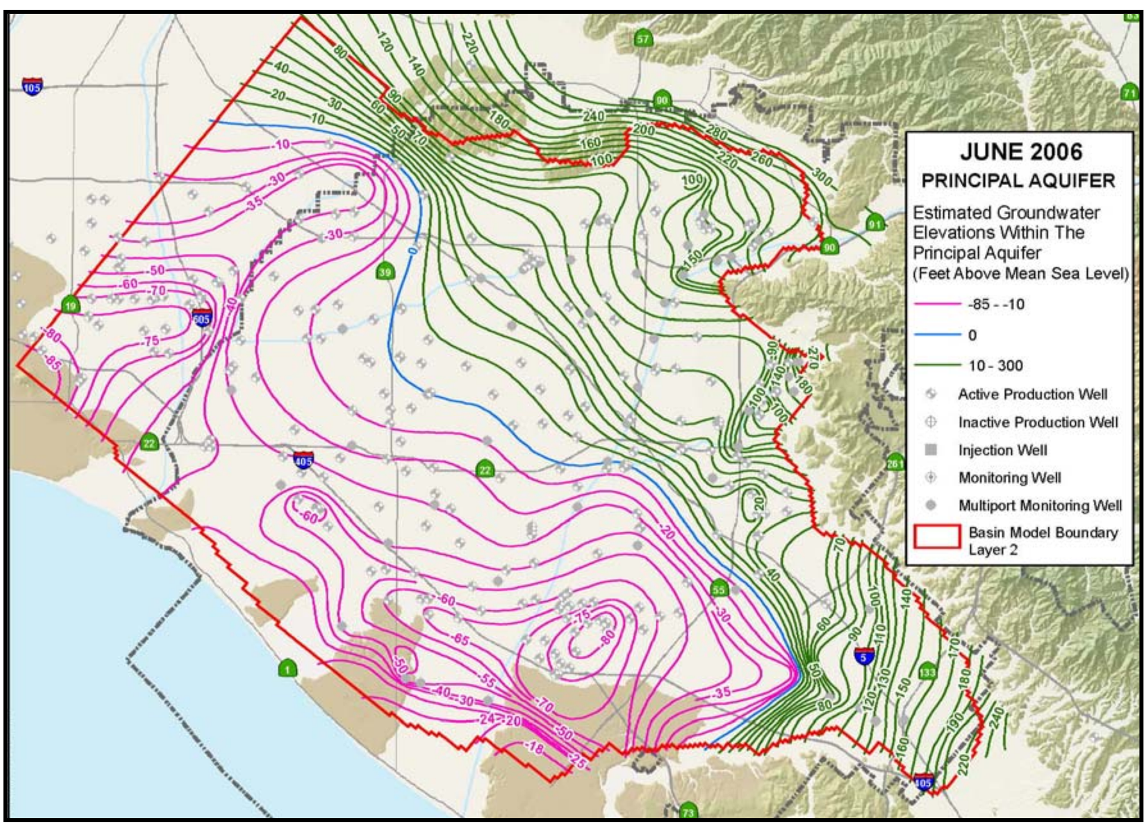
Throughout most of the Irvine Sub-basin, January 2006 represented a historical high similar to the rest of the Pressure area. Thus, full basin water levels in Irvine were also set within 5 feet of observed January 2006 levels. However, in north Irvine near the Santa Ana mountain front, 1999 water levels were used since they were nearly 15 feet higher than January 2006 in that immediate area.

In the Anaheim and Orange Forebay areas, full basin water levels were generally set at or within 5 feet of the historical high that occurred during March through June of 1994 depending on the exact location. For the majority of the Forebay area, 1994 still represented a historical high for the Principal aquifer, higher than January or June 2006.

Although the full water levels were based on different historical highs in different areas of the basin (coastal vs. inland), resulting gradients and flow patterns were reasonable and similar to those contoured for the observed data of June 2006 (see Figure 4.7).

Figure 4-7. Principal Aquifer Groundwater Contours: Full Basin and June 2006





4.4 Deep Aquifer Full Basin Water Level Map

For the Deep aquifer, the main data source for developing the full basin condition was water level data from the District's deep multi-port monitoring (Westbay) well network. Approximately two-thirds of these 56 wells were sufficiently deep and in appropriate locations overlying the Deep aquifer. Depending on the specific location, the monitoring ports of these wells that tap the Deep aquifer generally range from approximately 1,500 to 2,000 feet below ground surface.

In addition to the District's deep monitoring wells, a few other scattered well points that tap the Deep aquifer were used, such as two deep monitoring wells owned by the Water Replenishment District in LA County (very close to the county line).

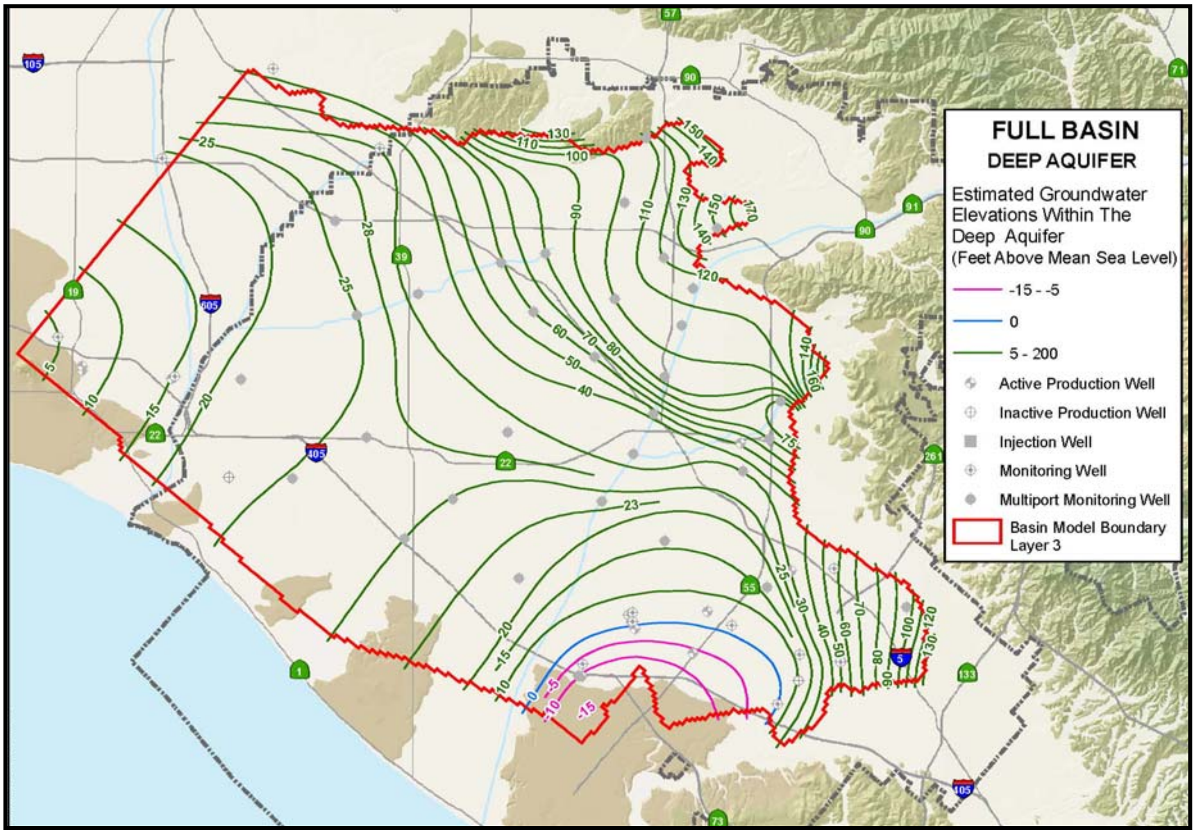
The new full condition for the Deep aquifer was predominantly based on the historical high that occurred in 1994. Throughout the basin, the recent June 2006 Deep aquifer water levels were still well below the historical high of 1994, likely due to the IRWD Deep Aquifer Treatment System (DATS) Project which began pumping approximately 8,000 afy of colored water in December 2001 from this otherwise little-used zone. Also, there was no MCWD colored water project yet in 1994. Fortunately, most of the District's deep monitoring wells are old enough to have captured the historical high condition of 1994.

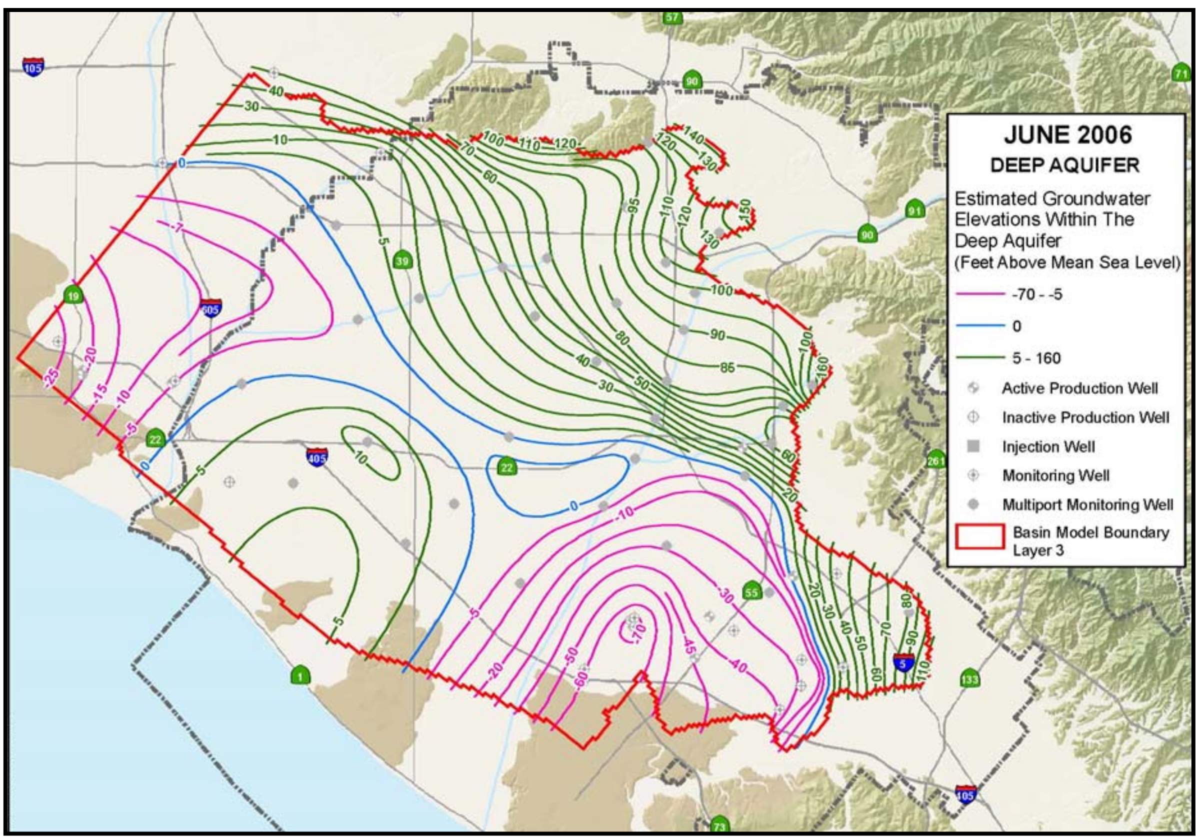
It is somewhat speculative as to how high the piezometric level of the Deep aquifer can rise. Therefore, full water levels were conservatively adjusted only 0 to 5 feet higher than the observed historical peak that occurred April to June of 1994. In so doing, the observed vertical piezometric head difference between the overlying Principal aquifer and the Deep aquifer was maintained. Throughout most of the basin, Deep aquifer piezometric levels typically ranged from 10 to 30 feet higher than the more heavily pumped Principal aquifer, except in the furthest inland locations near the mountain front and near recharge facilities where the Deep aquifer levels are actually lower than the Principal aquifer due to being more vertically removed from surficial recharge.

While contouring the resulting Deep aquifer full basin piezometric levels (also referred to as water levels for simplicity), the Principal aquifer full condition contour map was used as a backdrop on the light table to ensure that the Deep aquifer full contours maintained the vertical head difference discussed above. Also, in areas lacking data, the contours were drawn with similar patterns as those predicted during basin model calibration.

Figure 4-8 shows the resulting contour maps for both the new full condition and also June 2006 for comparison. The contour shapes are quite similar for both maps except in the area near the aforementioned DATS wells. The Full map assumes no DATS pumping since it was based on the historical high water levels of 1994, whereas the June 2006 map shows a relatively deep pumping depression in that immediate area. However, due to the confined nature of the Deep aquifer, the storage coefficients of this zone are very small (see Appendix 2) and thus even a relatively large water level difference leads to a small storage change.

Figure 4-8. Deep Aquifer Groundwater Contours: Full Basin and June 2006





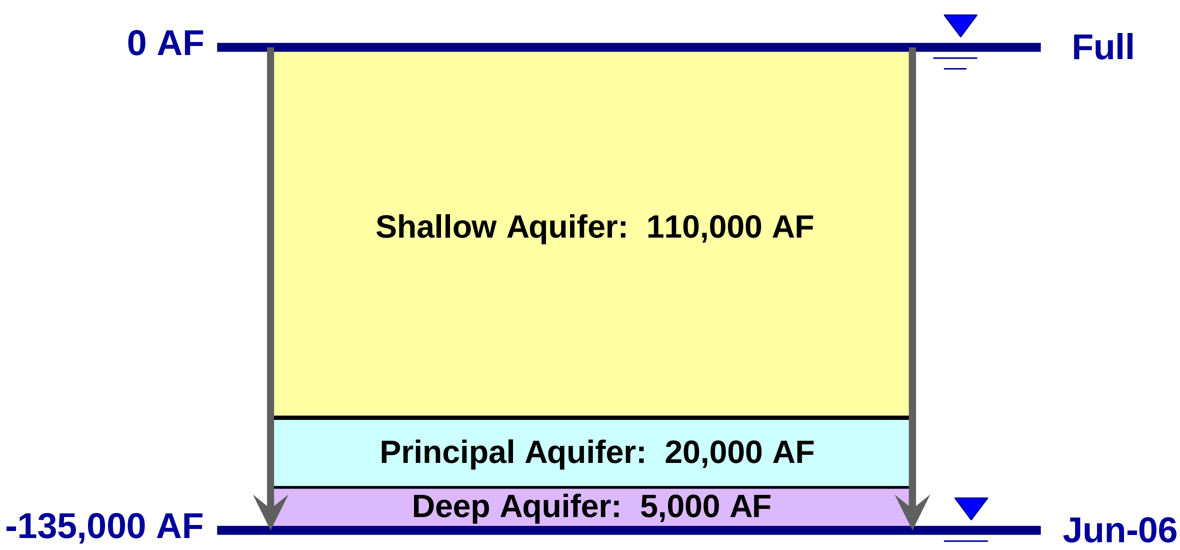
5. ACCUMULATED OVERDRAFT FROM NEW FULL CONDITION

The accumulated overdraft is the amount of storage capacity below full, sometimes referred to as dewatered storage or available storage capacity. In various literature, overdraft often has a negative connotation implying that a basin is in a steady state of decline or has been drawn-down below some critical threshold to where negative impacts such as subsidence and seawater intrusion begin to occur. In this report, use of the term “accumulated overdraft,” which is defined in the District Act, is not intended to have any negative connotation and is strictly used as a measure of available basin storage below the new full benchmark or zero-overdraft condition established in Section 4.

5.1 Accumulated Overdraft as of June 30, 2006

The new three-layer storage change methodology was used to calculate the accumulated overdraft for June 2006. Three groundwater contour maps (one for each aquifer layer) representing June 30, 2006 had already been constructed for testing the new three-layer approach described in Section 3. For the storage change calculation, Year 1 was set to the new full water level condition and Year 2 was set to the June 2006 water level condition. The resulting change in storage from the new full condition to June 2006 was -135,000 af, or in other words, the accumulated overdraft as of June 30, 2006 was 135,000 af below the new full benchmark. The breakdown per aquifer layer is schematically shown below in Figure 5-1.

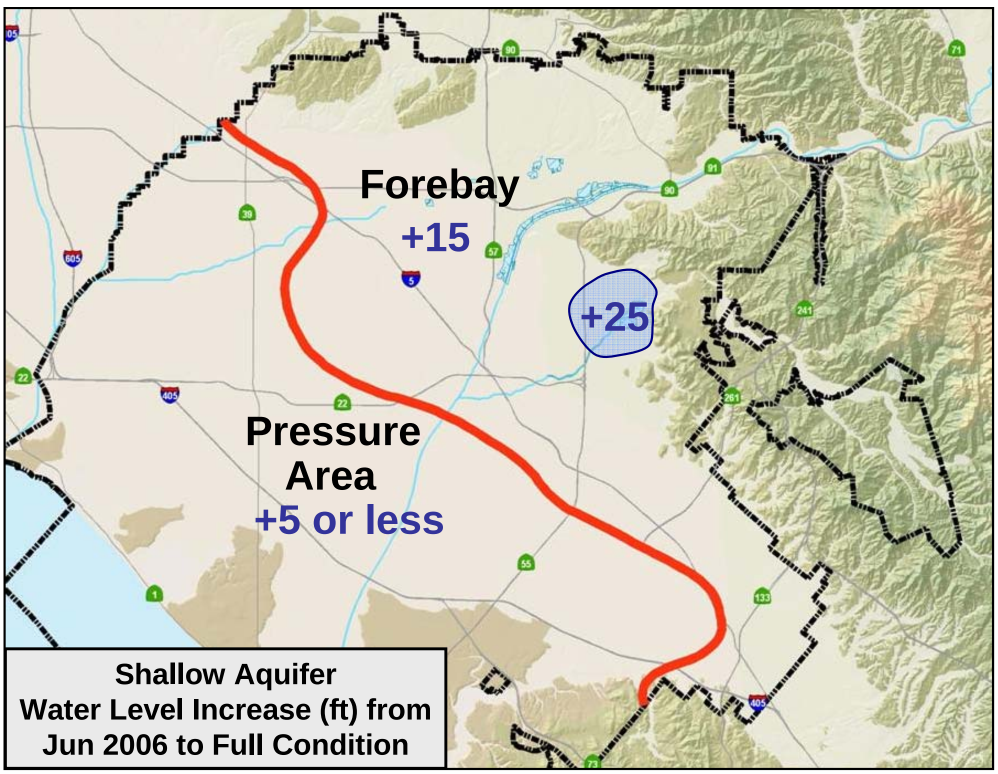
Figure 5-1. Three-Layer Accumulated Overdraft for June 2006



To put the Shallow aquifer storage change from the full condition (110,000 af) into perspective, Shallow aquifer water levels in most of the Forebay area were approximately 15 feet higher in the full condition as compared to June 2006 (Figure 5-2). In the coastal area, full water levels were only about 5 feet higher than June 2006. And since much more storage change occurs in the Forebay than the Pressure area per foot of water level change, nearly all of the Shallow aquifer storage change from full to June 2006 occurred in the Forebay area. Therefore, in general, a 15-foot Shallow aquifer water level change throughout the Forebay caused approximately 100,000 af of storage change.

Detailed water level change maps for June 2006 to the new full condition for all three aquifer layers are shown in Appendix 3.

Figure 5-2. Average Shallow Aquifer Water Level Difference from June 2006 to Full



5.2 Accumulated Overdraft as of June 30, 2005

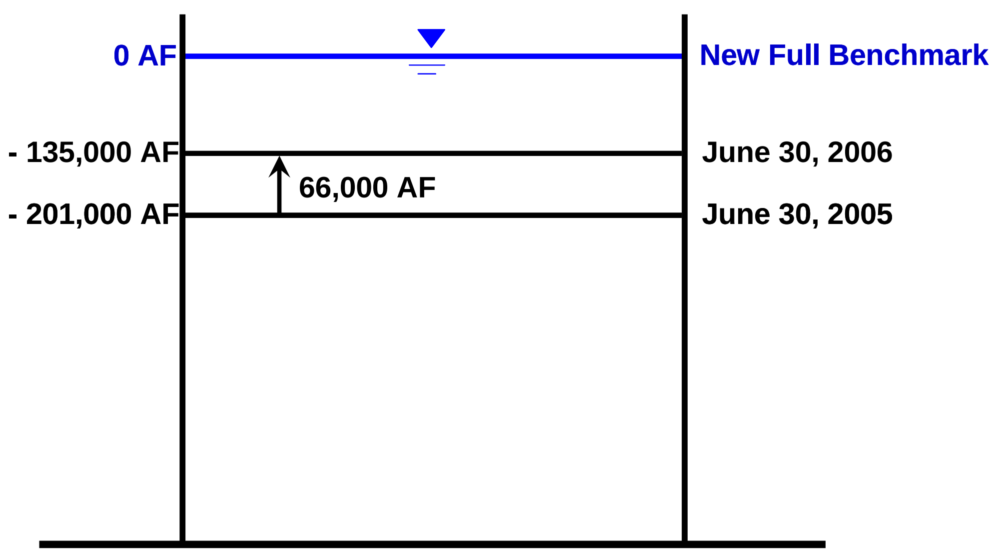
Using the new three-layer storage change method, the accumulated overdraft was calculated for June 2005 by directly comparing to the new full benchmark once again. In the storage change calculation, Year 1 was set to the new full water level condition and Year 2 was set to the June 2005 water level condition. The resulting total change in storage from the new full to June 2005 was -201,000 af, or in other words, the accumulated overdraft was 201,000 af below the new full benchmark.

The June 30, 2005 accumulated overdraft for each aquifer layer was as follows:

Shallow aquifer:	166,000 af
Principal aquifer:	25,000 af
Deep aquifer:	10,000 af
Total:	201,000 af

The difference between the June 2005 and June 2006 accumulated overdraft was 66,000 af, which represents the annual increase in storage from July 1, 2005 through June 30, 2006 (see figure 5-3). As a check, this storage change of 66,000 af was exactly the same as that calculated directly using the new three-layer method with Year 1 as June 2005 and Year 2 as June 2006 (see previous Figure 3-7). Therefore, this confirmed that the new three-layer approach yields exactly the same results summing the annual storage change over multiple years or calculating the storage change using the start and end of the multiple year period. In addition, the new method has been shown to yield the same identical storage change, but opposite in sign, when reversing the order of Year 1 vs. Year 2.

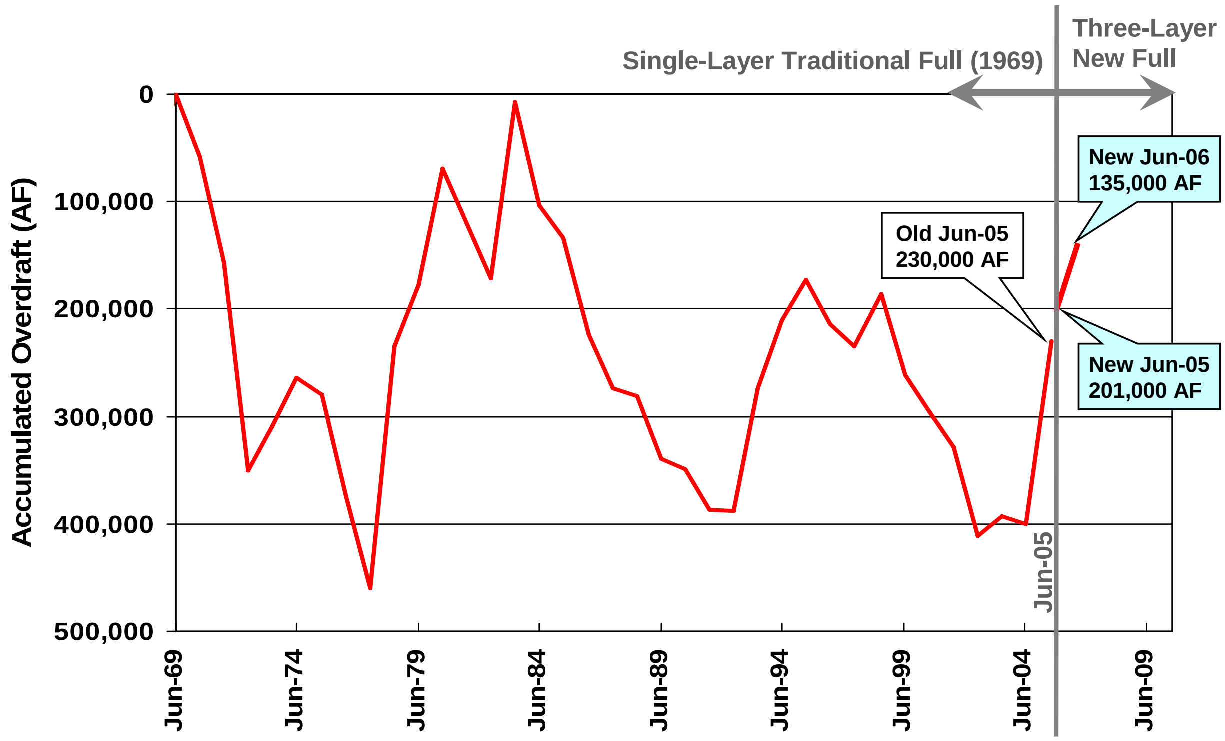
Figure 5-3. Accumulated Overdraft Schematic for June 2005 and June 2006



5.3 Historical vs. New Accumulated Overdraft Estimates

The new accumulated overdraft estimate of 201,000 af for June 2005 is 29,000 af less than the traditional method estimate of 230,000 af published in the 2004-05 OCWD Engineer's Report. This discrepancy is relatively minor when considering the major differences between the traditional single-layer and new three-layer storage change methods and also their two corresponding different full basin benchmarks. Since the historical accumulated overdraft levels are all relative to the 1969 condition as being the zero-overdraft benchmark, the two new accumulated overdraft estimates for June 2005 and June 2006 are plotted on the same familiar historical overdraft graph in Figure 5-4. However, this graph has been divided at the June 2005 line due to the two different zero-overdraft benchmarks of 1969 water levels and the new full condition.

Figure 5-4. Historical and New Accumulated Overdraft



5.4 Implementation of New Three-Layer Storage Change Method

To prevent or minimize any accumulation of potential discrepancy from year to year when implementing this new storage change method, it is important to follow the steps enumerated below.

1. Hand-contour water levels collected on or about June 30 for each of the three aquifer layers, maintaining consistency with how the water level data is interpreted from year to year, unless new well data in a specific area causes a different interpretation.

2. Use the GIS to calculate the water level change and corresponding storage change from the three-layer full benchmark to the current June condition. The resulting storage change below the full condition represents the accumulated overdraft for June of that year.

3. Subtract the previous year's accumulated overdraft from the current year to obtain the annual change in storage for that water year.

4. This step is a quality control check. Use the three-layer storage change method once again to calculate the water level change and storage change from the previous June (Year 1) to the current June (Year 2). This storage change should exactly equal the storage change calculated in Step 3.

5. Calculate incidental recharge for that water year by inputting the annual storage change estimate from Step 3 or 4 (if they are the same) into the water budget method described in Section 3.3. The resulting incidental recharge should be reasonable given the annual rainfall for the year in question; otherwise, additional error checking should be done for the water budget terms as well as the input data for the storage change calculation. It should be pointed out though that incidental recharge is not solely a function of rainfall because the flow across the LA County line – along with all other unknown inflows and outflows – is lumped into the incidental recharge term. That being said, incidental recharge for a somewhat typical year with average rainfall is thought to be approximately 60,000 afy but could vary by upwards of 20,000 af based on changes in outflow to LA County, which unfortunately is difficult to quantify.

6. The water budget method should not be used to determine or adjust the official storage change estimate calculated using the new three-layer method. It can be used to calculate preliminary monthly storage change estimates (using assumed incidental recharge) prior to performing the annual three-layer storage calculation. However, the annual storage change and accumulated overdraft official record for that year should be the exact value from the three-layer storage method steps above. This will prevent an accumulation of unknown discrepancy when rectifying back to previous years.

6. BASIN OPERATING RANGE AND STRATEGY

The level of accumulated overdraft in the basin, both for the current and upcoming year, affects important basin management decisions, including determining imported water needs and setting the Basin Pumping Percentage (BPP), both of which have major financial effects on the District and groundwater producers. Therefore, it is crucial to have an operational strategy to ensure that the basin is managed within acceptable overdraft limits to prevent detrimental impacts to the basin while also striving to maximize water reliability and financial efficiency.

In the discussion that follows, all storage and overdraft conditions are defined for June 30 of a given year, which is the ending date of the water year (July 1 through June 30) and thus the date represented by the June annual contour maps used for the storage change calculation. Seasonal fluctuations in water levels and basin storage occur throughout the water year and are tracked monthly for reporting purposes, and are used, along with the end-of-year accumulated overdraft, in making management decisions.

6.1 Basin Operating Range and Optimal Target

The operating range of the basin is considered to be the maximum allowable storage range without incurring detrimental impacts. The upper limit of the operating range is defined by the new full basin condition, which represents the zero-overdraft benchmark. Although it may be physically possible to fill the basin higher than this full condition, it could lead to detrimental impacts such as percolation reductions in recharge facilities and increased risk of shallow groundwater seepage in low-lying coastal areas.

The lower limit of the operating range is considered to be 500,000 af overdraft and represents the lowest acceptable level in the basin, not the lowest achievable. This level also assumes that all MWD water stored in the basin (e.g., Conjuctive Use Storage Project and Super In-Lieu) has already been withdrawn. Although it is considered to be generally acceptable to allow the basin to decline to 500,000 af overdraft for brief periods due to severe drought conditions and lack of supplemental imported water supplies, it is not considered to be an acceptable management practice to intentionally manage the basin for sustained periods at this lower limit for the following reasons:

- Seawater intrusion likely
- Drought supply depleted
- Pumping levels detrimental to a handful of wells
- Increased pumping lifts and electrical costs
- Increased potential for color upwelling from the Deep aquifer

Of course, detrimental impacts like those listed above do not suddenly happen when the overdraft gets down to exactly 500,000 af; rather, they occur incrementally, or the potential for their occurrence grows as the basin declines to lower levels. However, basin model computer simulations indicate that many of these detrimental impacts become evident at an overdraft of approximately 500,000 af. For example, at 500,000 af overdraft, model-simulated water levels in the Talbert Gap area were marginally low and not protective of seawater intrusion, even with the increased injection from GWRS Phase 1. Furthermore, worst case basin model runs at 700,000 af overdraft indicated seawater intrusion becoming even worse and considerably more production wells being impacted by low pumping levels. Thus, an accumulated overdraft level of 700,000 af did not appear to be acceptable, not even for short durations. At overdraft levels significantly below 500,000 af overdraft, the potential for land subsidence could also become an issue.

Based on historical hydrology and recharge water availability, an accumulated overdraft of 100,000 af best represents an optimal basin management target. This optimal target level provides sufficient storage space to accommodate anticipated recharge from a single wet year while also providing water in storage for at least 2 or 3 consecutive years of drought.

Table 6-1 shows that basin storage could increase by as much as 100,000 af in a somewhat typical wet year based on predicted increased supplies. The Captured Santa Ana River Flows and Natural Incidental Recharge terms were both based on an average of four historical wet years: 1992-93, 1994-95, 1997-98, and 2004-05. Based on historical rainfall records for the Orange County area, wet years typically do not occur back-to-back. Therefore, the optimal overdraft target of 100,000 af provides the storage capacity to capture the increased supplies from this one typically wet year.

Table 6-1. Anticipated Supply Increases for a Typical Wet Year

Increased Supplies (Above Average Annual Amounts)	**1 Year (AF)**
Captured Santa Ana River Flows *	50,000
Natural Incidental Recharge *	30,000
Reduced Demand (Pumping)	20,000
**Potential Storage Increase ** **	**100,000**

***** Average of four wet years: 92-93, 94-95, 97-98, 04-05
****** Assumes no mid-year BPP change

Table 6-2 shows that basin storage could decrease by approximately 90,000 af in a dry year based on reduced supplies. However, unlike wet years, historical rainfall records for this area show that dry years often occur for 2 or 3 consecutive years. Therefore, the 90,000 af of reduced supplies in a dry year could result in a 270,000 af decrease in basin storage after 3 consecutive years of drought. Assuming the basin to be at the optimal target of 100,000 af going into a three-year drought, the accumulated overdraft at the end of the drought would be 370,000 af, which is still within the acceptable operating range.

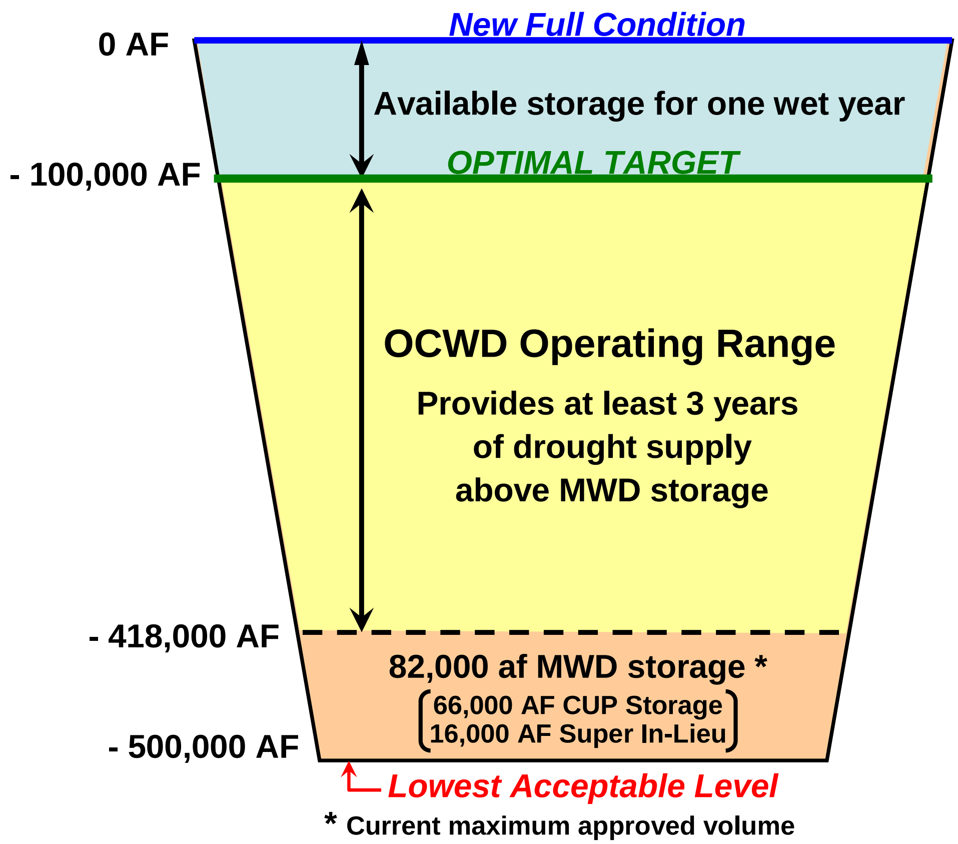
Table 6-2. Anticipated Supply Reductions for Typical Dry Years

Reduced Supplies (From Average Annual Amounts)	**1 Year (AF)**	**3 Years (AF)**
MWD Replenishment Water	-30,000	-90,000
Santa Ana River Flows	-40,000	-120,000
Natural Incidental Recharge	-20,000	-60,000
Total Potential Storage Change*	**-90,000**	**-270,000**

* Assumes no mid-year BPP change

Figure 6-1 schematically illustrates the various overdraft levels discussed above in relation to one another; namely, the new full benchmark, the optimal overdraft target of 100,000 af, and the lower limit of the operating range at 500,000 af accumulated overdraft.

Figure 6-1. Strategic Basin Operating Levels and Optimal Target



6.2 Basin Management Operational Strategy

The primary “tool” for managing the basin is the Basin Production Percentage (BPP). Each year in April, the District’s Board of Directors sets the BPP for the upcoming water year. In addition to purchasing replenishment water, adjusting the BPP allows the District to effectively increase or decrease basin storage. Figure 6-2 shows the formula used to calculate the BPP each year. Only the two terms highlighted in blue and red in the BPP formula are adjustable at the District’s discretion, namely the planned amount of recharge (including replenishment water purchases) and the planned amount of basin refill or storage decrease for the coming year.

The amount of recharge planned and budgeted for the coming year may be limited by factors outside the District’s control, such as the availability of imported water for either direct replenishment or In-Lieu. For example, following statewide wet years, MWD may offer incentives (financial or otherwise) for local water agencies to take additional amounts of surplus imported water, whereas during a long-term statewide drought the surplus imported water may simply not be available.

Figure 6-2. BPP Formula

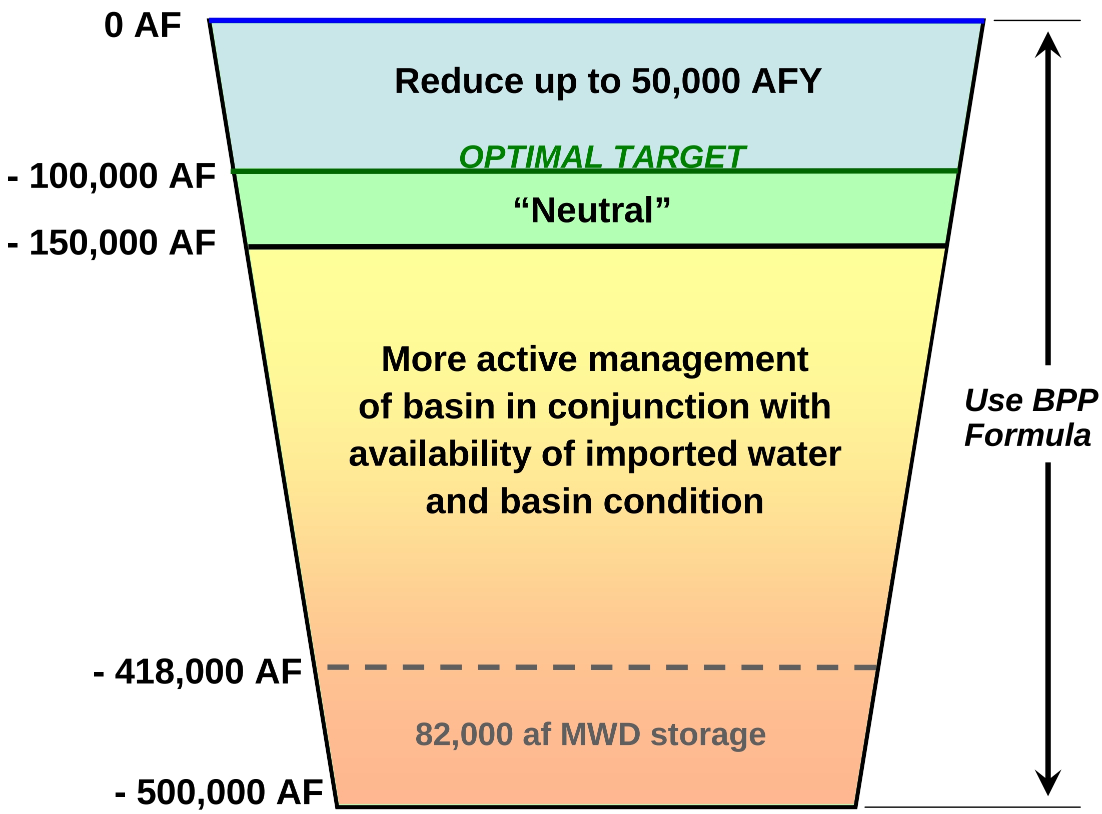
$$\mathbf{BPP} = \frac{\boxed{\text{Water Recharged}} - \boxed{\text{Basin Refill or Decrease}} - \boxed{\text{Water Quality Improvement Projects (Pumping Above BPP)}}}{\boxed{\text{Last Calendar Year's Total Water Demand}} - \boxed{\text{Reclaimed \& Local Supplies}}}$$

The planned amount of basin refill or storage decrease for the coming year is within the District's control but is also considered within the context of financial impacts to both the District and the groundwater producers. Therefore, unless the basin is near the bottom of the acceptable operating range or close to being full, a moderate amount of basin refill or decrease would typically be proposed that aims to move toward the optimal overdraft target. If the basin is already at or near the 100,000 af overdraft target, then a neutral stance can be taken that attempts to balance basin production and recharge with no planned storage change.

Figure 6-3 schematically illustrates the generalized basin refill or storage decrease strategy based on the accumulated overdraft. When the basin is higher than the optimal overdraft target and nearly full, the amount of planned storage decrease of up to 50,000 af for the coming year may be recommended. This may be accomplished by a combination of raising the BPP and reducing replenishment purchases.

The proposed operational strategy illustrated in Figure 6-3 provides a flexible guideline to assist in determining the amount of basin refill or storage decrease for the coming water year based on using the BPP formula and considering storage goals based on current basin conditions and other factors such as water availability. This strategy is not intended to dictate a specific basin refill or storage decrease amount for a given storage condition but to provide a general guideline for the District's Board of Directors.

Figure 6-3. Basin Management Operational Strategy



7. FINDINGS

Findings of this study are enumerated below.

1. The new three-layer storage change approach is technically feasible and provides a more accurate assessment than the traditional single-layer storage change method.

2. Using the new three-layer method, the majority of the storage change occurs in the Forebay area of the basin within the unconfined Shallow aquifer where rising or falling of the water table fills or drains empty pore space.

3. Accuracy of the storage change and accumulated overdraft estimates is dependent upon good spatial distribution of water level measurements as well as the storage coefficient values used in the calculations. Water level data for the Shallow aquifer were relatively sparse in outlying Forebay areas of the basin, leading to some uncertainty in preparing groundwater elevation contours in those areas.

4. 1969 no longer represents a truly full-basin benchmark. A new full-basin water level condition was developed based on the following prescribed conditions:

    - Observed historical high water levels
    - Present-day pumping and recharge conditions
    - Protective of seawater intrusion
    - Minimal potential for mounding at or near recharge basins

    The new full-basin water levels in the Forebay area are essentially at or very near the bottom of the District's deep percolation basins (e.g., Anaheim Lake). Historical water level data from 1994 have shown that this condition is achievable without detrimental effects. Water levels slightly higher than this new full condition may be physically achievable in the Forebay area but not recommended due to the likelihood of groundwater mounding and reduced percolation in recharge basins.

5. Using the new three-layer storage change calculation in conjunction with the new full benchmark and June 2006 water levels, an accumulated overdraft of 135,000 af was calculated representing June 30, 2006. Similarly, using the new three-layer method to compare the new full water levels to those of June 2005, an accumulated overdraft of 201,000 af was calculated representing June 30, 2005. Subtracting the June 2006 accumulated overdraft from that of June 2005 yielded an annual storage increase of 66,000 af for WY 2005-06.

6. Comparing the current year's water level conditions to the full basin benchmark each successive year for calculating the basin storage will eliminate the potential for cumulative discrepancies over several years.

7. An accumulated overdraft of 500,000 af represents the lowest acceptable limit of the basin's operating range. This lower limit of 500,000 af assumes that stored MWD water (CUP and Super In-Lieu) has already been removed and is only acceptable for short durations due to drought conditions. It is not recommended to manage the basin for sustained periods at this lower limit for the following reasons:

    - Seawater intrusion likely
    - Drought supply depleted
    - Pumping levels detrimental to a handful of wells
    - Increased pumping lifts and electrical costs
    - Increased potential for color upwelling from the Deep aquifer

8. An optimal basin management target of 100,000 af of accumulated overdraft provides sufficient storage space to accommodate increased supplies from one wet year while also providing enough water in storage to offset decreased supplies during a two- to three-year drought.

9. The proposed operational strategy provides a flexible guideline to assist in determining the amount of basin refill or storage decrease for the coming water year based on using the BPP formula and considering storage goals based on current basin conditions and other factors such as water availability. This strategy is not intended to dictate a specific basin refill or storage decrease amount for a given storage condition but to provide a general guideline for the District's Board of Directors.

8. RECOMMENDATIONS

Based on the findings of this study are the following recommendations:

1. Adopt the new three-layer storage change methodology along with the associated new full-basin condition that will serve as a benchmark for calculating the basin accumulated overdraft.

2. Adopt the proposed basin operating strategy including a basin operating range spanning the new full condition to an accumulated overdraft of 500,000 af, and an optimal overdraft target of 100,000 af.

3. Include in the 2007-08 CIP budget the installation of six Shallow aquifer monitoring wells to increase accuracy of the three-layer storage change calculation.

9. BIBLIOGRAPHY

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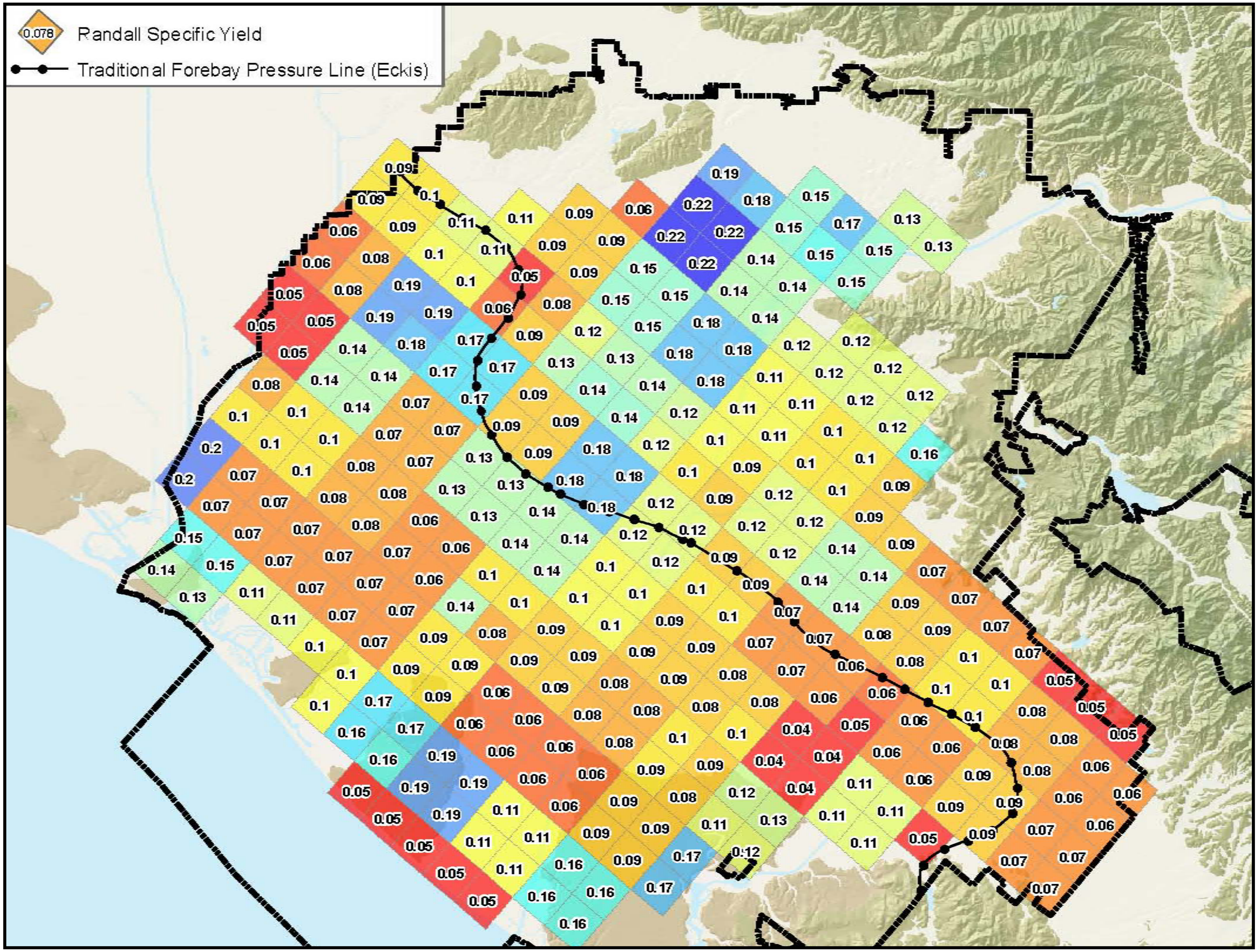
Phraner, R. W., B. Harley, E. G. Reichard, and B. Stollar. 2001. Letter from OCWD Basin Model Advisory Panel to OCWD: "Findings of Model Advisory Panel – Transient Calibration of Multi-layer Basin Flow Model," 7pp.

APPENDIX 1

“Randall” Specific Yield Values

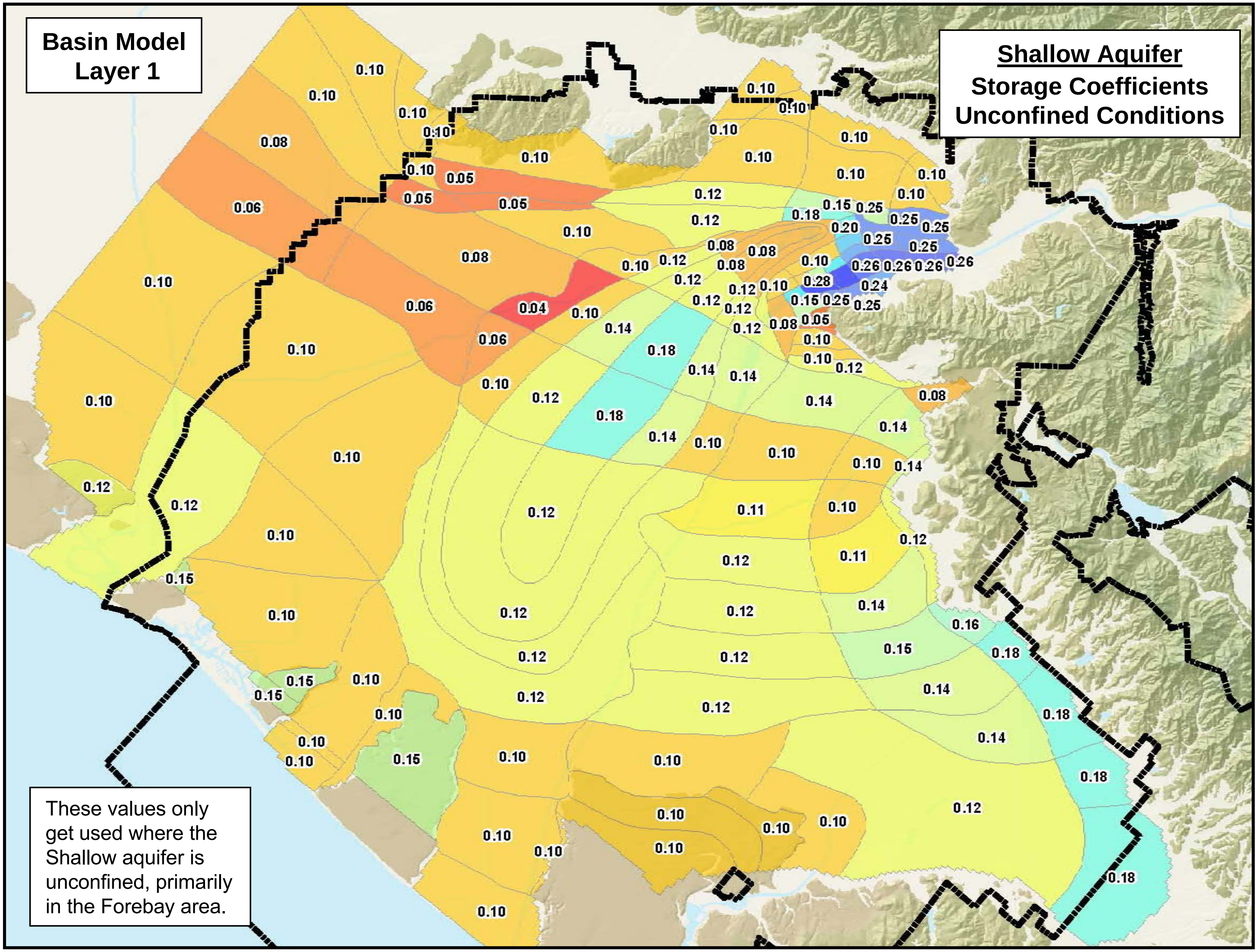
From Traditional Storage Change Method

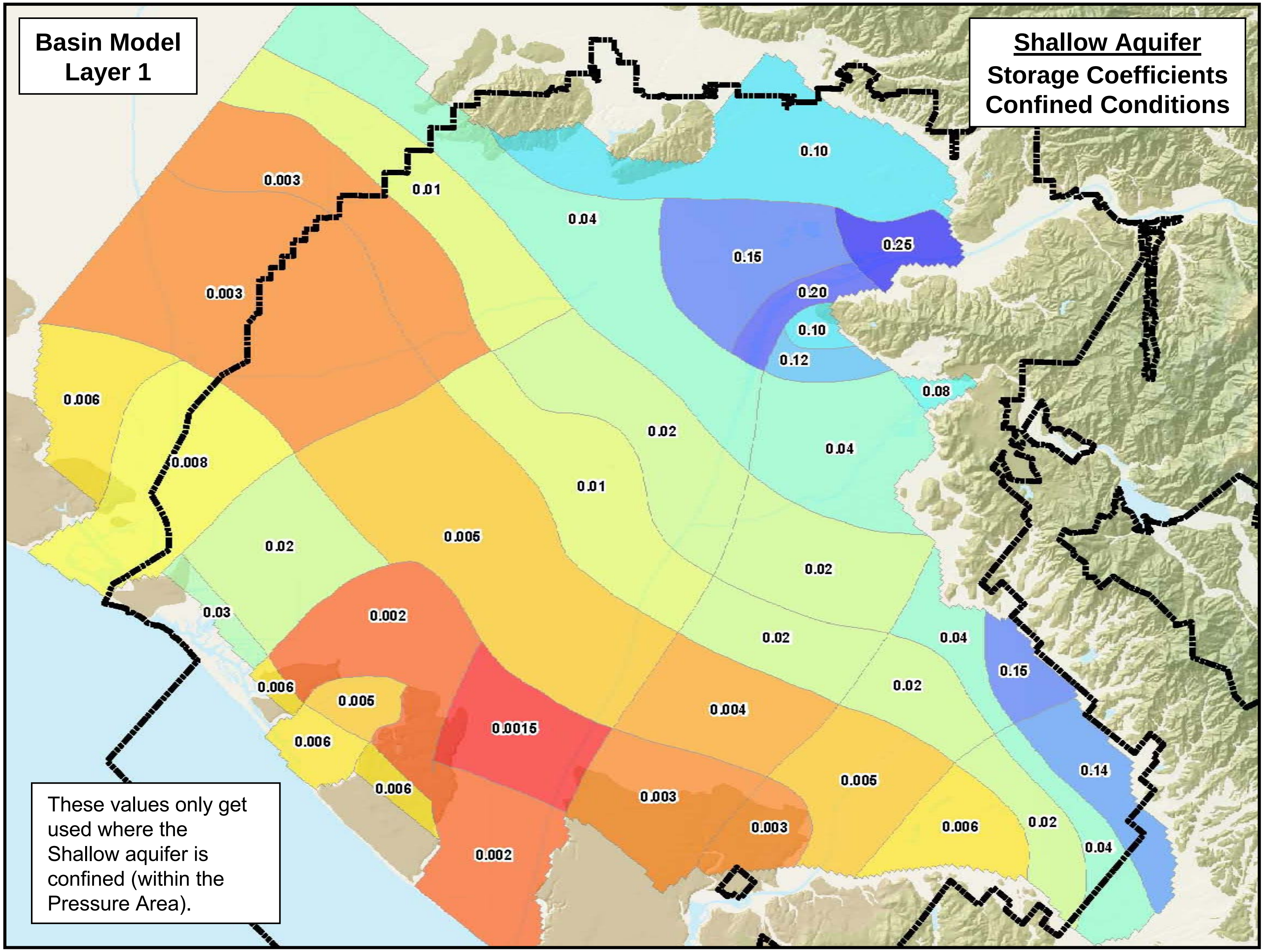

0.078
Randall Specific Yield
Traditional Forebay Pressure Line (Eckis)

APPENDIX 2

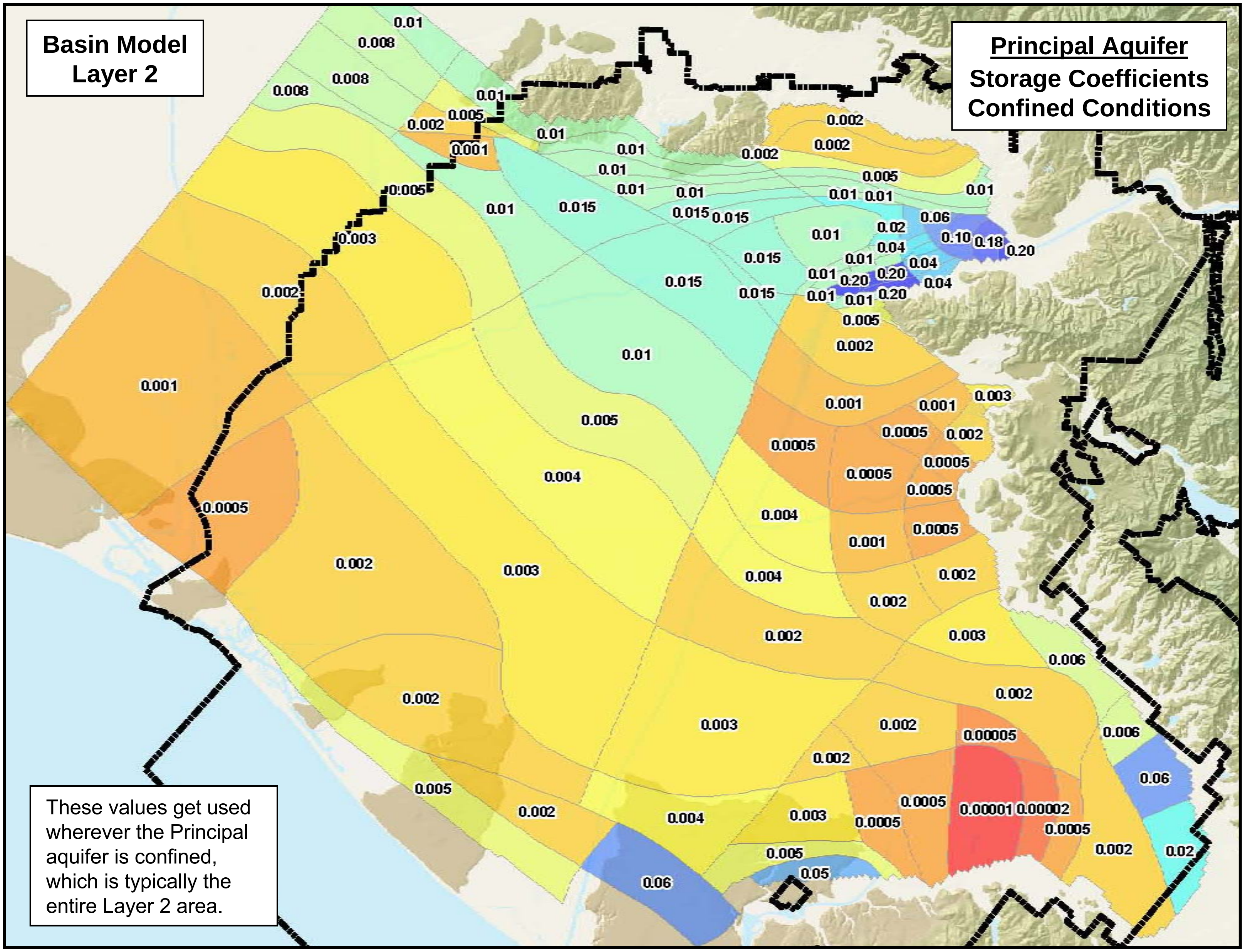
Basin Model Storage Coefficient Values

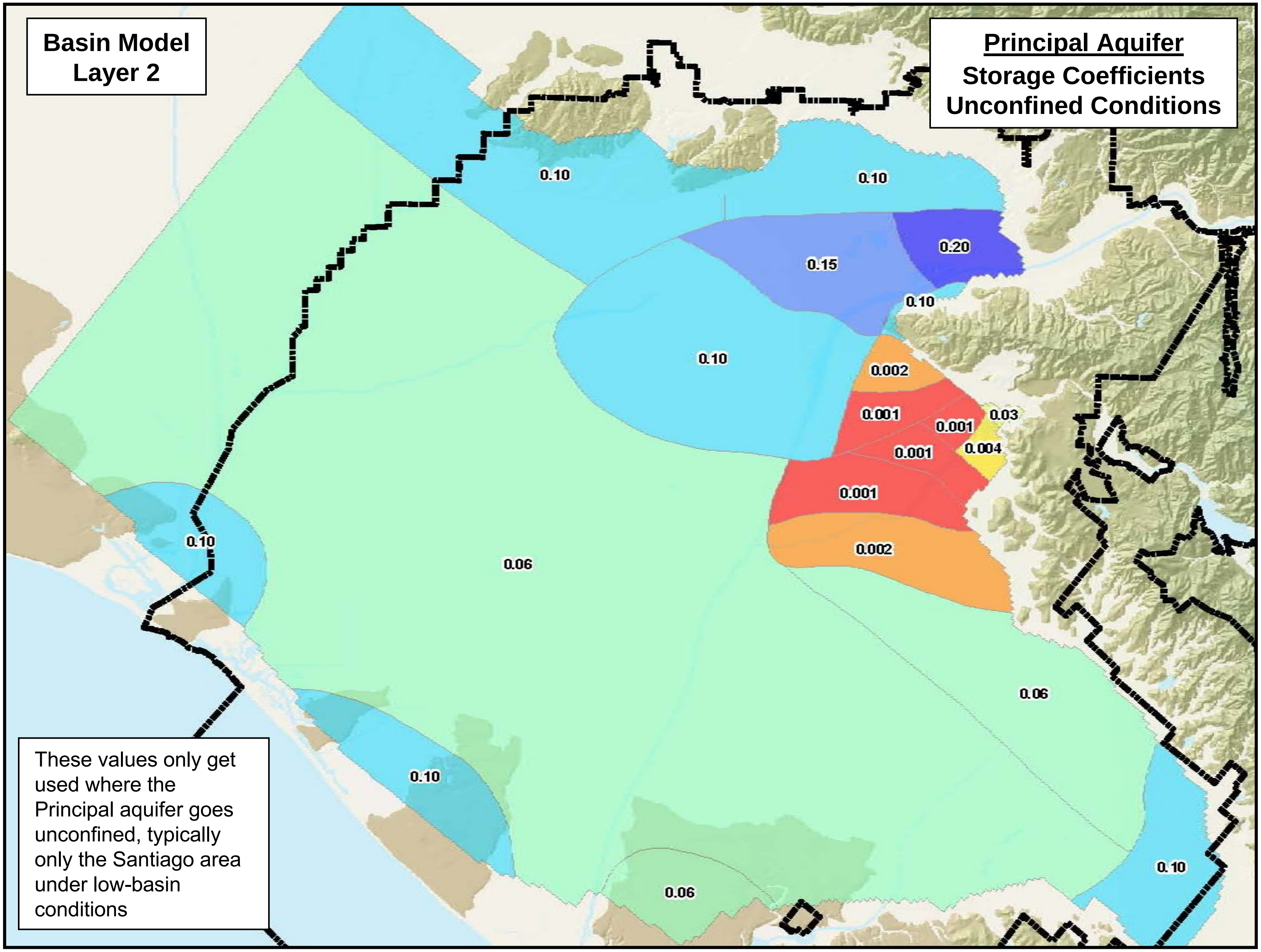
For Three-Layer Storage Change Method

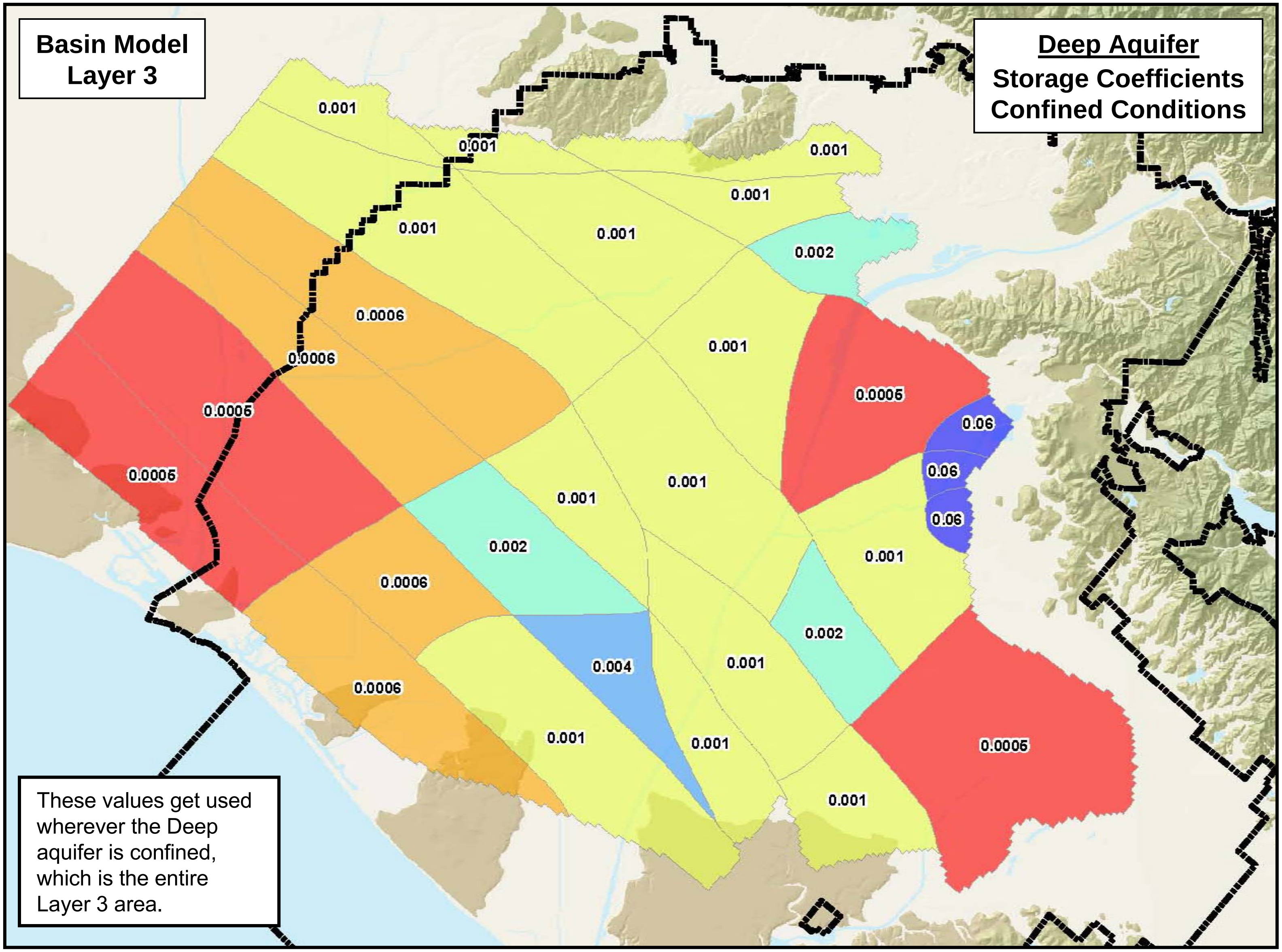

Basin Model
Layer 1
Shallow Aquifer
Storage Coefficients
Unconfined Conditions
These values only get used where the Shallow aquifer is unconfined, primarily in the Forebay area.

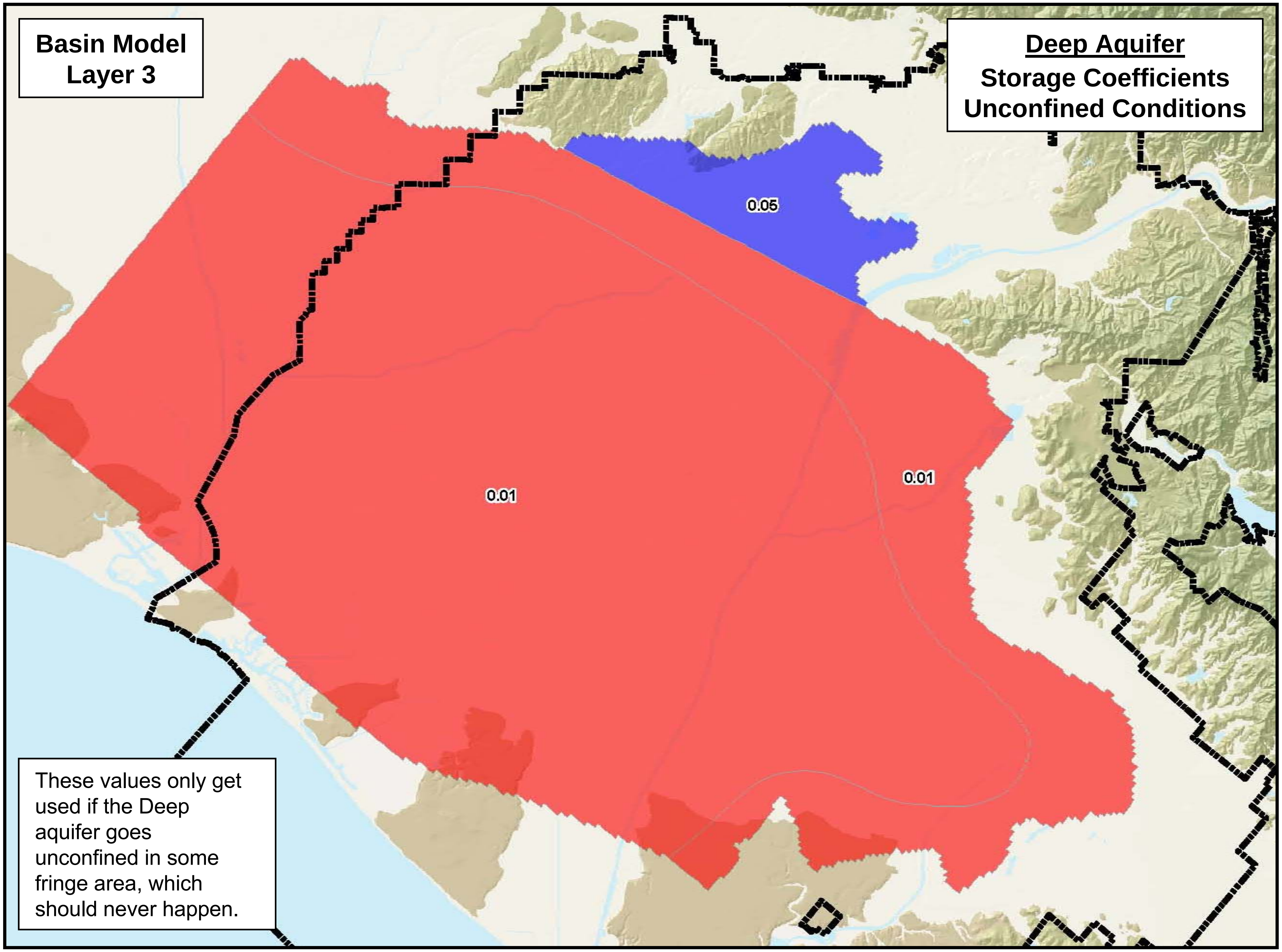


Basin Model
Layer 1
Shallow Aquifer
Storage Coefficients
Confined Conditions
These values only get used where the Shallow aquifer is confined (within the Pressure Area).
0.003
0.01
0.04
0.10
0.25
0.15
0.003
0.20
0.10
0.12
0.006
0.08
0.008
0.02
0.04
0.01
0.02
0.005
0.02
0.03
0.002
0.02
0.04
0.006
0.005
0.02
0.15
0.0015
0.004
0.006
0.14
0.006
0.005
0.003
0.003
0.006
0.02
0.04
0.002


Basin Model
Layer 2
Principal Aquifer
Storage Coefficients
Confined Conditions
These values get used wherever the Principal aquifer is confined, which is typically the entire Layer 2 area.


Basin Model
Layer 2
Principal Aquifer
Storage Coefficients
Unconfined Conditions
0.10
0.10
0.20
0.15
0.10
0.10
0.002
0.001
0.001
0.03
0.001
0.004
0.001
0.002
0.10
0.06
0.06
0.10
0.06
0.10
These values only get used where the Principal aquifer goes unconfined, typically only the Santiago area under low-basin conditions

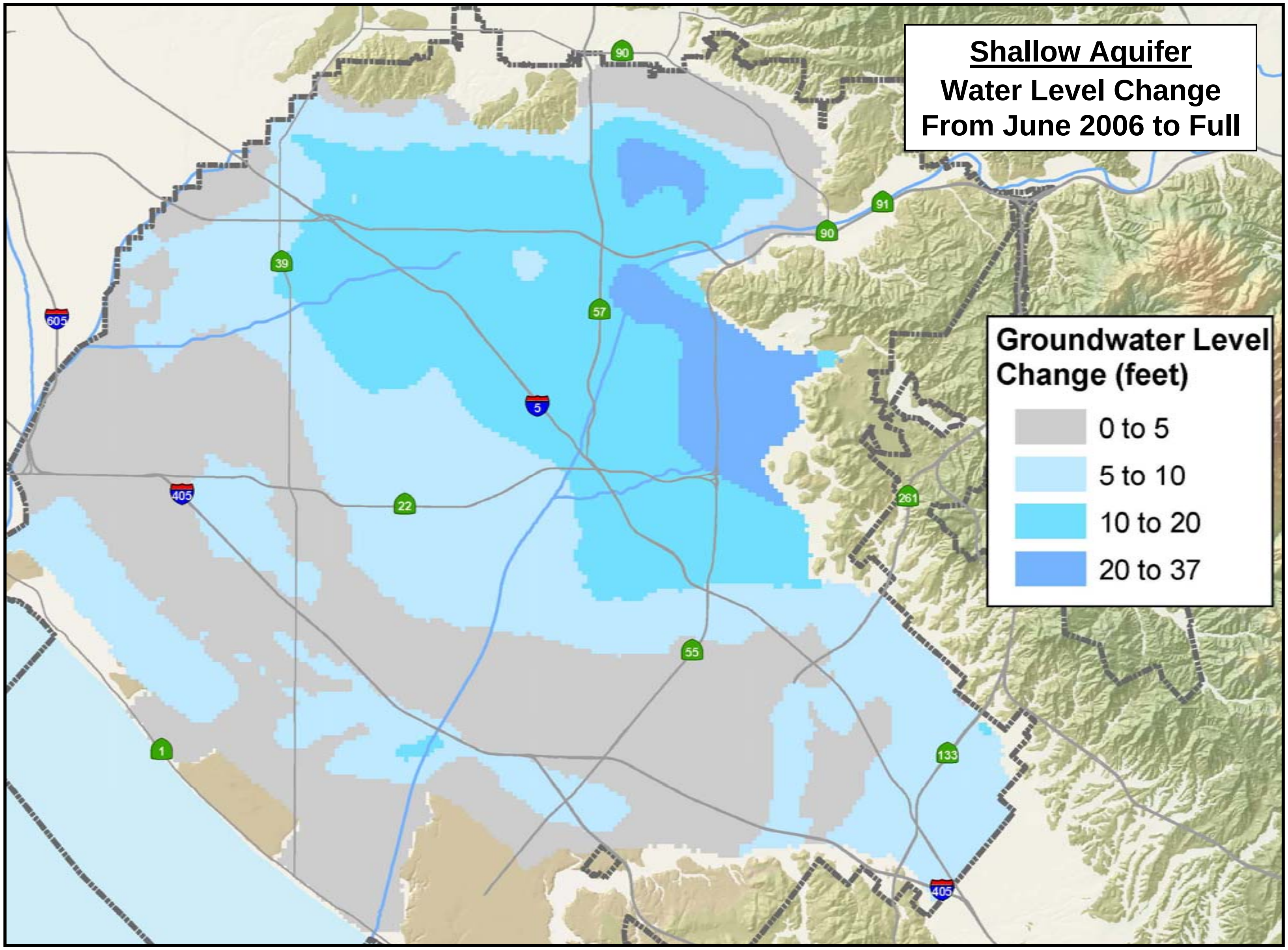

Basin Model
Layer 3
Deep Aquifer
Storage Coefficients
Confined Conditions
0.001
0.001
0.001
0.001
0.001
0.001
0.002
0.0006
0.0006
0.001
0.0005
0.0005
0.0005
0.06
0.06
0.06
0.001
0.001
0.001
0.002
0.0006
0.002
0.004
0.001
0.0006
0.001
0.001
0.0005
0.001
These values get used
wherever the Deep
aquifer is confined,
which is the entire
Layer 3 area.


Basin Model
Layer 3
Deep Aquifer
Storage Coefficients
Unconfined Conditions
0.05
0.01
0.01
These values only get used if the Deep aquifer goes unconfined in some fringe area, which should never happen.

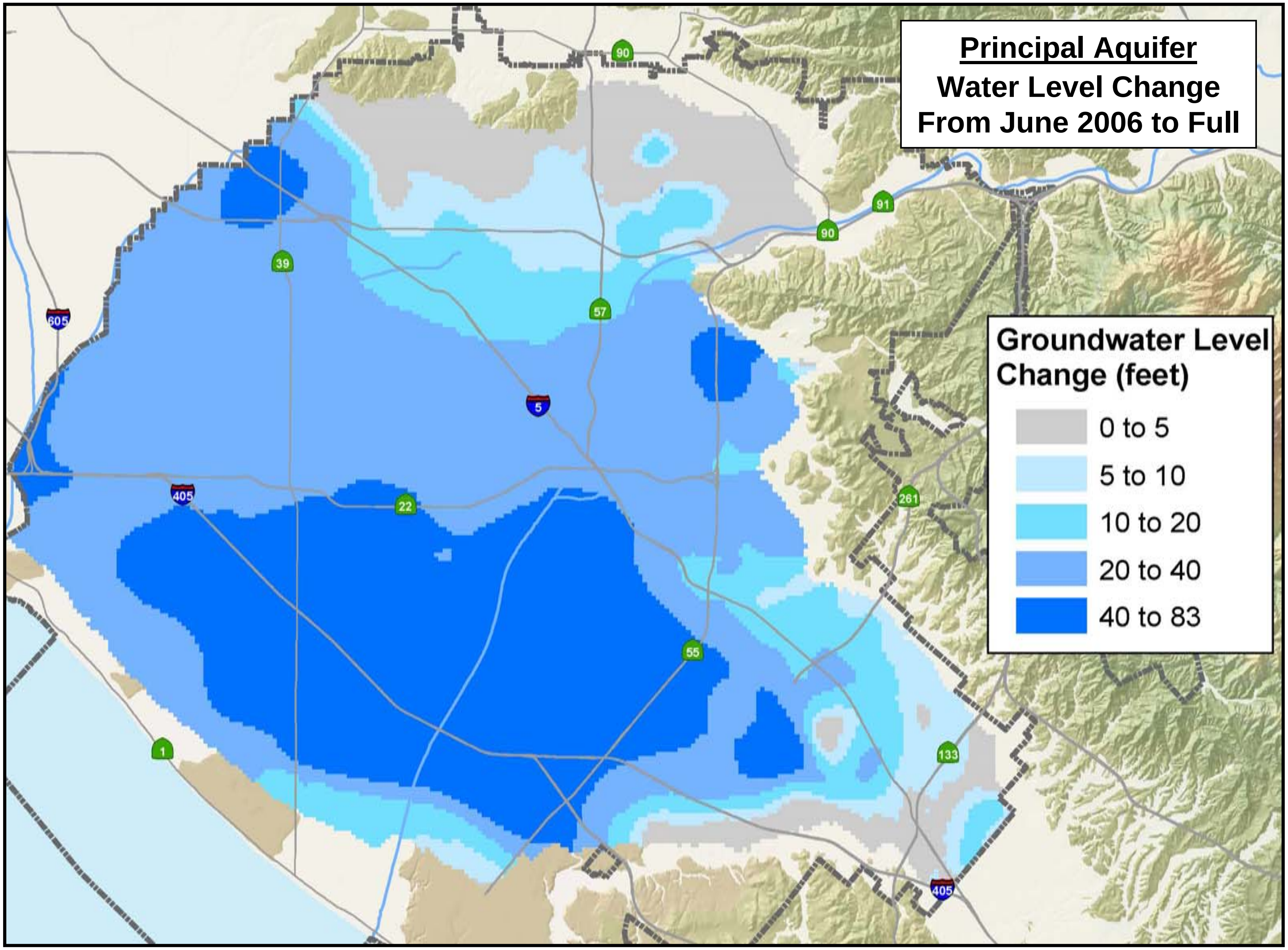
APPENDIX 3

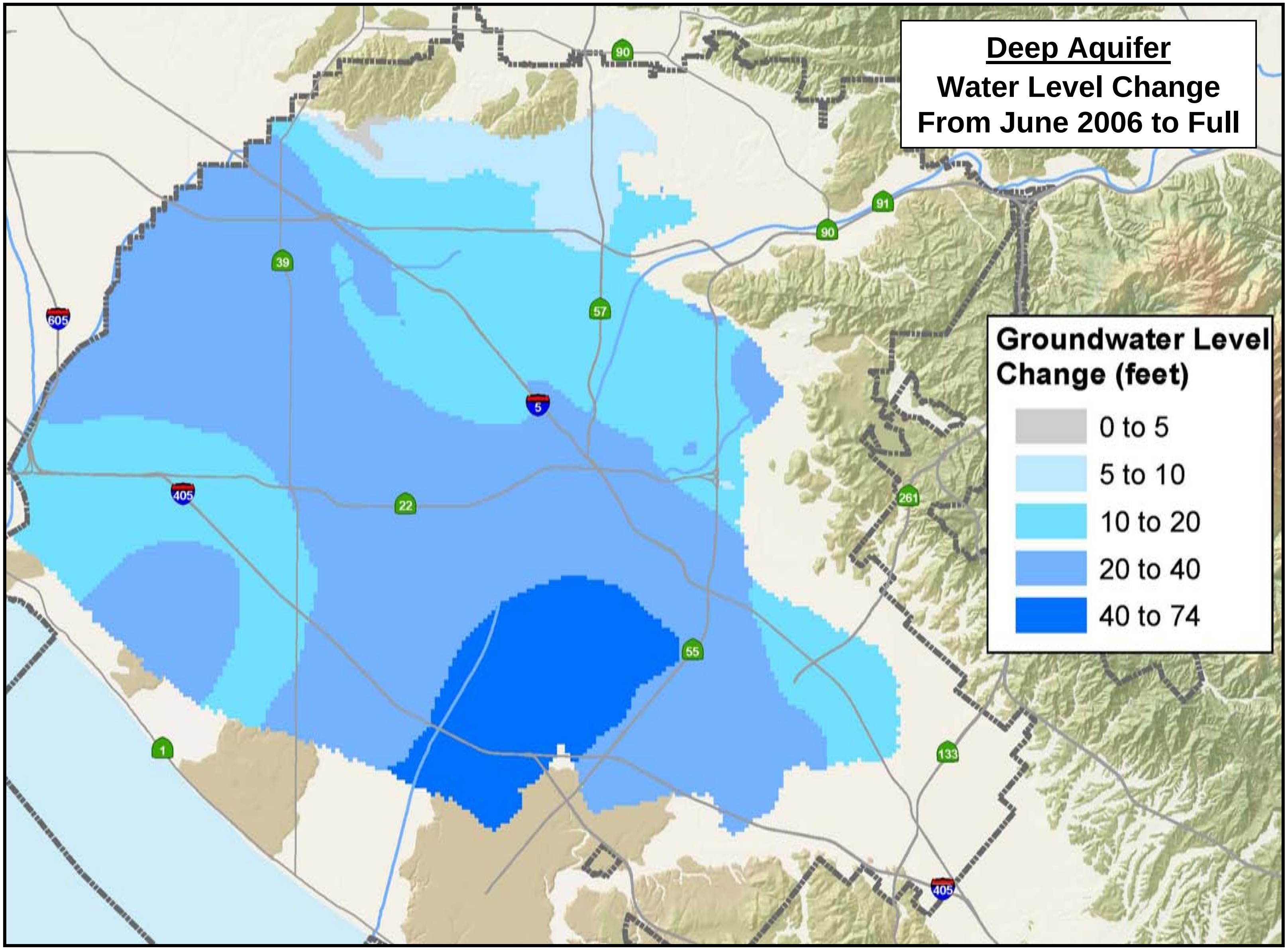
Water Level Change Maps

For June 2006 to the New Full Condition



Shallow Aquifer
Water Level Change
From June 2006 to Full
Groundwater Level Change (feet)
0 to 5
5 to 10
10 to 20
20 to 37
90
91
39
605
57
5
405
22
261
55
1
133
405


Principal Aquifer
Water Level Change
From June 2006 to Full
Groundwater Level
Change (feet)
0 to 5
5 to 10
10 to 20
20 to 40
40 to 83
90
91
90
39
57
605
5
405
22
261
55
133
1
405


Deep Aquifer
Water Level Change
From June 2006 to Full
Groundwater Level Change (feet)
0 to 5
5 to 10
10 to 20
20 to 40
40 to 74
90
91
90
39
57
605
5
405
22
261
55
1
133
405

APPENDIX E

OCWD MONITORING WELLS

APPENDIX E - OCWD ACTIVE GROUNDWATER MONITORING WELLS
(Excluding Westbay Multiport Wells)

Well Name	Well Type	Casing Sequence No.	Cased Depth (ft.)	Top Perforation (ft.)	Bottom Perforation (ft.)
ABS-2	SINGLE CASING	1	175	155	165
AM-1	SINGLE CASING	1	137	97	115
AM-2	SINGLE CASING	1	156	87	100
AM-3	SINGLE CASING	1	112	91	107
AM-4	SINGLE CASING	1	296	187	205
AM-5	SINGLE CASING	1	247	230	245
AM-5A	SINGLE CASING	1	180	168	175
AM-6	SINGLE CASING	1	296	232	250
AM-7	SINGLE CASING	1	297	210	225
AM-8	SINGLE CASING	1	297	268	285
AM-9	SINGLE CASING	1	317	285	303
AM-10	SINGLE CASING	1	298	217	235
AM-11	SINGLE CASING	1	276	218	240
AM-12	SINGLE CASING	1	294	210	225
AM-13	SINGLE CASING	1	275	252	270
AM-14	SINGLE CASING	1	317	297	315
AM-15	SINGLE CASING	1	318	300	317
AM-15A	SINGLE CASING	1	231	214	220
AM-16	SINGLE CASING	1	320	300	315
AM-16A	SINGLE CASING	1	227	215	222
AM-17	SINGLE CASING	1	318	290	308
AM-18	SINGLE CASING	1	316	291	309
AM-18A	SINGLE CASING	1	234	208	215
AM-19	SINGLE CASING	1	237	217	225
AM-19A	SINGLE CASING	1	126	115	123
AM-20	SINGLE CASING	1	397	361	379
AM-20A	SINGLE CASING	1	268	250	258
AM-21	SINGLE CASING	1	269	250	258
AM-21A	SINGLE CASING	1	179	157	165
AM-22	SINGLE CASING	1	356	339	353
AM-22A	SINGLE CASING	1	239	216	224
AM-23	SINGLE CASING	1	351	330	347
AM-24	SINGLE CASING	1	378	335	350
AM-24A	SINGLE CASING	1	306	279	294
AM-25	SINGLE CASING	1	362	340	358
AM-25A	SINGLE CASING	1	219	188	195
AM-26	SINGLE CASING	1	388	377	383
AM-27	SINGLE CASING	1	336	287	305
AM-28	SINGLE CASING	1	398	358	376
AM-29	SINGLE CASING	1	367	340	358
AM-29A	SINGLE CASING	1	95	75	95
AM-30	SINGLE CASING	1	375	349	367
AM-30A	SINGLE CASING	1	398	152	159
AM-31	SINGLE CASING	1	358	335	353
AM-31A	SINGLE CASING	1	360	162	170
AM-32	SINGLE CASING	1	398	335	353
AM-33	SINGLE CASING	1	378	354	372
AM-33A	SINGLE CASING	1	238	206	221
AM-34	SINGLE CASING	1	354	317	335
AM-34A	SINGLE CASING	1	271	252	260
AM-35	SINGLE CASING	1	400	332	350

NA: Not Available

APPENDIX E - OCWD ACTIVE GROUNDWATER MONITORING WELLS
(Excluding Westbay Multiport Wells)

Well Name	Well Type	Casing Sequence No.	Cased Depth (ft.)	Top Perforation (ft.)	Bottom Perforation (ft.)
AM-36	SINGLE CASING	1	398	369	387
AM-37	SINGLE CASING	1	378	349	367
AM-38	SINGLE CASING	1	358	316	334
AM-39	SINGLE CASING	1	188	168	188
AM-39A	SINGLE CASING	1	135	115	135
AM-40	SINGLE CASING	1	191	175	190
AM-40A	SINGLE CASING	1	166	145	165
AM-41	SINGLE CASING	1	200	190	200
AM-41A	SINGLE CASING	1	166	156	166
AM-42	SINGLE CASING	1	190	180	190
AM-42A	SINGLE CASING	1	130	115	130
AM-43	SINGLE CASING	1	100	80	100
AM-44	SINGLE CASING	1	160	140	160
AM-44A	SINGLE CASING	1	88	78	88
AM-45	SINGLE CASING	1	132	102	132
AM-46	SINGLE CASING	1	124	94	124
AM-47	SINGLE CASING	1	247	227	242
AM-47A	SINGLE CASING	1	170	160	170
AM-48	SINGLE CASING	1	305	270	300
AM-48A	SINGLE CASING	1	151	116	146
AM-49	SINGLE CASING	1	155	120	150
AMD-9	NESTED	1	230	200	220
AMD-9	NESTED	2	480	450	470
AMD-9	NESTED	3	610	580	600
AMD-9	NESTED	4	926	896	916
AMD-10	NESTED	1	322	292	312
AMD-10	NESTED	2	470	440	460
AMD-10	NESTED	3	580	550	570
AMD-10	NESTED	4	804	774	794
AMD-10	NESTED	5	964	934	954
AMD-11	NESTED	1	328	298	318
AMD-11	NESTED	2	426	396	416
AMD-11	NESTED	3	630	600	620
AMD-11	NESTED	4	716	686	706
AMD-11	NESTED	5	936	906	926
AMD-12	NESTED	1	360	330	350
AMD-12	NESTED	2	530	490	520
AMD-12	NESTED	3	625	595	615
AMD-12	NESTED	4	755	725	745
AMD-12	NESTED	5	970	940	960
FM-1	SINGLE CASING	1	359	348	356
FM-1A	SINGLE CASING	1	197	164	172
FM-2	SINGLE CASING	1	352	320	338
FM-2A	SINGLE CASING	1	237	226	234
FM-3	SINGLE CASING	1	298	257	263
FM-4	SINGLE CASING	1	355	327	345
FM-4A	SINGLE CASING	1	170	142	160
FM-5	SINGLE CASING	1	141	121	141
FM-6	SINGLE CASING	1	320	150	310
FM-7	SINGLE CASING	1	197	187	197
FM-7A	SINGLE CASING	1	170	160	170

NA: Not Available

APPENDIX E - OCWD ACTIVE GROUNDWATER MONITORING WELLS
(Excluding Westbay Multiport Wells)

Well Name	Well Type	Casing Sequence No.	Cased Depth (ft.)	Top Perforation (ft.)	Bottom Perforation (ft.)
FM-8	SINGLE CASING	1	139	114	134
FM-9	SINGLE CASING	1	245	220	240
FM-9A	SINGLE CASING	1	191	166	186
FM-10	SINGLE CASING	1	240	215	235
FM-10A	SINGLE CASING	1	176	151	171
FM-11	SINGLE CASING	1	261	236	256
FM-11A	SINGLE CASING	1	159	134	154
FM-12	SINGLE CASING	1	231	206	226
FM-12A	SINGLE CASING	1	160	135	155
FM-13	SINGLE CASING	1	235	210	230
FM-13A	SINGLE CASING	1	165	140	160
FM-14	SINGLE CASING	1	259	234	254
FM-14A	SINGLE CASING	1	172	147	167
FM-15	SINGLE CASING	1	243	218	238
FM-15A	SINGLE CASING	1	145	120	140
FM-16	SINGLE CASING	1	273	248	268
FM-16A	SINGLE CASING	1	150	125	145
FM-17	SINGLE CASING	1	275	250	270
FM-18	SINGLE CASING	1	254	224	244
FM-18A	SINGLE CASING	1	156	121	151
FM-19A	SINGLE CASING	1	140	115	135
FM-19B	SINGLE CASING	1	265	230	260
FM-19C	SINGLE CASING	1	390	365	385
FM-20	SINGLE CASING	1	246	221	241
FM-20A	SINGLE CASING	1	155	130	150
FM-21	SINGLE CASING	1	275	260	270
FM-21A	SINGLE CASING	1	165	140	160
FM-22	SINGLE CASING	1	267	242	265
FM-22A	SINGLE CASING	1	175	150	170
FM-23	SINGLE CASING	1	253	234	249
FM-23A	SINGLE CASING	1	149	128	143
FM-24	SINGLE CASING	1	295	271	291
FM-24A	SINGLE CASING	1	184	154	174
FM-25	SINGLE CASING	1	152	132	152
FM-26	SINGLE CASING	1	155	145	155
FM-27	SINGLE CASING	1	125	105	125
IDM-3	NESTED	1	214	174	194
IDM-3	NESTED	2	330	290	310
IDM-3	NESTED	3	682	652	672
IDM-4	NESTED	1	166	136	156
IDM-4	NESTED	2	302	272	292
IDM-4	NESTED	3	684	654	674
IDP-2R	NESTED	1	205	155	195
IDP-2R	NESTED	2	350	300	340
IDP-3	SINGLE CASING	1	525	125	505
IDP-4	SINGLE CASING	1	430	125	410
KBS-1	SINGLE CASING	1	230	209	219
KBS-3	SINGLE CASING	1	90	80	90
KBS-4	SINGLE CASING	1	158	138	158
KBS-4A	SINGLE CASING	1	90	80	90
MCAS-4	SINGLE CASING	1	275	181	238

NA: Not Available

APPENDIX E - OCWD ACTIVE GROUNDWATER MONITORING WELLS
(Excluding Westbay Multiport Wells)

Well Name	Well Type	Casing Sequence No.	Cased Depth (ft.)	Top Perforation (ft.)	Bottom Perforation (ft.)
MCAS-5A	SINGLE CASING	1	133	120	130
MCAS-6	SINGLE CASING	1	285	167	222
MCAS-8	SINGLE CASING	1	435	392	410
MCAS-9	SINGLE CASING	1	450	372	445
MCAS-10	SINGLE CASING	1	389	347	377
MSP-10P	SINGLE CASING	1	50	40	50
MSP-10T	SINGLE CASING	1	140	70	140
OCWD-7	SINGLE CASING	1	48	28	48
OCWD-33Z11	NESTED	1	384	338	379
OCWD-33Z11	NESTED	2	490	435	485
OCWD-34F10	NESTED	1	231	215	225
OCWD-34F10	NESTED	2	291	270	285
OCWD-34F10	NESTED	3	346	315	340
OCWD-34F10	NESTED	4	465	420	460
OCWD-34H25	NESTED	1	356	300	350
OCWD-34H25	NESTED	2	470	410	465
OCWD-34H5	NESTED	1	360	300	340
OCWD-34H5	NESTED	2	475	405	455
OCWD-34L10	NESTED	1	191	165	185
OCWD-34L10	NESTED	2	266	225	260
OCWD-34L10	NESTED	3	371	311	365
OCWD-34L10	NESTED	4	455	405	450
OCWD-34N21	NESTED	1	NA	329	366
OCWD-34N21	NESTED	2	NA	424	464
OCWD-34U8	NESTED	1	180	149	174
OCWD-34U8	NESTED	2	240	224	234
OCWD-34U8	NESTED	3	325	279	319
OCWD-34U8	NESTED	4	389	359	384
OCWD-34V20	NESTED	1	313	235	307
OCWD-34V20	NESTED	2	422	387	417
OCWD-35F20	NESTED	1	NA	70	95
OCWD-35F20	NESTED	2	NA	115	125
OCWD-35F20	NESTED	3	NA	145	180
OCWD-35F20	NESTED	4	NA	235	265
OCWD-35H11	NESTED	1	225	200	220
OCWD-35H11	NESTED	2	163	125	158
OCWD-35H11	NESTED	3	82	44	77
OCWD-35H12	SINGLE CASING	1	159	137	147
OCWD-35J1	NESTED	1	260	190	240
OCWD-35J1	NESTED	2	190	130	170
OCWD-35K1	NESTED	1	263	193	243
OCWD-35K1	NESTED	2	190	130	170
OCWD-35N01	NESTED	1	90	80	85
OCWD-35N01	NESTED	2	80	39	79
OCWD-35T9	SINGLE CASING	1	432	390	411
OCWD-36FP1Z	SINGLE CASING	1	NA	504	514
OCWD-36FP14Z1	SINGLE CASING	1	135	115	125
OCWD-AIR1	NESTED	1	255	200	250
OCWD-AIR1	NESTED	2	515	410	510
OCWD-AIR1	NESTED	3	855	675	850
OCWD-AIR1	NESTED	4	1485	1375	1460

NA: Not Available

APPENDIX E - OCWD ACTIVE GROUNDWATER MONITORING WELLS
(Excluding Westbay Multiport Wells)

Well Name	Well Type	Casing Sequence No.	Cased Depth (ft.)	Top Perforation (ft.)	Bottom Perforation (ft.)
OCWD-AN1	SINGLE CASING	1	115	35	115
OCWD-AN2	SINGLE CASING	1	115	35	115
OCWD-BP1	SINGLE CASING	1	40	20	40
OCWD-BP2	SINGLE CASING	1	70	50	70
OCWD-BP3	SINGLE CASING	1	205	185	205
OCWD-BP4	SINGLE CASING	1	180	140	180
OCWD-BP5	NESTED	1	75	55	75
OCWD-BP5	NESTED	2	167	147	167
OCWD-BP6	SINGLE CASING	1	168	148	168
OCWD-BP7	NESTED	1	57	47	57
OCWD-BP7	NESTED	2	168	148	168
OCWD-BS15	SINGLE CASING	1	75	60	70
OCWD-BS16	SINGLE CASING	1	85	60	80
OCWD-BS18	SINGLE CASING	1	87	72	82
OCWD-BS19	SINGLE CASING	1	88	63	83
OCWD-CTG1	NESTED	1	265	160	260
OCWD-CTG1	NESTED	2	725	420	720
OCWD-CTG1	NESTED	3	1025	800	1025
OCWD-CTG1	NESTED	4	1225	1060	1220
OCWD-CTG5	NESTED	1	620	420	620
OCWD-CTG5	NESTED	2	1000	880	1000
OCWD-CTG5	NESTED	3	1120	1040	1120
OCWD-CTK1	NESTED	1	660	410	655
OCWD-CTK1	NESTED	2	1020	780	1015
OCWD-CTK1	NESTED	3	1320	1260	1315
OCWD-FBM1	SINGLE CASING	1	140	38	138
OCWD-FBM2	SINGLE CASING	1	140	39	139
OCWD-FC1	SINGLE CASING	1	185	165	185
OCWD-FC2	SINGLE CASING	1	115	95	115
OCWD-FH1	SINGLE CASING	1	140	120	140
OCWD-GA1	SINGLE CASING	1	40	30	40
OCWD-GA2	SINGLE CASING	1	40	30	40
OCWD-GA3	SINGLE CASING	1	40	30	40
OCWD-GA4	SINGLE CASING	1	40	30	40
OCWD-GA5	SINGLE CASING	1	40	30	40
OCWD-GA6	SINGLE CASING	1	40	30	40
OCWD-GA7	SINGLE CASING	1	40	30	40
OCWD-GA9	SINGLE CASING	1	29	19	29
OCWD-I27M1	SINGLE CASING	1	22	17	22
OCWD-I28M1	SINGLE CASING	1	24	19	24
OCWD-KB1	SINGLE CASING	1	200	180	200
OCWD-KR2	SINGLE CASING	1	394	NA	NA
OCWD-LB1	NESTED	1	35	25	35
OCWD-LB1	NESTED	2	168	148	168
OCWD-LB2	SINGLE CASING	1	30	15	30
OCWD-LB3	NESTED	1	46	36	46
OCWD-LB3	NESTED	2	165	145	165
OCWD-LV1	SINGLE CASING	1	155	135	155
OCWD-M1	SINGLE CASING	1	115	75	110
OCWD-M2	SINGLE CASING	1	155	85	150
OCWD-M4	NESTED	1	125	80	120

NA: Not Available

APPENDIX E - OCWD ACTIVE GROUNDWATER MONITORING WELLS
(Excluding Westbay Multiport Wells)

Well Name	Well Type	Casing Sequence No.	Cased Depth (ft.)	Top Perforation (ft.)	Bottom Perforation (ft.)
OCWD-M4	NESTED	2	180	145	175
OCWD-M4	NESTED	3	275	235	270
OCWD-M4	NESTED	4	335	295	330
OCWD-M5	NESTED	1	100	65	95
OCWD-M5	NESTED	2	165	115	160
OCWD-M5	NESTED	3	265	215	260
OCWD-M5	NESTED	4	310	285	305
OCWD-M6A	NESTED	1	130	65	125
OCWD-M6A	NESTED	2	170	150	165
OCWD-M6A	NESTED	3	290	260	285
OCWD-M6B	SINGLE CASING	1	240	185	235
OCWD-M7A	NESTED	1	140	70	135
OCWD-M7A	NESTED	2	175	155	170
OCWD-M7A	NESTED	3	225	190	220
OCWD-M7B	SINGLE CASING	1	265	240	260
OCWD-M8	NESTED	1	155	50	150
OCWD-M8	NESTED	2	210	185	205
OCWD-M8	NESTED	3	255	225	250
OCWD-M8	NESTED	4	315	275	310
OCWD-M9	NESTED	1	120	90	115
OCWD-M9	NESTED	2	160	135	155
OCWD-M9	NESTED	3	230	185	225
OCWD-M9	NESTED	4	300	250	295
OCWD-M10	NESTED	1	165	80	160
OCWD-M10	NESTED	2	200	175	195
OCWD-M10	NESTED	3	245	215	240
OCWD-M10	NESTED	4	310	280	305
OCWD-M11	NESTED	1	110	70	105
OCWD-M11	NESTED	2	155	125	150
OCWD-M11	NESTED	3	230	170	225
OCWD-M11	NESTED	4	295	260	290
OCWD-M12	NESTED	1	115	70	110
OCWD-M12	NESTED	2	225	130	220
OCWD-M12	NESTED	3	265	240	260
OCWD-M12	NESTED	4	355	330	350
OCWD-M13	NESTED	1	100	65	95
OCWD-M13	NESTED	2	205	140	200
OCWD-M13	NESTED	3	300	230	295
OCWD-M13	NESTED	4	400	360	395
OCWD-M14A	NESTED	1	95	60	90
OCWD-M14A	NESTED	2	185	120	180
OCWD-M14A	NESTED	3	305	200	300
OCWD-M14B	SINGLE CASING	1	345	320	340
OCWD-M15A	NESTED	1	90	60	85
OCWD-M15A	NESTED	2	180	115	175
OCWD-M15A	NESTED	3	295	195	290
OCWD-M15B	SINGLE CASING	1	340	310	335
OCWD-M16	NESTED	1	95	65	90
OCWD-M16	NESTED	2	165	115	160
OCWD-M16	NESTED	3	275	180	270
OCWD-M16	NESTED	4	320	295	315

NA: Not Available

APPENDIX E - OCWD ACTIVE GROUNDWATER MONITORING WELLS
(Excluding Westbay Multiport Wells)

Well Name	Well Type	Casing Sequence No.	Cased Depth (ft.)	Top Perforation (ft.)	Bottom Perforation (ft.)
OCWD-M17A	NESTED	1	100	60	95
OCWD-M17A	NESTED	2	190	130	185
OCWD-M17A	NESTED	3	350	330	345
OCWD-M17B	SINGLE CASING	1	310	210	305
OCWD-M18	NESTED	1	95	65	90
OCWD-M18	NESTED	2	180	110	175
OCWD-M18	NESTED	3	295	195	290
OCWD-M18	NESTED	4	340	310	335
OCWD-M19	NESTED	1	115	60	110
OCWD-M19	NESTED	2	200	130	195
OCWD-M19	NESTED	3	270	215	265
OCWD-M20	NESTED	1	110	60	105
OCWD-M20	NESTED	2	200	170	195
OCWD-M20	NESTED	3	275	255	270
OCWD-M21	NESTED	1	105	65	100
OCWD-M21	NESTED	2	190	150	185
OCWD-M21	NESTED	3	265	205	260
OCWD-M21	NESTED	4	345	320	340
OCWD-M22	NESTED	1	110	70	105
OCWD-M22	NESTED	2	215	140	210
OCWD-M22	NESTED	3	275	230	270
OCWD-M23A	NESTED	1	95	65	90
OCWD-M23A	NESTED	2	170	110	165
OCWD-M23A	NESTED	3	265	190	260
OCWD-M23B	SINGLE CASING	1	325	295	320
OCWD-M24	NESTED	1	100	70	95
OCWD-M24	NESTED	2	170	115	165
OCWD-M24	NESTED	3	235	185	230
OCWD-M24	NESTED	4	315	290	310
OCWD-M25	SINGLE CASING	1	195	65	185
OCWD-M26	SINGLE CASING	1	145	70	135
OCWD-M27	SINGLE CASING	1	120	60	110
OCWD-M28	SINGLE CASING	1	155	80	145
OCWD-M30	SINGLE CASING	1	120	90	110
OCWD-M31	SINGLE CASING	1	172	82	162
OCWD-M36	NESTED	1	95	80	90
OCWD-M36	NESTED	2	180	165	175
OCWD-M36	NESTED	3	255	240	250
OCWD-M36	NESTED	4	305	290	300
OCWD-M37	NESTED	1	135	120	130
OCWD-M37	NESTED	2	195	180	190
OCWD-M37	NESTED	3	245	230	240
OCWD-M37	NESTED	4	312	297	307
OCWD-M37	NESTED	5	353	338	348
OCWD-M38	NESTED	1	114	94	104
OCWD-M38	NESTED	2	176	156	166
OCWD-M38	NESTED	3	254	234	244
OCWD-M38	NESTED	4	356	336	346
OCWD-M38	NESTED	5	536	516	526
OCWD-M39	NESTED	1	90	70	80
OCWD-M39	NESTED	2	130	100	120

NA: Not Available

APPENDIX E - OCWD ACTIVE GROUNDWATER MONITORING WELLS
(Excluding Westbay Multiport Wells)

Well Name	Well Type	Casing Sequence No.	Cased Depth (ft.)	Top Perforation (ft.)	Bottom Perforation (ft.)
OCWD-M39	NESTED	3	180	150	170
OCWD-M39	NESTED	4	220	200	210
OCWD-M39	NESTED	5	280	250	270
OCWD-M40	NESTED	1	115	85	105
OCWD-M40	NESTED	2	190	160	180
OCWD-M40	NESTED	3	235	205	225
OCWD-M40	NESTED	4	530	330	520
OCWD-M41	NESTED	1	86	66	76
OCWD-M41	NESTED	2	115	95	105
OCWD-M41	NESTED	3	220	200	210
OCWD-M41	NESTED	4	256	236	246
OCWD-M41	NESTED	5	400	370	390
OCWD-M42	NESTED	1	130	100	120
OCWD-M42	NESTED	2	157	137	147
OCWD-M42	NESTED	3	230	210	220
OCWD-M42	NESTED	4	290	260	280
OCWD-M42	NESTED	5	530	500	520
OCWD-M42	NESTED	6	638	608	628
OCWD-M43	NESTED	1	156	136	146
OCWD-M43	NESTED	2	320	290	310
OCWD-M43	NESTED	3	360	340	350
OCWD-M43	NESTED	4	410	380	400
OCWD-M43	NESTED	5	550	520	540
OCWD-M44	NESTED	1	65	50	60
OCWD-M44	NESTED	2	125	100	120
OCWD-M44	NESTED	3	155	140	150
OCWD-M44	NESTED	4	280	245	275
OCWD-M44	NESTED	5	310	295	305
OCWD-M44A	SINGLE CASING	1	125	100	125
OCWD-M44	NESTED	1	65	50	60
OCWD-M44	NESTED	2	125	100	120
OCWD-M44	NESTED	3	155	140	150
OCWD-M44	NESTED	4	280	245	275
OCWD-M44	NESTED	5	310	295	305
OCWD-M45	NESTED	1	215	195	205
OCWD-M45	NESTED	2	270	250	260
OCWD-M45	NESTED	3	355	335	345
OCWD-M45	NESTED	4	400	380	390
OCWD-M45	NESTED	5	800	780	790
OCWD-M46	NESTED	1	380	350	370
OCWD-M46	NESTED	2	440	420	430
OCWD-M46	NESTED	3	545	515	535
OCWD-M46	NESTED	4	670	640	660
OCWD-M46	NESTED	5	920	890	910
OCWD-M46A	SINGLE CASING	1	380	350	370
OCWD-M46	NESTED	1	380	350	370
OCWD-M46	NESTED	2	440	420	430
OCWD-M46	NESTED	3	545	515	535
OCWD-M46	NESTED	4	670	640	660
OCWD-M46	NESTED	5	920	890	910
OCWD-M47	NESTED	1	385	355	375

NA: Not Available

APPENDIX E - OCWD ACTIVE GROUNDWATER MONITORING WELLS
(Excluding Westbay Multiport Wells)

Well Name	Well Type	Casing Sequence No.	Cased Depth (ft.)	Top Perforation (ft.)	Bottom Perforation (ft.)
OCWD-M47	NESTED	2	490	470	480
OCWD-M47	NESTED	3	610	580	600
OCWD-M47	NESTED	4	775	745	765
OCWD-M47	NESTED	5	970	940	960
OCWD-M48	NESTED	1	110	80	100
OCWD-M48	NESTED	2	205	175	195
OCWD-M48	NESTED	3	490	470	480
OCWD-MOOR	SINGLE CASING	1	470	NA	NA
OCWD-RVW1	SINGLE CASING	1	78	67	77
OCWD-RVW1A	SINGLE CASING	1	49	39	49
OCWD-T2	NESTED	1	33	20	30
OCWD-T2	NESTED	2	180	70	170
OCWD-T2	NESTED	3	370	300	360
OCWD-T3	NESTED	1	95	65	85
OCWD-T3	NESTED	2	180	110	170
OCWD-T4	SINGLE CASING	1	176	68	168
OCWD-T5	NESTED	1	200	110	190
OCWD-T5	NESTED	2	305	285	295
OCWD-W1	SINGLE CASING	1	398	NA	NA
OCWD-YLR1	SINGLE CASING	1	40	35	40
OCWD-YLR2	SINGLE CASING	1	37	32	37
OCWD-YLR3	SINGLE CASING	1	36	31	36
OM-1	SINGLE CASING	1	245	217	235
OM-2	SINGLE CASING	1	250	211	219
OM-2A	SINGLE CASING	1	130	118	125
OM-4	SINGLE CASING	1	237	221	230
OM-4A	SINGLE CASING	1	119	112	117
OM-6	SINGLE CASING	1	249	196	204
OM-8	SINGLE CASING	1	319	285	293
OM-8A	SINGLE CASING	1	178	156	164
SCS-3	SINGLE CASING	1	42	31	42
SCS-4	SINGLE CASING	1	32	21	32
SCS-5	SINGLE CASING	1	43	22	43
SCS-6	NESTED	1	29	23	29
SCS-6	NESTED	2	153	147	153
SCS-7	NESTED	1	36	20	36
SCS-7	NESTED	2	141	125	141
SCS-8	SINGLE CASING	1	129	108	129
SCS-9	SINGLE CASING	1	178	153	173
SCS-10	SINGLE CASING	1	221	206	216
SCS-B1	NESTED	1	43	18	43
SCS-B2	NESTED	1	10	5	10
SCS-B2	NESTED	2	29	19	29
SCS-B3	NESTED	1	10	5	10
SCS-B3	NESTED	2	25	16	26
TIC-67	SINGLE CASING	1	902	245	900
W-14659	SINGLE CASING	1	27	12	27
W-15061	SINGLE CASING	1	NA	NA	NA

NA: Not Available

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
ABS-1/1/WB1/MP1	WESTBAY MULTIPORT	1	27	25	35
ABS-1/1/WB1/MP2	WESTBAY MULTIPORT	2	77	75	85
ABS-1/1/WB1/MP3	WESTBAY MULTIPORT	3	257	255	265
AMD-1/1/WB1/MP1	WESTBAY MULTIPORT	1	105	104	114
AMD-1/1/WB1/MP2	WESTBAY MULTIPORT	2	135	135	145
AMD-1/1/WB1/MP3	WESTBAY MULTIPORT	3	180	180	190
AMD-1/1/WB1/MP4	WESTBAY MULTIPORT	4	245	246	256
AMD-1/1/WB1/MP5	WESTBAY MULTIPORT	5	329	330	340
AMD-1/1/WB1/MP6	WESTBAY MULTIPORT	6	383	384	394
AMD-1/1/WB1/MP7	WESTBAY MULTIPORT	7	523	524	534
AMD-1/1/WB1/MP8	WESTBAY MULTIPORT	8	762	760	770
AMD-1/1/WB1/MP9	WESTBAY MULTIPORT	9	1037	1038	1048
AMD-1/1/WB1/MP10	WESTBAY MULTIPORT	10	1392	1390	1400
AMD-2/1/WB1/MP1	WESTBAY MULTIPORT	1	157	156	166
AMD-2/1/WB1/MP2	WESTBAY MULTIPORT	2	262	260	270
AMD-2/1/WB1/MP3	WESTBAY MULTIPORT	3	387	384	394
AMD-2/1/WB1/MP4	WESTBAY MULTIPORT	4	512	510	520
AMD-2/1/WB1/MP5	WESTBAY MULTIPORT	5	659	658	668
AMD-2/1/WB1/MP6	WESTBAY MULTIPORT	6	824	820	830
AMD-2/1/WB1/MP7	WESTBAY MULTIPORT	7	1014	1012	1022
AMD-2/1/WB1/MP8	WESTBAY MULTIPORT	8	1154	1150	1160
AMD-2/1/WB1/MP9	WESTBAY MULTIPORT	9	1294	1290	1300
AMD-2/1/WB1/MP10	WESTBAY MULTIPORT	10	1444	1440	1450
AMD-3/1/WB1/MP1	WESTBAY MULTIPORT	1	65	66	76
AMD-3/1/WB1/MP2	WESTBAY MULTIPORT	2	135	134	144
AMD-3/1/WB1/MP3	WESTBAY MULTIPORT	3	210	210	220
AMD-3/1/WB1/MP4	WESTBAY MULTIPORT	4	360	360	370
AMD-3/1/WB1/MP5	WESTBAY MULTIPORT	5	480	480	490
AMD-3/1/WB1/MP6	WESTBAY MULTIPORT	6	569	570	580
AMD-3/1/WB1/MP7	WESTBAY MULTIPORT	7	823	820	830
AMD-3/1/WB1/MP8	WESTBAY MULTIPORT	8	923	920	930
AMD-3/1/WB1/MP9	WESTBAY MULTIPORT	9	1173	1170	1180
AMD-3/1/WB1/MP10	WESTBAY MULTIPORT	10	1283	1282	1292
AMD-4/1/WB1/MP1	WESTBAY MULTIPORT	1	206	204	214
AMD-4/1/WB1/MP2	WESTBAY MULTIPORT	2	296	295	305
AMD-4/1/WB1/MP3	WESTBAY MULTIPORT	3	381	380	390
AMD-4/1/WB1/MP4	WESTBAY MULTIPORT	4	561	560	570
AMD-4/1/WB1/MP5	WESTBAY MULTIPORT	5	702	700	710
AMD-4/1/WB1/MP6	WESTBAY MULTIPORT	6	794	790	800
AMD-4/1/WB1/MP7	WESTBAY MULTIPORT	7	939	935	945
AMD-4/1/WB1/MP8	WESTBAY MULTIPORT	8	1059	1055	1065
AMD-4/1/WB1/MP9	WESTBAY MULTIPORT	9	1124	1120	1130
AMD-4/1/WB1/MP10	WESTBAY MULTIPORT	10	1269	1265	1275
AMD-4/1/WB1/MP11	WESTBAY MULTIPORT	11	1409	1405	1415
AMD-5/1/WB1/MP1	WESTBAY MULTIPORT	1	101	100	110
AMD-5/1/WB1/MP2	WESTBAY MULTIPORT	2	201	200	210
AMD-5/1/WB1/MP3	WESTBAY MULTIPORT	3	301	300	310
AMD-5/1/WB1/MP4	WESTBAY MULTIPORT	4	415	414	424
AMD-5/1/WB1/MP5	WESTBAY MULTIPORT	5	497	495	505
AMD-5/1/WB1/MP6	WESTBAY MULTIPORT	6	642	640	650
AMD-5/1/WB1/MP7	WESTBAY MULTIPORT	7	754	750	760

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
AMD-5/1/WB1/MP8	WESTBAY MULTIPORT	8	924	920	930
AMD-5/1/WB1/MP9	WESTBAY MULTIPORT	9	1029	1025	1035
AMD-5/1/WB1/MP10	WESTBAY MULTIPORT	10	1214	1210	1220
AMD-5/1/WB1/MP11	WESTBAY MULTIPORT	11	1324	1320	1330
AMD-5/1/WB1/MP12	WESTBAY MULTIPORT	12	1424	1420	1430
AMD-6/1/WB1/MP1	WESTBAY MULTIPORT	1	112	110	120
AMD-6/1/WB1/MP2	WESTBAY MULTIPORT	2	152	150	160
AMD-6/1/WB1/MP3	WESTBAY MULTIPORT	3	222	220	230
AMD-6/1/WB1/MP4	WESTBAY MULTIPORT	4	277	275	285
AMD-6/1/WB1/MP5	WESTBAY MULTIPORT	5	372	370	380
AMD-6/1/WB1/MP6	WESTBAY MULTIPORT	6	497	495	505
AMD-6/1/WB1/MP7	WESTBAY MULTIPORT	7	622	620	630
AMD-6/1/WB1/MP8	WESTBAY MULTIPORT	8	714	710	720
AMD-6/1/WB1/MP9	WESTBAY MULTIPORT	9	794	790	800
AMD-6/1/WB1/MP10	WESTBAY MULTIPORT	10	904	900	910
AMD-6/1/WB1/MP11	WESTBAY MULTIPORT	11	1094	1090	1100
AMD-6/1/WB1/MP12	WESTBAY MULTIPORT	12	1264	1260	1270
AMD-6/1/WB1/MP13	WESTBAY MULTIPORT	13	1409	1405	1415
AMD-7/1/WB1/MP1	WESTBAY MULTIPORT	1	121	120	130
AMD-7/1/WB1/MP2	WESTBAY MULTIPORT	2	221	220	230
AMD-7/1/WB1/MP3	WESTBAY MULTIPORT	3	271	270	280
AMD-7/1/WB1/MP4	WESTBAY MULTIPORT	4	311	310	320
AMD-7/1/WB1/MP5	WESTBAY MULTIPORT	5	371	370	380
AMD-7/1/WB1/MP6	WESTBAY MULTIPORT	6	471	470	480
AMD-7/1/WB1/MP7	WESTBAY MULTIPORT	7	580	578	588
AMD-7/1/WB1/MP8	WESTBAY MULTIPORT	8	694	690	700
AMD-7/1/WB1/MP9	WESTBAY MULTIPORT	9	809	805	815
AMD-7/1/WB1/MP10	WESTBAY MULTIPORT	10	934	930	940
AMD-7/1/WB1/MP11	WESTBAY MULTIPORT	11	1074	1070	1080
AMD-7/1/WB1/MP12	WESTBAY MULTIPORT	12	1169	1165	1175
AMD-7/1/WB1/MP13	WESTBAY MULTIPORT	13	1299	1295	1305
AMD-7/1/WB1/MP14	WESTBAY MULTIPORT	14	1424	1420	1430
AMD-8/1/WB1/MP1	WESTBAY MULTIPORT	1	80	78	88
AMD-8/1/WB1/MP2	WESTBAY MULTIPORT	2	180	178	188
AMD-8/1/WB1/MP3	WESTBAY MULTIPORT	3	315	314	324
AMD-8/1/WB1/MP4	WESTBAY MULTIPORT	4	525	524	534
AMD-8/1/WB1/MP5	WESTBAY MULTIPORT	5	662	660	670
AMD-8/1/WB1/MP6	WESTBAY MULTIPORT	6	764	760	770
AMD-8/1/WB1/MP7	WESTBAY MULTIPORT	7	859	856	866
AMD-8/1/WB1/MP8	WESTBAY MULTIPORT	8	1004	1000	1010
AMD-8/1/WB1/MP9	WESTBAY MULTIPORT	9	1164	1160	1170
AMD-8/1/WB1/MP10	WESTBAY MULTIPORT	10	1289	1286	1296
AMD-8/1/WB1/MP11	WESTBAY MULTIPORT	11	1454	1450	1460
AMD-8/1/WB1/MP12	WESTBAY MULTIPORT	12	1569	1564	1574
AMD-8/1/WB1/MP13	WESTBAY MULTIPORT	13	1764	1760	1770
AMD-8/1/WB1/MP14	WESTBAY MULTIPORT	14	1949	1944	1954
AMD-8/1/WB1/MP15	WESTBAY MULTIPORT	15	2014	2010	2020
BPM-1/1/WB1/MP1	WESTBAY MULTIPORT	1	129	128	138
BPM-1/1/WB1/MP2	WESTBAY MULTIPORT	2	249	248	258
BPM-1/1/WB1/MP3	WESTBAY MULTIPORT	3	458	456	466
BPM-1/1/WB1/MP4	WESTBAY MULTIPORT	4	613	612	622

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
BPM-1/1/WB1/MP5	WESTBAY MULTIPORT	5	780	776	786
BPM-1/1/WB1/MP6	WESTBAY MULTIPORT	6	890	886	896
BPM-1/1/WB1/MP7	WESTBAY MULTIPORT	7	1040	1036	1046
BPM-1/1/WB1/MP8	WESTBAY MULTIPORT	8	1267	1264	1274
BPM-1/1/WB1/MP9	WESTBAY MULTIPORT	9	1392	1388	1398
BPM-1/1/WB1/MP10	WESTBAY MULTIPORT	10	1502	1498	1508
BPM-1/1/WB1/MP11	WESTBAY MULTIPORT	11	1687	1684	1694
BPM-1/1/WB1/MP12	WESTBAY MULTIPORT	12	1804	1800	1810
BPM-1/1/WB1/MP13	WESTBAY MULTIPORT	13	1934	1930	1940
BPM-1/1/WB1/MP14	WESTBAY MULTIPORT	14	2109	2105	2115
BPM-2/1/WB1/MP1	WESTBAY MULTIPORT	1	181	180	190
BPM-2/1/WB1/MP2	WESTBAY MULTIPORT	2	336	336	346
BPM-2/1/WB1/MP3	WESTBAY MULTIPORT	3	496	494	504
BPM-2/1/WB1/MP4	WESTBAY MULTIPORT	4	581	580	590
BPM-2/1/WB1/MP5	WESTBAY MULTIPORT	5	778	774	784
BPM-2/1/WB1/MP6	WESTBAY MULTIPORT	6	903	900	910
BPM-2/1/WB1/MP7	WESTBAY MULTIPORT	7	1028	1024	1034
BPM-2/1/WB1/MP8	WESTBAY MULTIPORT	8	1243	1240	1250
BPM-2/1/WB1/MP9	WESTBAY MULTIPORT	9	1367	1364	1374
BPM-2/1/WB1/MP10	WESTBAY MULTIPORT	10	1494	1490	1500
BPM-2/1/WB1/MP11	WESTBAY MULTIPORT	11	1614	1610	1620
BPM-2/1/WB1/MP12	WESTBAY MULTIPORT	12	1764	1760	1770
BPM-2/1/WB1/MP13	WESTBAY MULTIPORT	13	1931	1928	1938
BPM-2/1/WB1/MP14	WESTBAY MULTIPORT	14	2073	2070	2080
BPM-2/1/WB1/MP15	WESTBAY MULTIPORT	15	2173	2170	2180
CB-1/1/WB2/MP1	WESTBAY MULTIPORT	1	78	76	86
CB-1/1/WB2/MP2	WESTBAY MULTIPORT	2	143	140	150
CB-1/1/WB2/MP3	WESTBAY MULTIPORT	3	443	440	450
CB-1/1/WB2/MP4	WESTBAY MULTIPORT	4	663	659	669
CB-1/1/WB2/MP5	WESTBAY MULTIPORT	5	873	870	880
CB-1/1/WB2/MP6	WESTBAY MULTIPORT	6	1053	1050	1060
CB-1/1/WB2/MP7	WESTBAY MULTIPORT	7	1193	1190	1200
CB-1/1/WB2/MP8	WESTBAY MULTIPORT	8	1333	1329	1339
CB-1/1/WB2/MP9	WESTBAY MULTIPORT	9	1463	1460	1470
COSM-1/1/WB1/MP1	WESTBAY MULTIPORT	1	92	90	100
COSM-1/1/WB1/MP2	WESTBAY MULTIPORT	2	154	152	162
COSM-1/1/WB1/MP3	WESTBAY MULTIPORT	3	271	270	280
COSM-1/1/WB1/MP4	WESTBAY MULTIPORT	4	351	350	360
COSM-1/1/WB1/MP5	WESTBAY MULTIPORT	5	451	450	460
COSM-1/1/WB1/MP6	WESTBAY MULTIPORT	6	541	540	550
COSM-1/1/WB1/MP7	WESTBAY MULTIPORT	7	621	620	630
COSM-1/1/WB1/MP8	WESTBAY MULTIPORT	8	723	720	730
COSM-1/1/WB1/MP9	WESTBAY MULTIPORT	9	853	850	860
COSM-1/1/WB1/MP10	WESTBAY MULTIPORT	10	983	980	990
COSM-1/1/WB1/MP11	WESTBAY MULTIPORT	11	1103	1100	1110
COSM-1/1/WB1/MP12	WESTBAY MULTIPORT	12	1215	1212	1222
COSM-1/1/WB1/MP13	WESTBAY MULTIPORT	13	1435	1432	1442
COSM-1/1/WB1/MP14	WESTBAY MULTIPORT	14	1599	1594	1604
COSM-1/1/WB1/MP15	WESTBAY MULTIPORT	15	1764	1760	1770
COSM-2/1/WB1/MP1	WESTBAY MULTIPORT	1	60	58	68
COSM-2/1/WB1/MP2	WESTBAY MULTIPORT	2	115	113	123

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
COSM-2/1/WB1/MP3	WESTBAY MULTIPORT	3	202	198	208
COSM-2/1/WB1/MP4	WESTBAY MULTIPORT	4	309	307	317
COSM-2/1/WB1/MP5	WESTBAY MULTIPORT	5	409	406	416
COSM-2/1/WB1/MP6	WESTBAY MULTIPORT	6	541	540	550
COSM-2/1/WB1/MP7	WESTBAY MULTIPORT	7	651	649	659
COSM-2/1/WB1/MP8	WESTBAY MULTIPORT	8	763	757	767
COSM-2/1/WB1/MP9	WESTBAY MULTIPORT	9	890	886	896
COSM-2/1/WB1/MP10	WESTBAY MULTIPORT	10	1055	1051	1061
FFS-1/1/WB2/MP1	WESTBAY MULTIPORT	1	181	180	190
FFS-1/1/WB2/MP2	WESTBAY MULTIPORT	2	361	360	370
FFS-1/1/WB2/MP3	WESTBAY MULTIPORT	3	530	529	539
FFS-1/1/WB2/MP4	WESTBAY MULTIPORT	4	820	819	829
FFS-1/1/WB2/MP5	WESTBAY MULTIPORT	5	1060	1059	1069
FFS-1/1/WB2/MP6	WESTBAY MULTIPORT	6	1160	1159	1169
FFS-1/1/WB2/MP7	WESTBAY MULTIPORT	7	1300	1299	1309
FFS-1/1/WB2/MP8	WESTBAY MULTIPORT	8	1420	1419	1429
FVM-1/1/WB2/MP1	WESTBAY MULTIPORT	1	136	134	145
FVM-1/1/WB2/MP2	WESTBAY MULTIPORT	2	173	172	182
FVM-1/1/WB2/MP3	WESTBAY MULTIPORT	3	223	220	230
FVM-1/1/WB2/MP4	WESTBAY MULTIPORT	4	360	360	370
FVM-1/1/WB2/MP5	WESTBAY MULTIPORT	5	450	450	460
FVM-1/1/WB2/MP6	WESTBAY MULTIPORT	6	500	500	510
FVM-1/1/WB2/MP7	WESTBAY MULTIPORT	7	560	560	570
FVM-1/1/WB2/MP8	WESTBAY MULTIPORT	8	632	630	640
FVM-1/1/WB2/MP9	WESTBAY MULTIPORT	9	814	810	820
FVM-1/1/WB2/MP10	WESTBAY MULTIPORT	10	896	894	904
FVM-1/1/WB2/MP11	WESTBAY MULTIPORT	11	1003	1000	1010
FVM-1/1/WB2/MP12	WESTBAY MULTIPORT	12	1123	1120	1130
FVM-1/1/WB2/MP13	WESTBAY MULTIPORT	13	1178	1175	1185
FVM-1/1/WB2/MP14	WESTBAY MULTIPORT	14	1233	1230	1240
FVM-1/1/WB2/MP15	WESTBAY MULTIPORT	15	1323	1320	1330
FVM-1/1/WB2/MP16	WESTBAY MULTIPORT	16	1497	1492	1502
FVM-1/1/WB2/MP17	WESTBAY MULTIPORT	17	1587	1582	1592
FVM-1/1/WB2/MP18	WESTBAY MULTIPORT	18	1837	1834	1844
GGM-1/1/WB1/MP1	WESTBAY MULTIPORT	1	150	150	160
GGM-1/1/WB1/MP2	WESTBAY MULTIPORT	2	300	300	310
GGM-1/1/WB1/MP3	WESTBAY MULTIPORT	3	465	464	474
GGM-1/1/WB1/MP4	WESTBAY MULTIPORT	4	552	550	560
GGM-1/1/WB1/MP5	WESTBAY MULTIPORT	5	744	740	750
GGM-1/1/WB1/MP6	WESTBAY MULTIPORT	6	829	825	835
GGM-1/1/WB1/MP7	WESTBAY MULTIPORT	7	954	950	960
GGM-1/1/WB1/MP8	WESTBAY MULTIPORT	8	1074	1070	1080
GGM-1/1/WB1/MP9	WESTBAY MULTIPORT	9	1264	1260	1270
GGM-1/1/WB1/MP10	WESTBAY MULTIPORT	10	1519	1515	1525
GGM-1/1/WB1/MP11	WESTBAY MULTIPORT	11	1654	1650	1660
GGM-1/1/WB1/MP12	WESTBAY MULTIPORT	12	1771	1768	1778
GGM-1/1/WB1/MP13	WESTBAY MULTIPORT	13	2011	2008	2018
GGM-2/1/WB1/MP1	WESTBAY MULTIPORT	1	213	212	222
GGM-2/1/WB1/MP2	WESTBAY MULTIPORT	2	295	294	304
GGM-2/1/WB1/MP3	WESTBAY MULTIPORT	3	462	460	470
GGM-2/1/WB1/MP4	WESTBAY MULTIPORT	4	719	715	725

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
GGM-2/1/WB1/MP5	WESTBAY MULTIPORT	5	954	950	960
GGM-2/1/WB1/MP6	WESTBAY MULTIPORT	6	1049	1045	1055
GGM-2/1/WB1/MP7	WESTBAY MULTIPORT	7	1149	1145	1155
GGM-2/1/WB1/MP8	WESTBAY MULTIPORT	8	1254	1250	1260
GGM-2/1/WB1/MP9	WESTBAY MULTIPORT	9	1489	1485	1495
GGM-2/1/WB1/MP10	WESTBAY MULTIPORT	10	1629	1625	1635
GGM-2/1/WB1/MP11	WESTBAY MULTIPORT	11	1744	1740	1750
GGM-2/1/WB1/MP12	WESTBAY MULTIPORT	12	1904	1900	1910
GGM-2/1/WB1/MP13	WESTBAY MULTIPORT	13	1994	1990	2000
GGM-3/1/WB1/MP1	WESTBAY MULTIPORT	1	197	195	205
GGM-3/1/WB1/MP2	WESTBAY MULTIPORT	2	312	310	320
GGM-3/1/WB1/MP3	WESTBAY MULTIPORT	3	547	545	555
GGM-3/1/WB1/MP4	WESTBAY MULTIPORT	4	642	640	650
GGM-3/1/WB1/MP5	WESTBAY MULTIPORT	5	842	837	847
GGM-3/1/WB1/MP6	WESTBAY MULTIPORT	6	1007	1004	1014
GGM-3/1/WB1/MP7	WESTBAY MULTIPORT	7	1107	1104	1114
GGM-3/1/WB1/MP8	WESTBAY MULTIPORT	8	1279	1274	1284
GGM-3/1/WB1/MP9	WESTBAY MULTIPORT	9	1544	1539	1549
GGM-3/1/WB1/MP10	WESTBAY MULTIPORT	10	1684	1680	1690
GGM-3/1/WB1/MP11	WESTBAY MULTIPORT	11	1784	1780	1790
GGM-3/1/WB1/MP12	WESTBAY MULTIPORT	12	1954	1950	1960
HBM-1/1/WB1/MP1	WESTBAY MULTIPORT	1	91	90	100
HBM-1/1/WB1/MP2	WESTBAY MULTIPORT	2	191	190	200
HBM-1/1/WB1/MP3	WESTBAY MULTIPORT	3	321	320	330
HBM-1/1/WB1/MP4	WESTBAY MULTIPORT	4	483	482	492
HBM-1/1/WB1/MP5	WESTBAY MULTIPORT	5	562	560	570
HBM-1/1/WB1/MP6	WESTBAY MULTIPORT	6	702	700	710
HBM-1/1/WB1/MP7	WESTBAY MULTIPORT	7	924	920	930
HBM-1/1/WB1/MP8	WESTBAY MULTIPORT	8	1038	1034	1044
HBM-1/1/WB1/MP9	WESTBAY MULTIPORT	9	1130	1126	1136
HBM-1/1/WB1/MP10	WESTBAY MULTIPORT	10	1352	1348	1358
HBM-1/1/WB1/MP11	WESTBAY MULTIPORT	11	1464	1460	1470
HBM-1/1/WB1/MP12	WESTBAY MULTIPORT	12	1544	1540	1550
HBM-1/1/WB1/MP13	WESTBAY MULTIPORT	13	1644	1640	1650
HBM-1/1/WB1/MP14	WESTBAY MULTIPORT	14	1934	1930	1940
HBM-2/1/WB1/MP1	WESTBAY MULTIPORT	1	112	110	120
HBM-2/1/WB1/MP2	WESTBAY MULTIPORT	2	162	160	170
HBM-2/1/WB1/MP3	WESTBAY MULTIPORT	3	247	245	255
HBM-2/1/WB1/MP4	WESTBAY MULTIPORT	4	307	305	315
HBM-2/1/WB1/MP5	WESTBAY MULTIPORT	5	362	360	370
HBM-2/1/WB1/MP6	WESTBAY MULTIPORT	6	447	445	455
HBM-2/1/WB1/MP7	WESTBAY MULTIPORT	7	522	520	530
HBM-2/1/WB1/MP8	WESTBAY MULTIPORT	8	572	570	580
HBM-2/1/WB1/MP9	WESTBAY MULTIPORT	9	677	675	685
HBM-2/1/WB1/MP10	WESTBAY MULTIPORT	10	739	735	745
HBM-2/1/WB1/MP11	WESTBAY MULTIPORT	11	849	845	855
HBM-2/1/WB1/MP12	WESTBAY MULTIPORT	12	929	925	935
HBM-4/1/WB1/MP1	WESTBAY MULTIPORT	1	75	75	85
HBM-4/1/WB1/MP2	WESTBAY MULTIPORT	2	120	120	130
HBM-4/1/WB1/MP3	WESTBAY MULTIPORT	3	179	180	190
HBM-4/1/WB1/MP4	WESTBAY MULTIPORT	4	231	230	240

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
HBM-4/1/WB1/MP5	WESTBAY MULTIPORT	5	296	295	305
HBM-4/1/WB1/MP6	WESTBAY MULTIPORT	6	351	350	360
HBM-4/1/WB1/MP7	WESTBAY MULTIPORT	7	416	415	425
HBM-4/1/WB1/MP8	WESTBAY MULTIPORT	8	551	550	560
HBM-4/1/WB1/MP9	WESTBAY MULTIPORT	9	691	690	700
HBM-5/1/WB1/MP3	WESTBAY MULTIPORT	3	86	70	90
HBM-5/1/WB1/MP1	WESTBAY MULTIPORT	1	71	70	90
HBM-5/1/WB1/MP2	WESTBAY MULTIPORT	2	76	70	90
HBM-5/1/WB1/MP4	WESTBAY MULTIPORT	4	126	125	135
HBM-5/1/WB1/MP5	WESTBAY MULTIPORT	5	171	170	180
HBM-5/1/WB1/MP6	WESTBAY MULTIPORT	6	216	215	225
HBM-5/1/WB1/MP7	WESTBAY MULTIPORT	7	248	245	255
HBM-5/1/WB1/MP8	WESTBAY MULTIPORT	8	273	270	280
HBM-6/1/WB1/MP1	WESTBAY MULTIPORT	1	53	52	62
HBM-6/1/WB1/MP2	WESTBAY MULTIPORT	2	85	84	94
HBM-6/1/WB1/MP3	WESTBAY MULTIPORT	3	110	108	118
HBM-6/1/WB1/MP4	WESTBAY MULTIPORT	4	215	214	224
HBM-6/1/WB1/MP5	WESTBAY MULTIPORT	5	264	263	273
HBM-6/1/WB1/MP6	WESTBAY MULTIPORT	6	296	294	304
HBM-6/1/WB1/MP7	WESTBAY MULTIPORT	7	508	506	516
HBM-6/1/WB1/MP8	WESTBAY MULTIPORT	8	578	576	586
IDM-1/1/WB2/MP1	WESTBAY MULTIPORT	1	86	85	95
IDM-1/1/WB2/MP2	WESTBAY MULTIPORT	2	271	270	280
IDM-1/1/WB2/MP3	WESTBAY MULTIPORT	3	336	335	345
IDM-1/1/WB2/MP4	WESTBAY MULTIPORT	4	436	435	445
IDM-1/1/WB2/MP5	WESTBAY MULTIPORT	5	631	630	640
IDM-1/1/WB2/MP6	WESTBAY MULTIPORT	6	703	700	710
IDM-1/1/WB2/MP7	WESTBAY MULTIPORT	7	763	760	770
IDM-1/1/WB2/MP8	WESTBAY MULTIPORT	8	878	875	885
IDM-1/1/WB2/MP9	WESTBAY MULTIPORT	9	993	990	1000
IDM-1/1/WB2/MP10	WESTBAY MULTIPORT	10	1053	1050	1060
IDM-2/1/WB1/MP1	WESTBAY MULTIPORT	1	129	126	136
IDM-2/1/WB1/MP2	WESTBAY MULTIPORT	2	236	234	244
IDM-2/1/WB1/MP3	WESTBAY MULTIPORT	3	286	284	294
IDM-2/1/WB1/MP4	WESTBAY MULTIPORT	4	353	352	362
IDM-2/1/WB1/MP5	WESTBAY MULTIPORT	5	493	492	502
IDM-2/1/WB1/MP6	WESTBAY MULTIPORT	6	613	612	622
IDM-2/1/WB1/MP7	WESTBAY MULTIPORT	7	713	710	720
IDM-2/1/WB1/MP8	WESTBAY MULTIPORT	8	890	886	896
IDM-2/1/WB1/MP9	WESTBAY MULTIPORT	9	1055	1050	1060
IDM-2/1/WB1/MP10	WESTBAY MULTIPORT	10	1182	1178	1188
IDM-2/1/WB1/MP11	WESTBAY MULTIPORT	11	1259	1256	1266
IDM-2/1/WB1/MP12	WESTBAY MULTIPORT	12	1404	1400	1410
KBS-2/1/WB1/MP1	WESTBAY MULTIPORT	1	99	96	106
KBS-2/1/WB1/MP2	WESTBAY MULTIPORT	2	214	210	220
LAM-1/1/WB1/MP1	WESTBAY MULTIPORT	1	72	70	80
LAM-1/1/WB1/MP2	WESTBAY MULTIPORT	2	222	220	230
LAM-1/1/WB1/MP3	WESTBAY MULTIPORT	3	272	270	280
LAM-1/1/WB1/MP4	WESTBAY MULTIPORT	4	472	470	480
LAM-1/1/WB1/MP5	WESTBAY MULTIPORT	5	572	570	580
LAM-1/1/WB1/MP6	WESTBAY MULTIPORT	6	834	830	840

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
LAM-1/1/WB1/MP7	WESTBAY MULTIPORT	7	996	992	1002
LAM-1/1/WB1/MP8	WESTBAY MULTIPORT	8	1073	1070	1080
LAM-1/1/WB1/MP9	WESTBAY MULTIPORT	9	1153	1150	1160
LAM-1/1/WB1/MP10	WESTBAY MULTIPORT	10	1253	1250	1260
LAM-1/1/WB1/MP11	WESTBAY MULTIPORT	11	1498	1494	1504
LAM-1/1/WB1/MP12	WESTBAY MULTIPORT	12	1613	1610	1620
MCAS-1/1/WB2/MP1	WESTBAY MULTIPORT	1	65	60	70
MCAS-1/1/WB2/MP2	WESTBAY MULTIPORT	2	155	150	160
MCAS-1/1/WB2/MP3	WESTBAY MULTIPORT	3	215	210	220
MCAS-1/1/WB2/MP4	WESTBAY MULTIPORT	4	275	270	280
MCAS-1/1/WB2/MP5	WESTBAY MULTIPORT	5	335	330	340
MCAS-1/1/WB2/MP6	WESTBAY MULTIPORT	6	455	450	460
MCAS-1/1/WB2/MP7	WESTBAY MULTIPORT	7	545	540	550
MCAS-2/1/WB2/MP1	WESTBAY MULTIPORT	1	45	40	50
MCAS-2/1/WB2/MP2	WESTBAY MULTIPORT	2	135	130	140
MCAS-2/1/WB2/MP3	WESTBAY MULTIPORT	3	205	200	210
MCAS-2/1/WB2/MP4	WESTBAY MULTIPORT	4	375	370	380
MCAS-2/1/WB2/MP5	WESTBAY MULTIPORT	5	425	420	430
MCAS-2/1/WB2/MP6	WESTBAY MULTIPORT	6	495	490	500
MCAS-2/1/WB2/MP7	WESTBAY MULTIPORT	7	555	550	560
MCAS-2/1/WB2/MP8	WESTBAY MULTIPORT	8	625	620	630
MCAS-3/1/WB2/MP1	WESTBAY MULTIPORT	1	91	80	90
MCAS-3/1/WB2/MP2	WESTBAY MULTIPORT	2	166	160	170
MCAS-3/1/WB2/MP3	WESTBAY MULTIPORT	3	226	220	230
MCAS-3/1/WB2/MP4	WESTBAY MULTIPORT	4	346	340	350
MCAS-3/1/WB2/MP5	WESTBAY MULTIPORT	5	426	420	430
MCAS-3/1/WB2/MP6	WESTBAY MULTIPORT	6	496	490	500
MCAS-7/1/WB3/MP1	WESTBAY MULTIPORT	1	92	90	100
MCAS-7/1/WB3/MP2	WESTBAY MULTIPORT	2	192	190	200
MCAS-7/1/WB3/MP3	WESTBAY MULTIPORT	3	352	350	360
MCAS-7/1/WB3/MP4	WESTBAY MULTIPORT	4	442	440	450
MCAS-7/1/WB3/MP5	WESTBAY MULTIPORT	5	512	510	520
MCAS-7/1/WB3/MP6	WESTBAY MULTIPORT	6	802	800	810
MCAS-7/1/WB3/MP7	WESTBAY MULTIPORT	7	912	910	920
MCAS-7/1/WB3/MP8	WESTBAY MULTIPORT	8	982	980	990
MCAS-7/1/WB3/MP9	WESTBAY MULTIPORT	9	1082	1100	1110
SAR-1/1/WB2/MP1	WESTBAY MULTIPORT	1	162	150	170
SAR-1/1/WB2/MP2	WESTBAY MULTIPORT	2	297	290	300
SAR-1/1/WB2/MP3	WESTBAY MULTIPORT	3	327	320	330
SAR-1/1/WB2/MP4	WESTBAY MULTIPORT	4	367	360	370
SAR-1/1/WB2/MP5	WESTBAY MULTIPORT	5	519	510	530
SAR-1/1/WB2/MP6	WESTBAY MULTIPORT	6	584	580	590
SAR-1/1/WB2/MP7	WESTBAY MULTIPORT	7	829	820	840
SAR-1/1/WB2/MP8	WESTBAY MULTIPORT	8	894	890	900
SAR-1/1/WB2/MP9	WESTBAY MULTIPORT	9	914	910	920
SAR-1/1/WB2/MP10	WESTBAY MULTIPORT	10	1014	1010	1020
SAR-1/1/WB2/MP11	WESTBAY MULTIPORT	11	1114	1110	1120
SAR-1/1/WB2/MP12	WESTBAY MULTIPORT	12	1284	1280	1290
SAR-1/1/WB2/MP13	WESTBAY MULTIPORT	13	1374	1370	1380
SAR-1/1/WB2/MP14	WESTBAY MULTIPORT	14	1446	1441	1451
SAR-2/1/WB2/MP1	WESTBAY MULTIPORT	1	141	140	150

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
SAR-2/1/WB2/MP2	WESTBAY MULTIPORT	2	271	270	280
SAR-2/1/WB2/MP3	WESTBAY MULTIPORT	3	311	310	320
SAR-2/1/WB2/MP4	WESTBAY MULTIPORT	4	417	470	480
SAR-2/1/WB2/MP5	WESTBAY MULTIPORT	5	611	610	620
SAR-2/1/WB2/MP6	WESTBAY MULTIPORT	6	741	740	750
SAR-2/1/WB2/MP7	WESTBAY MULTIPORT	7	881	880	890
SAR-2/1/WB2/MP8	WESTBAY MULTIPORT	8	981	980	990
SAR-2/1/WB2/MP9	WESTBAY MULTIPORT	9	1021	1020	1030
SAR-2/1/WB2/MP10	WESTBAY MULTIPORT	10	1101	1100	1110
SAR-2/1/WB2/MP11	WESTBAY MULTIPORT	11	1231	1230	1240
SAR-2/1/WB2/MP12	WESTBAY MULTIPORT	12	1351	1350	1360
SAR-3/1/WB2/MP1	WESTBAY MULTIPORT	1	164	160	170
SAR-3/1/WB2/MP2	WESTBAY MULTIPORT	2	234	230	240
SAR-3/1/WB2/MP3	WESTBAY MULTIPORT	3	414	410	420
SAR-3/1/WB2/MP4	WESTBAY MULTIPORT	4	514	510	520
SAR-3/1/WB2/MP5	WESTBAY MULTIPORT	5	644	640	650
SAR-3/1/WB2/MP6	WESTBAY MULTIPORT	6	774	770	780
SAR-3/1/WB2/MP7	WESTBAY MULTIPORT	7	954	950	960
SAR-3/1/WB2/MP8	WESTBAY MULTIPORT	8	1074	1070	1080
SAR-3/1/WB2/MP9	WESTBAY MULTIPORT	9	1199	1195	1205
SAR-3/1/WB2/MP10	WESTBAY MULTIPORT	10	1269	1265	1275
SAR-3/1/WB2/MP11	WESTBAY MULTIPORT	11	1393	1390	1400
SAR-4/1/WB2/MP1	WESTBAY MULTIPORT	1	123	115	125
SAR-4/1/WB2/MP2	WESTBAY MULTIPORT	2	328	320	330
SAR-4/1/WB2/MP3	WESTBAY MULTIPORT	3	478	470	480
SAR-4/1/WB2/MP4	WESTBAY MULTIPORT	4	598	590	600
SAR-4/1/WB2/MP5	WESTBAY MULTIPORT	5	738	730	740
SAR-4/1/WB2/MP6	WESTBAY MULTIPORT	6	868	860	870
SAR-4/1/WB2/MP7	WESTBAY MULTIPORT	7	978	970	980
SAR-4/1/WB2/MP8	WESTBAY MULTIPORT	8	1068	1060	1070
SAR-4/1/WB2/MP9	WESTBAY MULTIPORT	9	1168	1160	1170
SAR-4/1/WB2/MP10	WESTBAY MULTIPORT	10	1398	1395	1405
SAR-5/1/WB2/MP1	WESTBAY MULTIPORT	1	80	80	90
SAR-5/1/WB2/MP2	WESTBAY MULTIPORT	2	170	170	180
SAR-5/1/WB2/MP3	WESTBAY MULTIPORT	3	360	360	370
SAR-5/1/WB2/MP4	WESTBAY MULTIPORT	4	617	616	626
SAR-5/1/WB2/MP5	WESTBAY MULTIPORT	5	764	760	770
SAR-5/1/WB2/MP6	WESTBAY MULTIPORT	6	944	940	950
SAR-5/1/WB2/MP7	WESTBAY MULTIPORT	7	1084	1080	1090
SAR-5/1/WB2/MP8	WESTBAY MULTIPORT	8	1193	1190	1200
SAR-5/1/WB2/MP9	WESTBAY MULTIPORT	9	1293	1290	1300
SAR-5/1/WB2/MP10	WESTBAY MULTIPORT	10	1543	1540	1550
SAR-5/1/WB2/MP11	WESTBAY MULTIPORT	11	1733	1730	1740
SAR-5/1/WB2/MP12	WESTBAY MULTIPORT	12	1823	1820	1830
SAR-6/1/WB2/MP1	WESTBAY MULTIPORT	1	206	200	210
SAR-6/1/WB2/MP2	WESTBAY MULTIPORT	2	366	360	370
SAR-6/1/WB2/MP3	WESTBAY MULTIPORT	3	476	470	480
SAR-6/1/WB2/MP4	WESTBAY MULTIPORT	4	581	574	584
SAR-6/1/WB2/MP5	WESTBAY MULTIPORT	5	706	700	710
SAR-6/1/WB2/MP6	WESTBAY MULTIPORT	6	786	780	790
SAR-6/1/WB2/MP7	WESTBAY MULTIPORT	7	1086	1080	1090

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
SAR-6/1/WB2/MP8	WESTBAY MULTIPORT	8	1186	1180	1190
SAR-6/1/WB2/MP9	WESTBAY MULTIPORT	9	1276	1270	1280
SAR-6/1/WB2/MP10	WESTBAY MULTIPORT	10	1501	1500	1510
SAR-7/1/WB2/MP1	WESTBAY MULTIPORT	1	111	110	120
SAR-7/1/WB2/MP2	WESTBAY MULTIPORT	2	171	170	180
SAR-7/1/WB2/MP3	WESTBAY MULTIPORT	3	310	310	320
SAR-7/1/WB2/MP4	WESTBAY MULTIPORT	4	440	440	450
SAR-7/1/WB2/MP5	WESTBAY MULTIPORT	5	605	604	614
SAR-7/1/WB2/MP6	WESTBAY MULTIPORT	6	742	740	750
SAR-7/1/WB2/MP7	WESTBAY MULTIPORT	7	862	856	866
SAR-7/1/WB2/MP8	WESTBAY MULTIPORT	8	1194	1190	1200
SAR-7/1/WB2/MP9	WESTBAY MULTIPORT	9	1354	1350	1360
SAR-8/1/WB1/MP1	WESTBAY MULTIPORT	1	44	34	44
SAR-8/1/WB1/MP2	WESTBAY MULTIPORT	2	94	84	94
SAR-8/1/WB1/MP3	WESTBAY MULTIPORT	3	159	150	160
SAR-9/1/WB1/MP1	WESTBAY MULTIPORT	1	150	148	160
SAR-9/1/WB1/MP2	WESTBAY MULTIPORT	2	239	236	248
SAR-9/1/WB1/MP3	WESTBAY MULTIPORT	3	409	406	418
SAR-9/1/WB1/MP4	WESTBAY MULTIPORT	4	491	488	500
SAR-9/1/WB1/MP5	WESTBAY MULTIPORT	5	606	604	616
SAR-9/1/WB1/MP6	WESTBAY MULTIPORT	6	730	724	736
SAR-9/1/WB1/MP7	WESTBAY MULTIPORT	7	877	872	884
SAR-9/1/WB1/MP8	WESTBAY MULTIPORT	8	1072	1068	1080
SAR-9/1/WB1/MP9	WESTBAY MULTIPORT	9	1262	1258	1270
SAR-9/1/WB1/MP10	WESTBAY MULTIPORT	10	1477	1473	1484
SAR-9/1/WB1/MP11	WESTBAY MULTIPORT	11	1572	1567	1578
SAR-9/1/WB1/MP12	WESTBAY MULTIPORT	12	1724	1719	1730
SAR-9/1/WB1/MP13	WESTBAY MULTIPORT	13	1821	1815	1826
SAR-9/1/WB1/MP14	WESTBAY MULTIPORT	14	1893	1889	1900
SBM-1/1/WB1/MP1	WESTBAY MULTIPORT	1	79	74	84
SBM-1/1/WB1/MP2	WESTBAY MULTIPORT	2	149	144	154
SBM-1/1/WB1/MP3	WESTBAY MULTIPORT	3	244	240	250
SBM-1/1/WB1/MP4	WESTBAY MULTIPORT	4	374	370	380
SBM-1/1/WB1/MP5	WESTBAY MULTIPORT	5	514	510	520
SBM-1/1/WB1/MP6	WESTBAY MULTIPORT	6	706	696	706
SBM-1/1/WB1/MP7	WESTBAY MULTIPORT	7	916	910	920
SBM-1/1/WB1/MP8	WESTBAY MULTIPORT	8	1256	1250	1260
SC-1/1/WB1/MP1	WESTBAY MULTIPORT	1	48	44	54
SC-1/1/WB1/MP2	WESTBAY MULTIPORT	2	93	90	100
SC-1/1/WB1/MP3	WESTBAY MULTIPORT	3	153	150	160
SC-1/1/WB1/MP4	WESTBAY MULTIPORT	4	197	194	204
SC-1/1/WB1/MP5	WESTBAY MULTIPORT	5	299	294	304
SC-1/1/WB1/MP6	WESTBAY MULTIPORT	6	394	390	400
SC-2/1/WB2/MP1	WESTBAY MULTIPORT	1	49	46	56
SC-2/1/WB2/MP2	WESTBAY MULTIPORT	2	96	94	104
SC-2/1/WB2/MP3	WESTBAY MULTIPORT	3	148	146	156
SC-2/1/WB2/MP4	WESTBAY MULTIPORT	4	192	190	200
SC-2/1/WB2/MP5	WESTBAY MULTIPORT	5	251	248	258
SC-2/1/WB2/MP6	WESTBAY MULTIPORT	6	303	300	310
SC-3/1/WB2/MP1	WESTBAY MULTIPORT	1	227	224	234
SC-3/1/WB2/MP2	WESTBAY MULTIPORT	2	412	410	420

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
SC-3/1/WB2/MP3	WESTBAY MULTIPORT	3	577	576	586
SC-3/1/WB2/MP4	WESTBAY MULTIPORT	4	712	710	720
SC-3/1/WB2/MP5	WESTBAY MULTIPORT	5	1022	1018	1028
SC-3/1/WB2/MP6	WESTBAY MULTIPORT	6	1154	1150	1160
SC-3/1/WB2/MP7	WESTBAY MULTIPORT	7	1234	1230	1240
SC-3/1/WB2/MP8	WESTBAY MULTIPORT	8	1374	1370	1380
SC-3/1/WB2/MP9	WESTBAY MULTIPORT	9	1459	1460	1470
SC-4/1/WB1/MP1	WESTBAY MULTIPORT	1	102	100	111
SC-4/1/WB1/MP2	WESTBAY MULTIPORT	2	201	198	209
SC-4/1/WB1/MP3	WESTBAY MULTIPORT	3	271	268	279
SC-4/1/WB1/MP4	WESTBAY MULTIPORT	4	393	391	402
SC-4/1/WB1/MP5	WESTBAY MULTIPORT	5	483	482	493
SC-4/1/WB1/MP6	WESTBAY MULTIPORT	6	573	572	583
SC-4/1/WB1/MP7	WESTBAY MULTIPORT	7	660	658	669
SC-4/1/WB1/MP8	WESTBAY MULTIPORT	8	830	827	838
SC-4/1/WB1/MP9	WESTBAY MULTIPORT	9	1082	1078	1089
SC-5/1/WB1/MP1	WESTBAY MULTIPORT	1	124	123	133
SC-5/1/WB1/MP2	WESTBAY MULTIPORT	2	196	196	206
SC-5/1/WB1/MP3	WESTBAY MULTIPORT	3	291	290	300
SC-5/1/WB1/MP4	WESTBAY MULTIPORT	4	470	468	478
SC-5/1/WB1/MP5	WESTBAY MULTIPORT	5	670	667	677
SC-5/1/WB1/MP6	WESTBAY MULTIPORT	6	807	804	814
SC-5/1/WB1/MP7	WESTBAY MULTIPORT	7	937	932	942
SC-5/1/WB1/MP8	WESTBAY MULTIPORT	8	1024	1020	1030
SC-5/1/WB1/MP9	WESTBAY MULTIPORT	9	1238	1234	1244
SC-5/1/WB1/MP10	WESTBAY MULTIPORT	10	1430	1426	1436
SC-6/1/WB1/MP1	WESTBAY MULTIPORT	1	92	90	100
SC-6/1/WB1/MP2	WESTBAY MULTIPORT	2	202	200	210
SC-6/1/WB1/MP3	WESTBAY MULTIPORT	3	302	300	310
SC-6/1/WB1/MP4	WESTBAY MULTIPORT	4	542	540	550
SC-6/1/WB1/MP5	WESTBAY MULTIPORT	5	789	785	795
SC-6/1/WB1/MP6	WESTBAY MULTIPORT	6	964	960	970
SC-6/1/WB1/MP7	WESTBAY MULTIPORT	7	1124	1120	1130
SC-6/1/WB1/MP8	WESTBAY MULTIPORT	8	1329	1325	1335
SC-6/1/WB1/MP9	WESTBAY MULTIPORT	9	1464	1460	1470
SC-6/1/WB1/MP10	WESTBAY MULTIPORT	10	1544	1540	1550
SC-6/1/WB1/MP11	WESTBAY MULTIPORT	11	1684	1680	1690
SC-6/1/WB1/MP12	WESTBAY MULTIPORT	12	1894	1890	1900
SC-6/1/WB1/MP13	WESTBAY MULTIPORT	13	2029	2025	2035
SC-6/1/WB1/MP14	WESTBAY MULTIPORT	14	2119	2115	2125
SCS-1/1/WB1/MP1	WESTBAY MULTIPORT	1	29	24	34
SCS-1/1/WB1/MP2	WESTBAY MULTIPORT	2	94	90	100
SCS-1/1/WB1/MP3	WESTBAY MULTIPORT	3	146	142	152
SCS-1/1/WB1/MP4	WESTBAY MULTIPORT	4	183	178	188
SCS-1/1/WB1/MP5	WESTBAY MULTIPORT	5	223	220	230
SCS-1/1/WB1/MP6	WESTBAY MULTIPORT	6	298	295	305
SCS-2/1/WB1/MP1	WESTBAY MULTIPORT	1	139	134	145
SCS-2/1/WB1/MP2	WESTBAY MULTIPORT	2	179	174	185
SCS-2/1/WB1/MP3	WESTBAY MULTIPORT	3	218	212	223
SCS-2/1/WB1/MP4	WESTBAY MULTIPORT	4	265	260	270
SCS-2/1/WB1/MP5	WESTBAY MULTIPORT	5	330	325	335

APPENDIX E - OCWD WESTBAY GROUNDWATER MONITORING WELLS
MONITORING PORT INFORMATION

Westbay Monitoring Port Name	Well Type	Monitoring Port No.	Westbay Port Depth (ft.)	Top of Zone (ft.)	Bottom of Zone (ft.)
WBS-2A/1/WB1/MP1	WESTBAY MULTIPORT	1	54	50	60
WBS-2A/1/WB1/MP2	WESTBAY MULTIPORT	2	94	90	100
WBS-2A/1/WB1/MP3	WESTBAY MULTIPORT	3	139	135	145
WBS-3/1/WB1/MP1	WESTBAY MULTIPORT	1	79	75	85
WBS-3/1/WB1/MP2	WESTBAY MULTIPORT	2	219	215	225
WMM-1/1/WB2/MP1	WESTBAY MULTIPORT	1	111	109	119
WMM-1/1/WB2/MP2	WESTBAY MULTIPORT	2	361	359	369
WMM-1/1/WB2/MP3	WESTBAY MULTIPORT	3	483	480	490
WMM-1/1/WB2/MP4	WESTBAY MULTIPORT	4	603	600	610
WMM-1/1/WB2/MP5	WESTBAY MULTIPORT	5	745	740	750
WMM-1/1/WB2/MP6	WESTBAY MULTIPORT	6	815	810	820
WMM-1/1/WB2/MP7	WESTBAY MULTIPORT	7	895	889	899
WMM-1/1/WB2/MP8	WESTBAY MULTIPORT	8	985	980	990
WMM-1/1/WB2/MP9	WESTBAY MULTIPORT	9	1065	1060	1070
WMM-1/1/WB2/MP10	WESTBAY MULTIPORT	10	1215	1210	1220
WMM-1/1/WB2/MP11	WESTBAY MULTIPORT	11	1315	1309	1319
WMM-1/1/WB2/MP12	WESTBAY MULTIPORT	12	1370	1364	1374
WMM-1/1/WB2/MP13	WESTBAY MULTIPORT	13	1435	1430	1440
WMM-1/1/WB2/MP14	WESTBAY MULTIPORT	14	1570	1565	1575
WMM-1/1/WB2/MP15	WESTBAY MULTIPORT	15	1625	1619	1629
WMM-1/1/WB2/MP16	WESTBAY MULTIPORT	16	1745	1740	1750
WMM-1/1/WB2/MP17	WESTBAY MULTIPORT	17	1805	1800	1810
WMM-1/1/WB2/MP18	WESTBAY MULTIPORT	18	1945	1940	1950

APPENDIX F

ACRONYMS AND ABBREVIATIONS

Abbreviations and Acronyms

The following abbreviations and acronyms are used in this report:

ACOE	U.S. Army Corps of Engineers
af	acre-feet
afy	acre-feet per year
AOC	assimiable organic carbon
AOP	advanced oxidation processes
AWT	advanced water treatment
basin	Orange County groundwater basin
Basin Model	OCWD groundwater model
BEA	Basin Equity Assessment
BPP	Basin Production Percentage
CDFG	California Department of Fish & Game
CDPH	California Department of Public Health
cfs	cubic feet per second
CWTF	Colored Water Treatment Facility
DATS	Deep Aquifer Treatment System
District	Orange County Water District
DOC	dissolved organic compound
DWR	Department of Water Resources
DWSAP	Drinking Water Source Assessment and Protection
EDCs	Endocrine Disrupting Compounds
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
FY	fiscal year
GAC	granular activated carbon
GIS	geographic information system
GWR	Groundwater Replenishment
H_2O_2	hydrogen peroxide
IEUA	Inland Empire Utilities Agency
IRWD	Irvine Ranch Water District
K	model layer hydraulic conductivity
LACDWP	Los Angeles County Department of Power & Water
maf	million acre feet
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
MCWD	Mesa Consolidated Water District
MWDOC	Municipal Water District of Orange County
MF	microfiltration
MODFLOW	Computer program developed by USGS
mgd	million gallons per day
mg/L	milligrams per liter
MTBE	methyl tertiary-butylether
Metropolitan	Metropolitan Water District of Southern California

MWDOC	Municipal Water District of Orange County
NDMA	n-Nitrosodimethylamine
NF	nanofiltration
ng/L	nanograms per liter
NBGPP	North Basin Groundwater Protection Program
NO_2	nitrite
NO_3^-	Nitrate
NPDES	National Pollution Discharge Elimination System
NWRI	National Water Research Institute
O&M	operations and maintenance
OCHCA	Orange County Health Care Agency
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
PCE	perchloroethylene
Plan	Groundwater Management Plan
ppb	less than one microgram per liter
PPCPs	pharmaceuticals and personal care products
Producers	Orange County groundwater producers
RA	replenishment assessment
REWG	Recharge Enhancement Working Group
RO	reverse osmosis
RWQCB	Regional Water Quality Control Board
SARI	Santa Ana River Interceptor
SARWQH	Santa Ana Regional Water Quality and Health
SAWA	Santa Ana Watershed Association
SAWPA	Santa Ana Watershed Project Authority
SBGPP	South Basin Groundwater Protection Project
SDWA	Safe Drinking Water Act
SOCs	synthetic organic chemicals
SWP	State Water Project
SWRCB	State Water Resource Control Board
TCE	trichloroethylene
TDS	total dissolved solids
TIN	total inorganic nitrogen
µg/L	micrograms per liter
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
UV	ultraviolet light
VOCs	volatile organic compounds
WACO	Water Advisory Committee of Orange County
WF-21	Water Factory 21
WRD	Water Replenishment District of Southern California
WRMS	Water Resources Management System

Urban WATER Management Plan

November 21, 2005

FINAL DRAFT

City of Huntington Beach

Class 1 Water System

2005

PSOMAS

URBAN WATER MANAGEMENT PLAN 2005

City of Huntington Beach

November 21, 2005
~~Final Draft~~

PSOMAS

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ACRONYMS and ABBREVIATIONS

AB	Assembly Bill
AF	Acre Feet
AFY	Acre Feet per Year
AWPF	Advanced Water Purification Facilities
BMP	Best Management Practices
BPP	Basin Pumping Percentage
CALSIM	California Water Allocation and Reservoir Operations Model
CCF	Hundred Cubic Feet
CEQA	California Environmental Quality Act
CPTP	Coastal Pumping Transfer Program
CRA	Colorado River Aqueduct
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
DBP	Disinfection Byproducts
DHS	Department of Health Services
DMM	Demand Management Measure
DWR	Department of Water Resources
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
GPCD	Gallons Per Capita Per Day
GPM	Gallons Per Minute
GWMP	Groundwater Management Plan
GWRS	Groundwater Replenishment System
IAWP	Interim Agricultural Water Program
IID	Imperial Irrigation District
In	Inches
IRP	Integrated Resources Plan
IRWM	Integrated Regional Water Management
LRP	Local Resources Program
LTFP	Long Term Facilities Plan
M&I	Municipal and Industrial
MAF	Million Acre Feet
MGD	Million Gallons per Day
Mg/L	Milligrams Per Liter
MOU	Memorandum of Understanding
MPR	Master Plan Report
MTBE	Methyl Tertiary Butyl Ether
MWD	Metropolitan Water District of Southern California
MWDOC	Municipal Water District of Orange County
NDMA	N-nitrosodimethylamine
NPDES	National Pollutant Discharge Elimination System
OC	Orange County
OCSD	Orange County Sanitation District
OCWA	Orange County Water Association
OCWD	Orange County Water District
PEIR	Program Environmental Impact Report
PVID	Palo Verde Irrigation District

QSA	Quantification Settlement Agreement
RA	Replenishment Assessment
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SBVMWD	San Bernardino Valley Municipal Water District
SCAB	South Coast Air Basin
SCADA	Supervisory Control Data Acquisition System
SCCWRRS	Southern California Comprehensive Water Reclamation and Reuse Study
SDWA	Safe Drinking Water Act
SOCWRS	South Orange County Water Reliability Study
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	Thousand Acre Feet
TDS	Total Dissolved Solids
THM	Trihalomethanes
TIN	Total Inorganic Nitrogen
ULFT	Ultra Low Flush Toilet
USBR	U.S. Bureau of Reclamation
UWMP	Urban Water Management Plan
VOC	Volatile Organic Compounds
WEROC	Water Emergency Response Organization of Orange County
WMP	Water Master Plan
WOC	Water Operations Center
WSDM	Water Surplus and Drought Management

SECTION 1
INTRODUCTION

1.1 PURPOSE AND UWMP SUMMARY

An Urban Water Management Plan (UWMP or Plan) prepared by a water purveyor is to ensure the appropriate level of reliability of water service sufficient to meet the needs of its various categories of customers during normal, single dry or multiple dry years. The California Water Management Planning Act of 1983 (Act), as amended, requires urban water suppliers to develop an UWMP every five years in the years ending in zero and five.

The legislature declared that waters of the state are a limited and renewable resource subject to ever increasing demands; that the conservation and efficient use of urban water supplies are of statewide concern; that successful implementation of plans is best accomplished at the local level; that conservation and efficient use of water shall be actively pursued to protect both the people of the state and their water resources; that conservation and efficient use of urban water supplies shall be a guiding criterion in public decisions; and that urban water suppliers shall be required to develop water management plans to achieve conservation and efficient use.

The City of Huntington Beach (City) 2005 UWMP has been prepared in compliance with the requirements of the Act, as amended to 2005[1] (Appendix A), and includes the following:

- Utilities Division Service Area
- Utilities Division Facilities
- Water Sources and Supplies
- Water Quality Information
- Water Reliability Planning
- Water Use Provisions
- Water Demand Management Measures
- Water Shortage Contingency Plan
- Water Recycling

1.2 UWMP UPDATE PREPARATION

The City's 2005 UWMP revises the 2000 UWMP prepared by the City and incorporates changes enacted by recent legislation including SB 610 (2001), AB 901 (2001), SB 672 (2001), SB 1348 (2002), SB 1384 (2002), SB 1518 (2002), AB 105 (2004, and SB 318 (2004). The UWMP also incorporates water use efficiency efforts the City has implemented or is considering implementing pursuant to the *Memorandum of*

[1]California Water Code, Division 6, Part 2.6; §10610, et. seq. Established by Assembly Bill 797 (1983).

Understanding Regarding Urban Water Conservation in California (MOU).[2] The City became signatory and adopted the MOU on December 19, 2000.

The sections in this Plan correspond to the outline of the Act, specifically Article 2, Contents of Plans, Sections 10631, 10632, and 10633. The sequence used for the required information, however, differs slightly in order to present information in a manner reflecting the unique characteristics of the City's water utility. The Department of Water Resources Review for Completeness form has been completed, which identifies the location of Act requirements in this Plan and is included as Appendix B.

The 2005 UWMP was adopted by resolution of the Huntington Beach City Council on November 21, 2005 following a public hearing. The Plan was submitted to the California Department of Water Resources and the State Library within 30 days of Council approval. Copies of the Notice of Public Hearing and the Resolution of Plan Adoption are included in Appendix C. Draft copies of the Plan were made available to the public within 30 days following City Council approval.

Agency Coordination

Development of this Plan was performed by the City of Huntington Beach Utilities Division staff, in coordination with other departments of the City including the City Administrator's Office, Public Works Department, Community Development Department, Economic Development Department, and City Clerk's Office.

The City is fully dependent on the Metropolitan Water District of Southern California (Metropolitan) through the Municipal Water District of Orange County (MWDOC) and the Orange County Water District (OCWD) for its long-term water supply. All of the City's water supply planning relates to the policies, rules, and regulations of these three water agencies. Development of the City's UWMP was also coordinated with MWDOC, which serves as the City's wholesaler of water received from Metropolitan; OCWD, which manages the Santa Ana River (Orange County) groundwater basin and provides recycled water in partnership with the Orange County Sanitation District (OCSD); and the OCSD, which manages wastewater.

This UWMP details the specifics as they relate to the City of Huntington Beach Utilities Division and its service area and will refer to MWDOC, Metropolitan, OCWD and OCSD throughout. Appendix D lists the numerous references used benefiting the development of this Plan.

[2]The *Memorandum of Understanding Regarding Urban Water Conservation in California* (MOU) was adopted in September 1991 by a large number of water suppliers, public advocacy organizations and other interested groups. It created the *California Urban Water Conservation Council* and established 16 Best Management Practices (BMPs) for urban water conservation, recently refined to 14 BMPs. The City of Huntington Beach adopted the MOU on August 21, 2000.

The UWMP is intended to serve as a general, flexible, and open-ended document that periodically can be updated to reflect changes in the Orange County water supply trends, and conservation and water use efficiency policies. This Plan, along with the City's Water Master Plan and other City planning documents, will be used by City staff to guide the City's water use and management efforts through the year 2010, when the UWMP is required to be updated

1.3 HUNTINGTON BEACH WATER SERVICE AREA

Location

The City of Huntington Beach is located 35 miles southeast of Los Angeles and 90 miles northwest of San Diego along the Southern California coast of Orange County as shown in Figure 1.1-1. Huntington Beach has a land area of 28 square miles and a water area of 26 square miles. The City is generally flat, with elevations ranging from a low of about 5 feet below to 120 feet above sea level. The City is predominately residential, although it also has nearly 500 major industrial businesses, 56 parks, and 8 ½ miles of beaches.

The City also supplies water to Sunset Beach, which is approximately 68 acres of unincorporated land located off Pacific Coast Highway near Huntington Harbor.

Climate Characteristics

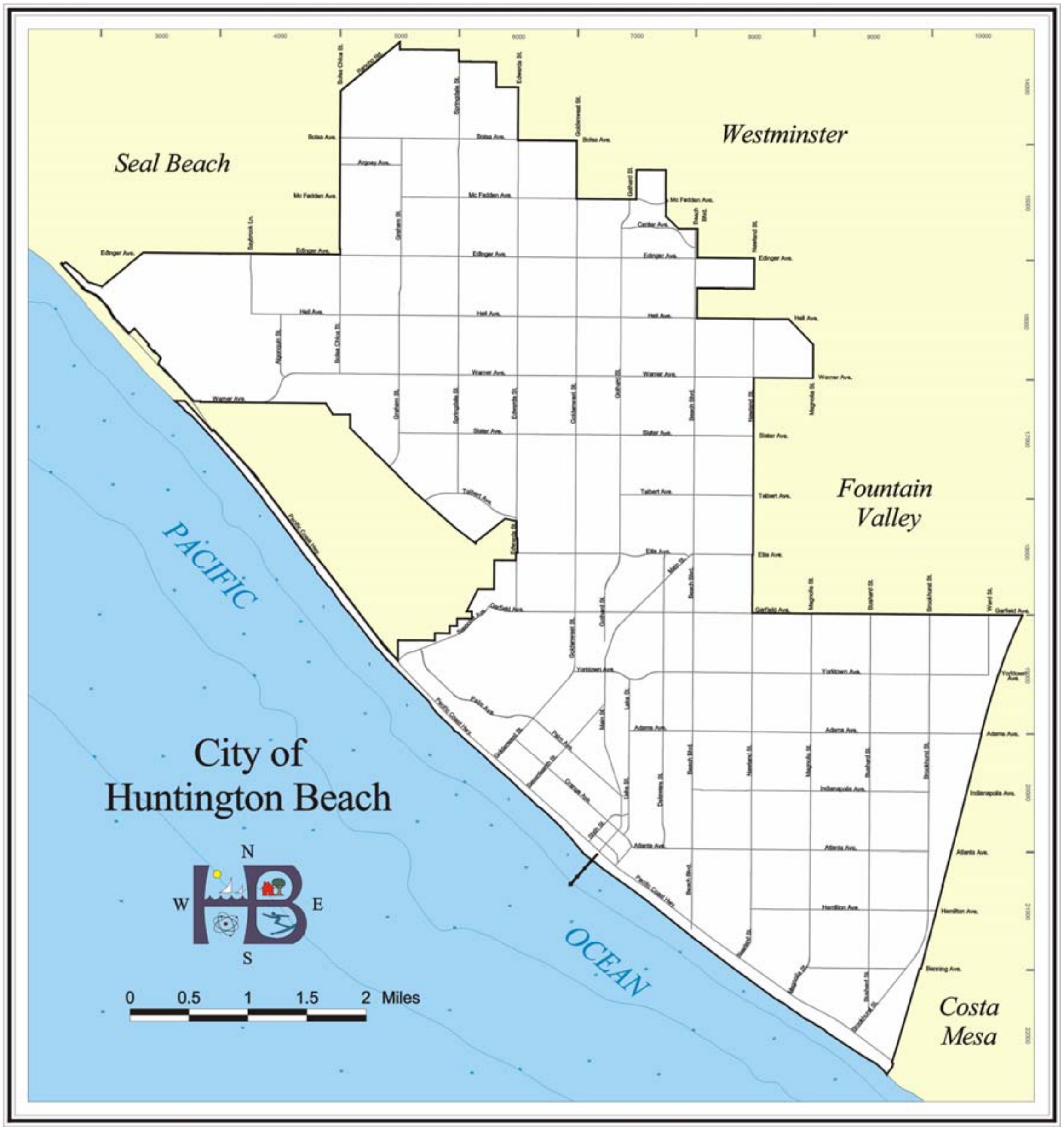
The City of Huntington Beach is located in an area known as the South Coast Air Basin (SCAB). The SCAB climate is characterized by what is known as Southern California's Mediterranean" climate: a semi-arid environment with mild winters, warm summers and moderate rainfall. The climate for the City is consistent with coastal Southern California. The general region lies in the semi-permanent high-pressure zone of the eastern Pacific. As a result, the climate is mild, tempered by cool sea breezes. The usually mild climatological pattern is interrupted infrequently by periods of extremely hot weather, winter storms, or Santa Ana winds.

The average annual temperature varies throughout the Basin, averaging 62 degrees Fahrenheit at the coast where the city is located. January is usually the coldest month while July and August are usually the hottest months of the year. Annual average relative humidity is 64.7 percent. Precipitation is typically 10 to 12 inches, occurring mostly between November and April.

Demographics

The population of the City is currently estimated at nearly 202,000, and is growing slowly, as there is very little remaining vacant land. The City provides water to over 52,000 service connections. The Huntington Beach water service area is predominantly residential with over 90 percent of water service connections serving single-family and multi-family residences. Approximately 65 percent of Huntington Beach residents live in single-family homes. The City also serves the Sunset Beach area of unincorporated Orange County.

Figure 1.1
City of Huntington Beach Location Area



The population per household was estimated at 2.56 by the Center for Demographic Research (CDR) at California State University Fullerton in 2004, which compares with 3.07 and 2.87 in Orange County and California, respectively. Data presented by the CDR projects an 11.1% increase in the City's population over the next 25 years. According to the CDR, the number of dwelling units in the city increased by 2,425 (75,852 to 78,277) between 2000 and 2005; however, this rate of growth is expected to decrease in future years as the city approaches build-out. Table 1.3-1 shows population projections in five-year increments to the year 2030.

Table 1.3-1
City of Huntington Beach
Population Projections*

	2005	2010	2015	2020	2025	2030
Huntington Beach Population	201,692	212,893	217,957	220,759	222,274	223,992
Annual % Increase	-	1.11%	0.47%	0.26%	0.15%	0.15%

Source: The Center for Demographic Research, California State University Fullerton
* Excludes Sunset Beach population of 1,255 (2000 U.S. Census for Tract 995.06)

1.4 HUNTINGTON BEACH UTILITIES DIVISION AND FACILITIES

Utilities Division

Huntington Beach was incorporated as a city in 1909, is one of the oldest cities in Orange County, and is the third largest city in the County. It is a charter city, administered by a council/administrator government. From 1936 to 1964, the water system serving Huntington Beach was owned and operated by the Southern California Water Company. In 1964, the City purchased the private system and the City's Water Division was established as a Division of the Public Works Department. In 2003, the Public Works Sewer Section was incorporated into the Water Division to form the Utilities Division. The Utilities Division is the principal water retailer within the City boundaries and the Sunset Beach area of unincorporated Orange County.

The Utilities Division is responsible for operating and maintaining wells, reservoirs, imported water connections, distribution pipelines, fire hydrants, water meters and related infrastructure, and for meter reading and billing. The Utilities Division also conducts comprehensive water quality testing and monitoring programs and develops long range operational and engineering plans designed to prepare for future needs and contingencies.

The City of Huntington Beach is 56.1 percent owner and acts as General Manager/Engineer for the West Orange County Water Board. The West Orange County

Water Board is a joint powers agreement between the cities of Huntington Beach, Garden Grove, Westminster and Seal Beach for the ownership and operation of two large capacity imported water transmission lines (OC-9 and OC-35). The Utilities Division performs operation and maintenance of the lines.

The Utilities Division establishes an annual operation budget managed through the Water Fund. Water Fund revenues are received from monthly water use and connection fees billed to water customers. By ordinance, revenues and expenditures for the Water Fund must balance, and the annual Water Fund budget is developed consistent with this premise. The annual budget includes programs for Engineering, Administration, Water Quality, Water Production, Water Maintenance, Water Meters, and Water Billing. Personnel, operating and capital outlay / equipment replacement costs are determined for each program. In addition, a capital projects budget is designed to address primarily replacements and upgrades of various water facilities and pipelines.

In 1995, the City Council adopted a Water Master Plan (WMP) and an accompanying Financial Plan. To fund improvements recommended in the WMP, a surcharge was established for water customers in December 1995. In addition, a capital facilities charge was instituted on all new residential development. Revenues from these charges are placed into the WMP Fund and used for capital improvements. The City is currently developing a 2005 WMP Update, which will address water needs for the current and future growth the City has experienced.

Service Area

The Utilities Division supplies customers throughout the City of Huntington Beach and the Sunset Beach area of unincorporated Orange County. Figure 1.2 shows the City limits and service areas, as well as the location of key water supply facilities, as described below.

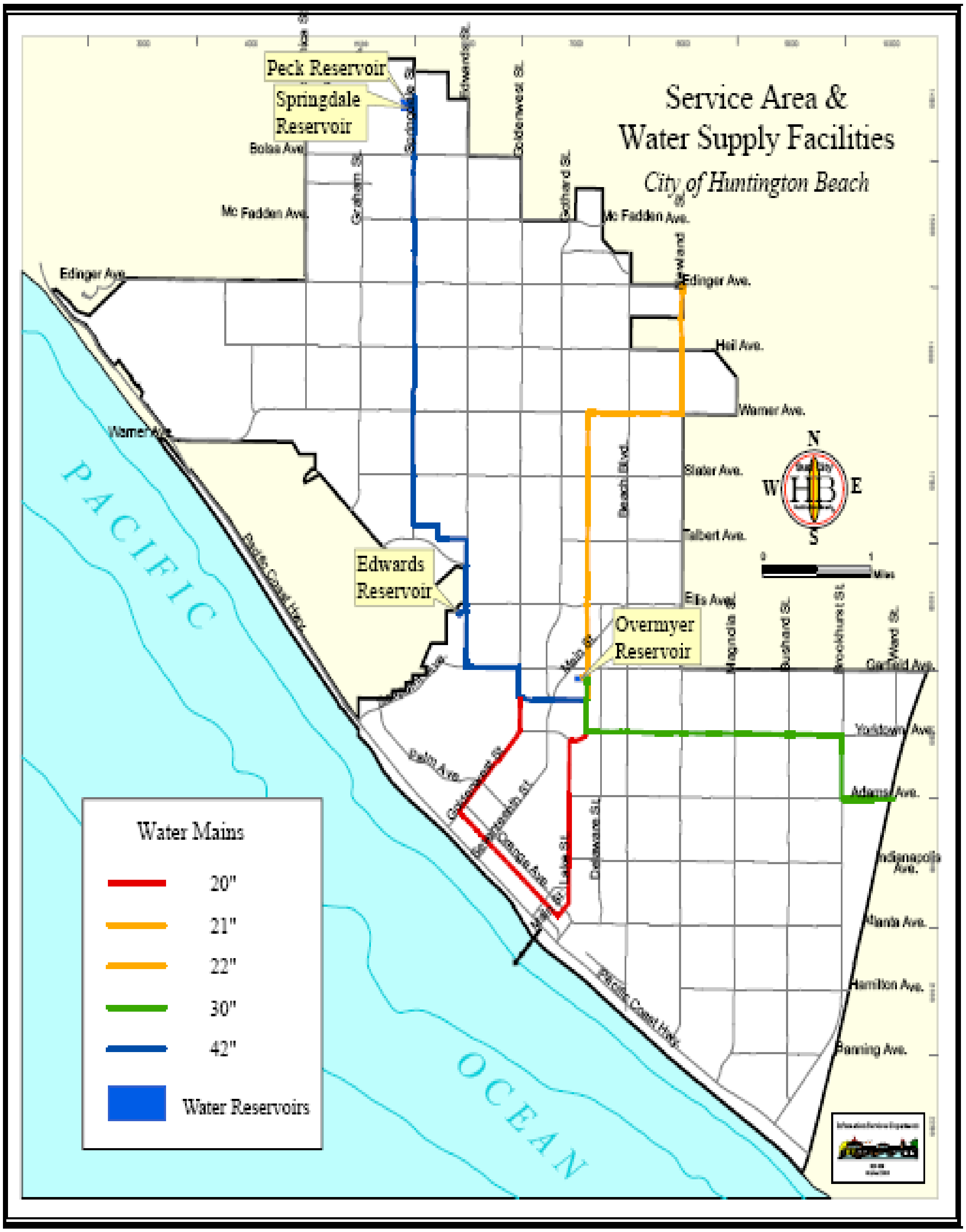
Water System Facilities

Groundwater is pumped from 10 active wells located throughout the City. The age, depth, design flow and production data for the active wells, wells not in use, and abandoned wells are summarized in Section 2.

MWDOC wholesales imported water to the City from Metropolitan. Metropolitan treats water supplied to the City at the Robert B. Diemer Filtration Plant in northern Orange County and the Joseph Jensen Filtration Plant in Granada Hills. The City's water distribution system is connected to Metropolitan transmission mains at OC-9, OC-35 and OC-44 located respectively along the northeast, northwest and southeast sides of the City.

The City also operates four storage and distribution reservoirs with a combined capacity of 55 million gallons. The storage system is supported with four booster stations located at the reservoir sites. The booster pumps have a total capacity of 58,690 gallons per minute, which is adequate to keep the system pressurized under peak flow conditions.

Figure 1.2
Water Service Area and Supply Facilities



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SECTION 2
WATER SOURCES AND SUPPLIES

2.1 WATER SOURCES

The City works together with three primary agencies to insure a safe and high quality water supply, which will continue to serve the community in periods of drought and shortage. The agencies who work in concert to provide these services are the Metropolitan Water District of Southern California (Metropolitan), the Municipal Water District of Orange County (MWDOC) and the Orange County Water District (OCWD).

Metropolitan Water District of Southern California (Metropolitan)

Metropolitan was formed in the late 1920's. At that time, Orange County was mostly an agriculturally based economy with the cities of Santa Ana, Anaheim, and Fullerton as the primary centers of urban development. Although other cities and residential communities existed at that time, it was these three cities that joined ten others located in Southern California, to form Metropolitan in 1928. Collectively, these charter members recognized the limited water supplies available within the region, and realized that continued prosperity and economic development of Southern California depended upon the acquisition and careful management of an adequate supplemental water supply. This foresight made the continued development of southern California and Orange County possible. Metropolitan acquires water from northern California via the State Water Project and from the Colorado River to supply water to most of southern California. As a wholesaler, Metropolitan has no retail customers, and distributes treated and untreated water directly to its member agencies. One such member agency is MWDOC.

Municipal Water District of Orange County (MWDOC)

In 1951, MWDOC was formed to provide supplemental water to many purveyors within Orange County who were not Metropolitan member agencies. The communities surrounding the Lower Santa Ana Groundwater Basin realized that the local underground supply might not be sufficient to meet future demands of the area.

MWDOC was formed for the purpose of contracting with Metropolitan to acquire supplemental import water supplies from northern California and the Colorado River for use within the Orange County area. MWDOC is Metropolitan's second largest wholesale member agency. MWDOC represents 30 member agencies, including 14 special districts, 14 city water departments, one private water company and one mutual water company. MWDOC provides imported water to all of Orange County except for the cities of Anaheim, Fullerton and Santa Ana.[3] It is through MWDOC that the City purchases imported water from Metropolitan.

[3] MWDOC 2005 Regional Urban Water Management Plan, Section 1.

Orange County Water District (OCWD)

In 1933, OCWD was formed by legislative act to protect and manage the County's vast, natural, underground water supply with the best available technology and to defend its water rights to the Santa Ana River Basin. As part of its original formation, OCWD was established by a special act (Act), of the State of California Legislature. This legislation is found in the State of California Statutes, Water – Uncodified Acts, Act 5683, as amended.[4] The basin is managed by OCWD under the Act, which functions as a statutorily-imposed physical solution. Section 77 of the Act states that, '*nothing in this act contained shall be so construed as to affect or impair the vested right of any person, association or corporation to the use of water*.[5] According to the Act, the City has the right to construct and operate groundwater-producing facilities in the basin. The Act also empowers OCWD to impose replenishment assessments and basin equity assessments on production and to require registration of water-producing facilities and the filing of certain reports; however, OCWD is expressly prohibited from limiting extraction unless a producer agrees.[6]

The basin is managed by OCWD for the benefit of municipal, agricultural and private groundwater producers. OCWD has 23 major producers extracting water from the Orange County groundwater basin (basin) serving a population of approximately 2.8 million.[7] Carefully managed by OCWD in collaboration with the other water and wastewater agencies, the growing population can be assured of a secure water supply from the groundwater source. Processes such as groundwater recharge of the Santa Ana River, recycling of wastewater, conservation and water use efficiency, and creative water purchases have aided in replenishing the groundwater basin to desired levels to meet required demands.

West Orange County Water Board (WOCWB)

As discussed earlier, the WOCWB is a Joint Powers Agency between four participating agencies. The members include the City of Huntington Beach, the City of Garden Grove, the City of Westminster, and the City of Seal Beach. The board consists of five members, with the City of Huntington Beach having two seats on the board. The board meets quarterly and manages surface water deliveries from Metropolitan (through MWDOC) to the agencies. The board oversees the maintenance of two feeder pipelines that connect to the treated surface water supply. The pipelines have a capacity of 21 CFS and 45 CFS. Each of the member agencies has paid for the capacity of the feeder pipelines and directly pays MWDOC for the use of water.

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[4] Orange County Water District Act.
[5] Orange County Water District Act, Section 77.
[6] Orange County Water District Act, Sections 23 and 31.5.
[7] Orange County Facts and Figures. Center for Demographic Research. Available: http://www.fullerton.edu/cdr/countyfacts.pdf. Note: Population served by OCWD is different than MWDOC as it serves the cities of Santa Ana, Fullerton, and Anaheim. June 2002.

2.2 WATER SUPPLY

The City currently receives approximately 64 percent of its water supply from groundwater wells accessing the Santa Ana River groundwater basin and 36 percent from Metropolitan through MWDOC. These percentages are established through OCWD's allowable Basin Pumping Percentage (BPP). The BPP is typically set by OCWD on an annual basis. However, OCWD does have the option of revising the BPP as needed. Actual percentages vary somewhat on an annual basis depending on the extent in-lieu delivery programs are implemented. For example, in 2003/04, the City's water supply was 66 percent imported water and 34 percent groundwater. Current and projected water supplies from imported water and groundwater are shown in Table 2.2-1 and described in subsequent sections.

Table 2.2-1
City of Huntington Beach
Current and Planned Water Supplies
(AFY)

Water Supply Sources	2005	2010	2015	2020	2025	2030
MWDOC – Import	11,772	13,620	13,320	14,170	13,470	12,780
Groundwater Production	22,183	24,300	24,540	24,790	25,040	25,260
Total Water Supply	**33,955**	**37,920**	**37,860**	**38,960**	**38,510**	**38,040**

Source: 2005 data from MWDOC; future projections are from Section 4.2 of this UWMP

Imported Water

Approximately 36 percent of the City's water supply comes from import water wholesaled by MWDOC through Metropolitan. Imported water is delivered from northern California via the State Water Project and from the Colorado River, and is treated at the Robert B. Diemer and Joseph Jensen Filtration Plant before the water is delivered to the City.

The City maintains three imported water connections to the Metropolitan system. The characteristics of these connections are shown in Table 2.2-2. OC-9 is located at the intersection of Dale and Katella Streets in the City of Stanton, and enters the city at the intersection of Newland and Edinger Streets. OC-35 is located at the same intersection and enters Huntington Beach at the intersection of Springdale and Glenwood Streets. OC-9 and OC-35 are under the jurisdiction of the West Orange County Water Board. OC-44 is a meter located at the East Orange County Feeder #2, and flow is delivered to the City's service area through a 24- to 42-inch transmission main jointly owned with the City and Mesa Consolidated Water District. A secondary metering station, jointly owned, is located on Adams Avenue at the Santa Ana River.

Table 2.2-2
Imported Water Connections

Designation	Capacity	Zone Supply
OC-9	6,750 gpm	Zone 1
OC-35	11,250 gpm	Zone 1
OC-44	7,000 gpm	Zone 1
Total Capacity	**25,000 gpm**	

Source: Huntington Beach Water System Master Plan, 1995

The City participates, in coordination with MWDOC and the OCWD, in Metropolitan's In-lieu Program. OCWD, MWDOC, and Metropolitan have developed a successful and efficient In-lieu Program to increase storage in the groundwater basin and anticipate working together on future programs. One such future program is the proposed Surplus Water Program.

The Surplus Water Program will allow Metropolitan to make direct deliveries to the City's distribution system in lieu of producing water from the Orange County groundwater basin. This In-lieu Program indirectly replenishes the basin by avoiding pumping. In the In-lieu Program, OCWD requests the City to limit pumping to defined volumes from specified wells. The City then takes replacement water through its import connections, which is purchased by OCWD from Metropolitan (through MWDOC). OCWD purchases the water at a reduced rate, and then bills the City the amount it would have had to pay for energy and the Replenishment Assessment (RA) if it had produced the water from its wells. The deferred local production results in water being left in local storage for future use.

Reservoirs

The City maintains four potable water storage reservoirs (Overmyer, Peck, Springdale, and Edwards Hill) with a total capacity of 55 million gallons. Pumps draw water from the reservoirs and pressurize it into the water system during high demand periods.

Groundwater

Orange County Groundwater Basin

The Orange County groundwater basin underlies the north half of Orange County beneath broad lowlands. The basin covers an area of approximately 350 square miles, bordered by the Coyote and Chino Hills to the north, the Santa Ana Mountains to the northeast, the Pacific Ocean to the southwest, and terminates at the Orange County line to the northwest, where its aquifer systems continue into the Central Basin of Los Angeles County. The aquifers comprising the Orange County groundwater basin extend over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits.

Groundwater supply currently meets approximately 64 percent of the water supply demand for all of Orange County that overlies the Orange County Groundwater Basin. This amount can be adjusted as needed based on groundwater basin hydrologic conditions, but is typically set on an annual basis.

During the water year July 2003 to June 2004, total basin production for all agencies was approximately 284,621 acre-feet.[8] The groundwater basin generally operates as a reservoir in which the net amount of water stored is increased in wet years to allow for managed overdrafts in dry years. The basin is recharged primarily from local rainfall (greater in wet years), base flow from the Santa Ana River (much of which is actually recycled wastewater from treatment plants in Riverside and San Bernardino Counties), imported water percolated into the basin, and recycled wastewater directly recharged into the basin. The production capability of the basin is being increased as a result of a variety of specific management initiatives including increased wastewater reclamation and the blending of lower quality water with potable water for public distribution.

The Orange County groundwater basin is not adjudicated and based on the Department of Water Resources' official departmental bulletins, California's Groundwater Bulletin 118 Updated 2003 and Bulletin 160, The California Water Plan Update 2005, the Orange County groundwater basin is not specifically identified as a basin in an overdraft condition. The California Water Plan Update, however, does state that groundwater overdraft is a challenge for the South Coast Hydrologic Region, which includes the Orange County groundwater basin. The Orange County groundwater basin is considered in an overdraft condition by OCWD, however the groundwater levels and amount of overdraft fluctuate overtime. OCWD continually monitors groundwater level trends and has collected data since 1962. OCWD's Groundwater Management Plan summarizes the accumulated overdraft and water level elevations within the basin. OCWD estimates that the accumulated overdraft in June 2004 was approximately 400,000 acre-feet.[9]

Based on OCWD's 2004 Groundwater Management Plan the target accumulated overdraft is 200,000 AF. An accumulated overdraft condition minimizes the localized high groundwater levels and increases ability to recharge storm events from the Santa Ana River. OCWD estimates that the groundwater basin can safely be operated on a short-term emergency basis with a maximum accumulated overdraft of approximately 500,000 AF; however, 400,000 AF is preferred. With an accumulated overdraft of 200,000 AF, the basin is considered 99.5 percent full with 40 MAF of groundwater in storage.

In an effort to eliminate long-term overdraft conditions, OCWD developed a comprehensive computer-based groundwater flow model to study and better understand the basin's reaction to pumping and recharge. OCWD has also implemented a monitoring

[8] Orange County Water District, *Draft 2003-2004 Engineer's Report on Groundwater conditions, Water Supply and Basin Utilization in the Orange County Water District*, February 2005

[9] Orange County Water District, *Draft 2003-2004 Engineer's Report on Groundwater conditions, Water Supply and Basin Utilization in the Orange County Water District*, February 2005

program to track dynamic conditions including groundwater production, storage, elevations, and quality. Components of this monitoring program include the request for the City to provide its groundwater production to OCWD on a monthly basis, yearly measurement of groundwater levels, water quality monitoring, and prevention of sea water intrusion.

Basin Pumping Percentage

One of the methods OCWD uses to manage the amount of production from the Orange County groundwater basin is the establishment of a Basin Production Percentage (BPP). OCWD recommends a BPP each water year which is calculated by dividing a producer's groundwater production by their total water demands. The BPP is based on groundwater conditions, availability of imported water supplies, and basin management objectives. The BPP is also a major factor in determining the cost of groundwater production from the basin for that year.

While the BPP has been as high as 75 percent in recent years, the BPP was set at 66 percent for 2004-2005. The BPP has been set at 64 percent for the water year 2005-2006 and is anticipated to increase to 70 percent over the next five years. Producers may pump above the BPP to 100 percent of their needs by paying the Basin Equity Assessment (BEA). The BEA is the additional fee paid on any water pumped above the BPP, making the cost of that water equal or greater to the cost of imported water. Such flexibility in producing over the BPP guarantees the City and other water utilities in Orange County the ability to provide water to their customers during periods of varying water availability.

When Metropolitan has an abundance of water, they may choose to activate their In-Lieu Program, where imported water is purchased in-lieu of pumping groundwater. This is a special program supported by OCWD, MWDOC and Metropolitan, which allows some agencies to pump above the BPP without penalty of the BEA.

Recharge Facilities

Another method for controlling overdraft is through recharge management programs. The basin is recharged by multiple sources including natural and artificial sources. Natural recharge occurs when groundwater producers use surface water in-lieu of groundwater. The reduction in pumping naturally recharges the basin. Another source of natural recharge is the result of precipitation and OCWD estimates that approximately 60,000 AFY recharged to the basin.

Artificial recharge occurs through developed percolation ponds (approximately 1,000 acres) and also via injection through the Talbert and Alamitos Barriers. The four groundwater spreading systems throughout OCWD's service area and their respectable percolations rates are summarized in Table 2.2-3.

Table 2.2-3
Orange County Groundwater Basin
Groundwater Spreading Systems

System	Area (acres)	Storage Capacity (AF)	Percolation Rate (cfs)
Main River System	245	480	87-115
Off-River System	126	394	15-40
Deep Basin System	280	8,484	89-300
Burris Pit/Santiago System	373	17,500	106-210

These percolation systems can recharge Santa Ana River baseflow and storm flows. OCWD estimates that approximately 155,000 AF of baseflow and 60,000 AF of storm flows are recharged each year on average. OCWD also imports between 35,000 and 60,000 AF of replenishment water to be used for recharging the basin.

OCWD also recharges the basin by injecting water to prevent seawater intrusion. The seawater intrusion barriers include the Talbert and Alamitos Barriers. The Talbert Barrier has 26 injection wells and injects 12 mgd into the groundwater basin. Over 95 percent of the water injected flows inland and is therefore considered replenishment water. The Alamitos Barrier injects approximately 5,000 AFY of which 50 percent stays within the basin for replenishment.

The estimated average annual recharge of the basin based on the information provided above is 328,400 AF to 353,400 AF. The range is due to the amount of imported water purchased from Metropolitan each year. The amount of water available for recharge will vary from year to year.

City Wells

Within the City, groundwater for potable use is produced from nine operating wells currently in use that vary in depth from 204 feet to 996 feet, with production varying from 350 gallons per minute (gpm) to 3,400 gpm, with a total system capacity of approximately 20,690 gpm as shown in Table 2.2-4.

Two other City wells are used only for irrigation: Goldenwest No 4 and Meadowlark No. 2. Goldenwest Well No. 4 is currently used to irrigate Huntington Central Park and the Meadowlark Golf Course. Goldenwest Well No. 4 will be destroyed after Well No 8 is put online in 2006, while Meadowlark Well No. 2 will continued to be used to irrigated Meadowlark Golf Course.

Table 2.2-4
City of Huntington Beach Active and Planned Wells

Well	Year Drilled	Well Depth (feet)	Capacity (gpm)	Normal Supply (gpm)
HB1[a]	1962	306	750	350
HB3A	1994	716	2,500	1,750
HB4	1967	804	500	450
HB5	1969	820	3,000	3,000
HB6	1973	810	3,000	2,500
HB7	1975	891	3,400	3,400
HB9	1981	996	3,000	1,750
HB10	1981	960	3,400	2,700
HB12[b]	1995	800	3,000	3,000
HB13	2001	800	2,500	2,500
Total (gpm)			25,050	21,400

(a) To be re-drilled with capacity increased to 750 gpm; schedule still to be determined.
(b) Scheduled start-up: 2005/06 at an estimated capacity of 3,000 gpm.

Table 2.2-5 summarizes the amount of groundwater pumped by the City for the last five years. Table 2.2-6 shows the amount of water that is projected to be pumped from each well in the future.

Table 2.2-5
Amount of Groundwater Pumped
(AFY)

Well No.	2001	2002	2003	2004	2005
Goldenwest No. 4	100.5	114.0	45.0	96.5	86.8
Meadowlark No. 2	225.5	240.2	248.2	232.4	224.9
HB1	595.0	647.8	295.1	408.8	567.2
HB3A	33.7	2,593.8	1,509.8	1,581.2	1,798.7
HB4	1,962.0	942.3	275.5	281.4	247.8
HB5	0.0	4,002.5	3,035.7	2,147.1	2301.0
HB6	3,474.7	3,050.8	1666.0	1721.7	2,054.5
HB7	5,011.3	4,164.5	2,045.4	1,905.6	2304.0
HB8	0.0	0.0	0.0	0.0	0.0
HB9	2,363.4	2,440.2	726.8	809.2	1,086.9
HB10	4,476.6	4,558.7	2,104.7	2,221.1	2,620
HB12	0.0	0.0	0.0	0.0	0.0
HB13	0.0	1,825.8	2,166.0	1,783.3	1,653.4
Total	**18,242.7**	**24,580.6**	**14,118.2**	**13,188.3**	**14,945.2**

Note: Totals are based on a fiscal year of June 30 to July 1. For example, production shown for 2001 is for groundwater pumped from 7/1/00 to 6/30/01.

Table 2.2-6
Amount of Groundwater Projected to be Pumped
(AFY)

Basin	2010	2015	2020	2025	2030
Santa Ana Groundwater Basin	24,300	24,540	24,790	25,040	25,260

Note: Groundwater demand is estimated to comprise 70% of the total demand based on a normal water year and a BPP of 70%.

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SECTION 3
WATER QUALITY

3.1 WATER QUALITY OF EXISTING SOURCES

As required by the Safe Drinking Water Act (reauthorized in 1996), the City provides annual Water Quality Reports to its customers; also known as Consumer Confidence Reports. This mandate is governed by the Environmental Protection Agency (EPA) and the California Department of Health Services (DHS) to inform customers of their drinking water quality. In accordance with the Safe Drinking Water Act, the City monitors a number of regulated and unregulated compounds in its water supply and in years past, the water delivered to the City meets the standards required by the state and federal regulatory agencies.[10] As mentioned earlier, the City's source of water is from imported water supplies and groundwater.

IMPORTED WATER

The City receives imported water through MWDOC from Metropolitan, which receives raw water from northern California through the SWP and the Colorado River Aqueduct. Metropolitan water is treated in accordance with potable standards at filtration plants located throughout Southern California. The City receives its treated imported water from the Robert B. Diemer Filtration Plant located in Yorba Linda, California and the Joseph Jensen Filtration Plant located in Granada Hills, California.

Metropolitan tests and treats its water for microbial, organic, inorganic, and radioactive contaminants as well as pesticides and herbicides. Protection of Metropolitan's water system continues to be a top priority. In coordination with its 26 member public agencies, Metropolitan added new security measures in 2001 and continues to upgrade and refine procedures. Changes have included an increase in the number of water quality tests conducted each year (more than 300,000) as well as contingency plans that coordinate with the Homeland Security Office's multicolored tiered risk alert system.[11] Metropolitan also has one of the most advanced laboratories in the county where water quality staff performs tests, collects data, reviews results, prepares reports, and researches other treatment technologies. Although not required, Metropolitan monitors and samples elements that are not regulated but have captured scientific and/or public interest. Metropolitan has tested for chemicals such as perchlorate, methyl tertiary butyl ether (MTBE), and chromium VI among others.

In Metropolitan's Integrated Resources Plan (IRP) Update, water quality was identified as a possible risk to Metropolitan's future water supply reliability. Existing supplies could be threatened in the future because of contamination, more stringent water quality regulations, or the discovery of an unknown contaminant. Water quality of imported

[10] City of Huntington Beach, 2005 Water Quality Report.
[11] Metropolitan's website, www.mwdh2o.com/mwdh2o/pages/yourwater/2005_report/protect_02.html

water could directly impact the amount of water supplies available to the City. Metropolitan's UWMP Update included the following examples:

- If a groundwater basin becomes contaminated and cannot be used, more water will be required from other sources
- Imported water from the Colorado River must be blended (mixed) with lower salinity water from the SWP. Higher salinity levels in the Colorado River would increase the proportion of SWP supplies required.
- High total dissolved solids in water supplies leads to high TDS in wastewater, which increases the cost of recycled water
- If diminished water quality causes a need for membrane treatment, the process typically results in losses of up to 15 percent of the water processed
- Degradation of imported water supply quality could limit the use of local groundwater basins for storage
- Changes in drinking water quality standards such as arsenic, radon, or perchlorate could increase demand on imported water supplies

Because of the concerns identified above, Metropolitan has identified those water quality issues that are most concerning and have identified necessary water management strategies to minimize the impact on water supplies. Water quality concerns with Metropolitan's water supplies and the approaches taken to ensure acceptable water quality are discussed in the following sections.

Salinity

Water from the Colorado River Aqueduct has the highest level of salinity of all Metropolitan's sources of supply, averaging 650 mg/L during normal water years.[12] Several actions have been taken on the state and federal level to control the salinity with the river such as the Colorado River Basin Salinity Control Act in 1974 and formation of the Colorado River Basin Salinity Control Forum. In 1975, water quality standards and a plan for controlling salinity were approved by the Environmental Protection Agency.

In contrast, water from the SWP is significantly lower in total dissolved solids, averaging 250 mg/L. Because of the lower salinity, Metropolitan blends SWP water with Colorado River water to reduce the salinity in the water delivered to its customers. The Metropolitan's board has adopted a salinity objective of 500 mg/L for blended imported water as defined in Metropolitan's Salinity Management Action Plan. Metropolitan estimates that the objective can be met in seven out of ten years. In the other three years, hydrologic conditions would result in increased salinity and reduced volume of SWP supplies.

In an effort to address the concerns over salinity, Metropolitan secured Proposition 13 funding for two water quality programs:

[12] The Metropolitan Water District of Southern California, Regional Urban Water Management Plan, 2005

1) Water Quality Exchange Partnership – the funding is being used to develop new infrastructure to optimize water management capabilities between the agricultural users of the eastern San Joaquin Valley and urban users of southern California. Installing infrastructure will provide opportunities for Metropolitan to exchange SWP water for higher quality water.
2) The Desalination Research and Innovation Partnership – the funding is being used to develop cost-effective advanced water treatment technologies for the desalination of Colorado River water, brackish groundwater, municipal wastewater, and agricultural drainage water.

Perchlorate in Colorado River

Perchlorate is a contaminant of concern and is known to have adverse effects on the thyroid. Perchlorate has been detected at low levels in the Colorado River water supply. Perchlorate is difficult to remove from water supplies with conventional water treatment. Successful treatment technologies include nanofiltration, reverse osmosis, biological treatment, and fluidized bed bioreactor treatment. Metropolitan continues to monitor perchlorate contamination of the Colorado River as well as research various treatment options. In 2002 Metropolitan adopted a Perchlorate Action Plan which defined the following nine objectives:

1) expand monitoring and reporting programs
2) assess the impact of perchlorate on local groundwater supplies
3) continue tracking health effects studies
4) continue tracking remediation efforts in the Las Vegas Wash
5) initiate modeling of perchlorate levels in the Colorado River
6) investigate the need for additional resource management strategies
7) pursue legislative and regulatory options for cleanup activities and regulatory standards
8) include information on perchlorate into outreach activities
9) provide periodic updates to Metropolitan's board and member agencies

Disinfection by-products formed by disinfectants reacting with bromide and total organic carbon in SWP water

SWP water supplies contain levels of total organic carbon and bromide that are a concern to Metropolitan to maintain safe drinking water supplies. When water is disinfected at treatment plants certain chemical reactions can occur with these impurities that can form Disinfection Byproducts (DBP). DBPs in turn can result in the formation of Trihalomethanes (THMs), Haloacetic Acids (HAAs) and other DBPs. THMs and HAAs have been found to cause cancer in laboratory animals. Inherent in any through-Delta water movement is the high organic and bromide loading imposed on the water from agricultural runoff and salt water intrusion. This poses significant treatment challenges to the receiving end users, like Metropolitan, to avoid problems with DBPs and the formation of THMs. It is imperative that the quality of SWP water delivered to Metropolitan be maintained at the highest levels possible.

In order to control the total organic carbon and bromide concentrations in Metropolitan's water supply, SWP water is blended with Colorado River water. The blending of the two water sources benefits in two ways: reduction in disinfection byproducts and reduction in salinity (as discussed earlier). Because of the recent drought conditions on the Colorado River, water supplies have been reduced which impacts the blending operations at the various filtration plants. As a result, Metropolitan's board authorized the use of ozone as the primary disinfectant at all five Metropolitan treatment plants in July 2003. Previously, only the Henry J Mills and Jensen Filtration Plants had been approved for this treatment. These two plants were chosen for the use of ozone in order to meet new disinfection byproducts regulations. Metropolitan's board plans to install ozonation at the remaining three plants by 2009, including the Diemer filtration plant.

Methyl Tertiary Butyl Ether (MTBE) in groundwater and local surface reservoirs

The California Department of Health Services has adopted a primary maximum contaminant level (MCL) of 13 ug/L for MTBE. MTBE is an oxygenate found in gasoline. Metropolitan monitors MTBE levels at Diamond Valley Lake and Lake Skinner. The reservoirs also have boat requirements such as MTBE-free fuel to aid in the protection of imported water supplies. MTBE concentrations have been below the MCL.

Uranium

Uranium is a contaminant of concern in the water from the Colorado River. There are uranium mine tailings located approximately 600 feet from the river at Moab, Utah. Rainfall seeps through the tailings and contaminates the local groundwater which flows to the river. In 2003, an interim action system was implemented that intercepts some of the contaminated groundwater prior to reaching the river. The Department of Energy is preparing an Environmental Impact Statement that will evaluate the possibility of moving the pile, capping it in place, and other alternatives. Uranium levels at Metropolitan's intake range from 1 to 5 pCi/L whereas the California drinking water standard is 20 pCi/L.[13]

N-nitrosodimethylamine (NDMA)

NDMA is an emerging contaminant that may have an impact on the water supply. Although Metropolitan's water supplies are non-detect for NDMA, there is a concern that chlorine and monochloramine can react with organic nitrogen precursors to form NDMA.

Hexavalent Chromium (Chromium VI)

Currently, the MCL for total chromium is 0.05 mg/L, which includes Chromium VI. California DHS is to set a MCL for Chromium VI, however, the Office of Health Hazard Assessment must first establish a public health goal. Metropolitan samples for Chromium VI and monitors levels within the Colorado River because of Chromium VI detection in groundwater near the river. The plume of Chromium VI has been detected in recently

[13] The Metropolitan Water District of Southern California, Regional Urban Water Management Plan, 2005

installed wells that are located less than 60 feet west of the Colorado River near Topock, Arizona. In February 2005, Chromium VI was detected at a concentration of 354 parts per billion (ug/L).[14] Metropolitan is involved in a Technical Work Group that reviews monitoring results and remediation plans for contaminated groundwater.

Water Quality Programs

Metropolitan supports and is involved in many programs that address water quality concerns related to both the SWP and Colorado River supplies. Some of the programs and activities include:

- CALFED Program – This program coordinates several SWP water feasibility studies and projects. These include:
    1. A feasibility study on water quality improvement in the California Aqueduct
    2. The conclusion of feasibility studies and demonstration projects under the Southern California-San Joaquin Regional Water Quality Exchange Project.[15] This exchange project was discussed earlier as a mean to convey higher quality water to Metropolitan.
    3. DWR's Municipal Water Quality Investigations Program and the Sacramento River Watershed Program. Both programs address water quality problems in the Bay-Delta and Sacramento River watershed.

- Delta Improvement Package – Metropolitan in conjunction with DWR and US Geologic Survey have completed modeling efforts of the Delta to determine if levee modifications at Franks Tract would reduce ocean salinity concentrations in water exported from the Delta. Currently, tidal flows trap high saline water in the track. By constructing levee breach openings and flow control structures, it is believed saline intrusion can be reduced. This would significantly reduce total dissolved solids and bromide concentrations in water from the Delta.

- Source Water Protection – In 2001, Metropolitan completed a Watershed Sanitary Survey as required by DHS to examine possible sources of drinking water contamination and identify mitigation measures that can be taken to protect the water at the source. DHS requires the survey to be completed every five years. Metropolitan also completed a Source Water Assessment (December 2002) to evaluate the vulnerability of water sources to contamination. Water from the Colorado River is considered to be most vulnerable to contamination by recreation, urban/storm water runoff, increasing urbanization in the watershed, wastewater and past industrial practices. Water supplies from SWP are most vulnerable to urban/storm-water runoff, wildlife, agriculture, recreation, and wastewater.[16]

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[14] Arizona Department of Health Services, Topock Groundwater Study Evaluation of Chromium in Groundwater Wells, September 7, 2005.
[15] The Metropolitan Water District of Southern California, Regional Urban Water Management Plan, 2005
[16] The Metropolitan Water District of Southern California, Regional Urban Water Management Plan, 2005

GROUNDWATER

OCWD manages the City's groundwater basin and conducts a comprehensive water quality monitoring program. OCWD collects over 13,500 groundwater samples each year from over 800 wells. The water quality data collected from these wells is used to assess ambient conditions of the basin, monitor the effects of extraction, monitor the effectiveness of the seawater intrusion barriers, evaluate impacts from historic and current land use, address poor water quality areas, and also provide early warning of emerging contaminants of concern.[17]

OCWD's water quality monitoring programs are broadly classified into three categories; (1) regulatory or compliance with permits, environmental and groundwater drinking water regulations, (2) committed OCWD and research projects, and (3) basin management, i.e., or evaluating and protecting basin water quality. OCWD is compliant with groundwater drinking water regulations and operates under a Department of Health Services' approved monitoring program that includes monitoring all drinking water wells within the OCWD, including the City's wells. Wells are sampled for regulated and unregulated chemicals at a required monitoring frequency.

OCWD operates an extensive groundwater quality management program that allows OCWD to address current issues and develop strategies to anticipated and resolve future issues. OCWD's 2004 Groundwater Management Plan has a section devoted solely to groundwater quality management. The groundwater quality issues facing OCWD and the City and the programs implemented to address those issues are summarized in the following sections.

Nitrates

The Orange County groundwater basin has a number of constituents that are water quality concerns. The early agricultural practices with OCWD contributed to the high concentrations of nitrates in the shallow groundwater. Although nitrates are present throughout the basin, only a small number of areas exceed the MCL. Nitrate management goals include remediating groundwater contaminated by nitrate, attaining the Regional Water Quality Control Board's groundwater subbasin nitrate-nitrogen water quality objective of 3 mg/L (the MCL is 10 mg/L), and increasing the frequency of monitoring to quarterly for those wells having concentrations of nitrate above 50 percent of the MCL. The two nitrate removal projects within Orange County include the Garden Grove Nitrate Removal Project and the Tustin Main Street Treatment Plant.

Total Dissolved Solids (TDS)

Another water quality concern is total dissolved solids (TDS). OCWD has been proactive to combat the increase in salinity within the basin; however, many wells within OCWD, with the exception of any in the City of Huntington Beach, exceed the RWQCB's water quality objective of 500 mg/L. TDS concentrations range from 223 to over 600 mg/L and

[17] Orange County Water District, *Groundwater Management Plan,* March 2004.

averages 461 mg/L within the basin.[18] The average TDS concentration of untreated groundwater pumped from the City is 336 mg/L.

The TDS levels within the recharge waters are higher than the average TDS concentrations within the groundwaters, as a result the TDS concentration within the groundwater continues to rise. In response to the rising TDS concentrations, OCWD has implemented groundwater desalter projects (the Irvine Desalter and the Tustin Seventeenth Street Desalter), has expanded barrier injection facilities, cooperates with upper Santa Ana watershed stakeholders to control TDS at the source, supports Metropolitan's efforts to import high quality water, maintains an aggressive monitoring program, and proposes the Groundwater Replenishment System.[19]

One of the major challenges for OCWD is the contamination of fresh groundwater by saltwater intrusion and therefore OCWD has implemented two seawater intrusion barriers: the Talbert Barrier and the Alamitos Barrier. The coastal seawater monitoring program focuses on the effectiveness of the barriers and the following parameters are monitored: water level elevations, chloride, TDS, electrical conductivity, and bromide. Each of these parameters aid OCWD to track the extent and movement of saline waters throughout the basin.

Volatile Organic Compounds (VOC)

OCWD has an aggressive VOC monitoring program. Because of the monitoring program, VOC's have been detected in a number of wells within OCWD. Several drinking water wells have been taken out of service, although not within the City. OCWD implemented the Irvine Desalter Project to address the VOC's and high TDS concentrations in the groundwater basin near Irvine. OCWD is also proposing the Forebay VOC Cleanup project to prevent further spread of groundwater contaminated with VOC's. The other VOC removal project is a well within the City of Santa Ana that treats water for irrigation at the River View Golf Course.

Methyl Tertiary-Butyl Ether (MTBE)

Drinking water wells within OCWD are tested for methyl tertiary-butyl ether, more commonly known as MTBE, at least annually and in some cases quarterly. OCWD aggressively monitors for MTBE to detect a problem before it reaches a drinking water well.[20] The health effects of MTBE are uncertain. The U.S. Environmental Protection Agency currently classifies MTBE as a possible human carcinogen.

Unfortunately there are hundreds of identified sites with leaky underground storage tanks throughout Orange County. The majority of these sites do not have a groundwater cleanup program to remove the MTBE from the shallow groundwater. In response to the MTBE contamination, OCWD filed a lawsuit in 2003 against numerous oil and

[18] Orange County Water District, *Draft 2003-2004 Engineer's Report on Groundwater Conditions, Water Supply and Basin Utilization in the Orange County Water District*, February 2005.
[19] Orange County Water District, *Groundwater Management Plan*, March 2004
[20] Orange County Water District, 2001-2002 Annual Report

petroleum-related companies. The suit seeks funding from the responsible parties to pay for the investigation, monitoring, and removal of oxygenates from the basin.[21] Two wells within OCWD, but not within the City, have been taken out of service because of MTBE contamination. Fortunately, a thick underground clay layer helps protect most of the groundwater basin from surface contamination of MTBE.

N-nitrosodimethylamine (NDMA)

In the year 2000, OCWD discovered NDMA, a known carcinogen, in the injection water used to prevent seawater intrusion at the Talbert Barrier. OCWD adjusted the operation of Water Factory 21, where recycled water is treated for injection, for NDMA treatment. Ultraviolet light treatment was added to the process to reduce the occurrence of NDMA in injection waters.

There is currently one NDMA removal project within OCWD. Mesa Consolidated Water District provides wellhead treatment for the removal of NDMA. The treatment process meets the current NDMA Action Level of 10 nanograms per liter and minimizes further down gradient migration of NDMA. The City's wells have been tested for NDMA and have not exceeded the action level.

Emerging Contaminants

Pharmaceuticals, personal care products, and endocrine disruptors are considered emerging environmental contaminants. There are water quality concerns associated with these emerging contaminants because of their wide spread use among the population and their impact on human health because of exposure to low doses over long periods of time. OCWD is aware of these contaminants and is working with DHS to track and report their concentrations in the groundwater.

Colored Groundwater

Colored groundwater is encountered over a broad region of Orange County and is estimated to total over 1 million acre-feet. The area identified as the "colored water" area includes the southern part the basin near the coastal area. The colored water is located at depths deeper than the clear zone and if a deep well can be constructed, a new source of water may be available. The OCWD 2004 Groundwater Management Plan reports nine wells have been drilled in the colored zone, including the City's Well No. 8. However, this well is inactive at this time and will be used to irrigate Central Park in 2006. These wells aid in reducing the groundwater level of the colored aquifer and thus minimize the potential for upward vertical migration of colored water into the clear zones.

Water Quality Programs

OCWD supports and is involved in many programs that address water quality concerns of the groundwater basin. Some of the programs and activities include:

[21] Orange County Water District, *Groundwater Management Plan*, March 2004

- Source Water Protection – Similar to Metropolitan, OCWD has completed a drinking water source assessment for the existing drinking supply wells. The source water assessment develops management strategies to prevent or reduce the risks to groundwater from pollution such as:
    1) delineates the time-of-travel aquifer capture zone of the source and identifies land area to be protected
    2) identifies and locates potential sources of contamination to the well
    3) manage land use and planning for future development
    4) requires development to comply with the County's Municipal Stormwater Water Quality Management Plan to protect groundwater replenishment water
- Surface Water Monitoring – OCWD also conducts routine monitoring of the Santa Ana River and other surface waterways in the upper watershed. OCWD is conducting the Santa Ana River Water Quality and Health Study to verify the sustainability of continued use of river water for recharge and its impact on groundwater quality.
- Constructed Wetlands – OCWD operates the Prado Basin Wetland in cooperation with the US Army Corps of Engineers and the US Fish and Wildlife Service to reduce the nitrogen concentration of river water. The constructed wetlands comprise of 465 acres.
- Public Outreach – OCWD has implemented a public education outreach program called the Groundwater Guardian Team to inform the public about the benefits of protecting the groundwater basin.
- Regulation – In May of 1987, OCWD adopted a Groundwater Quality Protection Policy. The policy established the following objectives:
    1) Maintain a suitable groundwater supply for all existing and potential beneficial uses
    2) Prevent degradation of the quality of the groundwater supply
    3) Assist responsible regulatory agencies in identifying sources of pollution to assure cleanup by the responsible party(s)
    4) Maintain or increase the basin's usable storage capacity
    5) Inform the general public of water quality problems as they are encountered as well as the overall condition of the groundwater supply, through appropriate regulatory agencies and producers

3.2 WATER QUALITY EFFECT ON WATER MANAGEMENT STRATEGIES AND SUPPLY RELIABILITY

The previous section summarized the general water quality issues of Metropolitan's imported water and OCWD's groundwater supplies. The same water quality concerns apply to the City's water. Similar to Metropolitan and OCWD, the City prepared an assessment of the City's drinking water in December 2002. The groundwater sources were found to be most vulnerable to possible contamination from dry cleaners, electrical/electronic manufacturing, gas stations, known contaminant plumes, metal plating/finishing/fabricating, military installations, and plastics/synthetic producers.[22] The City continues to monitor its groundwater wells for the first indication of problems as part of their water management strategy.

In April of 2004, the City delivered highly fluoridated water that exceeded the MCL. The MCL for fluoride is 2 mg/L. The City estimates that over a period of 24 hours, residential and commercial customers were served with water with fluoride levels up to 33 mg/L. The City isolated the affected area and notified DHS as well as the Orange County Health Care Agency. The City flushed the water system and notification letters were delivered to impacted customers.

Except for the occurrence of fluoride, the City has not experienced any significant water quality problems in the past and does not anticipate any significant changes in the future. In the near future, EPA's Stage 2 regulation of the disinfection byproducts rule will be in effect. Stage 1 was implemented in 2002 and lowered the total THM maximum annual average concentration level in water supplies; stage 2 will further lower the THM concentration level. The City's water supplies meet the requirements of Stage 1 and will be required to meet Stage 2 levels when they become finalized.

The City does not anticipate any changes in its available water supplies due to water quality issues in part because of the mitigation actions undertaken by Metropolitan and OCWD as described earlier.

[22] City of Huntington Beach, 2005 Water Quality Report.

SECTION 4
WATER RELIABILITY PLANNING

4.1 RELIABILITY OF WATER SUPPLIES

The City of Huntington Beach and all of the communities and water agencies in Orange County are facing increasing challenges in their role as stewards of water resources in the region. The region faces a growing gap between its water requirements and its firm water supplies. Increased environmental regulations and the collaborative competition for water from outside the region have resulted in reduced supplies of imported water. Continued population and economic growth in Orange County will increase water demand within the region and put an even larger burden on local supplies

The City receives approximately 64 percent of its water supply from local groundwater, managed by the OCWD, and 36 percent from import water through MWDOC.

MWDOC and OCWD are implementing water supply alternative strategies for the region and on behalf of their member agencies to ensure available water in the future. Strategies are identified in the MWDOC 2005 Regional UWMP, the OCWD Long Term Facilities Plan (Draft October 2005), and the OCWD 2004 Groundwater Management Plan. The optimum water supply strategy should attempt to meet the following objectives:

- Ensure that the groundwater basin is protected
- Ensure available water for Orange County residents and businesses in the future
- Minimize the consumers water supply cost
- Use a variety of sources
- Reverse the adverse salt balance in the groundwater basin
- Provide flexibility to allow both MWDOC and OCWD to quickly take advantage of changing and new markets if and when they develop

The reliability of the City's water supply is currently dependent on the reliability of both groundwater and imported water supplies, which are managed and delivered by OCWD and Metropolitan, respectively. The following sections will discuss these agencies, and others throughout the region, their roles in water supply reliability, and the near and long-term efforts they are involved with to ensure future reliability of water supplies to the City and the region as a whole.

4.1.1 Regional Agencies and Water Reliability

Metropolitan Water District of Southern California (Metropolitan)

Metropolitan's primary goal is to provide reliable water supplies to meet the water needs of its service area at the lowest possible cost. The reliability of Metropolitan's water supply has been threatened as existing imported water supplies from the Colorado River and SWP face increasing challenges. Despite these challenges, Metropolitan continues to develop and encourage projects and programs to ensure reliability now and into the future. One such project is Metropolitan's recently completed Diamond Valley Lake in Hemet, California, an 800,000 AF capacity reservoir for regional seasonal and emergency storage for SWP and Colorado River water. The reservoir began storing water in November 1999 and reached the sustained water level by early 2002.[23]

Colorado River Aqueduct (CRA)

Pursuant to the 1964 U.S. Supreme Court decree, Metropolitan's dependable supply of Colorado River water was limited to 550,000 acre-feet per year assuming no surplus or unused Arizona and Nevada entitlement was available and California agricultural agencies use all of their contractual entitlement. Historically, Metropolitan has also possessed a priority for an additional 662,000 AFY depending upon availability of surplus water. In addition, Metropolitan maintains agreements for storage, exchanges and transfers within the service area of Imperial Irrigation District that provide water to Metropolitan.[24]

Water supplies from the Colorado River have been and continue to be a topic of negotiation and intense debate. The 1964 Court Decree required the state of California to limit its annual use to 4.4 million acre-feet (MAF) basic annual apportionment of Colorado River water plus any available surplus. To keep California at 4.4 MAF, Metropolitan reduced its level of diversions in years when no surplus is available.

In 1999, the Colorado River Board developed "California's Colorado River Water Use Plan," also known as the "California Plan" and the 4.4 Plan", which was endorsed by all seven Colorado River Basin states and the U.S. Department of the Interior. This plan developed the framework that specifies how California will transition and live within its basic apportionment of 4.4 MAF of Colorado River water.

The U.S. Bureau of Reclamation implemented Interim Surplus Guidelines to assist California's transition to the Plan. Seven priorities for use of the waters of the Colorado River within the State of California were established. Metropolitan would only be able to exercise its fourth priority right to 550,000 AF annually, instead of the maximum aqueduct capacity of 1.3 MAF. Priorities 1 through 3 cannot exceed 3.85 MAF annually. Together, Priorities 1 through 4 total California's 4.4 MAF apportionment.

In October 2003, the Quantification Settlement Agreement (QSA), a critical component of the California's Colorado River Water Use Plan and for purposes of Section 5(B) of the Interim Surplus Guidelines, was authorized defining Colorado River water deliveries, delivery of Priority 3(a) and 6(a) Colorado River water, and transfer and other water delivery commitments, thus facilitating the transfer of water from agricultural agencies to urban uses. The QSA is a landmark agreement, signed by the four California Colorado River water use agencies and the U.S. Secretary of the Interior, which will guide reasonable and fair use of the Colorado River by California through the year 2037.

[23] The Metropolitan Water District of Southern California, Regional Urban Water Management Plan, 2005
[24] Metropolitan Water District of Southern California. Integrated Water Resources Plan. 2003 Update. May 2004.

Metropolitan's Integrated Water Resources Plan 2003 Update, recognizes that the QSA supports Metropolitan's development plans for CRA deliveries, and demonstrates the reliability benefits as a result of the QSA and existing supply enhancement programs.

State Water Project (SWP)

The reliability of the SWP impacts Metropolitan's member agencies' ability to plan for future growth and supply. DWR's Bulletin 132-03, December 2004, provides certain SWP reliability information, and in 2002, the DWR Bay-Delta Office prepared a report specifically addressing the reliability of the SWP.[25] This report, *The State Water Project Delivery Reliability Report,* provides information on the reliability of the SWP to deliver water to its contractors assuming historical precipitation patterns. The following SWP reliability information is included in these reports.

On an annual basis, each of the 29 SWP contractors including Metropolitan request an amount of SWP water based on their anticipated yearly demand. In most cases, Metropolitan's requested supply is equivalent its full Table A Amount; currently at 1,911,500 AFY. After receiving the requests, DWR assesses the amount of water supply available based on precipitation, snow pack on northern California watersheds, volume of water in storage, projected carry over storage, and Sacramento-San Joaquin Bay Delta regulatory requirements. For example, the SWP annual delivery of water to contractors has ranged from 552,600 AFY in 1991 to 3.5 MAF in 2000. Due to the uncertainty in water supply, contractors are not typically guaranteed their full Table A Amount, but instead a percentage of that amount based on the available supply.

Typically, around December of each year, DWR provides the contractors with their first estimate of allocation for the following year. Due to the variability in water supply for any given year, it is important to understand the reliability of the SWP to supply a specific amount of water each year to the contractors. As hydrologic and water conditions develop throughout the year, DWR revises the allocations.

On January 1, 2005, SWP supplies are projected to meet 60 percent of most SWP contractor's Table A Amounts. This allocation was increased to 70 percent on April 1, 2005. However, the allocation was again revised with the May 25, 2005 Notice to State Water Project Contractors. The Notice informed that DWR is preparing an update to the SWP Reliability Report issued in 2003, which is expected to be complete by the end of 2005. In order to assist agencies to prepare their 2005 UWMP Updates, DWR provided relevant sections from the working draft of the 2005 Reliability Report and recommended the results of studies 6 and 7 since they contain the most current information for assumed demands. The results of studies 6 and 7 show average deliveries of 69 percent of full Table A under current conditions and 77 percent under future conditions. The more recent studies also show a minimum delivery of 4 and 5 percent, current and future years respectively, compared to 20 percent for the 2003 report. These amounts are shown in

[25] Department of Water Resources, State Water Project Delivery Reliability Report. 2002.

Table 4.1.1-1 on the following page compared to the earlier CALSIM modeling as discussed below.

DWR analyzed the SWP's reliability using the California Water Allocation and Reservoir Operations Model (CALSIM II model) in their Reliability Report. The CALSIM II model was developed by DWR and the U.S. Bureau of Reclamation (USBR) to simulate operations of the SWP and the Central Valley Project (CVP). The CALSIM II model is used to estimate water deliveries to both SWP and CVP users under various assumptions such as hydrologic conditions, land use, regulations, and facility configurations. Documentation for CALSIM II, including assumptions, can be found on the DWR Web site at http://modeling.water.ca.gov.

One of the key assumptions of the CALSIM II model is that past weather patterns will repeat themselves in the future. The model uses a monthly time step to calculate available water supply based on historical rainfall data from 73 years of records (1922 – 1994). The model scenarios used in the preparation of the Reliability Report also assumed that regulatory requirements and facilities would not change in the future. DWR considered this assumption conservative since additional facilities such as reservoirs may be implemented in the future to specifically increase the SWP's reliability.

The CALSIM II model was used to complete three benchmark studies dated May 17, 2002 for the Reliability Report. The benchmark studies evaluated the water supply and demand at the 2001 condition and at the 2021 condition. In 2001, SWP water demand was estimated to vary from 3.0 to 4.1 MAF per year depending on the weather conditions (wet or dry years). SWP water demands in 2021 were estimated to range from 3.3 to 4.1 MAF per year. DWR prepared two benchmark studies for the 2021 condition. The first study assumed that SWP water demands would depend on weather conditions, whereas the second study assumed the contractor's water demand would be their maximum Table A Amount; 4.1 MAF per year regardless of weather. Table 4.1-1 shows the results, which demonstrate that SWP deliveries, on average, can meet 75 percent of the maximum Table A Amount.

The Monterey Agreement states that contractors will be allocated part of the total available project supply in proportion to their Table A Amount. The Monterey Agreement changed SWP water allocation rules by specifying that, during drought years, project supplies be allocated proportionately based on the maximum contractual Table A Amount. Water is allocated to urban and agricultural purposes on a proportional basis, deleting a previous initial supply reduction to agricultural contractors. The agreement further defines and permits permanent sales of SWP Table A Amounts and provides for transfer of up to 130,000 AF of annual Table A Amounts from agricultural use to municipal use. The Agreement also allows SWP contractors to store water in another agency's reservoir or groundwater basin, facilitates the implementation of water transfers and provides a mechanism for using SWP facilities to transport non-project water for SWP water contractors. The Agreement provides greater flexibility for SWP contractors to use their share of storage in SWP reservoirs.

Table 4.1-1
SWP Table A Deliveries from the Delta
Percent of Total Table A Amount of 4.133 MAF
(MAF)

Study	Average	Maximum	Minimum
2001 Study	2.962 (72%)	3.845 (93%)	0.804 (19%)
2021 Study A[1]	3.083 (75%)	4.133 (100%)	0.830 (20%)
2021 Study B[2]	3.130 (76%)	4.133 (100%)	0.830 (20%)
Revised-Demand Today[3]	2.818 (69%)	3.848 (94%)	0.159 (4%)
Revised-Demand Future[4]	3.178 (77%)	4.133 (100%)	0.187 (5%)

Source: Department of Water Resources, Excerpts from Working Draft of 2005 SWP Delivery Reliability Report – Attachment 1, May 25, 2005

[1] Assumes demands depend on weather conditions.
[2] Assumes demands at maximum Table A amount.
[3] Revises demands to current conditions.
[4] Revises demands at levels of use projected to occur by 2025.

Report on Metropolitan's Water Supplies: Blueprint for Water Reliability

Metropolitan released a *Report on Metropolitan's Water Supplies, A Blueprint for Water Reliability* on March 25, 2003, to provide updated information on Metropolitan's projected supply and demand for incorporation into Water Verification and Water Supply Assessments for compliance with SB 221 and SB 610, respectively. These bills implement requirements to connect land use to a sufficient water supply before a development can be approved. The Metropolitan report addresses water supply reliability issues and states Metropolitan's roles and responsibilities, which include the following: (1) implementing water management programs that support the development of cost-effective local resources; (2) securing additional imported supplies as necessary through programs that increase the availability of water delivered through the Colorado River Aqueduct and the SWP; (3) providing the infrastructure needed to integrate imported and local sources; (4) establishing a comprehensive management plan dealing with periodic surplus and shortage conditions; and (5) developing a rate structure that strengthens Metropolitan's financial capabilities to implement water supply programs and make infrastructure improvements.

The report details that Metropolitan's regional water demand projections are 6 percent to 16 percent *higher,* depending on which 5-year projection period and 11 percent for Year 2025, than the aggregated projections of Metropolitan's member agencies. As stated in the Report, "this difference indicated that Metropolitan supplies would provide a level of 'margin of safety' or flexibility to accommodate delays in local resources development or adjustments in development plans."[26] Additionally, the report concludes that "current practices allow Metropolitan to bring water supplies on-line at least ten years in advance of demand with a very high degree of reliability." More particularly, Metropolitan documented sufficient currently available supplies to meet 100 percent of member agencies' supplemental water demands for 20 years under Average and Wet Year conditions, for 15 years under Multiple Dry Year conditions (with 8 to 26 percent reserve capacity), and for 15 years under Single Dry Year conditions (with 8-25 percent reserve capacity). With the addition of supplies under development, Metropolitan will be able to meet 100 percent of its agencies' supplemental water needs under all supply and demand conditions through 2030 with 20-25 percent reserve capacity.[27]

The Report also identifies the ways Metropolitan is managing changes in Southern California's water supplies, including reduced Colorado River deliveries and water quality constraints. In addition, opportunities for additional supplies are currently being implemented in the following ways:

1) Full Diamond Valley Lake: The Lake is now fully operational with an increased conveyance capacity for refill system storage.
2) Re-Operation of Storage and Transfer Programs: In 2003, Metropolitan developed additional storage and transfer capabilities and completed filling local resources to achieve full storage accounts in operational reservoirs and banking/transfer programs.
3) Enhanced Conservation Programs: A new campaign is designed to encourage more efficient outdoor water use and promote innovative conservation measures.
4) Development of Additional Local Resources: There are promising opportunities identified to develop seawater desalination and expand the Local Resources Program.

In addition to the *Report on Metropolitan's Water Supplies, A Blueprint for Water Reliability*, MWD's September 2005 Draft Regional Urban Water Management Plan (RUWMP) demand and supply analysis also projects surpluses (of regional supplies compared with regional demands) ranging from 5 percent to 35 percent in all years and all drought scenarios through 2030.[28]

As demand forecasts are refined, supply goals are also refined. Metropolitan has consistently supplied over 50 percent of water supplies to the Southern California region. To continue to accomplish this, Metropolitan continues to approve new and innovative projects and programs to ensure reliability. For example, in August 2001, Metropolitan took action to move forward initiatives to bolster future supplies by supporting seawater

[26] Metropolitan Water District of Southern California. Report on Metropolitan Water Supplies, A Blueprint for Water Reliability, p. 9. March 25, 2003.
[27] Metropolitan Water District of Southern California. Report on Metropolitan Water Supplies, A Blueprint for Water Reliability, p. 24-25. March 25, 2003.
[28] Tables II-7, 8 and 9 of MWD's September 2005 Draft Regional Urban Water Management Plan

desalination projects, increased commercial conservation efforts, improve water quality by decreasing salinity in supplies from the State Water Project and the Colorado River, increased underground storage and retrieval facilities, adopted principles for establishing cooperative programs, and endorsed legislation that would further water reliability. Some of these projects are further described in Section 4.4.

Integrated Water Resources Plan (IRP)

To address Metropolitan's reliability challenges, Metropolitan and its member agencies developed an Integrated Water Resources Plan (IRP) in 1996. The overall objective of the IRP process is the selection and implementation of a Preferred Resource Mix (or strategy) consisting of complementary investments in local water resources, imported supplies and demand-side management that meet the region's desired reliability goal in a cost-effective and environmentally sound manner. The 1996 IRP was reviewed as part of Metropolitan's strategic plan and rate refinement to guide the development and implementation of revised Metropolitan water management programs through the year 2005.

The IRP 2003 Update was approved and released July 13, 2004, and includes various projects and programs that contribute to the reliability of Metropolitan's imported water supplies. The IRP Update concluded that the resource targets from the 1996 IRP, factored in with changed conditions, will continue to provide for 100 percent reliability through 2025.

While the IRP 2003 Update includes goals for a variety of resource targets, it identified the most significant programs as conservation and local supply development among the Preferred Resource Mix. The IRP details the Local Resources Program (LRP) and the Seawater Desalination Program as a means to increase reliability of local supplies. Metropolitan initiated the LRP to promote the development of water recycling projects that reduced demand for imported water and improved regional water supply reliability in 1982. In 1991, the Groundwater Recovery Program was implemented to similarly promote the recovery of local degraded groundwater supplies. In 1995, both programs were combined into the LRP. Currently, the LRP, including both recycling and groundwater recovery, has invested over $121 million and partnered with member agencies on 53 recycled water projects and 22 groundwater recovery projects generating 251,000 acre feet of local supply in 2002.[29]

The IRP 2003 Update states that Metropolitan's regional production target is 500,000 AF by 2020 for its LRP. Metropolitan's current projection of regional implementation of recycling, groundwater recovery, and seawater desalination resource targets exceeds the 1996 IRP goals. Although in FY 2002, recycling and groundwater recovery programs narrowly missed their target, the region is expected to meet its 2010 and 2020 targets. Meeting the targets will require the region to produce 159,000 AF of additional local project and/or seawater desalination supply by 2010 and 249,000 AF by 2020. Overall,

[29] Metropolitan Water District of Southern California. Integrated Water Resources Plan, 2003 Update. May 2004.

the region has developed about 50 percent of the 1996 IRP local resources target for 2020.

Metropolitan continues to encourage development of local water resource projects through offering financial incentives through the LRP to its member agencies. These anticipated water supply benefits are incorporated into the forecasts of demand on Metropolitan.

In addition to the LRP, Metropolitan also provides financial and technical assistance for implementing water conservation Best Management Practices, as well as a significant investment in regional and local water conservation programs. Metropolitan was also responsible for distributing $45 million in funds from Proposition 13 funding for development of conjunctive management programs in Southern California.

Municipal Water District of Orange County (MWDOC)

MWDOC represents its members at a regional, state and federal level, and advocates for the development and protection of imported water supplies and planning along with coordinating the water needs for its service area.[30] MWDOC's water management goals and objectives include working together with Orange County water agencies, including the City, to focus on solutions and priorities for improving Orange County's future water supply reliability.

MWDOC's engineering and planning staffs also represent its member agencies' interests in such water planning efforts as Metropolitan's IRP and Water Surplus and Drought Management (WSDM) Plan, the focus on Orange County's water future effort, and the Orange County Water Plan. Through these efforts, the goal is to improve water planning in Orange County to ensure a high degree of reliability and quality in future water supplies.[31]

Efforts of MWDOC to maintain a reliable water supply include a commitment to the intensive and cost-effective development of Orange County's water resources. Development of local water supplies will lessen Orange County's dependence on imported water. Therefore, in order to maintain a more reliable water supply, a number of projects including storage, recycling, conjunctive use with groundwater basins, ocean desalination and new groundwater development will contribute to enhanced water reliability.

Programs and projects directly managed by MWDOC include exchanges and transfers, participation with the Best Management Practices (BMPs) as well as extensive conservation and educational programs available to its member agencies. These programs

[30] [On-Line]. Municipal Water District of Orange County. Available: http://www.mwdoc.com. 2002.
[31] MWDOC. Regional Urban Water Management Plan, p. 1-7. 2000.

and projects support further water reliability for its member agencies and throughout Orange County.[32]

Integrated Regional Water Management Plan

MWDOC has been working with the County of Orange, as the lead agency, and 24 other cities and special districts to develop and integrate regional strategies for water management within the region. In an effort to manage local and imported water supplies, projects have been identified that protect communities from drought, enhance water supply reliability, ensure continued water security, optimize watershed and coastal resources, improve water quality, and protect habitat. To date, nearly 100 projects have been identified and the responsibility of implementing the projects has been granted to the South Orange County Integrated Regional Water management (IRWM) Group.

South Orange County Water Reliability Study

To ensure continued water reliability for south Orange County, 11 Orange County agencies, Metropolitan, and the USBR joined together to fund the South Orange County Water Reliability Study (SOCWRS). MWDOC served as the lead agency in this effort.

The SOCWRS provides an objective plan that addresses the pressing need to ensure water supply in the event of future water supply outages and/or emergencies. Although the study is focused on south Orange County, implementing measures recommended in the study will provide regional benefits for all of Orange County's water supply, and thus benefit the City.

The purpose of the SOCWRS was to do the following:[33]

1. Identify risks, including earthquakes that pose the greatest threat to the regional water treatment and distribution infrastructure.
2. Identify ways to bolster source-of-supply and regional distribution systems, building on earlier engineering investigations and studies.
3. Develop a list of projects that accomplish the above objectives, and identify appropriate investments.
4. Allow for flexibility in phasing. Most notably project operational dates and sizing should be flexible to account for changes in local resources development.
5. The plan builds on a number of prior studies, including: SOCWRS Phase 1, which served as the foundation for this effort; Metropolitan's Central Pool Augmentation Project, currently in project right-of-way refinement; Santa Margarita Water District's Lined and Covered Reservoir investigations to increase local storage for emergency need; Irvine Ranch Water District's Water Resources Master Plan Update and Planning Area-6 Sub-Area Master Plan; and various Orange County Water District plans and groundwater basin operations studies.

[32] MWDOC. Regional Urban Water Management Plan. 2005.
[33] MWDOC. South Orange County Water Reliability Study: Phase 2 System Reliability Plan. June 2004.

The SOCWRS also identifies key planning principles that were used to guide the formulation of alternatives, including such items as accommodating Metropolitan planned shutdowns, regional project planning, Metropolitan system investments for improved system operation and capability, and assessment of risks and scenarios.

Based on the analysis of water supply outages, the SOCWRS recommended projects that would provide a reliable supply for south Orange County in the event of an emergency. The projects are grouped into the following three categories: 1) regional distribution system; 2) storage/treatment; and 3) ocean desalination. The projects are expected to minimize shortages. Currently, MWDOC is seeking to implement the recommended plan with south Orange County agencies.

Orange County Water District (OCWD)

OCWD is responsible for the protection of water rights to the Santa Ana River in Orange County as well as the management and replenishment of the basin.[34] OCWD replenishes and maintains the basin at safe levels while more than doubling the basin's annual yield with the best available technology. OCWD primarily recharges the basin with water from the Santa Ana River and to a lesser extent with imported water purchased from Metropolitan. Other processes such as recycling of wastewater, conservation and water use efficiency programs, and creative water purchases have aided in replenishing the basin to desired levels to meet required demands.

Furthermore, OCWD has invested in seawater intrusion control (injection barriers), recharge facilities, laboratories, and basin monitoring to effectively manage the basin. Consequently, although the basin is defined to be in an "overdraft" condition, it is actually managed to allow utilization of up to 500,000 AF of storage capacity of the basin during dry periods, acting as an underground reservoir and buffer against drought.[35] OCWD also operates the basin to keep the target dewatered basin storage at 200,000 AF as an appropriate accumulated overdraft.[36] If the basin is too full, artesian conditions can occur along the coastal area, causing rising water and water logging, an adverse condition.

Since the formation of OCWD in 1933, OCWD has made substantial investment in facilities, basin management and water rights protection, resulting in the elimination and prevention of adverse long-term "mining" overdraft conditions. OCWD continues to develop new replenishment supplies, recharge capacity and basin protection measures to meet projected production from the basin during average/normal rainfall and drought periods.

[34] OCWD Groundwater Management Plan, 2004.
[35] Orange County Water District, *Groundwater Management Plan*, 2004.
[36] Orange County Water District, *Draft 2003-2004 Engineer's Report on Groundwater conditions, Water Supply and Basin Utilization in the Orange County Water District*, February 2005.

OCWD Long Term Facilities Plan

OCWD is preparing the Long Term Facilities Plan (LTFP) and will evaluate potential projects that may be implemented in the 20-year planning period. The LTFP's goal is to enhance basin management and water quality management activities. The LTFP is proposed to do the following:

- Evaluate projects to cost effectively increase the amount of sustainable basin production and protect water quality;
- Develop an implementation program for the recommended projects;
- Establish the basin's future maximum (target) annual production amount and correspondingly how much new recharge capacity would be required; and
- Estimate impacts to potential future Replenishment Assessment and Basin Production Percentage rates.

A program environmental impact report (PEIR), pursuant to California Environmental Quality Act (CEQA), is being prepared to evaluate environmental impacts of projects in the LTFP and increased levels of basin production to serve lands currently within OCWD plus proposed annexations of lands, including by the City of Anaheim and Irvine Ranch Water District. In the PEIR, OCWD's groundwater model would be used to evaluate groundwater conditions, such as groundwater elevations and protection of basin water supplies from seawater intrusion, for specified amounts of basin production with and without annexation.

The LTFP utilizes information recently developed in OCWD's Groundwater Management Plan and Recharge Development Study. The LTFP includes a master list of developed and proposed projects. The various projects are grouped into five categories: 1) recharge facilities, 2) water source facilities, 3) basin management facilities, 4) water quality management facilities, 5) operational improvements facilities. Each project is evaluated using criteria such as technical feasibility, cost, institutional support, functional feasibility, and environmental compliance. The LTFP develops an implementation plan for the 28 recommended projects over the 20 year planning period.

At the time of this Plan, the LTFP was scheduled to be complete in 2005, and would be updated periodically to reflect changes in pumping and basin response forecasts to future production increases.

OCWD 2020 Water Master Plan Report (MPR)

OCWD's 2020 Water Master Plan Report (MPR) describes local water supplies and estimates their availability extending to the year 2020. Specifically, OCWD states in their 2020 Water MPR that significant water supply sources will be available in the future for potable, non-potable, and recharge purposes. The 2020 Water MPR discusses source waters such as imported water from Metropolitan, base flows from the Santa Ana River, treated wastewater through the OCWD/OCSD Groundwater Replenishment System (GWRS) program, and possibly desalinated ocean water. The local supplies' availability and projections from the 2020 Water MPR are not being pursued, but instead will be revised and replaced with the LTFP.

Orange County Sanitation District (OCSD)

Wastewater from the City's service area is collected and treated by OCSD. OCSD manages wastewater collection and treatment for approximately 471 square miles in central and northwest Orange County, which includes 21 cities, 3 special districts, and 2.4 million residents.[37] OCSD utilizes the following two facilities: Reclamation Plant No. 1 in Fountain Valley and Treatment Plant No. 2 in Huntington Beach to treat a combined daily average of 264 million gallons of wastewater.[38] Effluent from Reclamation Plant No. 1 is either routed to the ocean disposal system or is sent to the OCWD facility, Green Acres Project, for advanced treatment and recycling. The Green Acres Project supplies recycled water to various municipal users in Orange County and offsets the demand for potable water supplies.

OCWD/OCSD Groundwater Replenishment System (GWRS)

The GWRS is a jointly funded project of OCWD and OCSD. The GWRS is a water supply project designed to ultimately reuse approximately 110,000 AFY of advanced treated wastewater.[39] The objective of the project is to develop a new source of reliable, high quality, low salinity water that will be used to replenish the Basin and expand the existing seawater intrusion barrier. Additional information regarding the GWRS is presented in Section 8. The benefits of the proposed GWRS include:

- Supply a significant amount of highly treated recycled water required by OCWD to maintain a higher basin production percentage through and beyond the year 2020.
- Provide a reliable replenishment water supply in times of drought.
- Expand the seawater intrusion barrier to provide additional groundwater production in the coastal zone.

Regional Water Quality Control Board – Region 8

Background

The State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (Regional Boards) are responsible for the protection and, where possible, the enhancement of the quality of California's waters. The SWRCB sets statewide policy, and together with Regional Boards, implements state and federal laws and regulations. Each of the nine Regional Boards adopts a Water Quality Control Plan or Basin Plan, which recognizes and reflects regional differences in existing water

[37] Orange County Sanitation District Facts and Key Statistics. www.ocsd.com. January 2005
[38] MWDOC 2005 Regional Urban Water Management Plan
[39] Orange County Water District, Draft Long-Term Facilities Plan Review Draft, August 2005.

quality, the beneficial uses of the region's ground and surface waters, and local water quality conditions and problems.[40]

In 1975, the Santa Ana Regional Water Quality Control Board (RWQCB) adopted the original Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin. In 1995, the RWQCB updated the Basin Plan to address issues that had evolved over time due to increasing populations and changing water demands in the region. The scope of the document covers the Santa Ana River Basin, which includes the upper and lower Santa Ana River watersheds including northwestern Orange County. In 2002, a triennial review of the Basin Plan was performed. In July 2002, at a public hearing, the RWQCB adopted Resolution No. R8-2002-0070, approving the Triennial Review Priority List and Work Plan.

The Basin Plan is more than just a collection of water quality goals and policies, descriptions of conditions, and discussions of solutions. It is also the basis for the RWQCB's regulatory programs. The Basin Plan establishes water quality standards for all the ground and surface waters of the region. The RWQCB also regulates water discharges to minimize and control their effects on the quality of the region's ground and surface water. Permits are issued under a number of programs and authorities.

Water quality problems in the region are listed in the Basin Plan, along with the causes, where they are known. For water bodies with quality below the levels necessary to allow all the beneficial uses of the water to be met, plans for improving water quality are included. Legal basis and authority for the RWQCB reflects, incorporates, and implements applicable portions of a number of national and statewide water quality plans and policies, including the California Water Code (Porter-Cologne Water Quality Control Act) and the Clean Water Act.[41]

Key Regional Issues

Water quality degradation due to high concentrations of nitrogen and total dissolved solids (TDS) is the most significant regional water quality problem in the Santa Ana River Watershed (Watershed). Historically, the Santa Ana River likely flowed during most of the year, recharging deep alluvial groundwater basins in the inland valley and the coastal plain. However, irrigation projects eventually led to the diversion of all surface flow in the river, and the quantity of groundwater recharge diminished greatly. Water quality concerns in the Watershed focus on elevated concentrations of TDS and total inorganic nitrogen (TIN).

A Task Force was formed in 1995 to provide oversight, supervision, and approval of a study to evaluate the impact of TIN and TDS on water resources in the Watershed. The study is coordinated by the Santa Ana Watershed Project Authority (SAWPA), a joint

[40] Santa Ana Regional Water Quality Control Board. Region 8 Water Quality Control Plan (Santa Ana River Basin). January 1995.
[41] Santa Ana Regional Water Quality Control Board. Region 8 Water Quality Control Plan (Santa Ana River Basin). January 1995.

powers agency of which OCWD and OCSD are member agencies, and is investigating questions related to TIN and TDS management in the Watershed, including groundwater subbasin water quality objectives, subbasin boundaries, and regulatory approaches to wastewater reclamation and recharge.[42]

Water Resources and Water Quality Management

Numerous water resource management studies and projects, focused on water quality and/or water supply, are in progress in the Region under the auspices of a variety of parties. As stated above, the RWQCB has been working with SAWPA concerning water supply and reliability issues. SAWPA has been studying TIN and TDS issues and is a valuable partner in water resource and water quality management. SAWPA, and its member agencies, conduct water related investigations and planning studies, and build physical facilities where needed for water supply, wastewater treatment or water quality remediation. Other studies and projects ongoing and planned that will affect reliability and quality of water supplies to the Region, including areas affecting water supplies in the Orange County Basin, are discussed further in following sections of this Assessment.

Some of these activities bear directly on the implementation of the Basin Plan, while others may lead to future Basin Plan amendments to incorporate appropriate changes, such as revised regulatory strategies for various dischargers. These investigations and the implementation of appropriate physical solutions are an essential and integral part of the effort to restore and maintain water quality in the Region.

4.2 DEMAND AND SUPPLIES RELIABILITY COMPARISON

Metropolitan Water District Supplies and Demands

As previously discussed, the City is a member agency of the MWDOC, which is a member agency of Metropolitan. In its September 2005 Draft Regional UWMP, Metropolitan has chosen the year 1977 as the single driest year since 1922 and the years 1990-1992 as the multiple driest years over that same period. These years have been chosen because they represent the timing of the least amount of available water resources from the SWP, a major source of Metropolitan’s supply.

Over the 20 year period beginning in 2010 and ending in 2030, Metropolitan projects a 0.5 percent decrease in available supply during an average year, a 4.5 percent increase during a single dry year, and a 3.8 percent increase during the third year of the multiple dry year period. The increased available supplies during drought year scenarios are primarily due to increased contract allotments of in-basin storage as well as a number of supplies under development.

In its Draft UWMP, Metropolitan also projects an increase in member agency demands. Specifically, they project a 10.2 percent increase over the same 20-year period in the

[42] Santa Ana Regional Water Quality Control Board. Watershed Management Initiative. Revised May 2004.

average demand, an 8.5 percent increase during the single dry year scenario, and an 8.9 percent increase during the multiple dry year scenario. However, in all cases, the projected regional increase in demands by member agencies are offset by available surpluses in the Metropolitan supply.

Table 4.2-1 summarizes Metropolitan's current imported supply availability projections for average and single dry years over the 20-year period beginning in 2010 and ending in 2030. Based on these projections, Metropolitan will be able to meet all of its projected single dry year service area demands through the year 2030.

Table 4.2-2 summarizes Metropolitan's current imported supply availability projections over the 20-year period beginning in 2010 and ending in 2030 for average and multiple dry year scenarios. When reviewing Table 4.2-2, it is important to note that Metropolitan is projecting a surplus of supply for all multiple dry year scenarios through 2030.

The findings in this plan were derived based upon Metropolitan's September 2005 Draft Regional UWMP. These figures can be interpolated to project Metropolitan's ability to meet a specified demand expressed in terms of a percentage of average demand and supply availability. When viewed on a regional basis, some member agency demands will exceed these averages, while others will fall below the stated averages. However, when viewed from the regional perspective, it is reasonable to assume that these averages will apply to all local water purveyors.

Although a less conservative assumption might suggest surplus water supplies not used by agencies experiencing low or no growth may be freed up for use by those water purveyors experiencing more growth, this is not borne out by the overall Metropolitan supply and demand picture. In fact, Metropolitan is projecting a 19.4 percent increase in total demand (including local supplies) over its entire service area between 2005 and 2030 (4,115,700 AFY to 4,914,000 AFY)[43] compared with a 20.9 percent increase in population over the same period of (18,233,700 to 22,053,200).[44] In other words, Metropolitan's projected increase in demand roughly parallels its projected increase in population.

[43] Table A.1-5 from Metropolitan Water District of Southern California, September 2005 Draft RUWMP
[44] Table A.1-2 from Metropolitan Water District of Southern California, September 2005 Draft RUWMP

Table 4.2-1
Metropolitan Regional Imported Water Supply Reliability Projections for Average and Single Dry Years[45]
(AFY)

Row	Region Wide Projections	2010	2015	2020	2025	2030
Supply Information						
A	Projected Supply During an Average Year[1]	2,668,000	2,600,000	2,654,000	2,654,000	2,654,000
B	Projected Supply During a Single Dry Year[1]	2,842,000	3,033,000	3,002,000	2,970,000	2,970,000
C = B/A	Projected Supply During a Single Dry Year as a % of Average Supply	**106.5**	**116.7**	**113.1**	**111.9**	**111.9**
Demand Information						
D	Projected Demand During an Average Year	2,040,000	2,053,000	1,989,000	2,115,000	2,249,000
E	Projected Demand During a Single Dry Year	2,293,000	2,301,000	2,234,000	2,363,000	2,489,000
F = E/D	Projected Demand During a Single Dry Year as a % of Average Demand	**112.4**	**112.0**	**112.3**	**111.7**	**110.7**
Surplus Information						
G = A-D	Projected Surplus During an Average Year	628,000	547,000	665,000	539,000	405,000
H = B-E	Projected Surplus During a Single Dry Year	549,000	732,000	768,000	607,000	481,000
Additional Supply Information						
I = A/D	Projected Supply During an Average Year as a % of Demand During an Average Year	**130.8**	**126.6**	**133.4**	**125.5**	**118.0**
J = A/E	Projected Supply During an Average Year as a % of Demand During a Single Dry Year	**116.3**	**113.0**	**118.8**	**112.3**	**106.6**
K = B/E	Projected Supply During a Single Dry Year as a % of Single Dry Year Demand (including surplus)	**123.9**	**131.8**	**134.3**	**125.6**	**119.3**

[1] Projected supplies include current supplies and supplies under development, but are limited by MWD's 1.25 MAF allotment to Colorado River Water; data obtained from MWD September 2005 Draft RUWMP supply/demand projections

[45] Metropolitan Water District of Southern California, Draft Regional UWMP September 2005

Table 4.2-2
Metropolitan Regional Imported Water Supply Reliability Projections for Average and Multiple Dry Years[46]
(in AFY)

Row	Region Wide Projections	2010	2015	2020	2025	2030
Supply Information						
A	Projected Supply During an Average Year[1]	2,668,000	2,600,000	2,654,000	2,654,000	2,654,000
B	Projected Supply During Year 3 of a Multiple Dry Year Period[1]	2,619,000	2,776,600	2,741,000	2,719,000	2,719,000
C = B/A	Projected Supply During Year 3 of a Multiple Dry Year as a % of Average Supply	**98.2**	**106.8**	**103.3**	**102.4**	**102.4**
Demand Information						
D	Projected Demand During an Average Year	2,040,000	2,053,000	1,989,000	2,115,000	2,249,000
E	Projected Demand During Year 3 of a Multiple Dry Year Period[2]	2,376,000	2,389,000	2,317,000	2,454,000	2,587,000
F = E/D	Projected Demand During Year 3 of a Multiple Dry Year Period as a % of Average Demand	**116.5**	**116.4**	**116.5**	**116.0**	**115.0**
Surplus Information						
G = A-D	Projected Surplus During an Average Year	549,000	732,000	768,000	607,000	481,000
H = B-E	Projected Surplus During Year 3 of a Multiple Dry Year Period	243,000	377,000	424,000	265,000	132,000
Additional Supply Information						
I = A/D	Projected Supply During an Average Year as a % of Demand During an Average Year	**130.8**	**126.6**	**133.4**	**125.5**	**118.0**
J = A/E	Projected Supply During an Average Year as a % of Demand During Year 3 of a Multiple Dry Year	**112.3**	**108.8**	**114.5**	**108.1**	**102.6**
K = B/E	Projected Supply During a Multiple Dry Year as a % of Multiple Dry Year Demand (including surplus)	**110.2**	**116.2**	**118.3**	**110.7**	**105.1**

[1] Projected supplies include current supplies and supplies under development, but are limited by MWD's 1.25 MAF allotment to Colorado River Water; data obtained from MWD August 18, 2005 final draft RUWMP supply/demand projections
[2] MWD only projects demands for year 3 of a multiple dry year period

[46] Metropolitan Water District of Southern California, Draft Regional UWMP September 2005

In addition to Metropolitan's Regional UWMP, MWDOC has also prepared a draft 2005 UWMP for the Orange County region and has also held a series of workshops for its member agencies including direct Metropolitan member agencies in Orange County. MWDOC is also looking at the 1922 though 2004 period and has adopted the same average year scenario as Metropolitan; however, they differ in the selection of a single dry year and the multiple dry year scenario. MWDOC has chosen to determine these years based on hydrologic records for Orange County rather than on the State Water Project availability. That methodology has resulted in the selection of 1961 as the single driest year on record and the years 1959 through 1961 as the multiple dry years.

In viewing its entire service area, MWDOC projects single dry year demands that are 105.5 percent of normal and three multiple dry years demands that are 106.7, 103.7 and 105.5 percent of normal. These same factors are representative of all of Orange County and will be applied to project the City's demands in single and multiple dry years.

Tables 4.2-3 through 4.2-9 compare current and projected water supplies and demands in normal, single dry year and multiple dry year scenarios. The results displayed in these tables indicate that Metropolitan can meet all of the City's demands in average, single dry, and multiple dry years through 2030.

Table 4.2-3
City of Huntington Beach
Projected Water Supply and Demand

Normal Water Year
(AFY – All projections rounded to nearest ten AF)

Water Sources	2010	2015	2020	2025	2030
Supply	**Normal Water Years**				
Projected Supply During an **Average Year** as a % of Demand During an Average Year[1]	130.8	126.6	133.4	125.5	118.0
Imported[2]	13,620	13,320	14,170	13,470	12,780
Local (Groundwater)[3]	24,300	24,540	24,790	25,040	25,260
Total Supply	**37,920**	**37,860**	**38,960**	**38,510**	**38,040**
% of Normal Year[4]	100.0	100.0	100.0	100.0	100.0
Demand					
Imported[2]	10,410	10,520	10,620	10,730	10,830
Local (Groundwater)[3]	24,300	24,540	24,790	25,040	25,260
Total Demand[5]	**34,710**	**35,060**	**35,410**	**35,770**	**36,090**
% of Year 2005 Demand (33,941 AF)	102.3	103.3	104.3	105.4	106.3
Supply/ Demand Difference	**3,210**	**2,800**	**3,550**	**2,740**	**1,950**
Difference as % of Supply	**8.5**	**7.4**	**9.1**	**7.1**	**5.1**
Difference as % of Demand	**9.2**	**8.0**	**10.0**	**7.7**	**5.4**

[1] From Table 4.2-1, Row I
[2] Imported water supply = (imported water demand) x (MWD Projected Supply Available During an Average Year as a % of Demand During an Average Year (from Table 4.2-1, Row I); Imported demand = 30% of total demand based on a BPP of 70%
[3] Groundwater demand is estimated to comprise 70% of the total demand based on a BPP of 70%; groundwater supply is estimated to equal demand
[4] Normal Year supply is assumed to reflect the total supply available in the row labeled “Total Supply.”
[5] Total water demand figures are based on the City’s projections provided to MWDOC and included in MWDOC’s July 2005 draft supply/demand projections.

Table 4.2-4
City of Huntington Beach
Projected Water Supply and Demand

Single Dry Water Year
(AFY – All projections rounded to nearest 10 AF)

Water Sources	2010	2015	2020	2025	2030
Supply	**Single Dry Years**				
MWD Projected Supply Available During an **Average Year** as a % of Demand During a Single Dry Year[1]	116.3	113.0	118.8	112.3	106.6
MWD Projected Supply Available During a **Single Dry Year** as a % of Single Dry Year Demand (including surplus) [2]	123.9	131.8	134.3	125.6	119.3
Imported[3]	12,900	13,870	14,260	13,480	12,920
Local (Groundwater)[4]	25,630	25,890	26,150	26,420	26,650
Total Supply	**38,530**	**39,760**	**40,410**	**39,900**	**39,570**
Normal Year Supply[5]	37,920	37,860	38,960	38,510	38,040
% of Normal Year	101.6	105.0	103.7	103.6	104.0
Demand					
Imported[3]	10.990	11,100	11,210	11,320	11,420
Local (Groundwater)[4]	25,630	25,890	26,150	26,420	26,650
Total Demand[6]	**36,620**	**36,990**	**37,360**	**37,740**	**38,070**
Normal Year Demand[5]	34,710	35,060	35,410	35,770	36,090
% of normal year demand	105.5	105.5	105.5	105.5	105.5
% of Year 2005 Demand (33,941 AF)	107.9	109.0	110.1	111.2	112.2
Supply/ Demand Difference	**1,910**	**2,770**	**3,050**	**2,160**	**1,500**
Difference as % of Supply	**5.0**	**7.0**	**7.5**	**5.4**	**3.8**
Difference as % of Demand	**5.2**	**7.5**	**8.2**	**5.7**	**3.9**

[1] From Table 4.2-1, Row J
[2] From Table 4.2-1, Row K (includes MWD surplus supplies)
[3] Available Imported supply is estimated to equal MWD's September 2005 Final Draft RUWMP projected available supplies including surplus supplies = (normal year import) x (MWD projected supply as a % of the single dry year demand); Imported demand = (normal year demand) x (105.5% single dry year demand developed by MWDOC based on hydrologic analysis of 1922-2004 period and applicable to entire Orange County region) x (0.3 based on BPP=70%)
[4] Groundwater demand is estimated to comprise 70% of the total demand during a single dry year based on a BPP of 70%; groundwater supply is estimated to equal demand
[5] Normal year supplies and demands taken from Table 4.2-3
[6] Total Demand = (normal year demand) x (105.5% single dry year demand developed by MWDOC based on hydrologic analysis of 1922-2004 period and applicable to entire Orange County region)

Table 4.2-5
City of Huntington Beach
Projected Water Supply and Demand

Multiple Dry Water Years 2006-2010
(AFY – All projections rounded to nearest 10 AF)

Water Sources	2006	2007	2008	2009	2010
Supply	**Normal Years**		**Dry Years**		
MWD Projected Supply During a **Multiple Dry Year** as a % of Average Supply[1]			98.2	98.2	98.2
Imported[2]	12,920	13,100	13,080	13,230	13,370
Local (Groundwater)[3]	22,980	23,300	25,690	25,090	25,630
Total Supply	**35,900**	**36,400**	**38,770**	**38,320**	**39,000**
Normal Year Supply[4]	35,900	36,400	36,900	37,400	37,920
% of Normal Year	100.0	100.0	105.1	102.5	102.4
Demand					
MWD Projected Multiple Dry Year Demand as % of Normal Year[5]			116.5	116.5	116.5
Imported[2]	12,270	12,330	11,010	10,750	10,990
Local (Groundwater)[3]	21,820	21,920	25,690	25,090	25,630
Total Demand	**34,090**	**34,250**	**36,700**	**35,840**	**36,620**
Normal Year Demand[6]	34,090	34,250	34,400	34,560	34,710
% of Normal Year	100.0	100.0	106.7	103.7	105.5
% of Year 2005 Demand (33,941 AF)	99.6	100.9	108.1	105.6	107.9
Supply/ Demand Difference	**1,810**	**2,150**	**2,070**	**2,480**	**2,380**
Difference as % of Supply	**5.0**	**5.9**	**5.3**	**6.5**	**6.1**
Difference as % of Demand	**5.3**	**6.3**	**5.6**	**6.9**	**6.5**

[1] From Table 4.2-2, Row C
[2] Imported supply = (imported supply interpolated from Table 4.2-5) x (escalation factor from Table 4.2-2, Row C); Imported demand = (normal year demand) x (106.7%, 103.7% or 105.5% Year 1, 2 and 3 multiple dry year demand factors developed by MWDOC based on hydrologic analysis of 1922-2004 period and applicable to entire Orange County region) x (0.3 based on BPP=70%); imported demand for normal years is 100% of normal demand interpolated from Table 4.2-4.
[3] Groundwater demand is estimated to comprise 70% of the total demand during a multiple dry year based with a BPP of 70%; groundwater supply is estimated to equal demand (except for 2006 and 2007 when the BPP is assumed to be 64%; all other years the BPP is assumed to be 70%)
[4] Interpolated from Table 4.2-4
[5] From Table 4.2-2, Row F; In its September 2005 Draft UWMP Multiple Dry Year Projections, MWD only projected demands for Year 3, therefore Years 1 and 2 are assumed to equal Year 3 demand; these percentages are presented only to reflect the fact that the City's demand is well below the factor presented in the table, e.g., 2010 multiple dry year demand is 105.5% as opposed to 116.5%
[6] Interpolated from Table 4.2-4

Table 4.2-6
City of Huntington Beach
Projected Water Supply and Demand

Multiple Dry Water Years 2011-2015
(AFY – All projections rounded to nearest 10 AF)

Water Sources	2011	2012	2013	2014	2015
Supply	**Normal Years**		**Dry Years**		
MWD Projected Supply During a Multiple Dry Year as a % of Average Supply[1]			106.8	106.8	106.8
Imported[2]	13,560	13,500	14,350	14,290	14,230
Local (Groundwater)[3]	24,350	24,400	26,080	25,400	25,890
Total Supply	**37,910**	**37,900**	**40,430**	**39,660**	**40,120**
Normal Year Supply[4]	37,910	37,900	38,880	38,870	37,860
% of Normal Year	100.0	100.0	104.0	102.1	106.0
Demand					
MWD Projected Multiple Dry Year Demand as % of Normal Year[5]			116.4	116.4	116.4
Imported[2]	10,430	10,450	11,180	10,880	11,100
Local (Groundwater)[3]	24,350	24,400	26,080	25,400	25,890
Total Demand	**34,780**	**34,850**	**37,260**	**36,280**	**36,990**
Normal Year Demand[6]	34,780	34,850	34,920	34,990	35,060
% of Normal Year	100.0	100.0	106.7	103.7	105.5
% of Year 2005 Demand (33,941 AF)	102.5	102.7	109.8	106.9	109.0
Supply/ Demand Difference	**3,130**	**3,050**	**3,170**	**3,410**	**3,130**
Difference as % of Supply	**8.3**	**8.0**	**7.8**	**8.6**	**7.8**
Difference as % of Demand	**9.0**	**8.8**	**8.5**	**9.4**	**8.5**

[1] From Table 4.2-2, Row C
[2] Imported supply = (imported supply interpolated from Table 4.2-5) x (escalation factor from Table 4.2-2, Row C); Imported demand = (normal year demand) x (106.7%, 103.7% or 105.5% Year 1, 2 and 3 multiple dry year demand factors developed by MWDOC based on hydrologic analysis of 1922-2004 period and applicable to entire Orange County region) x (0.3 based on BPP=70%); imported demand for normal years is 100% of normal demand interpolated from Table 4.2-4.
[3] Groundwater demand is estimated to comprise 70% of the total demand during a multiple dry year based with a BPP of 70%; groundwater supply is estimated to equal demand
[4] Interpolated from Table 4.2-4
[5] From Table 4.2-2, Row F; In its September 2005 Draft UWMP Multiple Dry Year Projections, MWD only projected demands for Year 3, therefore Years 1 and 2 are assumed to equal Year 3 demand; these percentages are presented only to reflect the fact that the City's demand is well below the factor presented in the table, e.g., 2015 multiple dry year demand is 105.5% as opposed to 116.4%
[6] Interpolated from Table 4.2-4

Table 4.2-7
City of Huntington Beach
Projected Water Supply and Demand

Multiple Dry Water Years 2016-2020
(AFY – All projections rounded to nearest 10 AF)

Water Sources	2016	2017	2018	2019	2020
Supply	**Normal Years**		**Dry Years**		
MWD Projected Supply During a Multiple Dry Year as a % of Average Supply[1]			103.3	103.3	103.3
Imported[2]	13,490	13,660	14,460	14,420	14,640
Local (Groundwater)[3]	24,590	24,640	26,340	25,560	26,150
Total Supply	**38,080**	**38,300**	**40,800**	**39,980**	**40,790**
Normal Year Supply[4]	38,080	38,300	38,520	38,740	38,960
% of Normal Year	100.0	100.0	105.9	103.2	104.7
Demand					
MWD Projected Multiple Dry Year Demand as % of Normal Year[5]			116.5	116.5	116.5
Imported[2]	10,540	10,560	11,290	10,950	11,210
Local (Groundwater)[3]	24,590	24,640	26,340	25,560	26,150
Total Demand	**35,130**	**35,200**	**37,630**	**36,510**	**37,360**
Normal Year Demand[6]	35,130	35,200	35,270	35,340	35,410
% of Normal Year	100.0	100.0	106.7	103.7	105.5
% of Year 2005 Demand (33,941 AF)	103.5	103.7	110.9	107.6	110.1
Supply/ Demand Difference	**2,950**	**3,100**	**3,170**	**3,470**	**3,430**
Difference as % of Supply	**7.7**	**8.1**	**7.7**	**8.7**	**8.4**
Difference as % of Demand	**8.4**	**8.8**	**8.4**	**9.5**	**9.2**

[1] From Table 4.2-2, Row C
[2] Imported supply = (imported supply interpolated from Table 4.2-5) x (escalation factor from Table 4.2-2, Row C); Imported demand = (normal year demand) x (106.7%, 103.7% or 105.5% Year 1, 2 and 3 multiple dry year demand factors developed by MWDOC based on hydrologic analysis of 1922-2004 period and applicable to entire Orange County region) x (0.3 based on BPP=70%); imported demand for normal years is 100% of normal demand interpolated from Table 4.2-4.
[3] Groundwater demand is estimated to comprise 70% of the total demand during a multiple dry year based with a BPP of 70%; groundwater supply is estimated to equal demand
[4] Interpolated from Table 4.2-4
[5] From Table 4.2-2, Row F; In its September 2005 Draft UWMP Multiple Dry Year Projections, MWD only projected demands for Year 3, therefore Years 1 and 2 are assumed to equal Year 3 demand; these percentages are presented only to reflect the fact that the City's demand is well below the factor presented in the table, e.g., 2010 multiple dry year demand is 105.5% as opposed to 116.5%
[6] Interpolated from Table 4.2-4

Table 4.2-8
City of Huntington Beach
Projected Water Supply and Demand

Multiple Dry Water Years 2021-2025
(AFY – All projections rounded to nearest 10 AF)

Water Sources	2021	2022	2023	2024	2025
Supply	**Normal Years**		**Dry Years**		
MWD Projected Supply During a Multiple Dry Year as a % of Average Supply[1]			102.4	102.4	102.4
Imported[2]	14,030	13,890	13,510	13,650	13,790
Local (Groundwater)[3]	24,840	24,890	26,610	25,910	26,420
Total Supply	**38,870**	**38,780**	**40,130**	**39,560**	**40,210**
Normal Year Supply[4]	38,870	38,780	38,690	38,600	38,510
% of Normal Year	100.0	100.0	103.7	102.5	104.4
Demand					
MWD Projected Multiple Dry Year Demand as % of Normal Year[5]			116.0	116.0	116.0
Imported[2]	10,640	10,660	11,410	11,110	11,320
Local (Groundwater)[3]	24,840	24,890	26,610	25,910	26,420
Total Demand	**35,480**	**35,550**	**38,020**	**37,020**	**37,740**
Normal Year Demand[5]	35,480	35,550	35,630	35,700	35,770
% of Normal Year	100.0	100.0	106.7	103.7	105.5
% of Year 2005 Demand (33,941 AF)	104.5	104.7	112.0	109.1	111.2
Supply/ Demand Difference	**3,390**	**3,230**	**2,100**	**2,540**	**2,470**
Difference as % of Supply	**8.7**	**8.3**	**5.2**	**6.4**	**6.1**
Difference as % of Demand	**9.6**	**9.1**	**5.5**	**6.9**	**6.5**

[1] From Table 4.2-2, Row C
[2] Imported supply = (imported supply interpolated from Table 4.2-5) x (escalation factor from Table 4.2-2, Row C); Imported demand = (normal year demand) x (106.7%, 103.7% or 105.5% Year 1, 2 and 3 multiple dry year demand factors developed by MWDOC based on hydrologic analysis of 1922-2004 period and applicable to entire Orange County region) x (0.3 based on BPP=70%); imported demand for normal years is 100% of normal demand interpolated from Table 4.2-4.
[3] Groundwater demand is estimated to comprise 70% of the total demand during a multiple dry year based with a BPP of 70%; groundwater supply is estimated to equal demand
[4] Interpolated from Table 4.2-4
[5] From Table 4.2-2, Row F; In its September 2005 Draft UWMP Multiple Dry Year Projections, MWD only projected demands for Year 3, therefore Years 1 and 2 are assumed to equal Year 3 demand; these percentages are presented only to reflect the fact that the City's demand is well below the factor presented in the table, e.g., 2010 multiple dry year demand is 105.5% as opposed to 116.0%
[6] Interpolated from Table 4.2-4

Table 4.2-9
City of Huntington Beach
Projected Water Supply and Demand

Multiple Dry Water Years 2026-2030
(AFY – All projections rounded to nearest 10 AF)

Water Sources	2026	2027	2028	2029	2030
Supply	**Normal Years**		**Dry Years**		
MWD Projected Supply During a Multiple Dry Year as a % of Average Supply[1]			102.4	102.4	102.4
Imported[2]	13,340	13,190	13,370	13,230	13,090
Local (Groundwater)[3]	25,080	25,130	26,860	26,150	26,650
Total Supply	**38,420**	**38,320**	**40,230**	**39,380**	**39,740**
Normal Year Supply[4]	38,420	38,320	38,230	38,130	38,040
% of Normal Year	100.0	100.0	105.2	103.3	104.5
Demand					
MWD Projected Multiple Dry Year Demand as % of Normal Year[5]			115.0	115.0	115.0
Imported[2]	10,750	10,770	11,510	11,210	11,420
Local (Groundwater)[3]	25,080	25,130	26,860	26,150	26,650
Total Demand	**35,830**	**35,900**	**38,370**	**37,360**	**38,070**
Normal Year Demand[6]	35,830	35,900	35,960	36,030	36,090
% of Normal Year	100.0	100.0	106.7	103.7	105.5
% of Year 2005 Demand (33,941 AF)	105.6	105.8	113.0	110.1	112.2
Supply/ Demand Difference	**2,590**	**2,420**	**1,860**	**2,020**	**1,670**
Difference as % of Supply	**6.7**	**6.3**	**4.6**	**5.1**	**4.2**
Difference as % of Demand	**7.2**	**6.7**	**4.8**	**5.4**	**4.4**

[1] From Table 4.2-2, Row C
[2] Imported supply = (imported supply interpolated from Table 4.2-5) x (escalation factor from Table 4.2-2, Row C); Imported demand = (normal year demand) x (106.7%, 103.7% or 105.5% Year 1, 2 and 3 multiple dry year demand factors developed by MWDOC based on hydrologic analysis of 1922-2004 period and applicable to entire Orange County region) x (0.3 based on BPP=70%); imported demand for normal years is 100% of normal demand interpolated from Table 4.2-4.
[3] Groundwater demand is estimated to comprise 70% of the total demand during a multiple dry year based with a BPP of 70%; groundwater supply is estimated to equal demand
[4] Interpolated from Table 4.2-4.
[5] From Table 4.2-2, Row F; In its September 2005 Draft UWMP Multiple Dry Year Projections, MWD only projected demands for Year 3, therefore Years 1 and 2 are assumed to equal Year 3 demand; these percentages are presented only to reflect the fact that the City's demand is well below the factor presented in the table, e.g., 2010 multiple dry year demand is 105.5% as opposed to 115.0%
[6] Interpolated from Table 4.2-4

4.3 VULNERABILITY OF SUPPLY TO SEASONAL OR CLIMATIC SHORTAGE

The City's climate is a semi-arid environment with mild winters, warm summers and moderate rainfall, consistent with coastal Southern California. The general region lies in the semi-permanent high-pressure zone of the eastern Pacific. As a result, the climate is mild, tempered by cool sea breezes. The usually mild climatological pattern is interrupted infrequently by periods of extremely hot weather, winter storms, or Santa Ana winds. The average annual temperature is 62 degrees Fahrenheit. Precipitation is typically 10-12 inches, occurring mostly between November and April.

Climatological data in California has been recorded since the year 1858. During the twentieth century, California has experienced three periods of severe drought: 1928-34, 1976-77 and 1987-91. The year 1977 is considered to be the driest year of record in the Four Rivers Basin by DWR. These rivers flow into the San Francisco Bay Delta and are the source of water for the State Water Project.

Southern California and, in particular, Orange County sustained few adverse impacts from the 1976-77 drought, due in large part to the availability of Colorado River water and groundwater stored in the Santa Ana Basin. But the 1987-91 drought created considerably more concern for Southern California and Orange County.

As a result, the City is vulnerable to water shortages due to its climatic environment and seasonally hot summer months. While the data shown in Tables 4.2.1.-1 through 4.2.1-8 identifies water availability during single and multiple dry year scenarios, response to a future drought would follow the water use efficiency mandates of MWDOC and its support of the Metropolitan Water Surplus and Drought Management (WSDM) Plan, along with implementation of the appropriate stage of the City's Water Conservation Program. These programs are more specifically discussed in Section 7.

4.4 PLANNED WATER SUPPLY PROJECTS AND PROGRAMS TO MEET PROJECTED WATER USE

4.4.1 City of Huntington Beach Projects

The City continually reviews practices that will provide its customers with adequate and reliable supplies. Trained staff continues to ensure the water quality is safe and the water supply will meet present and future needs in an environmentally and economically responsible manner. The City consistently coordinates its long-term water shortage planning with MWDOC and OCWD, which is further described in the MWDOC 2005 Regional UWMP and OCWD's LTFP.

The City projects water demand in the City could remain relatively constant over the next 20 years due to minimal growth combined with water use efficiency measures. Water use efficiency measures described in Section 6 of this Plan have the potential to reduce overall demand. Any new water supply sources will be developed primarily to better manage the Santa Ana Groundwater Basin resource and to replace or upgrade inefficient wells, rather than to support population growth and new development. The projects that have been identified by the City to improve the City's water supply reliability and enhance the operations of the City's facilities include replacement of water meters, fire hydrants, valves, and pipelines; security improvements; and improvement projects on water supply wells. The improvement projects identified for production purposes include the following:

- Well 1 – Scheduled to be redrilled with a capacity of 750 gpm sometime in the future. The existing well has a capacity of 500 gpm.
- Well 8 – Will be removed from stand-by mode and be used to irrigate Central Park.
- Well 12 – Has been drilled and is expected to yield 3,000 gpm in November 2005.

Although Wells 1, 8, and 12 will provide additional capacity to the City, the City is still regulated by the BPP and, therefore, pumping above the BPP is not expected.

4.4.2 Regional Agency Projects

Since the City purchases imported water from the State Water Project and the Colorado River through Metropolitan's member agency MWDOC, the projects implemented by Metropolitan and MWDOC to secure their water supplies have an indirect effect on the City. In addition, OCWD's planned projects and programs for groundwater and recycled water will also impact the City.

Metropolitan Water District of Southern California (Metropolitan)

Metropolitan is implementing water supply alternative strategies for the region and on behalf of their member agencies to insure available water in the future. Some of the strategies identified in Metropolitan's 2005 UWMP include:

- Conservation
- Water recycling and groundwater recovery
- Storage and groundwater management programs within the Southern California region
- Storage programs related to the State Water Project and the Colorado River
- Other water supply management programs outside of the region

Metropolitan has made investments in conservation, water recycling, storage, and supply that are all part of Metropolitan's long-term water management strategy. Metropolitan's approach to a long-term water management strategy was to develop an Integrated Resource Plan that depended on many sources of supply. Metropolitan's implementation approach for achieving the goals of the Integrated Resource Plan Update is summarized in Table 4.4-2. A comprehensive description of Metropolitan's implementation approach is contained in their 2003 report on Metropolitan water supplies "A Blueprint for Water

Reliability" as well as their 2005 Regional Urban Water Management Plan. A brief description of the various programs implemented by Metropolitan is also included following Table 4.4-1.

Table 4.4-1
Metropolitan Integrated Resource Plan Update Resources Status

Target	Programs and Status
• **Conservation**	**Current** - Conservation Credits Program - Residential; Non-residential Landscape Water Use Efficiency;, Commercial, Industrial, and Institutional Programs - Grant Programs **In Development or Identified** - Innovative Conservation Program
• **Recycling** • **GW Recovery** • **Desalination**	**Current** - LRP Program **In Development or Identified** - Additional LRP Requests for Proposals - Seawater Desalination Program - Innovative Supply Program
• **In Region Dry-Year Surface Water Storage**	**Current** - Diamond Valley Reservoir, Lake Mathews, Lake Skinner - SWP Terminal Reservoirs (Monterey Agreement)
• **In Region Groundwater Conjunctive Use**	**Current** - North Las Posas (Eastern Ventura County) - Cyclic Storage - Replenishment Deliveries - Proposition 13 Programs (short listed) **In Development or Identified** - Raymond Basin GSP - Proposition 13 Programs (wait listed) - Expanding existing programs - New groundwater storage programs
• **SWP**	**Current** - SWP Deliveries - San Luis Carryover Storage (Monterey Agreement) - SWP Call Back with DWCV Table A transfer **In Development or Identified** - Sacramento Valley Water Management Agreement - CALFED Delta Improvement Program (Phase 8 Agreement)
• **Colorado River Aqueduct**	**Current** - Base Apportionment - IID/Metropolitan Conservation Program - Coachella and All American Canal Lining Programs - PVID Land Management Program **In Development or Identified**

Target	Programs and Status
	- Lower Coachella Storage Program - Hayfield Storage Program - Chuckwalla Storage Program - Storage in Lake Mead
• **CVP/SWP Storage and Transfers** • **Spot Transfers and Options**	**Current** - Arvin Edison Program - Semitropic Program - San Bernardino Valley MWD Program - Kern Delta Program **In Development or Identified** - Mojave Storage Program - Other Central Valley Transfer Programs

Conservation Target

Metropolitan's conservation policies and practices are shaped by Metropolitan's Integrated Resource Plan and the California Urban Water Conservation Council *Memorandum of Understanding Regarding Water Conservation in California*.

Recycled Water, Groundwater Recovery, and Desalination Target

Metropolitan supports the use of alternative water supplies such as recycled water and degraded groundwater when there is a regional benefit to offset imported water supplies. Currently, 355 thousand acre-feet (TAF) of recycled water is permitted for use within Metropolitan service area.[47] Metropolitan estimates that an additional 480 TAF per year of new recycled water could be developed and used by 2025 with an additional 130 TAF per year by 2050. Approximately 30 percent of the recycled water use within Metropolitan's service area is for groundwater replenishment and seawater barriers. In the future it is anticipated that up to 90 percent of all water used for seawater barriers will be recycled water.

Metropolitan recognizes the importance of member agencies developing local supplies and has implemented several programs to provide financial assistance. Metropolitan's incentive programs include:

- Competitive Local Resources Program: Supports the development of cost-effective water recycling and groundwater recovery projects that reduce demands for imported supplies
- Seawater Desalination Program: Supports the development of seawater desalination within Metropolitan's service area
- Innovative Supply Program: Encourages investigations into alternative approaches to increasing the region's water supply.

[47] Metropolitan Water District of Southern California, Regional UWMP, Draft September 2005

According to Metropolitan's 2005 UWMP, 13 projects were selected in 2004 for implementation under the Competitive Local Resources Program. None of the projects are within the City's service area, however two projects are proposed under MWDOC. The projects include the Groundwater Replenishment System and a recycled water upgrade within Irvine Ranch Water District's service area. The Groundwater Replenishment System is discussed as a planned project under OCWD. Under the Innovative Supply Program, Metropolitan selected 10 projects for grant funding. Proposals included harvesting storm runoff, onsite recycling, and desalination. The project findings will be presented to member agencies in 2006.

Regional Groundwater Conjunctive Use Target

Other programs within Metropolitan to maximize water supplies include storage and groundwater management programs. The IRP Update identified the need for dry-year storage within surface water reservoirs and the need for groundwater storage. In 2002, Diamond Valley Lake reached its full storage capacity of 800,000 AF. Approximately 400,000 AF are dedicated for dry-year storage. Metropolitan has developed a number of local programs to increase storage in the groundwater basins. The programs include:

- North Las Posas – In 1995, Metropolitan and Calleguas Municipal Water District developed facilities for groundwater storage and extraction from the North Las Posas Basin. Metropolitan has the right to store up to 210,000 AF of water. The well fields are expected to be fully operational in 2007 with Phases I and II already complete. It is expected the North Las Posas program will yield 47,000 AF of groundwater from the basin each year.
- Proposition 13 Projects – In 2000, DWR selected Metropolitan to receive financial funding to help fund the Southern California Water Supply Reliability Projects Program. The program coordinates eight conjunctive use projects with a total storage capacity of 195 TAF and a dry-year yield of 65 TAF per year. One of the projects selected through the request for proposals for Proposition 13 funding includes the Orange County Groundwater Conjunctive Use Program. This program was submitted by OCWD and MWDOC and is discussed in Section 4
- Raymond Basin – In January 2000, Metropolitan entered into agreements with the City of Pasadena and Foothill Municipal Water District to implement a groundwater storage program that is anticipated to yield 22 TAF per year by 2010.
- Other Programs – Metropolitan intends to expand the conjunctive use programs to add another 80 TAF to groundwater storage. Other basins in the area are being evaluated for possible conjunctive use projects.

State Water Project Target

The major actions Metropolitan is completing to improve SWP reliability include the following:

- Delta Improvements Package – The actions outlined in this package are related to water project operations in the Delta. The actions are designed to allow the SWP to operate the Banks Pumping Plant in the Delta at 8,500 CFS. Currently Banks Pumping Plant operates at 6,680 CFS. Metropolitan anticipates that increase diversion from the Delta will result in an increase of 130 TAF per year will be available for groundwater and surface water storage.
- Phase 8 Settlement – This agreement includes various recommended water supply projects that meet demand and water quality objectives within the Sacramento Valley. The various conjunctive use projects will yield approximately 185 TAF per year in the Sacramento Valley of which approximately 55 TAF would be available to Metropolitan through it's SWP allocation.
- Monterey Amendment – The Monterey Amendment enables Metropolitan to use a portion of the San Luis Reservoir's capacity for carryover storage. This will increase SWP delivery to Metropolitan by 93 to 285 TAF depending on supply conditions.
- SWP Terminal Storage – Metropolitan has water rights for storage at Lake Perris and Castaic Lake. The storage provides Metropolitan with options for managing SWP deliveries and store up to 73 to 219 TAF of carryover water.
- Desert Water Agency/Coachella Valley Water District (DWCV) SWP Table A Transfer – This transfer to DWCV includes 100 TAF of Metropolitan SWP Table A amount in exchange for other rights such as its full carryover amounts in San Luis and full use of flexible storage in Castaic and Perris Reservoirs. It is anticipated that the call-back provision of the entitlement transfer can provide between 5 and 26 TAF of water depending on the water year.
- Desert Water Agency/Coachella Valley Water District (DWCV) Advance Delivery Program – Under this program Metropolitan delivers Colorado River water to the DWCV in exchange for their SWP Contract Table A allocations. Metropolitan can expect increases in SWP Table A deliveries of 6 to 18 TAF depending on the water year.

Central Valley Project Target

Metropolitan also receives imported water from the Colorado River Aqueduct. Metropolitan, Imperial Irrigation District (IID) and Coachella Valley Water District executed the Quantification Settlement Agreement (QSA) in October 2003. The QSA established the baseline water use for each agency and facilitated the transfer agricultural water to urban uses. A number of programs have been identified to assist Metropolitan meet their target goal of 1.2 MAF per year from the Colorado River Aqueduct. These programs include the following:

- Coachella and All-American Canal Lining Project – The Coachella Canal Lining Project is scheduled to be completed in January 2007 and is expected to conserve 26,000 AFY. The All-American Canal Lining Project is scheduled to be completed in 2008 and is expected to conserve 67,700 AFY. The conserved water will be made available in Lake Havasu for diversion from Metropolitan. In exchange, Metropolitan will supply a like amount to the San Luis Rey Settlement Parties and San Diego County Water Authority.

- IID/San Diego County Water Authority Transfer – IID has agreed to implement a conservation program and transfer water to San Diego County Water Authority. The transfer began in 2003 with 10 TAF and will increase yearly until 2023 where the transfer will be 200 TAF annually. Water will be conserved through land fallowing and irrigation efficiency measures. Metropolitan will supply the water conserved to San Diego County Water Authority in exchange for a like amount out of Lake Havasu.
- Imperial Irrigation District/Metropolitan Conservation Program – The program originally provided funding from Metropolitan to implement water efficiency improvements within IID. Metropolitan in tern would reserve the right to divert the water conserved by those investments. Execution of the QSA extended the term of the program to 2078 and guaranteed Metropolitan at least 80 TAF per year.
- Palo Verde Land Management and Crop Rotation Program – This program offers financial incentives to farmers with Palo Verde Irrigation District to not irrigate a portion of their land. A maximum of 29 percent of lands within Palo Verde Irrigation District can be fallowed in any year. The water conserved will be available to Metropolitan with a maximum of 111 TAF per year expected.
- Hayfield Groundwater Storage Program – Metropolitan will divert Colorado River water and store it in the Hayfield Groundwater Basin in east Riverside County. Currently there is 73 TAF of water in storage. Metropolitan expects the program to eventually develop a storage capacity of approximately 500 TAF.
- Chuckwalla Groundwater Storage Program – Metropolitan proposes to store water when available in the Upper Chuckwalla Groundwater Basin for future delivery to Metropolitan.
- Lower Coachella Valley Groundwater Storage Program – Metropolitan, Coachella Valley Water District, and the Desert Water Agency are investigating the feasibility of a conjunctive use program in the Lower Coachella Groundwater Basin. The basin has the potential to store 500 TAF of groundwater for Metropolitan.
- Salton Sea Restoration Transfer – A transfer of up to 1.6 MAF would be conserved by IID and made available to Metropolitan. The proceeds from the DWR transfer would be placed in the Salton Sea Restoration Fund.
- Lake Mead Storage – Metropolitan is exploring options for storing water in Lake Mead.

CVP/SWP Storage and Transfers Target

Metropolitan has focused on voluntary short and long-term transfer and storage programs with Central Valley Project and other SWP contractors. Currently, Metropolitan has enough transfer and storage programs to meet their 2010 target goal of 300 TAF. Metropolitan has four CVP/SWP transfer and storage programs in place for a total of 317,000 acre-feet of dry-year supply. Metropolitan is also pursuing a new storage program with Mojave Water Agency and continues to pursue Central Valley water transfers on an as needed basis. The operational programs include:

- Semitropic – 107,000 AF dry-year supply
- Arvin-Edison – 90,000 AF dry-year supply
- San Bernardino Valley Municipal Water District – 70,000 AF dry-year supply
- Kern Delta Water District – 50,000 AF dry-year supply
- Mojave Storage Program – 35,000 AF dry-year supply
- Central Valley Transfer Program – 160,000 AF dry-year supply

Municipal Water District of Orange County (MWDOC) Projects

Sufficient water storage programs will help to ensure adequate water supplies in the future and in time of drought. The need for local storage intensifies with Southern California's and the Orange County region's dependence on imported water to serve water demands. One of the most effective forms of storage in a highly dry and arid climate is conjunctive use wherein water is stored under ground during wet periods and pumped out during dry or drought periods.

The MWDOC 2005 Regional Urban Water Management Plan discusses a number of water supply opportunities in Orange County, including the Groundwater Replenishment System, to protect and maximize the yield of the basin.

Orange County Groundwater Conjunctive Use Program

As discussed above, the Orange County Groundwater Conjunctive Use Program was selected by Metropolitan in June 2003, funded by Proposition 13, to construct groundwater conjunctive use projects that would store imported water in wet years for use in dry years. This is a 25-year project between MWDOC, OCWD, and Metropolitan to store up to 60,000 AF of imported water in the Orange County groundwater basin for this purpose, extracting up to 20,000 AF of water during dry periods from 7-10 strategically sited wells. Although the City was not selected to participate in this program, the additional wells would reduce the region's dependence on imported water during dry periods and would provide greater reliability.

Orange County Water District (OCWD) Projects

OCWD is dedicated to maintaining a reliable supply of water for its groundwater users. OCWD has identified reliability measures to help mitigate emergency water shortages or increase water supply, including the following:

- OCWD has an agreement with San Bernardino Valley Municipal Water District (SBVMWD) to purchase groundwater supplies. SBVMWD's groundwater table is very high, making excess supply available for pumping to the Santa Ana River for OCWD's use.
- OCWD continues to discuss the purchase of non-SWP water supplies via SBVMWD's capacity in the SWP system.
- OCWD previously entered into a one-year contract with Western Water Company to purchase water from Northern California and plans to continue with similar contracts in the future.
- Wheeled water supplies are available for purchase through Metropolitan.
- Facilities to capture greater amounts of Santa Ana River Storm flows are being proposed and constructed such as recharge basins.
- OCWD continues to work with the Army Corps of Engineers to allow an increase in the water conservation pool level behind Prado Dam. An increase in the conservation pool level allows more storage of storm flows for later use as recharge water.

Orange County Sanitation Districts (OCSD)

As mentioned earlier, OCSD supplies treated wastewater to OCWD for further treatment. OCWD relies on recycled water from OCSD's treatment facilities to protect the Basin through seawater intrusion barriers and landscape irrigation. OCSD in conjunction with OCWD have implemented the GWRS, beginning in October 2002 with OCWD and OCSD signing a Joint Exercise of Powers Agreement for the GWRS. The first phase is currently underway, which will treat wastewater to drinking water standards for direct injection into the existing seawater intrusion barrier and percolation through recharge basins in Anaheim, California.[48] The project is scheduled to go online in 2007 and will maintain and improve the reliability of the region's water supply. Further discussion on water recycling is included in Section 8 of this Plan.

4.5 TRANSFER AND EXCHANGE OPPORTUNITIES

The City maintains three connections to the Metropolitan system and four emergency inter-city connections with surrounding communities. In aggregate, these connections have the ability to transfer well over 25,000 gpm into the City distribution system. The Metropolitan connections are typically operating as constant flow sources.

The City is 56.1 percent owner and acts as General Manager/Engineer and performs operations and maintenance for the West Orange County Water Board. The WOCWB is a joint powers agreement between the cities of Huntington Beach, Garden Grove, Westminster and Seal Beach for the ownership and operation of two large capacity

[48] Orange County Water District, *Draft 2002-2003 Engineer's Report on Groundwater conditions, Water Supply and Basin Utilization in the Orange County Water District*, February 2004

import water transmission lines (OC-9 and OC-35). The City is joint owner of a water transmission main operated by the Mesa Consolidated Water District system via OC-44. OCWD has proposed the West Orange County Wellfield Project, which would shift pumping away from the coastal areas where seawater intrusion, colored water and low well levels are ongoing concerns. If developed, the project proposes to use WOCWB lines to transmit groundwater produced in the Cypress/Stanton area of Orange County to coastal cities.

The City has not entered into any agreements for transfer or exchange of water. However, Metropolitan, MWDOC, and OCWD are exploring options that would benefit the entire Orange County region. These exchanges were discussed earlier under proposed projects.

4.6 DESALINATED WATER OPPORTUNITIES

Desalination is viewed as a way to develop a local, reliable source of water that assists agencies reduce their demand on imported water, reduce groundwater overdraft, and in some cases make unusable groundwater available for municipal uses. Currently, there are no identified City projects for desalination of seawater or impaired groundwater. However, from a regional perspective, desalination projects within the region indirectly benefit the City.

Department of Water Resources Desalination Task Force

Assembly Bill 2717 called for DWR to establish a Desalination Task Force to evaluate the following: 1) Potential opportunities for desalination of seawater and brackish water in California, 2) Impediments to using desalination technology, and 3) the role of the State in furthering the use of desalination.[49] The task force comprised of 27 organizations and in October 2003 provided a list of recommendations related to the following issues: general, energy, environment, planning, and permitting.

Metropolitan's Seawater Desalination Program

In August 2001, Metropolitan launched its Seawater Desalination Program. The program objectives were to provide financial and technical support for the development of cost-effective seawater desalination projects that will contribute to greater water supply reliability. In 2004, Metropolitan adopted an IRP Update that includes a target of 150,000 AFY for seawater desalination projects to meet future demands. A call for proposals, under the Seawater Desalination Program, produced five projects by member agencies including the Los Angeles Department of Water and Power, Long Beach Water Department, MWDOC, San Diego County Water Authority, and West Basin Municipal Water District. Collectively, the projects could produce approximately 126,000 AFY. This additional source of water supply would provide greater water reliability for Southern California residents.

[49] DWR, California Water Plan Update 2005, Volume 2 – Resource Management Strategies

Metropolitan has also provided funding to five member agencies to research specific aspects of seawater desalination. The agencies are reviewing and assessing treatment technologies, pretreatment alternatives, and brine disposal, permitting, and regulatory approvals associated with delivery of desalinated seawater to the local distribution system.[50] Metropolitan continues to work with its member agencies to develop local projects, inform decision makers about the role of desalinated sea water on future supplies, and secure funding from various state and federal programs.

Department of Water Resources Proposition 50 Funding

In January 2005, DWR received 42 eligible applications requesting $71.3 million from funds available through Proposition 50. Proposition 50, the Water Quality, Supply and Safe Drinking Water Projects, Coastal Wetlands Purchase and Protection Act was passed by voters in 2002. Projects eligible for the program include construction projects, research and development, feasibility studies, pilot projects, and demonstration programs. Local agencies, water districts, academic and research institution will be able to use the funds in the development of new water supplies through brackish water and seawater desalination.

DWR is recommending funding for 25 of the 43 projects with the available $25 million under the current desalination grant cycle. With this funding recommendation, 54 percent of the fund will support brackish water desalination related projects and 46 percent will support ocean desalination related projects. The projects recommended for funding include facilities in Marin, Alameda and San Bernardino counties. Pilot projects in Long Beach, Santa Cruz, San Diego and Los Angeles are among those that will receive grants under the proposed funding plan. Research and development activities at the Lawrence Livermore National Laboratory and the University of California, Los Angeles are included in the recommendations, as are feasibility studies by agencies in the Bay Area, Monterey, and Riverside County.

MWDOC and OCWD's Seawater Desalination Concept Analysis

MWDOC and OCWD conducted a study, *Seawater Desalination Concept Analysis,* in March 1999, to determine the relative cost-effectiveness of ocean desalting compared to other potential supplies. They continued to develop a program concept and in 2003 published their draft *Ocean Water Desalination Program Concept Development Paper* (Concept Paper). The Concept Paper was prepared to provide the OCWD and MWDOC with additional information on potentially developing an ocean water desalter at the AES Huntington Beach Generating Station site, owned by AES Corporation.

The purpose was to outline the AES site opportunities and identify the key issues to be resolved before moving forward with planning and implementation efforts. The project continues to be conceptual in nature; however, the concept paper investigates the opportunities surrounding the planning and feasibility of ocean desalination in Orange

[50] Metropolitan Water District of Southern California, Regional Urban Water Management Plan, September 2005 Draft

County using a specified site with existing infrastructure. The project concept is the development of a 50 MGD ocean water desalination plant to provide base water supply for the OCWD service area. A 50 MGD plant could be expected to produce 50,000 AFY.

The implementation of an ocean water desalination plant can reduce groundwater pumping levels in coastal OCWD and assist in refilling the groundwater basin. It could serve as an emergency backup supply for South Orange County as well as reduce the amount of water required for seawater barrier injection. Implementation of the ocean water desalination plant would require regulatory compliance, environmental stewardship stakeholder interface, and a lengthy completion schedule.

Proposed Projects for Desalination

In Orange County, there are three proposed ocean desalination projects that could serve MWDOC, including one specifically that may benefit the City. The proposed projects are discussed in MWDOC's 2005 Regional UWMP and summarized below.

Poseidon Resources Corporation Proposed Project – Poseidon Resources Corporation, a private company, is proposing a seawater desalination project to be located adjacent to the AES Generation Power Plant in Huntington Beach. The proposed project would provide 50 MGD of water supply to coastal and south Orange County. In 2003, the City denied certification of the Environmental Impact Report (EIR). A Recirculated EIR was subsequently prepared. The project is currently in the environmental review and permitting phase and there are no contractual agreements in place for the purchase of water.

Joint San Diego/Orange County Proposed Regional San Onofre Project – This joint project is currently being investigated to determine project feasibility. The project size is anticipated to range from 50 – 150 MGD and utilize the decommissioned Unit 1 San Onofre Nuclear Generation Station cooling water inlet and outlet conduits for feedwater and brine disposal. The project may be implemented in 2020.

MWDOC Proposed Dana Point Ocean Desalination Project – MWDOC is currently investigating the feasibility of a desalination project in Dana Point adjacent to San Juan Creek. The feasibility study will evaluate feedwater supply, concentrated RO reject disposal, and energy. The recommended capacity is 25 mgd. MWDOC received DWR Proposition 50 funding in the amount of $1,000,000 to investigate horizontal directional drilling with water well technology for use in constructing feedwater supply wells in the marine alluvial channel system.[51]

[51] MWDOC 2005 Regional Urban Water Management Plan.

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SECTION 5
WATER USE PROVISIONS

5.1 PAST, CURRENT AND PROJECTED WATER USE AMONG SECTORS

Since 1990, new connections are being added at a rate of approximately one percent per year. Due to new plumbing efficiency standards, landscape guidelines, and other water use efficiency programs, water demand is projected to increase at a rate of less than one percent per year. Table 5.1-1 shows past, current and projected water use between 2000 and 2030.

Table 5.1-1
Past, Current and Projected Water Use by Billing Classification
(AF)

City Billing Class	2000	2005	2010	2015	2020	2025	2030
Residential	23,707	24,474	25,029	25,281	25,533	25,793	26,024
Commercial/Industrial	6,019	6,213	6,355	6,419	6,483	6,549	6,607
Municipal/Irrigation	3,151	3,254	3,326	3,360	3,394	3,428	3,459
Subtotal	**32,877**	**33,941**	**34,710**	**35,060**	**35,410**	**35,770**	**36,090**
Unaccounted for System Losses[1]	2,248	2,172	2,221	2,244	2,266	2,289	2,310
Total Water Use	**35,125**	**36,113**	**36,931**	**37,304**	**37,676**	**38,059**	**38,400**

Source: Year 2000 data from City of Huntington Beach. Draft Water Master Plan. August 2005; Year 2005 data from MWDOC; all future total demands from Table 4.2-3; future projections are equivalent to the percentages reflected in the year 2000 data.
[1] 2000 is based on actual data; all other years based on an estimated average loss of 6.4%.

Unaccounted-for water was 9.9% in 1995/96, but has averaged 6.4% since 1996/97. The decrease in unaccounted-for water can be in part attributed to a leak detection survey conducted for the City in 1996/97. A total of 498 miles of pipeline was surveyed, with a water loss of approximately 67,000 gpd quantified from 17 identified leaks. The annual water loss from these leaks was quantified as approximately 24.4 million gallons. The City repaired all of the leaks identified in the survey and the City has since implemented an on-going leak investigation and repair program as a measure to keep water losses to a minimum while facilitating cost savings.[52]

Unaccounted-for water is the difference between water production and water consumption and represents "lost" water. Unaccounted-for water occurs for a number of reasons:

» Water lost from system leaking, i.e. from pipes, valves, pumps, and other water system appurtenances.

[52] City of Huntington Beach, Draft Water Master Plan. August 2005

» The City Fire Department performs hydrant testing to monitor the level of fire protection available throughout the City. The City Utilities Division performs hydrant flushing to eliminate settled sediment and ensure better water quality. Hydrant testing and flushing is not metered. However, this quantity of water is estimated and taken into consideration when calculating unaccounted-for water.

» Water used by the Fire Department to fight fires. This water is also not metered.

» Customer meter inaccuracies. Meters have an inherent accuracy for a specified flow range. However, flow above or below this range is usually registered at a lower rate. Meters become less accurate with time due to wear.

5.2 WATER SERVICE CONNECTIONS BY SECTOR

Table 5.1-2 shows the current and projected number of water service customers by sector from 2000 through 2030. Connections include 478 in the Sunset Beach area[53], which is represented by 91 percent residential.

Table 5.1-2
Number of Water Service Connections by Billing Classification

City Billing Class	2000	2005	2010	2015	2020	2025	2030
Residential	42,714	43,887	44,880	45,330	45,780	46,250	46,660
Multi-family	4,120	4,173	4,270	4,310	4,350	4,390	4,430
Commercial	2,359	2,337	2,390	2,410	2,430	2,450	2,470
Municipal	538	591	600	610	620	630	640
Irrigation	738	873	890	900	910	920	930
Industrial	338	307	310	310	310	310	310
Total Connections	**50,807**	**52,168**	**53,340**	**53,870**	**54,400**	**54,950**	**55,440**

Note: Future projections are based on percentages proportionate to 2005 actual data.

5.3 PER CAPITAL MUNICIPAL AND INDUSTRIAL WATER DEMAND

Average daily per capita municipal and industrial (Per Capita M&I) water demand has been used by the water industry to measure and compare mean urban water demand. Per Capita M&I water demand includes the municipal, industrial, commercial, residential water demand, and unaccounted-for water associated with each person in the population. It also includes recycled water demand but excludes some water usage (such as agricultural usage and replenishment of groundwater storage) which are not directly

[53] Single Family Residential – 255; Multi-Family Residential – 179; Commercial – 40; Industrial – 3; and Municipal - 1.

associated with the population. Historical Per Capita M&I water demand for the City in comparison with the Orange County as a whole is shown in Table 5.3-1.

Table 5.3-1
Historical Per Capita M&I Water Demands (1992/93 – 1999/00)

Water Demand	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	Avg
Huntington Beach									
Total Demand[a] (af)	33,595	33,515	34,064	35,099	36,286	34,057	36,143	35,397	34,769
Population (1,000)	183.5	184.3	185.2	186.0	186.8	187.6	188.4	189.2	186.4
Total Per Capita[b] (gpcd)	163	162	164	169	173	162	171	167	167
Rainfall[c] (in)	23.4	11.1	25.6	11.2	14.8	31.0	7.93	8.1	16.7
Orange County									
Total Per Capita[d] (gpcd)	194	198	197	202	211	203	197	206	201

a) Total water production including non-potable water well production.
b) Total City water production/City population.
c) Rainfall at Santa Ana Fire Station (ANA)
d) From MWDOC 2000 Regional UWMP. Orange County water production including recycled water but not including agricultural usage or replenishment of groundwater storage/Orange County population.

As shown, Per Capita M&I water demand has averaged 167 gpcd for the City compared with 201 gpcd for Orange County for the 8 year period 1992/93 through 1999/00. The lower water demand for Huntington Beach is due in part to a milder coastal climate compared with the warmer inland climates associated with other parts of Orange County.

Although Per Capita M&I water demand is still a useful measure for evaluating urban water demand, the various demand components evaluated separately can offer a more complete perspective. Historical City water demands are shown in Table 5.3-2 for three user types: 1) residential per capita, 2) commercial/industrial, and 3) municipal/irrigation.

Table 5.3-2
Historical City Water Demands Per Billing Classification (1996/97 – 2003/04)[a]

Demands Per City Billing Class[b]	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	Avg
Residential (af)	24,106	22,752	23,352	23,707	22,968	23,429	23,312	23,194	23,353
Population (1,000)	186.8	187.6	188.4	189.2	190.8	193.4	195.7	197.5	191.2
Residential Per Capita (gpcd)	115	108	111	112	107	108	106	105	109
Commercial/Industrial (af)	6,601	6,131	6,350	6,019	5,934	5,683	5,496	5,334	5,944
Municipal/Irrigation (af)	2,503	2,421	2,812	3,151	2,931	3,059	2,994	3,264	2,892
Rainfall[c] (in)	14.8	31.0	7.9	8.1	14.2	3.5	14.3	7.4	12.6

a) All years shown are water years (Jun – Jul) except 2003/04, which is a fiscal year (Oct – Sep). 2003/04 is shown as a fiscal year so that Sep 2003, which is overstated as a result of the City switching to monthly meter readings starting in that month, can be omitted.
b) Does not include unaccounted for water.
c) Rainfall at Santa Ana Fire Station (ANA)

5.4 CITY OF HUNTINGTON BEACH LAND USE

The majority of the City of Huntington Beach is zoned for residential use. Commercial uses are generally scattered throughout the City, partially in strip areas and partially in concentrated specific centers. Several hundred industrial uses are located in Huntington Beach, included with some of the largest: Boeing Space and Defense Systems, AES Power Plant and Calarum. An additional significant use category is open space, which primarily consists of public school properties. Currently, vacant area within the City is quite limited. Projected population increases are not related to the redevelopment of any specific area, but is instead indicative of a general density increase.

There are 17,231 acres of land within the City boundaries. Of existing land, only 3 percent of the City remains as vacant land (520 acres). Of this vacant land, approximately 25 percent is zoned residential, 24 percent is zoned industrial, and 18 percent is zoned open space parks. It is assumed that all of this land will be developed ultimately with the exceptions of land to be left vacant per City Specific Plans and vacant land in the open space conservation category, which is assumed to remain open space, i.e. no future water demands.[54]

Housing density data for the City, as determined by the Center for Demographics Research California State University Fullerton, is shown in Table 5.4-1. The largest land use in the City is residential at 7,904 acres (approximately 46 percent of the total). Approximately 72 percent of the residential land use is low density residential (3 to 7 dwelling units (DU) per acre). [55]

Table 5.4-1
Existing Water System Service Area Housing Density

Category	Description	Dwelling Units (DU)	DU per Acre
Low Density Residential	Single family residences	49,074	6.75
High Density Residential	Multi-family units	31,244	11.11

Source: Center for Demographic Research California State University Fullerton.

[54] City of Huntington Beach Water Master Plan Update, 2005
[55] City of Huntington Beach Water Master Plan Update, 2005

SECTION 6
WATER DEMAND MANAGEMENT MEASURES

6.1 INTRODUCTION

On August 21, 2000, the City Council of Huntington Beach elected to become Signatory to the Memorandum of Understanding (MOU) Regarding Best Management Practices (BMPs) for Urban Water Conservation with the California Urban Water Conservation Council (CUWCC). The City was officially voted in as a member of the CUWCC at the September 21, 2000 plenary session of CUWCC.

MWDOC implements many of the urban water conservation BMPs on behalf of its member agencies, including the City of Huntington Beach. MWDOC’s 2005 Regional Urban Water Management Plan should be referred to for a detailed discussion of each regional BMP program.

6.2 DETERMINATION OF DMM IMPLEMENTATION

As Signatory to the MOU, the City has committed to a good faith effort in implementing the 14 cost-effective BMPs. “Implementation” means achieving and maintaining the staffing, funding, and in general, the priority levels necessary to achieve the level of activity called for in each BMP's definition, and to satisfy the commitment by the signatories to use good faith efforts to optimize savings from implementing BMPs as described in the MOU. A BMP as defined in the MOU is a “practice for which sufficient data are available from existing water conservation practices to indicate that significant conservation or conservation related benefits can be achieved; that the practice is technically and economically reasonable and not environmentally or socially unacceptable; and that the practice is not otherwise unreasonable for most water agencies to carry out.”

These 14 BMPs include technologies and methodologies that have been sufficiently documented in multiple demonstration projects that result in more efficient water use and conservation. Many of the BMPs are implemented by the City in coordination with MWDOC and their regional conservation programs.

As signatory to the MOU, the City is responsible for completing and submitting BMP Activity Reports to the CUWCC every two years for each year prior. The City’s BMP Activity Report is a comprehensive document that shows implementation of each BMP and provides a determination of implementation from the City’s 2000 UWMP. The City has maintained complete compliance with all the BMPs to date. Appendix E includes the Activity Reports for reporting years 2003-2004, Annual Reports for 2001-2002 and the Coverage Reports. The Coverage Report indicates that the City is on track for meeting BMP coverage in its service area according to the MOU.

6.3 DEMAND MANAGEMENT MEASURES

As signatory to the MOU, the City has committed to use good-faith efforts to implement the 14 cost-effective BMPs established by the CUWCC. The 14 BMPs include:

1. Water survey programs for single-family residential and multifamily residential customers
2. Residential plumbing retrofit
3. System water audits, leak detection, and repair
4. Metering with commodity rates for all new connections and retrofit of existing connections
5. Large landscape conservation programs and incentives
6. High-efficiency washing machine rebate programs
7. Public information programs
8. School education programs
9. Conservation programs for commercial, industrial, and institutional accounts
10. Wholesale agency programs
11. Conservation pricing
12. Water conservation coordinator
13. Water waste prohibition
14. Residential ultra-low-flush toilet replacement programs

The City works cooperatively with MWDOC for technical and financial support needed to facilitate meeting the terms of the MOU. MWDOC's current Water Use Efficiency Program includes regional programs, detailed in their 2005 Regional UWMP, implemented on behalf of its member agencies following three basic goals:

1. Provide on-going water use efficiency program support for member agencies

2. Assume the position of lead agency to implement water use efficiency programs that are more cost-effectively implemented on a regional basis rather than a local basis.

3. Secure outside funding from Metropolitan's Conservation Credits Program, United States Bureau of Reclamation, and other sources.

SECTION 7
WATER SHORTAGE CONTINGENCY PLAN

7.1 INTRODUCTION

California's extensive system of water supply infrastructure, its reservoirs, groundwater basins, and inter-regional conveyance facilities, mitigates the effect of short-term dry periods. Defining when a drought begins is a function of drought impacts to water users. Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Droughts occur slowly, over a multiyear period. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

In order to meet short-term water demand deficiencies, and short-or long-term drought requirements, the City of Huntington Beach will implement its own water shortage policy based upon Chapter 14.18 of the City's Municipal Water Code. In addition, the City's Water Efficient Landscape Requirements, included in Chapter 14.52 of the City's Municipal Code, sets forth standards for landscape irrigation during drought and non-drought times, and acknowledges the constant need to establish long-term water efficiency. Chapter 14.16 of the Municipal Code also establishes overall Water Use Regulations, including regulations for water meters. Provisions of the City's Municipal Code will be implemented in congruence with the policy of MWDOC and OCWD's water shortage/drought activities. MWDOC's policy will be based Metropolitan's adopted Water Surplus and Drought Management Plan (WSDM Plan). The WSDM Plan is designed to guide management of regional water supplies to achieve reliability goals for southern California.

7.2 STAGES OF ACTION

City of Huntington Beach Water Shortage Response

In the event of a water shortage, the City's Director of Public Works and the City Administrator, or their designated representative, are authorized and directed by City Council to implement provisions of the Water Management Program. All actions taken will be confirmed at the earliest practicable time by the City Council.

The Director of Public Works determines the extent of conservation or water use efficiency required through the implementation and/or termination of particular conservation stages in order for the City to prudently plan for and supply water to its customers. The City Council directs the City Administrator to order the appropriate stage of water conservation. However, in case of local emergencies, the City Administrator has the authority to order the implementation of the appropriate stage of water conservation subject to ratification by the City Council within seven days thereafter.

As defined in Chapter 14.18 (included in Appendix F) of the City's Municipal Water Code, a water shortage is declared based on one or more of the following conditions:

a) A general water supply shortage due to increased demand or limited supplies.
b) A major failure of the supply, storage and distribution facilities of the Metropolitan Water District of Southern California or of the City occurs.
c) A local or regional disaster, which limits the water, supply.

The City's Water Management Program includes the following stages of water shortage actions, which take effect upon declaration. The Water Management Program, defined in Chapter 14.18 of the Huntington Beach Municipal Code, includes mandatory conservation phase implementation. The Director of Public Works shall determine the extent of the conservation required through implementation and/or termination of particular conservation stages in order for the City to plan for and supply water to its customers, including consumption reduction up to 50%. As a MWDOC member agency, the City will follow the stages of action set forth by Metropolitan, as detailed below, which accomplish and ensure 100% reliability.

Rationing Stages and Reduction Goals

In order to meet short-term water demand deficiencies, and short- or long-term drought requirements, Huntington Beach will implement its own water shortage policy in accordance with the City's Water Conservation Program and the policy of MWDOC, which is anticipated to be based on Metropolitan's WSDM Plan. The WSDM Plan defines the expected sequence of resource management actions Metropolitan will take during surpluses and shortages of water to minimize the probability of severe shortages that require curtailment of full-service demands. The MWDOC 2005 Regional UWMP details each of the surplus and shortage stages, actions by stage and allocation of supply for M&I demand. Mandatory allocations are avoided to the extent practicable, however, in the event of an extreme shortage, an allocation plan will be adopted in accordance with the principles of the WSDM Plan.

Metropolitan Water Surplus and Drought Management Plan

In 1999, Metropolitan in conjunction with its member agencies developed the WSDM Plan. This plan addresses both surplus and shortage contingencies.

The WSDM Plan will guide management of regional water supplies to achieve the reliability goals of Southern California's IRP. The IRP sought to meet long-term supply and reliability goals for future water supply planning. The WSDM Plan guiding principle is to minimize adverse impacts of water shortage and ensure regional reliability. From this guiding principle come the following supporting principles:

- Encourage efficient water use and economical local resource programs.
- Coordinate operations with member agencies to make as much surplus water as possible available for use in dry years.
- Pursue innovative transfers and banking programs to secure more imported water for use in dry years.

- Increase public awareness about water supply issues.

The WSDM Plan guides the operations of water resources (local resources, Colorado River, State Water Project, and regional storage) to ensure regional reliability. It identifies the expected sequence of resource management actions Metropolitan will take during surpluses and shortages of water to minimize the probability of severe shortages that require curtailment of full-service demands. Mandatory allocations are avoided to the extent practicable, however, in the event of an extreme shortage an allocation plan will be adopted in accordance with the principles of the WSDM Plan.

The WSDM Plan distinguishes between *Surpluses, Shortages, Severe Shortages,* and *Extreme Shortages.* Within the WSDM Plan, these terms have specific meaning relating to Metropolitan's capability to deliver water to the City.

Surplus: Metropolitan can meet full-service and interruptible program demands, and it can deliver water to local and regional storage.

Shortage: Metropolitan can meet full-service demands and partially meet or fully meet interruptible demands, using stored water or water transfers as necessary.

Severe Shortage: Metropolitan can meet full-service demands only by using stored water, transfers, and possibly calling for extraordinary conservation. In a Severe Shortage, Metropolitan may have to curtail Interim Agricultural Water Program (IAWP) deliveries in accordance with IAWP.

Extreme Shortage: Metropolitan must allocate available supply to full-service customers.

The WSDM Plan also defines five surplus management stages and seven shortage management stages to guide resource management activities. Each year, Metropolitan will consider the level of supplies available and the existing levels of water in storage to determine the appropriate management stage for that year. Each stage is associated with specific resource management actions designed to: 1) avoid an Extreme Shortage to the maximum extent possible; and 2) minimize adverse impacts to retail customers should an "Extreme Shortage" occur. The current sequencing outline in the WSDM Plan reflects anticipated responses based on detailed modeling of Metropolitan's existing and expected resource mix. This sequencing may change as the resource mix evolves.

WSDM Plan Shortage Actions by Shortage Stage

When Metropolitan must make net withdrawals from storage, it is considered to be in a shortage condition. However, under most of these stages, it is still able to meet all end-use demands for water. The following summaries describe water management actions to be taken under each of the seven shortage stages.

Shortage Stage 1. Metropolitan may make withdrawals from Diamond Valley Lake.

Shortage Stage 2. Metropolitan will continue Shortage Stage 1 actions and may draw from out-of-region groundwater storage.

Shortage Stage 3. Metropolitan will continue Shortage Stage 2 actions and may curtail or temporarily suspend deliveries to Long Term Seasonal and Replenishment Programs in accordance with their discounted rates.

Shortage Stage 4. Metropolitan will continue Shortage Stage 3 actions and may draw from conjunctive use groundwater storage (such as the North Las Posas program) and the SWP terminal reservoirs.

Shortage Stage 5. Metropolitan will continue Shortage Stage 4 actions. Metropolitan's Board of Directors may call for extraordinary conservation through a coordinated outreach effort and may curtail Interim Agricultural Water Program deliveries in accordance with their discounted rates. In the event of a call for extraordinary conservation, Metropolitan's Drought Program Officer will coordinate public information activities with member agencies and monitor the effectiveness of ongoing conservation programs. The Drought Program Officer will implement monthly reporting on conservation program activities and progress and will provide quarterly estimates of conservation water savings.

Shortage Stage 6. Metropolitan will continue Shortage Stage 5 actions and may exercise any and all water supply option contracts and/or buy water on the open market either for consumptive use or for delivery to regional storage facilities for use during the shortage.

Shortage Stage 7. Metropolitan will discontinue deliveries to regional storage facilities, except on a regulatory or seasonal basis, continue extraordinary conservation efforts, and develop a plan to allocate available supply fairly and efficiently to full-service customers. The allocation plan will be based on the Board-adopted principles for allocation listed previously. Metropolitan intends to enforce these allocations using rate surcharges. Under the current WSDM Plan, the surcharges will be set at a minimum of $175 per af for any deliveries exceeding a member agency's allotment. *Any deliveries exceeding 102% of the allotment will be assessed a surcharge equal to three times Metropolitan's full-service rate.*

The overriding goal of the WSDM Plan is to never reach Shortage Stage 7, an Extreme Shortage. Given present resources, Metropolitan fully expects to achieve this goal over the next ten years.

Reliability Modeling of the WSDM Plan

Using a technique known as "sequentially indexed Monte Carlo simulation," Metropolitan undertook an extensive analysis of system reservoirs, forecasted demands, and probable hydrologic conditions to estimate the likelihood of reaching each Shortage Stage through 2010. The results of this analysis demonstrated the benefits of coordinated management of regional supply and storage resources. Expected occurrence of a Severe Shortage is four percent or less in most years and never exceeds six percent; equating to an expected shortage occurring once every 17 to 25 years. An Extreme Shortage was avoided in every simulation run.

Metropolitan also tested the WSDM Plan by analyzing its ability to meet forecasted demands given a repeat of the two most severe California droughts in recent history. Hydrologic conditions for the years 1923–34 and 1980–91 were used in combination with demographic projections to generate two hypothetical supply and demand forecasts for the period 1999–2010. Metropolitan then simulated operation to determine the extent of regional shortage, if any. The results again indicate 100 percent reliability for full-service demands through the forecast period.

Allocation of Supply for M&I Demands

The equitable allocation of supplies is addressed by the Implementation Goals for the WSDM Plan, with the first goal being to "avoid mandatory import water allocations to the extent practicable." The reliability modeling for the WSDM Plan discussed above results in 100 percent reliability for full-service demands through the year 2010. However, the second fundamental goal of the WSDM Plan is to "equitably allocate imported water on the basis of agencies' needs." Factors for consideration in establishing the equitable allocation include retail and economic impacts, recycled water production, conservation levels, growth, local supply production, and participation and investment in Metropolitan's system and programs. In the event of an extreme shortage, an allocation plan will be adopted in accordance with the principles of the WSDM Plan.

In an effort to avoid allocation, import water reliability is planned through the Southern California IRP and the WSDM Plan. The IRP presents a comprehensive water resource strategy to provide the region with a reliable and affordable water supply for the next 25 years. The WSDM Plan will guide management of regional water supplies to achieve the reliability goals of the IRP.

Under a drought scenario, OCWD may have Metropolitan replenishment water temporarily unavailable to them for replenishment of the groundwater basin. OCWD would first attempt to purchase other water supplies at a similar cost to replace the Metropolitan source. If no alternative water supply sources are economically available, OCWD may temporarily mine the basin by increasing the BPP to meet local demand and refill it in the future. OCWD used this strategy during the later years of the 1986-92 drought period. If this option is not available, then OCWD may lower the current 64 percent BPP to match the basin's Dependable Yield. Under this last scenario, the City may request increased imported water along with conservation and water use efficiency measures by customers to meet demand. The OCWD Master Plan Report, Chapter 14 – Basin Management Issues, further describes OCWD activities that may affect the City during a declared drought.

Health and Safety Requirements

The primary goal of the City's water system is to preserve the health and safety of its personnel and the public. Meeting this goal is a continuous function of the system – before, during and after a disaster or water shortage. Fire suppression capabilities will continue to be maintained during any water shortage contingency stage. Some water needs are more immediate than others are. The following list of public health needs and the allowable time without potable water is a guideline and will depend on the magnitude of the water shortage:

- Hospitals – continuous need
- Emergency shelters – immediate need
- Kidney dialysis – 24 hours
- Drinking water – 72 hours
- Personal hygiene, waste disposal – 72 hours

Based on commonly accepted estimates of interior residential water use in the United States, Table 7.2-1 indicates per capita health and safety water requirements. During the initial stage of a shortage, customers may adjust either interior and/or outdoor water use in order to meet the voluntary water reduction goal.

Table 7.2-1
Per Capita Health and Safety Water Quantity Calculations

	Non-Conserving Fixtures		Habit Changes[1]		Conserving Fixtures[2]	
Toilet	5 flushes x 5.5 gpf	27.5	3 flushes x 5.5 gpf	16.5	5 flushes x 1.6 gpf	8.0
Shower	5 min. x 4.0 gpm	20.0	4 min. x 3.0 gpm	12.0	4 min. x 2.5 gpm	10.0
Washer	12.5 gpcd	12.5	11.5 gpcd	11.5	11.5 gpcd	11.5
Kitchen	4 gpcd	4.0	4 gpcd	4.0	4 gpcd	4.0
Other	4 gpcd	4.0	4 gpcd	4.0	4 gpcd	4.0
Total		68.0		48.0		37.5
CCF per capita per year		33.0		23.0		18.0

gpcd = gallons per capita per day
gpf = gallons per flush
gpm = gallons per minute
ccf = hundred cubic feet
[1] Reduced shower use results from shorter and reduced flow. Reduced washer use results from fuller loads.
[2] Fixtures include ULF 1.6 gpf toilets, 2.5 gpm showerheads, and efficient clothes washers.

Priority by Use

Conditions prevailing in the City of Huntington Beach area require that the water resources available be put to maximum beneficial use to the extent to which they are capable. The waste or unreasonable use, or unreasonable method of use, of water should be prevented and that water conservation and water use efficiency is encouraged with a view to the maximum reasonable and beneficial use thereof in the interests of the people of the City and for the public welfare. Preservation of health and safety will be a top priority for the City.

7.3 ESTIMATE OF MINIMUM SUPPLY FOR NEXT THREE YEARS

According to MWDOC, Metropolitan projects 100 percent reliability for full-service demands through the year 2025. Additionally, through a variety of groundwater reliability programs conducted by OCWD and participated in by the City, local supplies are projected to be maintained at demand levels. The City anticipates the ability to meet water demand through the next three years based on the driest historic three-years as shown in Table 7.3-1.

Table 7.3-1
Three Year Estimated Minimum Water Supply
(Based on Driest 3-Year Historic Sequence)
(AF)

Source	Normal			Multiple Dry Years		
	2006	2007	2008	2006	2007	2008
Local Supplies	22,980	23,300	23,620	24,140	24,470	25,690
Imported Supply	12,920	13,100	13,280	13,580	13,770	13,080
Total	35,900	36,400	36,900	37,720	38,240	38,770

Source: Projections are interpolated from data in Tables 4.2-3 and 4.2-5; BPP is assumed to be 64% in 2006-2008.

The City relies on groundwater wells accessing the Santa Ana River groundwater basin managed by OCWD and imported water from Metropolitan through MWDOC. Both sources of water are vitally important to the City. MWDOC and OCWD are implementing water supply alternative strategies for the region and on behalf of its member agencies to insure available water in the future and during shortages.

Supplemental water supplies are discussed in Section 4, Water Reliability Planning. Supplies discussed include regionally beneficial programs, including management of water system pressures and peak demands, water exchanges or transfers, conjunctive use programs, recycled water projects and desalination. These options include programs for expanded local supplies. Additional actions to manage limited supplies would include both operational and demand management measures, encompassing alternative rate structures, distribution of water use efficiency devices, and enhanced school education and public information.

The MWDOC 2005 Regional UWMP further discusses programs by MWDOC, OCWD and Metropolitan for the benefit of the region and its member agencies, including the City of Huntington Beach.

7.4 CATASTROPHIC SUPPLY INTERRUPTION PLAN

Water Shortage Emergency Response

A water shortage emergency could be the result of a catastrophic event such as result of drought, failures of transmission facilities, a regional power outage, earthquake, flooding, supply contamination from chemical spills, or other adverse conditions. The City maintains and exercises a comprehensive Emergency Management Program for such emergencies including Water Shortage Emergency Response. The Utilities Division of the Public Works Department is responsible for water operations and the maintenance of the Water & Utilities section of the City of Huntington Beach Emergency Management Plan.

The plan describes the organizational and operational policies and procedures required to meet the needs of sufficient water for firefighting operations and safe drinking water and provides a system for organizing and prioritizing water repairs. It also cites authorities and specifies the public and private organizations responsible for providing water service.

The Utilities Division will operate under normal operating procedures until a situation is beyond its control. This includes implementation of any allocation plan passed through by MWDOC for Metropolitan, and water shortage contingency plans of OCWD.

If the situation is beyond the Utilities Division’s control, the Water Operations Center (WOC) may be activated to better manage the situation. If the situation warrants, the City Emergency Operations Center (EOC) may be activated at which time a water representative will be sent to the EOC to coordinate water emergency response with all other City department’s emergency response. The representative sent to the EOC is called the *Water Tactical Officer*.

In the event the EOC is activated, the City management Policy Group will set priorities. When the EOC is activated, the WOC will take its direction from the EOC. An EOC *Action Plan* will be developed in the EOC that will carry out the policies dictated by the *Policy Group*. The WOC will use the EOC *Action Plan* in determining its course of action. Coordination between the WOC and the EOC will be done by the Water Utilities Manager (located in the WOC) and the *Water Tactical Officer* (located in the EOC) under the direction of the *Public Works Chief* (located in the EOC).

If the situation is beyond the Utilities Division's and the City's control, additional assistance will be sought through coordination with the Water Emergency Response Organization of Orange County.

Water Emergency Response Organization of Orange County (WEROC)

The City of Huntington Beach Utilities Division actively participates in the Water Emergency Response Organization of Orange County (WEROC). WEROC performs coordination of information and mutual-aid requests among water agencies, and conducts disaster training exercises for the Orange County water community and with Metropolitan.

In 1983, the Orange County water community developed a *Water Supply Emergency Preparedness Plan* to respond effectively to disasters impacting the regional water distribution system. This plan was jointly funded by three regional water agencies: Coastal Municipal Water District, MWDOC, and OCWD, with the support and guidance from the Orange County Water Association (OCWA). The collective efforts of these agencies resulted in the formation of the countywide WEROC, which is unique in its ability to provide a single point of contact for water representation in Orange County during a disaster. The MWDOC 2005 Regional Urban Water Management Plan presents further details of WEROC.

Additional emergency services available to the City of Huntington Beach in the State of California include the Master Mutual Aid Agreement, WARN and Plan Bulldozer. The Master Mutual Aid Agreement includes all public agencies that have signed the agreement and is planned out of the California Office of Emergency Services. The California Water Agencies Response Network (WARN) includes all public agencies that have signed the agreement to WARN and provides mutual aid assistance. It is managed by a State Steering Committee. Plan Bulldozer provides mutual aid for construction equipment to any public agency for the initial time of disaster when danger to life and property exists.

7.5 PROHIBITIONS, PENALTIES, AND CONSUMPTION REDUCTION METHODS

As part of the City's Water Management Program, water use regulations are set forth in Chapter 14.16 of the City's Municipal Code, as included in Appendix F. Some of the regulations included apply to fires (fire hydrants), waste (improper fixtures), meters (use and location), violations, drawing into steam boilers, water sales outside of city, and cross-connections protection. Refer to Appendix F for the complete ordinance.

Any violation of the City's Water Management Program, including waste of water and excessive use, is a misdemeanor. In addition to any other remedies that the City may have for enforcement, service of water would be discontinued or appropriately limited to any customer who willfully uses water in violation of any provision of the ordinance.

The City of Huntington Beach will follow the allocation plan guidelines of MWDOC as adopted by Metropolitan once an extreme shortage is declared. This allocation plan will be enforced by Metropolitan using rate surcharges. MWDOC will follow the guidelines of the allocation plan and impose the surcharge that Metropolitan applies to its member agencies that exceed their water allocation, as appropriate, to enforce consumption reduction up to 50% reduction in water supply. The City would correspondingly impose surcharges or penalties in accordance with its ordinance on excessive use of water.

7.6 REVENUE AND EXPENDITURE IMPACTS AND MEASURES TO OVERCOME THOSE IMPACTS

The City receives water revenue from a commodity charge, a fixed customer charge and a capital surcharge. The rates have been designed to recover the full cost of water service in the commodity charge. Therefore, the cost of purchasing water and producing groundwater would decrease as the usage or sale of water decreases. Should an extreme shortage be declared and a large reduction in water sales occurs for an extended period of time, the Utilities Division would reexamine its water rate structure and monitor projected expenditures. In the event of a 50% reduction in water supply, the City will take action in congruence with MWDOC to ensure adequate consumption reduction methods.

In September 2003, MWDOC partnered with the Orange County Business Council and prepared a report, "*Determining the Value of Water Supply Reliability in Orange County, California.*" The study provides insights into how to value water supply reliability by providing projected estimates of the economic impacts of different water shortages that could result in Orange County. The study does not assess the likelihood of different disruptions to water supply, but instead estimates the economic impacts of the resulting water shortages if a particular supply interruption occurs. Two types of shortages are examined in the study – short-term emergency disruptions and multiple-year droughts. A range of scenarios was examined for both situations. Those scenarios were:

» Emergency Disruptions: Water supply reductions of 20%, 40%, 60% and 80% for 10, 20, 30, and 60 days.

» Drought: Water supply reductions of 5% and 20% for one, two, and three years.

The estimated economic impacts are separated into business impacts and residential impacts. Residential users are often required to reduce their water usage more than business customers during water shortages to help preserve the economic base of the area. In addition to residential and business impacts, this report also includes an estimate of the value of landscape losses that would be expected during droughts, and a discussion of the impact of emergency outages on damages from firestorms due to a lack of water supply for firefighting.

The study has produced dollar estimates of economic impacts of given water shortages to both the business and residential sectors of three regions within Orange County. The water shortage scenarios analyzed included both short-term emergency disruptions (10 to 60 days in duration) and multiple-year drought situations (1 to 3 years). The three regions of the County analyzed were defined based on the availability of local supplies and the potential risk of supply reliability impacts.

The results revealed that business impacts are larger than residential impacts. For short-term, emergency disruptions, the difference between business impacts and residential impacts varies depending on the magnitude and length of a shortage. For an 80% water loss in South Orange County for 60 days, business impacts are approximately five times as large as residential impacts. For a 20% water loss in the Basin, business impacts are approximately ten times as large as resident impacts. At low levels of water disruption, resident impacts more closely approximate business impacts. For example, the residential impacts from a 20% water loss for 10 days in South Orange County are about 75% of the business impacts from the same disruption.

For all of Orange County during an emergency outage that causes a 20% water supply shortfall and lasts from 10 to 60 days, the economic impacts range from $0.4 to $3 billion. Employment losses were estimated at 3,000 to 23,000 over the 10—60 days.
For all of Orange County during a drought that results in a 5% shortage to the Basin area and 20% shortage outside the basin area for a 1 to 3 year period, the economic impacts range from $15 to $43 billion. Employment losses were estimated at 75,000 to 225,000 over the one to three-year period.

If shortages were to occur:

- South Orange County would experience approximately 12% of the business and employment impacts, but 25% of the residential and landscape losses. South Orange County has a higher dependence on imported water supplies and hence is more vulnerable to supply outages.
- The Orange County Basin would experience 84% of the business impacts and 71% of the residential and landscape losses, but has a significant supply of water available from the groundwater basin and hence is somewhat insulated from imported water supply emergency disruptions.
- Brea/La Habra area would experience about 3% of all impacts.

Drought scenarios generally cause a higher level of impact than do emergency outages and exceed all but the worst-case emergency disruptions. The exception is a 60-day, 60% reduction in water supplies to the Basin business sector, which would exceed the impact of a year-long 5% drought in the Basin. (20% reduction in imported supply assuming a 70% BPP.) In most scenarios, about half of the business losses are in the manufacturing and service sectors. Employment losses are highest in services and retail throughout the County.

The study provides extensive insight into the City's water reliability and water shortage contingency plan for planning for the future. The study also demonstrates the extensive importance to the City's water reliability and water shortage contingency plan for planning for the future. If such impacts occur in the residential and business community, the municipal community will be impacted correspondingly. Economic impacts to the community create economic impacts to the City revenue from water sales, among other City revenue sources. The City must and will continue to be diligent in maintaining appropriate water rates and rate structure, and making reasonable adjustments as justified; maintaining sufficient water reserve funds; and managing expenses accordingly.

7.7 WATER SHORTAGE CONTINGENCY ORDINANCE

In 1991, the City of Huntington Beach adopted by ordinance a comprehensive Water Management Program based upon the need to conserve water supplies and to avoid or minimize the effects of future shortage. A copy of the City's Water Management Program Ordinance, Chapter 14.18 of the City Municipal Code, is included as Appendix F. Chapter 14.16 of the Municipal Code also establishes overall Water Use Regulations, including regulations for water meters. In addition, the City's Water Efficient Landscaping Ordinance, Chapter 14.52 of the City's Municipal Code. Both are also included in Appendix F.

7.8 MECHANISMS TO DETERMINE REDUCTIONS IN WATER USE

Under normal conditions, potable water production figures are recorded daily. Weekly and monthly reports are prepared and monitored. This data will be used to measure the effectiveness of any water shortage contingency stage that may be implemented.

As stages of water shortage are declared by MWDOC, the City of Huntington Beach will follow implementation of those stages and continue to monitor water demand levels. It is not until Shortage Stage 5 that Metropolitan may call for extraordinary conservation. During this stage, Metropolitan's Drought Program Officer will coordinate public information activities with MWDOC and monitor the effectiveness of ongoing conservation programs. Monthly reporting on estimated conservation water savings will be provided.

The City will participate in monthly member agency manager meetings with both MWDOC and OCWD to monitor and discuss monthly water allocation charts. This will enable the City to be aware of import water use on a timely basis as a result of specific actions taken responding to the City's Water Shortage Contingency Plan.

SECTION 8
WATER RECYCLING

8.1 RECYCLED WATER IN SOUTHERN CALIFORNIA

The Southern California region, from Ventura to San Diego, discharges over 1 billion gallons (1.1 million AFY) of treated wastewater to the ocean each day. This is considered a reliable and drought-proof water source and could greatly reduce the areas' and the City's reliance on imported water. As technological improvements continue to reduce treatment costs, and as public perception and acceptance continue to improve, numerous reuse opportunities should develop. Recycled water is a critical part of the California water picture because of the strong drought potential and as technology continues to improve, demand continues to increase for its use.

8.2 COORDINATION OF RECYCLED WATER IN THE CITY SERVICE AREA

Currently, the City does not utilize or serve directly applied recycled water to any of its customers or for municipal purposes. However, the City produces a majority of its water supply from the Basin. OCWD utilizes recycled water generated from Orange County Sanitation District's (OCSD) treatment facilities to protect the Basin through seawater intrusion barriers and groundwater recharge basins. The City, therefore, indirectly benefits from this regional use of recycled water. The regional projects are discussed later in this section.

8.3 WASTEWATER COLLECTION AND TREATMENT IN THE CITY SERVICE AREA

Wastewater from the City's water service area is collected and treated by OCSD. The City operates and maintains the localized sewer branches that feed into OCSD's trunk system from the City. The City of Huntington Beach sewer system includes 385 miles of sewer lines, 10,000 manholes and 28 lift stations. OCSD operates the third largest wastewater system on the west coast, consisting of nearly 600 miles of trunk sewers and 200 miles of subtrunk sewers, two regional treatment plants, and an ocean disposal system.

The OCSD sewerage system collects wastewater through an extensive system of gravity flow sewers, pump stations, and pressurized sewers (force mains). The sewer system consists of 12 trunk sewer systems ranging in size from 12 to 96 inches in diameter and collectively over 500 miles long. Additionally, there are 39 sewer interconnections and 87 diversions to maximize conveyance of flows through the system. Twenty pump stations are used to pump sewage from lower lying areas to the treatment plants.

Orange County Sanitation Districts (OCSD) Treatment Plants

OCSD's Reclamation Plant No. 1 is located in the City of Fountain Valley about 4 miles northeast of the ocean and adjacent to the Santa Ana River. The plant provides advanced primary and secondary treatment and supplies secondary treatment water to OCWD which further treats and distributes the water for various uses, including irrigation, groundwater recharge, and operation of coastal seawater barrier system.

The treatment process at Reclamation Plant No. 1 includes secondary treatment through an activated sludge system. This plant receives raw wastewater from six major sewer pipes, often called "interceptors" or "trunk lines." The secondary effluent is either blended with the advanced primary effluent and routed to the ocean disposal system, or is sent to the OCWD facilities for advanced treatment and recycling. The solid materials removed in the treatment systems are processed in large tanks to facilitate natural decomposition. Half of the material is converted to methane, which is burned as fuel in the energy recovery system, and the remaining solids are used as a soil amendment or fertilizer in Kern, Kings, Riverside, and San Diego Counties.

OCSD's Treatment Plant No. 2 is located in the City of Huntington Beach adjacent to the Santa Ana River and about 1,500 feet from the ocean. This plant provides a mix of advanced primary and secondary treatment. The plant receives raw wastewater through five major sewers. The treatment process is similar to Plant No. 1. Approximately 33 percent of the influent receives secondary treatment through an activated sludge system, and all of the effluent is discharged to the ocean disposal system.

OCSD's treated wastewater is discharged through a 120-inch outfall at a depth of approximately 200 feet below sea level and nearly five miles offshore from the mouth of the Santa Ana River. Its high tide hydraulic capacity is 480 mgd. A 78-inch standby outfall stretches approximately one mile from shore that is used for emergency purposes. Table 8.3-1 projects the treated wastewater discharged to the ocean from Treatment Plant No. 1 and 2.

Table 8.3-1
Wastewater Discharged to the Ocean
(AFY)

Year	Wastewater Discharged to the Ocean
2005	249,678
2010	197,055
2015	217,209
2020	200,414
2025	200,414
2030	200,414

Source: MWDOC 2005 Regional UWMP

Current capacity for Reclamation Plant No. 1 is 218 million gallons per day (mgd) of wastewater, with an average day flow of 120 mgd. Current capacity for Plant No. 2 is 168 mgd of wastewater, with an average flow of 144 mgd.[56] The City provides significant amount of wastewater to OCSD's plants. The quantities of wastewater generated are generally proportional to the population and the water use in the service area. Estimates of the wastewater flows in the City are included in Table 8.3-2. The wastewater flows were calculated using the population projections included in Section 1.

Table 8.3-2
Wastewater Generated Within the City
(AFY)

Year	Unit Flow Coefficient (gpcd)[1]	Wastewater Generated by the City
2000	104	24,145
2005	106	23,900
2010	109	25,950
2015	112	27,290
2020	115	28,385
2025	115	28,580
2030	115	28,800

[1] The OCSD Interim Strategic Plan Update, September 2002. Years 2025 and 2030 were assumed to be the same as 2020.

8.4 REGIONAL RECYCLED WATER

Since the City depends on groundwater for at least 64 percent of its total water supply, the City supports the efforts of the regional water management agencies to utilize recycled water in Orange County. Recycled water is used to protect the Basin through recharge and prevention of saltwater intrusion. Recycled water in Orange County is also used to irrigate crops, golf courses, parks, schools, business landscapes, residential lawns, and some industrial uses thus offsetting potable water demands. In 2003/2004, over 10,000 AF of recycled water was applied by water retailers in the County.[57] The regional projects planned or currently used to provide recycled water are discussed in the following sections.

Green Acres Project (GAP)

OCSD produces recycled water year round for OCWD's Green Acres Project (GAP), providing recycled water for industrial customers and landscape irrigation in the cities of Santa Ana, Fountain Valley, Costa Mesa, and Newport Beach. The GAP has the capacity to treat up to 7.5 mgd of recycled water.

[56] MWDOC 2005 Regional Urban Water Management Plan.
[57] OCWD, 2003-2004 Engineer's Report, February 2005.

Water Factory 21

Although currently offline due to the construction of the GWRS, Water Factory 21 had been used by OCWD since 1976 to produced recycled water for injection into the groundwater basin to protect against seawater intrusion. Water Factory 21 purified approximately 4 mgd of recycled water and deep well water. This blended water supplied a hydraulic barrier system that consisted of a series of injection wells, located approximately four miles inland, to produce a fresh water mound within the groundwater aquifer to block further passage of seawater. The GWRS will replace Water Factory 21 and continue to provide recycled water for injection into the basin.

Southern California Comprehensive Water Reclamation and Reuse Study (SCCWRRS)

In 1993, the DWR, in cooperation with the U.S. Bureau of Reclamation (USBR) and seven southern California water agencies, including Metropolitan, undertook a study to evaluate the feasibility of a regional water reclamation plan. The Southern California Comprehensive Water Reclamation and Reuse Study (SCCWRRS) is a six-year effort to identify regional reclamation systems, and promote efficient use of total water resources by increasing the use of recycled water and identifying opportunities for and constraints to maximizing water reuse in Southern California.

Based upon draft findings of the SCCWRRS, a regional water recycling system that spans the entire study area is not practical or feasible; however, subregional systems warrant further evaluation. Orange County and the Lower Santa Ana River Watershed has been identified as one of the four geographical regions, and is being examined for a regional water recycling system for short-term (2010) and long-term (2040) applications.

OCWD/OCSD Groundwater Replenishment System (GWRS)

The most immediate potential use for recycled water in Orange County is for groundwater basin recharge. To supplement regional water recycling projects such as the Green Acres Project, the GWRS (a groundwater recharge project) jointly sponsored by OCWD and OCSD is being implemented.

The GWRS is a water supply project designed to ultimately reuse approximately 110,000 AFY of advanced treated wastewater. The first phase is currently underway and is scheduled to go online in 2007. The first phase anticipates treating 61,000 AFY in 2007/08, 68,000 AFY in 2008/09, and eventually 72,000 AFY.[58] Timing of future phases will be determined by projected flow requirements for anticipated water demands.

The objective of the project is to develop a new source of reliable, high quality, low salinity water that will be used to replenish the Basin and expand the existing seawater intrusion barrier. The GWRS supplements existing water supplies, and provides a new,

[58] Orange County Water District, Long Term Facilities Plan, Draft October 2005.

cost-effective and reliable source of water to recharge the Basin, protect the Basin from further degradation due to seawater intrusion, and augment the supply of recycled water for irrigation and industrial use. Thus, the GWRS is comprised of three major components: (1) Advanced Water Purification Facilities (AWPF) and pumping stations; (2) a major pipeline connecting the treatment facilities to existing recharge basins; and (3) expansion of an existing seawater intrusion barrier.

The GWRS will take secondary, treated municipal wastewater from the OCSD Treatment Plant No. 1 in Fountain Valley and further cleans this water to levels that exceed current drinking water standards. A portion of the treated product water would be pumped upstream via a major conveyance pipeline generally paralleling the Santa Ana River to the OCWD spreading basins where it would be allowed to percolate into the Orange County Groundwater Basin. The treated water will also be injected into the ground to create an expanded seawater intrusion barrier.

A small portion of the treated water will be made available to supplement the irrigation demands of OCWD's existing GAP. Some of the treated water may also be made available for use as industrial process water, irrigation water or for other approved uses in industrial areas, business parks, golf courses, and parks located near the Santa Ana River pipeline alignment.

8.5 Potential Uses of Recycled Water

While the City recognizes the potential uses of recycled water in its community, such as landscape irrigation, parks, industrial and other uses, the OCWD does not have the recycled water infrastructure to support the use of recycled water. The community is essentially built-out, beginning development in the 1950's. The cost-effectiveness analyses that have been conducted throughout the years regarding recycled water infrastructure have not shown beneficial. Therefore, the City supports, encourages and contributes to the continued development of recycled water and potential uses throughout the region through the GWRS.

8.6 2000 Projected and Potential Uses of Recycled Water

The City's 2000 UWMP projected that by 2005 the City recycled water from OCWD's Green Acres Project would be available to the City of Huntington Beach for irrigation use. The City had projected 400 AFY of recycled water through the year 2020. Some infrastructure was and is currently in place in anticipation of the expansion of the project into the City. However, the expansion did not occur and recycled water was unavailable to the City. The City does not project any recycled water use for subsequent years, and currently does not utilize or serve directly applied recycled water to any of its customers or for municipal uses.

8.7 Encouraging Recycled Water Use

Studies of water recycling opportunities within southern California provide a context for promoting the development of water recycling plans. It is recognized that broad public acceptance of recycled water requires continued education and public involvement. However, planning for most of the recycled water available is being directed toward replenishment of the Basin and improvements in groundwater quality. As a user of groundwater, the City supports the efforts of OCWD and OCSD to utilize recycled water as a primary resource for groundwater recharge in Orange County.

Public Education

The City participates in the MWDOC public education and school education programs, which include extensive sections on water recycling. MWDOC's water use efficiency public information programs are a partnership with agencies throughout the county.

Through a variety of public information programs, MWDOC reaches the public, including those in the City, with accurate information regarding present and future water supplies, the demands for a suitable quantity and quality of water, including recycled water, and the importance of implementing water efficient techniques and behaviors. Through MWDOC, water education programs have reached thousands of students with grade-specific programs that include information on recycled water. Between September 2004 and June 2005, school education presentations were made in six City schools reaching over 1,900 students. One school is expected to participate between September 2005 and June 2006 with over 1,900 students in attendance.

Financial Incentives

The implementation of recycled water projects involves a substantial upfront capital investment for planning studies, environmental impact reports, engineering design and construction before there is any recycled water to market. For some water agencies, these capital costs exceed the short-term expense of purchasing additional imported water supplies from Metropolitan.

The establishment of new supplemental funding sources through federal, state and regional programs now provide significant financial incentives for local agencies to develop and make use of recycled water. Potential sources of funding include federal, state and local funding opportunities. These funding sources include the USBR, California Proposition 13 Water Bond, and Metropolitan Local Resources Program. These funding opportunities may be sought by the City or possibly more appropriately by regional agencies. The City will continue to support seeking funding for regional water recycling projects and programs.

8.8 Optimizing Recycled Water Use

In Orange County, the majority of recycled water is used for irrigating golf courses, parks, schools, business and communal landscaping. However, future recycled water use can increase by requiring dual piping in new developments, retrofitting existing landscaped areas and constructing recycled water pumping stations and transmission mains to reach areas far from the treatment plants. Gains in implementing some of these projects have been made throughout the county; however, the additional costs, large energy requirements and facilities create such projects very expensive to pursue.

To optimize the use of recycled water, cost/benefit analysis must be conducted for each potential project. Once again, this brings about the discussion on technical and economic feasibility of a recycled water project requiring a relative comparison to alternative water supply options. For the City, analysis has shown capital costs exceed the short-term expense of purchasing additional imported water supplies from Metropolitan. Except for some limited irrigation expansion, it is not anticipated that direct reuse projects will be pursued by the City.

The City will continue to conduct cost/benefit analysis when feasible for recycled water projects, and seek creative solutions and a balance to recycled water use, in coordination with OCWD, Metropolitan and other cooperative agencies. These include solutions for funding, regulatory requirements, institutional arrangements and public acceptance.

APPENDIX A

CALIFORNIA URBAN WATER MANAGEMENT PLANNING ACT

Established: AB 797, Klehs, 1983
Amended: AB 2661, Klehs, 1990
AB 11X, Filante, 1991
AB 1869, Speier, 1991
AB 892, Frazee, 1993
SB 1017, McCorquodale, 1994
AB 2853, Cortese, 1994
AB 1845, Cortese, 1995
SB 1011, Polanco, 1995
AB 2552, Bates, 2000
SB 553, Kelley, 2000
SB 610, Costa, 2001
AB 901, Daucher, 2001
SB 672, Machado, 2001
SB 1348, Brulte, 2002
SB 1384, Costa, 2002
SB 1518, Torlakson, 2002
AB 105, Wiggins, 2004
SB 318, Alpert, 2004

CALIFORNIA WATER CODE DIVISION 6 PART 2.6. URBAN WATER MANAGEMENT PLANNING

CHAPTER 1. GENERAL DECLARATION AND POLICY

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. (a) The Legislature finds and declares all of the following:

(1) The waters of the state are a limited and renewable resource subject to ever-increasing demands.

(2) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.

(3) A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate.

(4) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years.

(5) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.

(6) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may

require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.
(7) Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.
(8) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.
(9) The quality of source supplies can have a significant impact on water management strategies and supply reliability.

(b) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:

(a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.
(b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.
(c) Urban water suppliers shall be required to develop water management plans to actively pursue the efficient use of available supplies.

CHAPTER 2. DEFINITIONS

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. "Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10616.5. "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

CHAPTER 3. URBAN WATER MANAGEMENT PLANS
Article 1. General Provisions

10620.

(a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d)

(1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those

plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

10621.

(a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero.

(b) Every urban water supplier required to prepare a plan pursuant to this part shall notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

(c) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

Article 2. Contents of Plans

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree.

For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(1) An average water year.

(2) A single dry water year.

(3) Multiple dry water years.

For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(e)

(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers.

(B) Residential plumbing retrofit.

(C) System water audits, leak detection, and repair.

(D) Metering with commodity rates for all new connections and retrofit of existing connections.

(E) Large landscape conservation programs and incentives.

(F) High-efficiency washing machine rebate programs.

(G) Public information programs.

(H) School education programs.

(I) Conservation programs for commercial, industrial, and institutional accounts.

(J) Wholesale agency programs.

(K) Conservation pricing.

(L) Water conservation coordinator.

(M) Water waste prohibition.

(N) Residential ultra-low-flush toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

(4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.

(h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

(j) Urban water suppliers that are members of the California Urban Water Conservation Council and submit annual reports to that council in accordance with the ‘‘Memorandum of Understanding Regarding Urban Water Conservation in California,’’ dated September 1991, may submit the annual reports identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirements of subdivisions (f) and (g).

(k) Urban water suppliers that rely upon a wholesale agency for a source of water, shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier’s plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c), including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

10631.5. The department shall take into consideration whether the urban water supplier is implementing or scheduled for implementation, the water demand management activities that the urban water supplier identified in its urban water management plan, pursuant to Section 10631, in evaluating applications for grants and loans made available pursuant to Section 79163. The urban water supplier may submit to the department copies of its annual reports and other relevant documents to assist the department in determining whether the urban water supplier is implementing or scheduling the implementation of water demand management activities.

10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:

(a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage.

(b) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

(c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

(d) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

(e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

(f) Penalties or charges for excessive use, where applicable.

(g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

(h) A draft water shortage contingency resolution or ordinance.

(i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area, and shall include all of the following:

(a) A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

(b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

(c) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

(f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

(g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

Article 2.5 Water Service Reliability

10635.

(a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

(c) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.

(d) Nothing in this article is intended to change existing law concerning an urban water supplier's obligation to provide water service to its existing customers or to any potential future customers.

Article 3. Adoption and Implementation of Plans

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630).

The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water demand management methods and techniques.

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644.

(a) An urban water supplier shall file with the department and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be filed with the department and any city or county within which the supplier provides water supplies within 30 days after adoption.

(b) The department shall prepare and submit to the Legislature, on or before December 31, in the years ending in six and one, a report summarizing the status of the plans adopted pursuant to this part. The report prepared by the department shall identify the outstanding elements of the individual plans. The department shall provide a copy of the report to each urban water supplier that has filed its plan with the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans submitted pursuant to this part.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

CHAPTER 4. MISCELLANEOUS PROVISIONS

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part.

(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of actions taken pursuant to Section 10632. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing Section 10632, or any project for expanded or additional water supplies.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board and the Public Utilities Commission, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board or the Public Utilities Commission requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

10654. An urban water supplier may recover in its rates the costs incurred in preparing its plan and implementing the reasonable water conservation measures included in the plan. Any best water management practice that is included in the plan that is identified in the "Memorandum of Understanding Regarding Urban Water Conservation in California" is deemed to be reasonable for the purposes of this section.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. An urban water supplier that does not prepare, adopt, and submit its urban water management plan to the department in accordance with this part, is ineligible to receive funding pursuant to Division 24 (commencing with Section 78500) or Division 26 (commencing with Section 79000), or receive drought assistance from the state until the urban water management plan is submitted pursuant to this article.

10657.

(a) The department shall take into consideration whether the urban water supplier has submitted an updated urban water management plan that is consistent with Section 10631, as amended by the act that adds this section, in determining whether the urban water supplier is eligible for funds made available pursuant to any program administered by the department.

(b) This section shall remain in effect only until January 1, 2006, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2006, deletes or extends that date.

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APPENDIX B

2005 URBAN WATER MANAGEMENT PLAN "REVIEW FOR COMPLETENESS" FORM

2005 Urban Water Management Plan "Review for Completeness" Form

For DWR Review Staff Use

Coordination with Appropriate Agencies	**(Water Code § 10620 (d)(1)(2))**

Yes

X	Participated in area, regional, watershed or basin wide plan	Sec 1, p.1-2	Reference & Page Number
	Name of plan 2005 UWMP Lead Agency City of Huntington Beach	Sec 1, p.1-2	Reference & Page Number
X	Describe the coordination of the plan preparation and anticipated benefits.	Sec 1, p.1-2	Reference & Page Number

Table 1
Coordination with Appropriate Agencies

Check at least one box on each row	Participated in developing the plan	Commented on the draft	Attended public meetings	Was contacted for assistance	Was sent a copy of the draft plan	Was sent a notice of intention to adopt	Not Involve / No Informatio
Public Works Dept.	X	X	X	X	X	X	
City Departments	X		X	X	X	X	
Municipal Water District of Orange County	X			X		X	
Orange County Water District	X			X		X	
Orange County Sanitation District	X			X		X	
Metropolitan Water District of Southern California	X			X		X	
County of Orange						X	X

Describe resource maximization / import minimization plan	**(Water Code §10620 (f))**

X	Describe how water management tools / options maximize resources & minimize need to import water	Sec 2, p.2-3	Reference & Page Number

Plan Updated in Years Ending in Five and Zero	**(Water Code § 10621(a))**

X	Date updated and adopted plan received ____________ (enter date)	Sec 1, p.1-2	Reference & Page Number

City and County Notification and Participation	**(Water Code § 10621(b))**

X	Notify any city or county within service area of UWMP of plan review & revision	Sec 1, p.1-2	Reference & Page Number
X	Consult and obtain comments from cities and counties within service area	Sec 1, p.1-2	Reference & Page Number

Service Area Information		**Water Code § 10631 (a))**	
X	Include current and projected population	Sec 1, p.1-5	Reference & Page Number
X	Population projections were based on data from state, regional or local agency	Sec 1, p.1-5	Reference & Page Number

Table 2
Population - Current and Projected

	2005	2010	2015	2020	2025	2030 - opt
Service Area Population	201,692	212,893	217,957	220,759	222,274	223,992

X	Describe climate characteristics that affect water management	Sec 1, p.1-3	Reference & Page Number
X	Describe other demographic factors affecting water management	Sec 1, p.1-3	Reference & Page Number

Table 3
Climate

	January	February	March	April	May	June
Standard Average ETo						
Average Rainfall	2	2	2	2	--	--
Average Temperature						

Table 3 (continued)
Climate

	July	August	September	October	November	December	Annual
Average ETo							
Average Rainfall	--	--	--	--	2	2	**10-12 inch**
Average Temperature							**62 ^{o}F**

Water Sources		(Water Code § 10631 (b))	
X	Identify existing and planned water supply sources	Sec 2, p.2-1	Reference & Page Number
X	Provide current water supply quantities	Sec 2, p.2-3	Reference & Page Number
X	Provide planned water supply quantities	Sec 2, p.2-3	Reference & Page Number

Table 4
Current and Planned Water Supplies - AFY

Water Supply Sources	2005	2010	2015	2020	2025	2030 - opt
Water purchased from:						
Municipal Water District of Orange County - Import	11,772	13,620	13,320	14,170	13,470	12,78
Orange County Water District-Groundwater	22,183	24,300	24,540	24,790	25,040	25,26
Total	**33,955**	**37,920**	**37,860**	**38,960**	**38,510**	**38,04**

If Groundwater identified as existing or planned source		(Water Code §10631 (b)(1-4))	
	Has management plan		Reference & Page Number
	Attached management plan (b)(1)		Reference & Page Number
X	Description of basin(s) (b)(2)	Sec 2, p.2-4	Reference & Page Number
	Basin is adjudicated		Reference & Page Number
	If adjudicated, attached order or decree (b)(2)		Reference & Page Number
	Quantified amount of legal pumping right (b)(2)		Reference & Page Number

Table 5
Groundwater Pumping Rights - AF Year

Basin Name	Pumping Right - AFY
Orange County Groundwater Basin (Coastal Plain of Orange County)	Managed Basin
Total	0

X	DWR identified, or projected to be, in overdraft (b)(2)	Sec 2, p.2-5	Reference & Page Number
X	Plan to eliminate overdraft (b)(2)	Sec 2, p.2-5	Reference & Page Number
X	Analysis of location, amount & sufficiency, last five years (b)(3)	Sec 2, p.2-9	Reference & Page Number
X	Analysis of location & amount projected, 20 years (b)(4)	Sec 2, p.2-9	Reference & Page Number

Table 6 Amount of Groundwater pumped - AFY					
Basin Name (s)	**2000**	**2001**	**2002**	**2003**	**2004**
Orange County Groundwater Basin (Coastal Plain of Orange County)		18,242.70	24,580.60	14,118.20	13,188.20
% of Total Water Supply		49.0%	68.0%	39.0%	37.0%

Table 7 Amount of Groundwater projected to be pumped - AFY					
Basin Name(s)	**2010**	**2015**	**2020**	**2025**	**2030 - opt**
Orange County Groundwater Basin (Coastal Plain of Orange County)	24,300	24,540	24,790	25,040	25,260
% of Total Water Supply	64.1%	64.8%	63.6%	65.0%	66.4%

Reliability of Supply **(Water Code §10631 (c) (1-3)**

X Describes the reliability of the water supply and vulnerability to seasonal or climatic shortage Sec 4,4-1,26 Reference & Page Number

Table 8 Supply Reliability - AF Year					
		Multiple Dry Water Years			
Average / Normal Water Year (2006)	**Single Dry Water Year**	**Year 1**	**Year 2**	**Year 3**	**Year 4**
35,900	36,400	35,900	36,400	36,900	
35,900	36,400	36,900	37,400	37,920	
% of Normal	100.0%	102.8%	102.7%	102.8%	0.0%

Table 9 Basis of Water Year Data				
Water Year Type	Year	Source name	Source name	
Average Water Year	1922-2004	MWD of SC		Sec 4, p.4-15 Reference & Page Number
Single-Dry Water Year	1997	MWD of SC		Sec 4, p.4-15 Reference & Page Number
Multiple-Dry Water Years	1990-92	MWD of SC		Sec 4, p.4-15 Reference & Page Number

Water Sources Not Available on a Consistent Basis (Water Code §10631 (c))

X	Describe the reliability of the water supply due to seasonal or climatic shortages	Sec 4, p.4-26	Reference & Page Number
X	Describe the vulnerability of the water supply to seasonal or climatic shortages	Sec 4, p.4-26	Reference & Page Number
X	No unreliable sources	Sec 4, p.4-26	Reference & Page Number

Table 10
Factors resulting in inconsistency of supply

Name of supply	Legal	Environ-mental	Water Quality	Climatic

	Describe plans to supplement or replace inconsistent sources with alternative sources or DMMs		Reference & Page Number
X	No inconsistent sources	Sec 4, p.4-1	Reference & Page Number

Transfer or Exchange Opportunities (Water Code §10631 (d))

X	Describe short term and long term exchange or transfer opportunities	Sec 4, p.4-34	Reference & Page Number
	No transfer opportunities		Reference & Page Number

Table11
Transfer and Exchange Opportunities - AF Year

Transfer Agency	Transfer or Exchange	Short term	Proposed Quantities	Long term	Proposed Quantities
Total			0		0

Water Use Provisions		**(Water Code §10631 (e)(1)(2))**	
X	Quantify past water use by sector	Sec 5, p.5-1	Reference & Page Number
X	Quantify current water use by sector	Sec 5, p.5-1	Reference & Page Number
X	Project future water use by sector	Sec 5, p.5-1	Reference & Page Number

TABLE 12 - Past, Current and Projected Water Deliveries

	2000		**2005**		**2010**	
	metered		metered		metered	
Water Use Sectors	# of accounts	Deliveries AFY	# of accounts	Deliveries AFY	# of accounts	Deliveries AFY
Accts=SFR; Residential=AFY	42,714	23,707	43,887	24,474	44,880	25,029
Multi-family	4,120	0	4,173	0	4,270	0
Commercial/Industrial	2,697	6,019	2,644	6,213	2,700	6,355
Municipal/Irrigation	1,276	3,151	1,464	3,254	1,490	3,326
Total	50,807	32,877	52,168	33,941	53,340	34,710

TABLE12 (continued) - Past, Current and Projected Water Deliveries

	2015		**2020**		**2025**		**20:**
	metered		metered		metered		m
Water Use Sectors	# of accounts	Deliveries AFY	# of accounts	Deliveries AFY	# of accounts	Deliveries AFY	# of accoun
Accts=SFR; Residential=AFY	45,330	25,281	45,780	25,533	46,250	25,793	46,66
Multi-family	4,310	0	4,350	0	4,390	0	4,43
Commercial/Industrial	2,720	6,419	2,740	6,483	2,760	6,549	2,78
Municipal/Irrigation	1,510	3,360	1,530	3,394	1,550	3,428	1,57
Total	53,870	35,060	54,400	35,410	54,950	35,770	55,44

	Identify and quantify sales to other agencies		Reference & Page Number
X	No sales to other agencies	Sec 5, p. 5-1	Reference & Page Number

Table 13 Sales to Other Agencies - AF Year						
Water Distributed	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
name of agency	0	0	0	0	0	
name of agency						
name of agency						
Total	0	0	0	0	0	

X Identify and quantify additional water uses — Sec 5, p.5-1 Reference & Page Number

Table 14 Additional Water Uses and Losses - AF Year						
Water Use	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Total	0	0	0	0	0	

Any recycled water was included in table 12 should not be included in table 14.

Table 15 Total Water Use - AF Year						
Water Use	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Total of Tables 12, 13, 14	32,877	33,941	34,710	35,060	35,410	35,770

2005 Urban Water Management Plan "Review of DMMs for Completeness" Form (Water Code §10631 (f)

(Water Code §10631 (f) & (g), the 2005 Urban Water Management Plan "Review of DMMs for Completeness" Form is found on Sheet 2

Planned Water Supply Projects and Programs, including non-implemented DMMs (Water Code §10631 (g))

X	No non-implemented / not scheduled DMMs	Sec 6, p.6-1	Reference & Page Number
	Cost-Benefit includes economic and non-economic factors (environmental, social, health, customer impact, and technological factors)		Reference & Page Number
	Cost-Benefit analysis includes total benefits and total costs		Reference & Page Number
	Identifies funding available for Projects with higher per-unit-cost than DMMs		Reference & Page Number
X	Identifies Suppliers' legal authority to implement DMMs, efforts to implement the measures and efforts to identify cost share partners	Sec 6, p.6-1	Reference & Page Number

Table 16 Evaluation of unit cost of water resulting from non-implemented / non-scheduled DMMs and planned water supply project and programs	
Non-implemented & Not Scheduled DMM / Planned Water Supply Projects (Name)	**Per-AF Cost ($)**

Planned Water Supply Projects and Programs **(Water Code §10631 (h))**

[ ]	No future water supply projects or programs		
[X]	Detailed description of expected future supply projects & programs	Sec 4, p.4-26	Reference & Page Number
[X]	Timeline for each proposed project	Sec 4,p.4-26+	Reference & Page Number
[ ]	Quantification of each projects normal yield (AFY)		Reference & Page Number
[ ]	Quantification of each projects single dry-year yield (AFY)		Reference & Page Number
[ ]	Quantification of each projects multiple dry-year yield (AFY)		Reference & Page Number

Table 17 Future Water Supply Projects							
Project Name	**Projected Start Date**	**Projected Completion Date**	**Normal-year AF to agency**	**Single-dry year yield AF**	**Multiple-Dry-Year 1 AF**	**Multiple-Dry-Year 2 AF**	**Multiple-Dr Year 3 AF**

Opportunities for development of desalinated water **(Water Code §10631 (i))**

[X]	Describes opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply	Sec 4, p.4-35	Reference & Page Number
[ ]	No opportunities for development of desalinated water		Reference & Page Number

Table 18 Opportunities for desalinated water	
Sources of Water	**Check if yes**
Ocean Water (by Metropolitan)	X
Brackish ocean water	
Brackish groundwater	

District is a CUWCC signatory **(Water Code § 10631 (j))**

Urban suppliers that are California Urban Water Conservation Council members may submit the annual reports identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirements of subdivisions (f) and (g). The supplier's CUWCC Best Management Practices Report should be attached to the UWMP.

X	Agency is a CUWCC member	Sec 6, p.6-1	Reference & Page Number
X	2003-04 annual updates are attached to plan	Sec 6, p.6-1	Reference & Page Number
X	Both annual updates are considered completed by CUWCC website	Sec 6, p.6-1	Reference & Page Number

If Supplier receives or projects receiving water from a wholesale supplier **(Water Code §10631 (k))**

	Yes			
	X	Agency receives, or projects receiving, wholesale water	Sec 2, p.2-1	Reference & Page Number
X		Agency provided written demand projections to wholesaler, 20 years	Sec 4, p.4-19	Reference & Page Number

Table 19 Agency demand projections provided to wholesale suppliers - AFY					
Wholesaler	**2010**	**2015**	**2020**	**2025**	**2030 - opt**
Municipal Water District of Orange County	10,410	10,520	10,620	10,730	10,830
(name 2)					
(name 3)					

X	Wholesaler provided written water availability projections, by source, to agency, 20 years	Sec 4, p.4-19	Reference & Page Number

(if agency served by more than one wholesaler, duplicate this table and provide the source availability for each wholesaler)

Table 20 Wholesaler identified & quantified the existing and planned sources of water- AFY					
Wholesaler sources	**2010**	**2015**	**2020**	**2025**	**2030 - opt**
Metropolitan WD of So Calif	13,620	13,320	14,170	13,470	12,780
(source 2)					
(source 3)					

X Reliability of wholesale supply provided in writing by wholesale agency — Sec. 4,4-16,17 — Reference & Page Number

(if agency served by more than one wholesaler, duplicate this table and provide the source availability for each wholesaler)

Table 21
Wholesale Supply Reliability - % of normal AFY

	Multiple Dry Water Years(MDY) (MWD Projected Year 3 of MDY)				
Wholesaler sources	**Single Dry 2010**	**2010**	**2015**	**2020**	**2025**
Metropolitan WD of So Calif	106.5%	98.2%	106.8%	103.3%	102.4%
(source 2)					
(source 3)					

Table 22
Factors resulting in inconsistency of wholesaler's supply

Name of supply	Legal	Environment	Water Quality	Climatic

Water Shortage Contingency Plan Section (Water Code § 10632)

Stages of Action (Water Code § 10632 (a))

X Provide stages of action — Sec 7, p.7-1 — Reference & Page Number

X Provide the water supply conditions for each stage — Sec 7, p.7-2 — Reference & Page Number

X Includes plan for 50 percent supply shortage — Sec 7, p.7-2 — Reference & Page Number

Table 23
Water Supply Shortage Stages and Conditions
RATIONING STAGES

Stage No.	Water Supply Conditions	% Shortage
Shortage Stage 1	General water supply shortage due to increased demand or limited supplies	
Shortage Stage 2	Major failure of Metroolitan or City supply, storage and distribution facilties	
Shortage Stage 3	Local or regional disaster, which limits the water supply	

Three-Year Minimum Water Supply (Water Code §10632 (b))

X	Identifies driest 3-year period	Sec 4, p.4-14	Reference & Page Number
X	Minimum water supply available by source for the next three years	Sec 7, p.7-7	Reference & Page Number

Table 24
Three-Year Estimated Minimum Water Supply - AF Year

source**	2006	2007	2008	
Local Supplies	24,140	24,470	25,690	
Imported Supply	13,580	13,770	13,080	
Total	37,720	38,240	38,770	0

*Note: If reporting after 2005, please chan the column headers (Year 1, 2, & 3) to the appropriate years

Preparation for catastrophic water supply interruption (Water Code §10632 (c))

X	Provided catastrophic supply interruption plan	Sec 7, p.7-8	Reference & Page Number

Table 25
Preparation Actions for a Catastrophe

Possible Catastrophe	Check if Discussed
Regional power outage	X
Earthquake	X
Water Repairs	X

Prohibitions (Water Code § 10632 (d))

X	List the mandatory prohibitions against specific water use practices during water shortages	Sec 7, p.7-9 Appendix F	Reference & Page Number

Table 26
Mandatory Prohibitions

Examples of Prohibitions	Stage When Prohibition Becomes Mandatory
Use of fire hydrants	Wtr shortage
Imporoper fixtures which lead to waste water	Wtr shortage
Use of meters	Wtr shortage
Drawing into steam boilers	Wtr shortage
Water sales outside of City	Wtr shortage
Cross-connections protection	Wtr shortage

Consumption Reduction Methods (Water Code § 10632 (e))

- [X] List the consumption reduction methods the water supplier will use to reduce water use in the most restrictive stages with up to a 50% reduction. — Sec 7, p.7-9; Appendix F — Reference & Page Number

Table 27 Consumption Reduction Methods		
Consumption Reduction Methods	Stage When Method Takes Effect	Projected Reduction (%)
Water Management Program		50

Penalties (Water Code § 10632 (f))

- [X] List excessive use penalties or charges for excessive use — Sec 7, p.7-9 — Reference & Page Number

Table 28 Penalties and Charges	
Penalties or Charges	Stage When Penalty Takes Effect
Misdemeanor	Violation of Water Management Program
Discontinuation of water	Violation of Ordinance

Revenue and Expenditure Impacts (Water Code § 10632 (g))

- [X] Describe how actions and conditions impact revenues — Sec 7, p.7-10 — Reference & Page Number
- [X] Describe how actions and conditions impact expenditures — Sec 7, p.7-10 — Reference & Page Number
- [X] Describe measures to overcome the revenue and expenditure impacts — Sec 7, p.7-10 — Reference & Page Number

Table 29 Proposed measures to overcome revenue impacts	
Names of measures	Check if Discussed
Rate adjustment	X
Development of reserves	X

Table 30 Proposed measures to overcome expenditure impacts	
Names of measures	**Check if Discussed**
Monitor projected expenditures	X

Water Shortage Contingency Ordinance/Resolution **(Water Code § 10632 (h))**

[X] Attach a copy of the draft water shortage contingency resolution or ordinance. Sec. 7,7-12 Appendix F Reference & Page Number

Reduction Measuring Mechanism **(Water Code § 10632 (i))**

[X] Provided mechanisms for determining actual reductions Sec 7, p.7-12 Reference & Page Number

Table 31 Water Use Monitoring Mechanisms	
Mechanisms for determining actual reductions	**Type data expected (pop-up?)**
Daily/Weekly/Monthly Reports	**Estimated water savings**
Drought Program Officer activities	**Monitored effectiveness**

Recycling Plan Agency Coordination **Water Code § 10633**

[X] Describe the coordination of the recycling plan preparation information to the extent available Sec 8, p.8-1 Reference & Page Number

Table 32 Participating agencies	
	participated
Water agencies	
Wastewater agencies	OCSD
Groundwater agencies	OCWD
Planning Agencies	

Wastewater System Description (Water Code § 10633 (a))

X	Describe the wastewater collection and treatment systems in the supplier's service area	Sec 8, p.8-1	Reference & Page Number
X	Quantify the volume of wastewater collected and treated	Sec 8, p.8-2	Reference & Page Number

Table 33
Wastewater Collection and Treatment - AF Year

Type of Wastewater	2000	2005	2010	2015	2020	2025
Wastewater collected & treated in service area	24,145	23,900	25,950	27,290	28,385	28,58
Volume that meets recycled water standard	All of RP-1 and 33% of RP-2					

Wastewater Disposal and Recycled Water Uses (Water Code § 10633 (a - d))

X	Describes methods of wastewater disposal	Sec 8, p.8-1	Reference & Page Number
X	Describe the current type, place and use of recycled water	Sec 8, p.8-3	Reference & Page Number
	None		Reference & Page Number
X	Describe and quantify potential uses of recycled water	Sec 8, p.8-5	Reference & Page Number

Table 34
Disposal of wastewater in OCSD Service Area (non-recycled) AF Year

Method of disposal	Treatment Level	2005	2010	2015	2020	2025
OCSD ocean discharge	Secondary Treatment	249,678	197,055	217,209	200,414	200,41
	Total	249,678	197,055	217,209	200,414	200,41

Table 35
Recycled Water Uses - Actual and Potential (AFY)

User type	Treatment Level	2005	2010	2015	2020	2025
Agriculture						
Landscape						
Wildlife Habitat						
Wetlands						
Industrial						
Groundwater Recharge						
Other (user type)						
Other (user type)						
	Total	0	0	0	0	

X	Determination of technical and economic feasibility of serving the potential uses	Sec 8,p.8-5/7	Reference & Page Number

Projected Uses of Recycled Water		**(Water Code § 10633 (e))**	
X	Projected use of recycled water, 20 years	Sec 8,p. 8-5	Reference & Page Number

Table 36
Projected Future Use of Recycled Water in Service Area - AF Year

	2010	2015	2020	2025	2030 - opt
Projected use of Recycled Water	0	0	0	0	0

X	Compare UWMP 2000 projections with UWMP 2005 actual (§ 10633 (e))	Sec 8, p.8-5	Reference & Page Number
X	None	Sec 8, p.8-5	Reference & Page Number

Table 37
Recycled Water Uses - 2000 Projection compared with 2005 actual - AFY

User type	2000 Projection for 2005	2005 actual use
Agriculture		
Landscape		
Wildlife Habitat		
Wetlands		
Industrial		
Groundwater Recharge		
Other (user type)		
Other (user type)		
Total	0	0

Plan to Optimize Use of Recycled Water		**(Water Code § 10633 (f))**	
X	Describe actions that might be taken to encourage recycled water uses	Sec 8, p.8-6	Reference & Page Number
	Describe projected results of these actions in terms of acre-feet of recycled water used per year		Reference & Page Number

Table 38 Methods to Encourage Recycled Water Use					
Actions	AF of use projected to result from this action				
	2010	2015	2020	2025	2030 - opt
Financial incentives					
Public Education					
Total	0	0	0	0	

[X] Provide a recycled water use optimization plan which includes actions to facilitate the use of recycled water (dual distribution systems, promote recirculating uses) — Sec 8, p.8-6 Reference & Page Number

Water quality impacts on availability of supply **(Water Code §10634)**

[X] Discusses water quality impacts (by source) upon water management strategies and supply reliability — Sec 3 , p.3-9 Reference & Page Number

[ ] No water quality impacts projected

Table 39 Current & projected water supply changes due to water quality - percentage						
water source	2005	2010	2015	2020	2025	2030 - opt

Supply and Demand Comparison to 20 Years **(Water Code § 10635 (a))**

[X] Compare the projected normal water supply to projected normal water use over the next 20 years, in 5-year increments. — Sec 4, p.4-21 Reference & Page Number

Table 40 Projected Normal Water Supply - AF Year					
(from table 4)	2010	2015	2020	2025	2030 - opt
Supply	37,920	37,860	38,960	38,510	38,040
% of year 2005	100.0%	100.0%	100.0%	100.0%	100.0%

Table 41 Projected Normal Water Demand - AF Year					
(from table 15)	2010	2015	2020	2025	2030 - opt
Demand	34,710	35,060	35,410	35,770	36,090
% of year 2005	102.3%	103.3%	104.3%	105.4%	106.3%

Table 42 Projected Supply and Demand Comparison - AF Year					
	2010	**2015**	**2020**	**2025**	**2030 - opt**
Supply totals	37,920	37,860	38,960	38,510	38,040
Demand totals	34,710	35,060	35,410	35,770	36,090
Difference	3,210	2,800	3,550	2,740	1,950
Difference as % of Supply	8.5%	7.4%	9.1%	7.1%	5.1%
Difference as % of Demand	9.2%	8.0%	10.0%	7.7%	5.4%

Supply and Demand Comparison: Single-dry Year Scenario **(Water Code § 10635 (a))**

X Compare the projected single-dry year water supply to projected single-dry year water use over the next 20 years, in 5-year increments. Sec 4, p.4-20 Reference & Page Number

Table 43 Projected single dry year Water Supply - AF Year					
	2010	**2015**	**2020**	**2025**	**2030 - opt**
Supply	38,530	39,760	40,410	39,900	39,570
% of projected normal	101.6%	105.0%	103.7%	103.6%	104.0%

Table 44 Projected single dry year Water Demand - AF Year					
	2010	**2015**	**2020**	**2025**	**2030 - opt**
Demand	36,620	36,990	37,360	37,740	38,070
% of projected normal	105.5%	105.5%	105.5%	105.5%	105.5%

Table 45 Projected single dry year Supply and Demand Comparison - AF Year					
	2010	**2015**	**2020**	**2025**	**2030 - opt**
Supply totals	38,530	39,760	40,410	39,900	39,570
Demand totals	36,620	36,990	37,360	37,740	38,070
Difference	1,910	2,770	3,050	2,160	1,500
Difference as % of Supply	5.0%	7.0%	7.5%	5.4%	3.8%
Difference as % of Demand	5.2%	7.5%	8.2%	5.7%	3.9%

Supply and Demand Comparison: Multiple-dry Year Scenario **(Water Code § 10635 (a))**

X Project a multiple-dry year period (as identified in Table 9) occurring between 2006-2010 and compare projected supply and demand during those years — Sec 4, p.4-21 Reference & Page Number

Table 46 Projected supply during multiple dry year period ending in 2010 - AF Year					
	2006	2007	2008	2009	2010
Supply	35,900.0	36,400.0	38,770.0	38,320.0	39,000.0
% of projected normal	100.0%	100.0%	105.1%	102.5%	102.4%

Table 47 Projected demand multiple dry year period ending in 2010 - AFY					
	2006	2007	2008	2009	2010
Demand	34,090	34,250	36,700	35,840	36,620
% of projected normal	100.0%	100.0%	106.7%	103.7%	105.5%

Table 48 Projected Supply and Demand Comparison during multiple dry year period ending in 2010- AF Year					
	2006	2007	2008	2009	2010
Supply totals	35,900	36,400	38,770	38,320	39,000
Demand totals	34,090	34,250	36,700	35,840	36,620
Difference	1,810	2,150	2,070	2,480	2,380
Difference as % of Supply	5.0%	5.9%	5.3%	6.5%	6.1%
Difference as % of Demand	5.3%	6.3%	5.6%	6.9%	6.5%

X Project a multiple-dry year period (as identified in Table 9) occurring between 2011-2015 and compare projected supply and demand during those years — Sec 4, p.4-22 Reference & Page Number

Table 49 Projected supply during multiple dry year period ending in 2015 - AF Year					
	2011	2012	2013	2014	2015
Supply	37,910	37,900	40,430	39,660	40,120
% of projected normal	100.0%	100.0%	104.0%	102.1%	106.0%

Table 50 Projected demand multiple dry year period ending in 2015 - AFY					
	2011	2012	2013	2014	2015
Demand	34,780	34,850	37,260	36,280	36,990
% of projected normal	102.5%	102.7%	109.8%	106.9%	109.0%

Table 51 Projected Supply and Demand Comparison during multiple dry year period ending in 2015- AF Year					
	2011	2012	2013	2014	2015
Supply totals	37,910	37,900	40,430	39,660	40,120
Demand totals	34,780	34,850	37,260	36,280	36,990
Difference	3,130	3,050	3,170	3,380	3,130
Difference as % of Supply	8.3%	8.0%	7.8%	8.5%	7.8%
Difference as % of Demand	9.0%	8.8%	8.5%	9.3%	8.5%

X Project a multiple-dry year period (as identified in Table 9) occurring between 2016-2020 and compare projected supply and demand during those years — Sec 4, p.4-23 Reference & Page Number

Table 52 Projected supply during multiple dry year period ending in 2020 - AF Year					
	2016	2017	2018	2019	2020
Supply	38,080	38,300	40,800	39,980	40,790
% of projected normal	100.0%	100.0%	105.9%	103.2%	104.7%

Table 53 Projected demand multiple dry year period ending in 2020 - AFY					
	2016	2017	2018	2019	2020
Demand	35,130	35,200	37,630	36,510	37,360
% of projected normal	103.5%	103.7%	110.9%	107.6%	110.1%

Table 54 Projected Supply and Demand Comparison during multiple dry year period ending in 2020- AF Year					
	2016	**2017**	**2018**	**2019**	**2020**
Supply totals	38,080	38,300	40,800	39,980	40,790
Demand totals	35,130	35,200	37,630	36,510	37,360
Difference	2,950	3,100	3,170	3,470	3,430
Difference as % of Supply	7.7%	8.1%	7.8%	8.7%	8.4%
Difference as % of Demand	8.4%	8.8%	8.4%	9.5%	9.2%

[X] Project a multiple-dry year period (as identified in Table 9) occurring between 2021-2025 and compare projected supply and demand during those years — Sec 4, p.4-24 Reference & Page Number

Table 55 Projected supply during multiple dry year period ending in 2025 - AF Year					
	2021	**2022**	**2023**	**2024**	**2025**
Supply	38,870	38,780	40,130	39,560	40,210
% of projected normal	100.0%	100.0%	103.7%	102.5%	104.4%

Table 56 Projected demand multiple dry year period ending in 2025 - AFY					
	2021	**2022**	**2023**	**2024**	**2025**
Demand	35,480	35,550	38,020	37,020	37,740
% of projected normal	100.0%	100.0%	106.7%	103.7%	105.5%

Table 57 Projected Supply and Demand Comparison during multiple dry year period ending in 2025- AF Year					
	2021	**2022**	**2023**	**2024**	**2025**
Supply totals	38,870	38,780	40,130	39,560	40,210
Demand totals	35,480	35,550	38,020	37,020	37,740
Difference	3,390	3,230	2,110	2,540	2,470
Difference as % of Supply	8.7%	8.3%	5.3%	6.4%	6.1%
Difference as % of Demand	9.6%	9.1%	5.5%	6.9%	6.5%

Provision of Water Service Reliability section to cities/counties within service area			(Water Code § 10635(b))	
X	Provided Water Service Reliability section of UWMP to cities and counties within which it provides water supplies within 60 days of UWMP submission to DWR		Sec 1, p.1-2	Reference & Page Number

Does the Plan Include Public Participation and Plan Adoption			(Water Code § 10642)	
X	Attach a copy of adoption resolution	Sec 1, p.1-2	Appendix C	Reference & Page Number
X	Encourage involvement of social, cultural & economic community groups		Sec 1, p.1-2	Reference & Page Number
X	Plan available for public inspection		Sec 1, p.1-2	Reference & Page Number
X	Provide proof of public hearing	Sec 1, p.1-2	Appendix C	Reference & Page Number
X	Provided meeting notice to local governments		Sec 1, p.1-2	Reference & Page Number

Review of implementation of 2000 UWMP			(Water Code § 10643)	
X	Reviewed implementation plan and schedule of 2000 UWMP		Sec 1, p.1-3	Reference & Page Number
X	Implemented in accordance with the schedule set forth in plan		Sec 1, p.1-3	Reference & Page Number
	2000 UWMP not required			Reference & Page Number

Provision of 2005 UWMP to local governments			(Water Code § 10644 (a))	
X	Provide 2005 UWMP to DWR, and cities and counties within 30 days of adoption		Sec 1, p.1-2	Reference & Page Number

Does the plan or correspondence accompanying it show where it is available for public review			(Water Code § 10645)	
X	Does UWMP or correspondence accompanying it show where it is available for public review	Sec 1, p.1-2,	Back Cover	Reference & Page Number

APPENDIX C

NOTICE OF PUBLIC HEARING

(Copy of Proof of Publication of Notice for Public Hearing to be inserted)

(Copy of Executed Resolution for Plan Adoption to be inserted)

APPENDIX D

REFERENCES

City of Huntington Beach

2005 Urban Water Management Plan

REFERENCES

Assembly Bill 797, *California Water Code Division 6 Part 2.6 Urban Water Management Planning,* 1983, as amended to 2005

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APPENDIX E

CUWCC ACTIVITY REPORTS, ANNUAL REPORTS AND COVERAGE REPORTS FOR WATER CONSERVATION BEST MANAGEMENT PRACTICES

Water Supply & Reuse

Reporting Unit:
City of Huntington Beach

Year:
2004

Water Supply Source Information		
Supply Source Name	**Quantity (AF) Supplied**	**Supply Type**
OCWD	12716	Groundwater
MWDOC	21444	Imported

Total AF: 34160

Accounts & Water Use

Reporting Unit Name:
City of Huntington Beach

Submitted to CUWCC
11/17/2004

Year:
2004

A. Service Area Population Information:

1. Total service area population 206000

B. Number of Accounts and Water Deliveries (AF)

Type	Metered		Unmetered	
	No. of Accounts	Water Deliveries (AF)	No. of Accounts	Water Deliveries (AF)
1. Single-Family	43819	15900	0	0
2. Multi-Family	4147	7290	0	0
3. Commercial	2321	4649	0	0
4. Industrial	307	683	0	0
5. Institutional	601	1112	0	0
6. Dedicated Irrigation	853	2152	0	0
7. Recycled Water	1	0	0	0
8. Other	0	20	0	0
9. Unaccounted	NA	2354	NA	0
Total	52049	34160	0	0
	Metered		**Unmetered**	

BMP 01: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

1. Based on your signed MOU date, 08/23/2000, your Agency STRATEGY DUE DATE is:	08/23/2002
2. Has your agency developed and implemented a targeting/ marketing strategy for SINGLE-FAMILY residential water use surveys?	yes
a. If YES, when was it implemented?	6/1/2000
3. Has your agency developed and implemented a targeting/ marketing strategy for MULTI-FAMILY residential water use surveys?	no
a. If YES, when was it implemented?	

B. Water Survey Data

Survey Counts:	**Single Family Accounts**	**Multi-Family Units**
1. Number of surveys offered:	0	0
2. Number of surveys completed:	0	0
Indoor Survey:		
3. Check for leaks, including toilets, faucets and meter checks	yes	no
4. Check showerhead flow rates, aerator flow rates, and offer to replace or recommend replacement, if necessary	yes	no
5. Check toilet flow rates and offer to install or recommend installation of displacement device or direct customer to ULFT replacement program, as necessary; replace leaking toilet flapper, as necessary	yes	no
Outdoor Survey:		
6. Check irrigation system and timers	yes	no
7. Review or develop customer irrigation schedule	yes	no
8. Measure landscaped area (Recommended but not required for surveys)	yes	no
9. Measure total irrigable area (Recommended but not required for surveys)	yes	no
10. Which measurement method is typically used (Recommended but not required for surveys)	Odometer Wheel	
11. Were customers provided with information packets that included evaluation results and water savings recommendations?	yes	no

12. Have the number of surveys offered and completed, survey results, and survey costs been tracked? yes no

a. If yes, in what form are surveys tracked? None

b. Describe how your agency tracks this information.

C. Water Survey Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

See 2003 comments

BMP 02: Residential Plumbing Retrofit

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

1. Is there an enforceable ordinance in effect in your service area requiring replacement of high-flow showerheads and other water use fixtures with their low-flow counterparts?	no
a. If YES, list local jurisdictions in your service area and code or ordinance in each:	
2. Has your agency satisfied the 75% saturation requirement for single-family housing units?	yes
3. Estimated percent of single-family households with low-flow showerheads:	100%
4. Has your agency satisfied the 75% saturation requirement for multi-family housing units?	yes
5. Estimated percent of multi-family households with low-flow showerheads:	86.6%

6. If YES to 2 OR 4 above, please describe how saturation was determined, including the dates and results of any survey research.

See the comments for 2003. These apply for 2004.

B. Low-Flow Device Distribution Information

1. Has your agency developed a targeting/ marketing strategy for distributing low-flow devices?	yes
a. If YES, when did your agency begin implementing this strategy?	6/1/2000

b. Describe your targeting/ marketing strategy.
See 2003 comments.

Low-Flow Devices Distributed/ Installed	**SF Accounts**	**MF Units**
2. Number of low-flow showerheads distributed:	0	0
3. Number of toilet-displacement devices distributed:	0	0
4. Number of toilet flappers distributed:	0	0
5. Number of faucet aerators distributed:	0	0

6. Does your agency track the distribution and cost of low-flow devices?	yes
a. If YES, in what format are low-flow devices tracked?	Database

b. If yes, describe your tracking and distribution system :
When the program was running, the costs were tracked by the vendor.

C. Low-Flow Device Distribution Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

See BMP #1

BMP 03: System Water Audits, Leak Detection and Repair

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

1. Has your agency completed a pre-screening system audit for this reporting year?	no
2. If YES, enter the values (AF/Year) used to calculate verifiable use as a percent of total production:	
a. Determine metered sales (AF)	31786
b. Determine other system verifiable uses (AF)	20
c. Determine total supply into the system (AF)	34160
d. Using the numbers above, if (Metered Sales + Other Verifiable Uses) / Total Supply is < 0.9 then a full-scale system audit is required.	0.93
3. Does your agency keep necessary data on file to verify the values used to calculate verifiable uses as a percent of total production?	yes
4. Did your agency complete a full-scale audit during this report year?	no
5. Does your agency maintain in-house records of audit results or the completed AWWA audit worksheets for the completed audit?	yes
6. Does your agency operate a system leak detection program?	no
a. If yes, describe the leak detection program:	

B. Survey Data

1. Total number of miles of distribution system line.	520
2. Number of miles of distribution system line surveyed.	0

C. System Audit / Leak Detection Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No
a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."	

E. Comments

Unaccounted water loss does not warrant a leak survey.

BMP 04: Metering with Commodity Rates for all New Connections and Retrofit of Existing

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

1. Does your agency require meters for all new connections and bill by volume-of-use?	yes
2. Does your agency have a program for retrofitting existing unmetered connections and bill by volume-of-use?	no
a. If YES, when was the plan to retrofit and bill by volume-of-use existing unmetered connections completed?	
b. Describe the program:	
3. Number of previously unmetered accounts fitted with meters during report year.	0

B. Feasibility Study

1. Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	no
a. If YES, when was the feasibility study conducted? (mm/dd/yy)	
b. Describe the feasibility study:	
2. Number of CII accounts with mixed-use meters.	0
3. Number of CII accounts with mixed-use meters retrofitted with dedicated irrigation meters during reporting period.	0

C. Meter Retrofit Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

The City has no unmetered connections. Information on mixed used meters is not kept, but dedicated irrigation meters are required on new commercial developments.

BMP 05: Large Landscape Conservation Programs and Incentives

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Water Use Budgets

1. Number of Dedicated Irrigation Meter Accounts:	1428
2. Number of Dedicated Irrigation Meter Accounts with Water Budgets:	0
3. Budgeted Use for Irrigation Meter Accounts with Water Budgets (AF):	0
4. Actual Use for Irrigation Meter Accounts with Water Budgets (AF):	0
5. Does your agency provide water use notices to accounts with budgets each billing cycle?	no

B. Landscape Surveys

1. Has your agency developed a marketing / targeting strategy for landscape surveys?	no
a. If YES, when did your agency begin implementing this strategy?	0
b. Description of marketing / targeting strategy:	
2. Number of Surveys Offered.	0
3. Number of Surveys Completed.	0
4. Indicate which of the following Landscape Elements are part of your survey:	
a. Irrigation System Check	no
b. Distribution Uniformity Analysis	no
c. Review / Develop Irrigation Schedules	no
d. Measure Landscape Area	no
e. Measure Total Irrigable Area	no
f. Provide Customer Report / Information	no
5. Do you track survey offers and results?	no
6. Does your agency provide follow-up surveys for previously completed surveys?	no
a. If YES, describe below:	

C. Other BMP 5 Actions

1. An agency can provide mixed-use accounts with ETo-based landscape budgets in lieu of a large landscape survey program. Does your agency provide mixed-use accounts with landscape budgets?	no
2. Number of CII mixed-use accounts with landscape budgets.	0
3. Do you offer landscape irrigation training?	yes
4. Does your agency offer financial incentives to improve landscape water use efficiency?	yes

Type of Financial Incentive:	Budget (Dollars/ Year)	Number Awarded to Customers	Total Amount Awarded
a. Rebates	0	0	0
b. Loans	0	0	0
c. Grants	0	0	0

5. Do you provide landscape water use efficiency information to new customers and customers changing services?	No
a. If YES, describe below:	
6. Do you have irrigated landscaping at your facilities?	yes
a. If yes, is it water-efficient?	yes
b. If yes, does it have dedicated irrigation metering?	yes
7. Do you provide customer notices at the start of the irrigation season?	no
8. Do you provide customer notices at the end of the irrigation season?	no

D. Landscape Conservation Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	35000
2. Actual Expenditures	0	

E. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

F. Comments

Please see comments from 2003.

BMP 06: High-Efficiency Washing Machine Rebate Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

1. Do any energy service providers or waste water utilities in your service area offer rebates for high-efficiency washers?	yes

a. If YES, describe the offerings and incentives as well as who the energy/waste water utility provider is.
Edison, PG&E and SDG&E offer rebates.

2. Does your agency offer rebates for high-efficiency washers?	yes
3. What is the level of the rebate?	100
4. Number of rebates awarded.	857

B. Rebate Program Expenditures

	This Year	**Next Year**
1. Budgeted Expenditures	1100	1100
2. Actual Expenditures	1100	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 07: Public Information Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

1. Does your agency maintain an active public information program to promote and educate customers about water conservation? yes

a. If YES, describe the program and how it's organized.
The City offers a number of brochures and informational pamphlets at various facilities. A Water Conservation page is included in the City's web site. It offers information and links to a number of sites, including CUWCC.

2. Indicate which and how many of the following activities are included in your public information program.

Public Information Program Activity	Yes/No	Number of Events
a. Paid Advertising	no	0
b. Public Service Announcement	yes	12
c. Bill Inserts / Newsletters / Brochures	yes	3
d. Bill showing water usage in comparison to previous year's usage	no	
e. Demonstration Gardens	no	0
f. Special Events, Media Events	no	0
g. Speaker's Bureau	no	0
h. Program to coordinate with other government agencies, industry and public interest groups and media	yes	

B. Conservation Information Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	9000	9000
2. Actual Expenditures	5737	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

A monthly water consumption report is now provided to the City Council and is published in various local media. A conservation message was added to the municipal services bill during the summer months for a total of 3 billing cycles (approx. 90 days); this is shown as 1 event under 2c. Other inserts included rebate and other information.

BMP 08: School Education Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

1.Has your agency implemented a school information program to promote water conservation?	yes

2. Please provide information on your school programs (by grade level):

Grade	Are grade-appropriate materials distributed?	No. of class presentations	No. of students reached	No. of teachers' workshops
Grades K-3rd	yes	20	1253	5
Grades 4th-6th	yes	10	634	0
Grades 7th-8th	yes	0	0	0
High School	yes	0	0	0

3. Did your Agency's materials meet state education framework requirements?	yes
4. When did your Agency begin implementing this program?	1/1/1989

B. School Education Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The City participates in a program run by MWDOC.

BMP 09: Conservation Programs for CII Accounts

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

1. Has your agency identified and ranked COMMERCIAL customers according to use?	No
2. Has your agency identified and ranked INDUSTRIAL customers according to use?	yes
3. Has your agency identified and ranked INSTITUTIONAL customers according to use?	yes

Option A: CII Water Use Survey and Customer Incentives Program

4. Is your agency operating a CII water use survey and customer incentives program for the purpose of complying with BMP 9 under this option?	Yes

CII Surveys	Commercial Accounts	Industrial Accounts	Institutional Accounts
a. Number of New Surveys Offered	0	0	0
b. Number of New Surveys Completed	0	0	0
c. Number of Site Follow-ups of Previous Surveys (within 1 yr)	0	0	0
d. Number of Phone Follow-ups of Previous Surveys (within 1 yr)	0	0	0

CII Survey Components	Commercial Accounts	Industrial Accounts	Institutional Accounts
e. Site Visit	no	no	no
f. Evaluation of all water-using apparatus and processes	no	no	no
g. Customer report identifying recommended efficiency measures, paybacks and agency incentives	no	no	no

Agency CII Customer Incentives	Budget ($/Year)	No. Awarded to Customers	Total $ Amount Awarded
h. Rebates	0	105	19470
i. Loans	0	0	0
j. Grants	0	0	0
k. Others	0	0	0

Option B: CII Conservation Program Targets

5. Does your agency track CII program interventions and water savings for the purpose of complying with BMP 9 under this option?	yes
6. Does your agency document and maintain records on how savings were realized and the method of calculation for estimated savings?	yes
7. Estimated annual savings (AF/yr) from site-verified actions taken by agency since 1991.	1.55
8. Estimated annual savings (AF/yr) from non-site-verified actions taken by agency since 1991.	13.94

B. Conservation Program Expenditures for CII Accounts

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	22176	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 09a: CII ULFT Water Savings

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

1. Did your agency implement a CII ULFT replacement program in the reporting year? If No, please explain why on Line B. 10.	Yes

A. Targeting and Marketing

1. What basis does your agency use to target customers for participation in this program? Check all that apply.	CII ULFT Study subsector targeting CII Sector or subsector

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

We found CII sectors and sub sectors most effective because we were able to version our marketing efforts appropriately.

2. How does your agency advertise this program? Check all that apply.	Bill insert Direct letter Newsletter Web page Trade publications Newspapers Other print media Trade shows and events Telemarketing

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

For the purposes of this program, Trade Allies have proven to be the most effective overall marketing tool, as well as the most effective per dollar expended. Trade Allies include plumbers, distributors, retail home improvement stores and product manufacturers.

B. Implementation

1. Does your agency keep and maintain customer participant information? (Read the Help information for a complete list of all the information for this BMP.)	Yes
2. Would your agency be willing to share this information if the CUWCC did a study to evaluate the program on behalf of your agency?	Yes
3. What is the total number of customer accounts participating in the program during the last year ?	1

CII Subsector	Number of Toilets Replaced			
4.	**Standard Gravity Tank**	**Air Assisted**	**Valve Floor Mount**	**Valve Wall Mount**
a. Offices	0	0	0	0
b. Retail / Wholesale	0	0	0	0
c. Hotels	0	0	0	0
d. Health	0	0	0	0
e. Industrial	0	0	0	0
f. Schools: K to 12	0	0	0	0
g. Eating	0	0	0	0
h. Government	0	0	0	0
i. Churches	0	0	0	0
j. Other	2	0	0	0

5. Program design.	Rebate or voucher
6. Does your agency use outside services to implement this program?	Yes
a. If yes, check all that apply.	Consultant
7. Participant tracking and follow-up.	Telephone Site Visit

8. Based on your program experience, please rank on a scale of 1 to 5, with 1 being the least frequent cause and 5 being the most frequent cause, the following reasons why customers refused to participate in the program.

a. Disruption to business	1
b. Inadequate payback	3
c. Inadequate ULFT performance	2
d. Lack of funding	5
e. American's with Disabilities Act	0
f. Permitting	0
g. Other. Please describe in B. 9.	

9. Please describe general program acceptance/resistance by customers, obstacles to implementation, and other issues affecting program implementation or effectiveness.

Customers are generally more willing to participate in the program if the cost of the retrofit is in balance with the amount of the rebate, and the projected water savings is significant. Resistance occurs if the out-of-pocket expense for the retrofit is too costly and the rebate amounts too low.

10. Please provide a general assessment of the program for this reporting year. Did your program achieve its objectives? Were your targeting and marketing approaches effective? Were program costs in line with expectations and budgeting?

Either Metropolitan or its Agencies to provide this response.

C. Conservation Program Expenditures for CII ULFT

1. CII ULFT Program: Annual Budget & Expenditure Data

	Budgeted	Actual Expenditure
a. Labor	0	0
b. Materials	0	0
c. Marketing & Advertising	0	0
d. Administration & Overhead	0	0
e. Outside Services	0	0
f. Total	0	0

2. CII ULFT Program: Annual Cost Sharing

a. Wholesale agency contribution	120
b. State agency contribution	0
c. Federal agency contribution	0
d. Other contribution	0
e. Total	120

D. Comments

See MWD of SC program for details.

BMP 11: Conservation Pricing

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

Rate Structure Data Volumetric Rates for Water Service by Customer Class

1. Residential

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Non-volumetric Flat Rate
c. Total Revenue from Volumetric Rates	$13341269
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$12847839

2. Commercial

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Non-volumetric Flat Rate
c. Total Revenue from Volumetric Rates	$2674786
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$1956414

3. Industrial

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Non-volumetric Flat Rate
c. Total Revenue from Volumetric Rates	$393120
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$286056

4. Institutional / Government

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$639678
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$428736

5. Irrigation

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$1237789
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$444354

6. Other

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$0
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$0

B. Conservation Pricing Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	77755
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The City is currently undergoing a rate study. The funds were encumbered in 2004, but are shown as next year, as this study has only recently started.

BMP 12: Conservation Coordinator

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

1. Does your Agency have a conservation coordinator?	yes
2. Is this a full-time position?	no
3. If no, is the coordinator supplied by another agency with which you cooperate in a regional conservation program ?	yes
4. Partner agency's name:	Municipal Water District of Orange County
5. If your agency supplies the conservation coordinator:	
a. What percent is this conservation coordinator's position?	10%
b. Coordinator's Name	Kenneth J. Dills
c. Coordinator's Title	Senior Administrative Analyst
d. Coordinator's Experience and Number of Years	Level I Water Conservation Practitioner - 5 years
e. Date Coordinator's position was created (mm/dd/yyyy)	3/1/1999
6. Number of conservation staff, including Conservation Coordinator.	1

B. Conservation Staff Program Expenditures

	This Year	**Next Year**
1. Budgeted Expenditures	7700	7900
2. Actual Expenditures	7700	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 13: Water Waste Prohibition

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Requirements for Documenting BMP Implementation

1. Is a water waste prohibition ordinance in effect in your service area? yes

   a. If YES, describe the ordinance:
   14.16.020 of the Huntington Beach Municipal Code states that no person shall waste water or allow it to be wasted from improper fixtures.

2. Is a copy of the most current ordinance(s) on file with CUWCC? yes

   a. List local jurisdictions in your service area in the first text box and water waste ordinance citations in each jurisdiction in the second text box:

   N/A N/A

B. Implementation

1. Indicate which of the water uses listed below are prohibited by your agency or service area.

a. Gutter flooding	yes
b. Single-pass cooling systems for new connections	no
c. Non-recirculating systems in all new conveyor or car wash systems	no
d. Non-recirculating systems in all new commercial laundry systems	no
e. Non-recirculating systems in all new decorative fountains	no
f. Other, please name	no

2. Describe measures that prohibit water uses listed above:
   Visual inspections and citations where warranted

Water Softeners:

3. Indicate which of the following measures your agency has supported in developing state law:

a. Allow the sale of more efficient, demand-initiated regenerating DIR models.	yes
b. Develop minimum appliance efficiency standards that:	
i.) Increase the regeneration efficiency standard to at least 3,350 grains of hardness removed per pound of common salt used.	yes
ii.) Implement an identified maximum number of gallons discharged per gallon of soft water produced.	yes
c. Allow local agencies, including municipalities and special districts, to set more stringent standards and/or to ban on-site regeneration of water softeners if it is demonstrated and found by the agency governing board that there is an adverse effect on the reclaimed water or groundwater supply.	yes

4. Does your agency include water softener checks in home water audit programs? yes

5. Does your agency include information about DIR and exchange-type water softeners in educational efforts to encourage replacement of less efficient timer models? no

C. Water Waste Prohibition Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Any expenditures are not tracked separately.

BMP 14: Residential ULFT Replacement Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2004**

A. Implementation

	Single-Family Accounts	Multi-Family Units
1. Does your Agency have program(s) for replacing high-water-using toilets with ultra-low flush toilets?	yes	yes

Number of Toilets Replaced by Agency Program During Report Year

Replacement Method	SF Accounts	MF Units
2. Rebate	1243	501
3. Direct Install	0	0
4. CBO Distribution	0	0
5. Other	0	0
Total	**1243**	**501**

6. Describe your agency's ULFT program for single-family residences.

Huntington Beach participates in a region wide ULFT rebate program for both SF and MF. Our regional wholesaler, MWDOC administers the program on our behalf. They contract with a vendor to market the program and facilitate the rebate process for our customers. The "Other" program is a distribution program that MWDOC administers on our behalf. They contract with a separate vendor that facilitates the free distribution of ULFTs to our customers.

7. Describe your agency's ULFT program for multi-family residences.

see #6

8. Is a toilet retrofit on resale ordinance in effect for your service area? no

9. List local jurisdictions in your service area in the left box and ordinance citations in each jurisdiction in the right box:

B. Residential ULFT Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Water Supply & Reuse

Reporting Unit:
City of Huntington Beach

Year:
2003

Water Supply Source Information

Supply Source Name	Quantity (AF) Supplied	Supply Type
OCWD	14289	Groundwater
MWDOC	19454	Imported

Total AF: 33743

Accounts & Water Use

Reporting Unit Name:	Submitted to CUWCC	Year:
City of Huntington Beach	**11/17/2004**	**2003**

A. Service Area Population Information:

1. Total service area population 206000

B. Number of Accounts and Water Deliveries (AF)

Type	Metered		Unmetered	
	No. of Accounts	Water Deliveries (AF)	No. of Accounts	Water Deliveries (AF)
1. Single-Family	43679	16035	0	0
2. Multi-Family	4126	7483	0	0
3. Commercial	2273	5255	0	0
4. Industrial	305	721	0	0
5. Institutional	561	860	0	0
6. Dedicated Irrigation	824	1983	0	0
7. Recycled Water	1	0	0	0
8. Other	0	275	0	0
9. Unaccounted	NA	2217	NA	0
Total	51769	34829	0	0
	Metered		**Unmetered**	

BMP 01: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

1. Based on your signed MOU date, 08/23/2000, your Agency STRATEGY DUE DATE is:	08/23/2002
2. Has your agency developed and implemented a targeting/ marketing strategy for SINGLE-FAMILY residential water use surveys?	yes
a. If YES, when was it implemented?	6/1/2000
3. Has your agency developed and implemented a targeting/ marketing strategy for MULTI-FAMILY residential water use surveys?	no
a. If YES, when was it implemented?	

B. Water Survey Data

Survey Counts:	**Single Family Accounts**	**Multi-Family Units**
1. Number of surveys offered:	0	0
2. Number of surveys completed:	0	0
Indoor Survey:		
3. Check for leaks, including toilets, faucets and meter checks	yes	no
4. Check showerhead flow rates, aerator flow rates, and offer to replace or recommend replacement, if necessary	yes	no
5. Check toilet flow rates and offer to install or recommend installation of displacement device or direct customer to ULFT replacement program, as neccesary; replace leaking toilet flapper, as necessary	yes	no
Outdoor Survey:		
6. Check irrigation system and timers	yes	no
7. Review or develop customer irrigation schedule	yes	no
8. Measure landscaped area (Recommended but not required for surveys)	yes	no
9. Measure total irrigable area (Recommended but not required for surveys)	yes	no
10. Which measurement method is typically used (Recommended but not required for surveys)	Odometer Wheel	
11. Were customers provided with information packets that included evaluation results and water savings recommendations?	yes	no

12. Have the number of surveys offered and completed, survey results, and survey costs been tracked?	no	no
a. If yes, in what form are surveys tracked?		None
b. Describe how your agency tracks this information.		

C. Water Survey Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

The City participated in a region wide program through MWDOC in 2001 and 2002. This program was discontinued and surveys were done on an informal, as requested basis in 2003 and 2004.

BMP 02: Residential Plumbing Retrofit

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

1. Is there an enforceable ordinance in effect in your service area requiring replacement of high-flow showerheads and other water use fixtures with their low-flow counterparts?	no

a. If YES, list local jurisdictions in your service area and code or ordinance in each:

2. Has your agency satisfied the 75% saturation requirement for single-family housing units?	yes
3. Estimated percent of single-family households with low-flow showerheads:	91.7%
4. Has your agency satisfied the 75% saturation requirement for multi-family housing units?	yes
5. Estimated percent of multi-family households with low-flow showerheads:	79.9%

6. If YES to 2 OR 4 above, please describe how saturation was determined, including the dates and results of any survey research.

In 2000, MWDOC and MET conducted the OC Saturation Survey and found countywide low flow showerhead saturation rates of 66.9% in single-family and 59.8% in multi-family dwelling units. Saturation rates provided above represent linear extrapolations of saturation survey results for 2003

B. Low-Flow Device Distribution Information

1. Has your agency developed a targeting/ marketing strategy for distributing low-flow devices?	yes
a. If YES, when did your agency begin implementing this strategy?	6/1/2000

b. Describe your targeting/ marketing strategy.
The program was done as part of the residential survey program noted in BMP #1, which was suspended for this reporting period.

Low-Flow Devices Distributed/ Installed	**SF Accounts**	**MF Units**
2. Number of low-flow showerheads distributed:	0	0
3. Number of toilet-displacement devices distributed:	0	0
4. Number of toilet flappers distributed:	0	0
5. Number of faucet aerators distributed:	0	0

6. Does your agency track the distribution and cost of low-flow devices?	yes
a. If YES, in what format are low-flow devices tracked?	Database

b. If yes, describe your tracking and distribution system :
When the program is running, the costs were tracked by the vendor.

C. Low-Flow Device Distribution Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

See BMP #1

BMP 03: System Water Audits, Leak Detection and Repair

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

1. Has your agency completed a pre-screening system audit for this reporting year?	no
2. If YES, enter the values (AF/Year) used to calculate verifiable use as a percent of total production:	
a. Determine metered sales (AF)	32337
b. Determine other system verifiable uses (AF)	275
c. Determine total supply into the system (AF)	33743
d. Using the numbers above, if (Metered Sales + Other Verifiable Uses) / Total Supply is < 0.9 then a full-scale system audit is required.	0.97
3. Does your agency keep necessary data on file to verify the values used to calculate verifiable uses as a percent of total production?	yes
4. Did your agency complete a full-scale audit during this report year?	no
5. Does your agency maintain in-house records of audit results or the completed AWWA audit worksheets for the completed audit?	yes
6. Does your agency operate a system leak detection program?	no
a. If yes, describe the leak detection program:	

B. Survey Data

1. Total number of miles of distribution system line.	520
2. Number of miles of distribution system line surveyed.	0

C. System Audit / Leak Detection Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No
a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."	

E. Comments

Unaccounted water loss does not warrant a leak survey.

BMP 04: Metering with Commodity Rates for all New Connections and Retrofit of Existing

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

1. Does your agency require meters for all new connections and bill by volume-of-use?	yes
2. Does your agency have a program for retrofitting existing unmetered connections and bill by volume-of-use?	no
a. If YES, when was the plan to retrofit and bill by volume-of-use existing unmetered connections completed?	
b. Describe the program:	
3. Number of previously unmetered accounts fitted with meters during report year.	0

B. Feasibility Study

1. Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	no
a. If YES, when was the feasibility study conducted? (mm/dd/yy)	
b. Describe the feasibility study:	
2. Number of CII accounts with mixed-use meters.	0
3. Number of CII accounts with mixed-use meters retrofitted with dedicated irrigation meters during reporting period.	0

C. Meter Retrofit Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

The City has no unmetered connections. Information on mixed used meters is not kept, but dedicated irrigation meters are required on new commercial developments.

BMP 05: Large Landscape Conservation Programs and Incentives

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Water Use Budgets

1. Number of Dedicated Irrigation Meter Accounts:	1399
2. Number of Dedicated Irrigation Meter Accounts with Water Budgets:	0
3. Budgeted Use for Irrigation Meter Accounts with Water Budgets (AF):	0
4. Actual Use for Irrigation Meter Accounts with Water Budgets (AF):	0
5. Does your agency provide water use notices to accounts with budgets each billing cycle?	no

B. Landscape Surveys

1. Has your agency developed a marketing / targeting strategy for landscape surveys?	no
a. If YES, when did your agency begin implementing this strategy?	0
b. Description of marketing / targeting strategy:	
2. Number of Surveys Offered.	0
3. Number of Surveys Completed.	0
4. Indicate which of the following Landscape Elements are part of your survey:	
a. Irrigation System Check	no
b. Distribution Uniformity Analysis	no
c. Review / Develop Irrigation Schedules	no
d. Measure Landscape Area	no
e. Measure Total Irrigable Area	no
f. Provide Customer Report / Information	no
5. Do you track survey offers and results?	no
6. Does your agency provide follow-up surveys for previously completed surveys?	no
a. If YES, describe below:	

C. Other BMP 5 Actions

1. An agency can provide mixed-use accounts with ETo-based landscape budgets in lieu of a large landscape survey program. Does your agency provide mixed-use accounts with landscape budgets?	no
2. Number of CII mixed-use accounts with landscape budgets.	0
3. Do you offer landscape irrigation training?	yes
4. Does your agency offer financial incentives to improve landscape water use efficiency?	yes

Type of Financial Incentive:	Budget (Dollars/ Year)	Number Awarded to Customers	Total Amount Awarded
a. Rebates	0	0	0
b. Loans	0	0	0
c. Grants	0	0	0

5. Do you provide landscape water use efficiency information to new customers and customers changing services?	No
a. If YES, describe below:	
6. Do you have irrigated landscaping at your facilities?	yes
a. If yes, is it water-efficient?	yes
b. If yes, does it have dedicated irrigation metering?	yes
7. Do you provide customer notices at the start of the irrigation season?	no
8. Do you provide customer notices at the end of the irrigation season?	no

D. Landscape Conservation Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

E. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

F. Comments

The City recently began participation in MWDOC's Landscape Certification Program. Included in this program is an informal survey process. Since it is informal, under B above #2 and #3 are listed as zero, while the components of the informal process are marked as yes in #4. Also, please note that 575 meters listed as "institutional" under "Accounts and Water Use" are dedicated landscape meters owned and operated by the City.

BMP 06: High-Efficiency Washing Machine Rebate Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

1. Do any energy service providers or waste water utilities in your service area offer rebates for high-efficiency washers?	yes

a. If YES, describe the offerings and incentives as well as who the energy/waste water utility provider is.
Edison, PG&E and SDG&E offer rebates.

2. Does your agency offer rebates for high-efficiency washers?	yes
3. What is the level of the rebate?	100
4. Number of rebates awarded.	486

B. Rebate Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	1100	1100
2. Actual Expenditures	1100	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 07: Public Information Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

1. Does your agency maintain an active public information program to promote and educate customers about water conservation? — yes

    a. If YES, describe the program and how it's organized.
    The City offers a number of brochures and informational pamphlets at various facilities. A Water Conservation page is included in the City's web site. It offers information and links to a number of sites, including CUWCC.

2. Indicate which and how many of the following activities are included in your public information program.

Public Information Program Activity	Yes/No	Number of Events
a. Paid Advertising	no	0
b. Public Service Announcement	yes	0
c. Bill Inserts / Newsletters / Brochures	yes	1
d. Bill showing water usage in comparison to previous year's usage	no	
e. Demonstration Gardens	no	0
f. Special Events, Media Events	yes	1
g. Speaker's Bureau	no	0
h. Program to coordinate with other government agencies, industry and public interest groups and media	yes	

B. Conservation Information Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	9000	9000
2. Actual Expenditures	3840	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? — No

    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The new billing system noted in the last reporting period was not implemented until 2003-2004.

BMP 08: School Education Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

1.Has your agency implemented a school information program to promote water conservation?	yes

2. Please provide information on your school programs (by grade level):

Grade	Are grade-appropriate materials distributed?	No. of class presentations	No. of students reached	No. of teachers' workshops
Grades K-3rd	yes	30	2447	5
Grades 4th-6th	yes	16	1265	0
Grades 7th-8th	yes	1	70	0
High School	yes	0	0	0

3. Did your Agency's materials meet state education framework requirements?	yes
4. When did your Agency begin implementing this program?	1/1/1989

B. School Education Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The City participates in a program run by MWDOC.

BMP 09: Conservation Programs for CII Accounts

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

1. Has your agency identified and ranked COMMERCIAL customers according to use?	yes
2. Has your agency identified and ranked INDUSTRIAL customers according to use?	yes
3. Has your agency identified and ranked INSTITUTIONAL customers according to use?	yes

Option A: CII Water Use Survey and Customer Incentives Program

4. Is your agency operating a CII water use survey and customer incentives program for the purpose of complying with BMP 9 under this option?	no

CII Surveys	Commercial Accounts	Industrial Accounts	Institutional Accounts
a. Number of New Surveys Offered	0	0	0
b. Number of New Surveys Completed	0	0	0
c. Number of Site Follow-ups of Previous Surveys (within 1 yr)	0	0	0
d. Number of Phone Follow-ups of Previous Surveys (within 1 yr)	0	0	0

CII Survey Components	Commercial Accounts	Industrial Accounts	Institutional Accounts
e. Site Visit	no	no	no
f. Evaluation of all water-using apparatus and processes	no	no	no
g. Customer report identifying recommended efficiency measures, paybacks and agency incentives	no	no	no

Agency CII Customer Incentives	Budget ($/Year)	No. Awarded to Customers	Total $ Amount Awarded
h. Rebates	0	63	0
i. Loans	0	0	0
j. Grants	0	0	0
k. Others	0	0	0

Option B: CII Conservation Program Targets

5. Does your agency track CII program interventions and water savings for the purpose of complying with BMP 9 under this option?	yes
6. Does your agency document and maintain records on how savings were realized and the method of calculation for estimated savings?	yes
7. Estimated annual savings (AF/yr) from site-verified actions taken by agency since 1991.	0
8. Estimated annual savings (AF/yr) from non-site-verified actions taken by agency since 1991.	0

B. Conservation Program Expenditures for CII Accounts

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The City participates in a Metropolitan Water District of Southern California (MWD)program. The number of rebates, but no the dollar amount is shown. MWD tracks this.

BMP 09a: CII ULFT Water Savings

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

1. Did your agency implement a CII ULFT replacement program in the reporting year? If No, please explain why on Line B. 10. — Yes

A. Targeting and Marketing

1. What basis does your agency use to target customers for participation in this program? Check all that apply.
   - CII ULFT Study subsector targeting
   - CII Sector or subsector

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

We found CII sectors and sub sectors most effective because we were able to version our marketing efforts appropriately.

2. How does your agency advertise this program? Check all that apply.
   - Bill insert
   - Direct letter
   - Newsletter
   - Web page
   - Newspapers
   - Trade publications
   - Other print media
   - Trade shows and events
   - Telemarketing

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

For the purposes of this program, Trade Allies have proven to be the most effective overall marketing tool, as well as the most effective per dollar expended. Trade Allies include plumbers, distributors, retail home improvement stores and product manufacturers.

B. Implementation

1. Does your agency keep and maintain customer participant information? (Read the Help information for a complete list of all the information for this BMP.) — Yes
2. Would your agency be willing to share this information if the CUWCC did a study to evaluate the program on behalf of your agency? — Yes
3. What is the total number of customer accounts participating in the program during the last year ? — 1

CII Subsector	Number of Toilets Replaced			
4.	**Standard Gravity Tank**	**Air Assisted**	**Valve Floor Mount**	**Valve Wall Mount**
a. Offices	0	0	0	0
b. Retail / Wholesale	0	0	0	0
c. Hotels	0	0	0	0
d. Health	0	0	0	0
e. Industrial	0	0	0	0
f. Schools: K to 12	0	0	0	0
g. Eating	0	0	0	0
h. Government	0	0	0	0
i. Churches	1	0	0	0
j. Other	0	0	0	0

5. Program design.	Rebate or voucher
6. Does your agency use outside services to implement this program?	Yes
a. If yes, check all that apply.	Consultant
7. Participant tracking and follow-up.	Telephone Site Visit

8. Based on your program experience, please rank on a scale of 1 to 5, with 1 being the least frequent cause and 5 being the most frequent cause, the following reasons why customers refused to participate in the program.

a. Disruption to business	1
b. Inadequate payback	3
c. Inadequate ULFT performance	2
d. Lack of funding	5
e. American's with Disabilities Act	0
f. Permitting	0
g. Other. Please describe in B. 9.	

9. Please describe general program acceptance/resistance by customers, obstacles to implementation, and other issues affecting program implementation or effectiveness.

Customers are generally more willing to participate in the program if the cost of the retrofit is in balance with the amount of the rebate, and the projected water savings is significant. Resistance occurs if the out-of-pocket expense for the retrofit is too costly and the rebate amounts too low.

10. Please provide a general assessment of the program for this reporting year. Did your program achieve its objectives? Were your targeting and marketing approaches effective? Were program costs in line with expectations and budgeting?

Either Metropolitan or its Agencies to provide this response.

C. Conservation Program Expenditures for CII ULFT

1. CII ULFT Program: Annual Budget & Expenditure Data

	Budgeted	**Actual Expenditure**
a. Labor	0	0
b. Materials	0	0
c. Marketing & Advertising	0	0
d. Administration & Overhead	0	0
e. Outside Services	0	0
f. Total	0	0

2. CII ULFT Program: Annual Cost Sharing

a. Wholesale agency contribution	60
b. State agency contribution	0
c. Federal agency contribution	0
d. Other contribution	0
e. Total	60

D. Comments

See MWD of SC program for details.

BMP 11: Conservation Pricing

Reporting Unit: **City of Huntington Beach**	BMP Form Status: **100% Complete**	Year: **2003**

A. Implementation

Rate Structure Data Volumetric Rates for Water Service by Customer Class

1. Residential

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Non-volumetric Flat Rate
c. Total Revenue from Volumetric Rates	$12507582
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$12847839

2. Commercial

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Non-volumetric Flat Rate
c. Total Revenue from Volumetric Rates	$2794790
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$1956414

3. Industrial

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Non-volumetric Flat Rate
c. Total Revenue from Volumetric Rates	$383363
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$276984

4. Institutional / Government

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$457286
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$421911

5. Irrigation

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$1054648
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$437207

6. Other

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$0
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$0

B. Conservation Pricing Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 12: Conservation Coordinator

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

1. Does your Agency have a conservation coordinator?	yes
2. Is this a full-time position?	no
3. If no, is the coordinator supplied by another agency with which you cooperate in a regional conservation program ?	yes
4. Partner agency's name:	Municipal Water District of Orange County
5. If your agency supplies the conservation coordinator:	
a. What percent is this conservation coordinator's position?	10%
b. Coordinator's Name	Kenneth J. Dills
c. Coordinator's Title	Senior Administrative Analyst
d. Coordinator's Experience and Number of Years	Level I Water Conservation Practitioner - 4 years
e. Date Coordinator's position was created (mm/dd/yyyy)	3/1/1999
6. Number of conservation staff, including Conservation Coordinator.	1

B. Conservation Staff Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	7700	7700
2. Actual Expenditures	7700	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 13: Water Waste Prohibition

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Requirements for Documenting BMP Implementation

1. Is a water waste prohibition ordinance in effect in your service area? yes

a. If YES, describe the ordinance:
14.16.020 of the Huntington Beach Municipal Code states that no person shall waste water or allow it to be wasted from improper fixtures

2. Is a copy of the most current ordinance(s) on file with CUWCC? yes

a. List local jurisdictions in your service area in the first text box and water waste ordinance citations in each jurisdiction in the second text box:

N/A N/A

B. Implementation

1. Indicate which of the water uses listed below are prohibited by your agency or service area.

a. Gutter flooding	yes
b. Single-pass cooling systems for new connections	no
c. Non-recirculating systems in all new conveyor or car wash systems	no
d. Non-recirculating systems in all new commercial laundry systems	no
e. Non-recirculating systems in all new decorative fountains	no
f. Other, please name	no

2. Describe measures that prohibit water uses listed above:
Visual inspections and citations where warranted

Water Softeners:

3. Indicate which of the following measures your agency has supported in developing state law:

a. Allow the sale of more efficient, demand-initiated regenerating DIR models.	yes
b. Develop minimum appliance efficiency standards that:	
i.) Increase the regeneration efficiency standard to at least 3,350 grains of hardness removed per pound of common salt used.	yes
ii.) Implement an identified maximum number of gallons discharged per gallon of soft water produced.	yes
c. Allow local agencies, including municipalities and special districts, to set more stringent standards and/or to ban on-site regeneration of water softeners if it is demonstrated and found by the agency governing board that there is an adverse effect on the reclaimed water or groundwater supply.	yes

4. Does your agency include water softener checks in home water audit programs?	yes
5. Does your agency include information about DIR and exchange-type water softeners in educational efforts to encourage replacement of less efficient timer models?	no

C. Water Waste Prohibition Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Any expenditures are not tracked separately.

BMP 14: Residential ULFT Replacement Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2003**

A. Implementation

	Single-Family Accounts	**Multi-Family Units**
1. Does your Agency have program(s) for replacing high-water-using toilets with ultra-low flush toilets?	yes	yes

Number of Toilets Replaced by Agency Program During Report Year

Replacement Method	**SF Accounts**	**MF Units**
2. Rebate	2620	1132
3. Direct Install	0	0
4. CBO Distribution	0	0
5. Other	0	0
Total	**2620**	**1132**

6. Describe your agency's ULFT program for single-family residences.

   Huntington Beach participates in a region wide ULFT rebate program for both SF and MF. Our regional wholesaler, MWDOC administers the program on our behalf. They contract with a vendor to market the program and facilitate the rebate process for our customers. The "Other" program is a distribution program that MWDOC administers on our behalf. They contract with a separate vendor that facilitates the free distribution of ULFTs to our customers.

7. Describe your agency's ULFT program for multi-family residences.

   see #6

8. Is a toilet retrofit on resale ordinance in effect for your service area? no

9. List local jurisdictions in your service area in the left box and ordinance citations in each jurisdiction in the right box:

   N/A N/A

B. Residential ULFT Program Expenditures

	This Year	**Next Year**
1. Budgeted Expenditures	1100	0
2. Actual Expenditures	1100	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? no

   a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Water Supply & Reuse

Reporting Unit:
City of Huntington Beach

Year:
2002

Water Supply Source Information		
Supply Source Name	**Quantity (AF) Supplied**	**Supply Type**
OCWD	24581	Groundwater
MWDOC	10458	Imported

Total AF: 35039

Accounts & Water Use

Reporting Unit Name:
City of Huntington Beach

Submitted to CUWCC
11/18/2002

Year:
2002

A. Service Area Population Information:

1. Total service area population 192000

B. Number of Accounts and Water Deliveries (AF)

Type	Metered		Unmetered	
	No. of Accounts	Water Deliveries (AF)	No. of Accounts	Water Deliveries (AF)
1. Single-Family	43295	15810	0	0
2. Multi-Family	4120	7615	0	0
3. Commercial	2267	4891	0	0
4. Industrial	305	791	0	0
5. Institutional	550	116	0	0
6. Dedicated Irrigation	807	2928	0	0
7. Recycled Water	1	0	0	0
8. Other	0	97	0	0
9. Unaccounted	NA	2792	NA	0
Total	51345	35040	0	0
	Metered		**Unmetered**	

BMP 01: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

1. Based on your signed MOU date, 08/23/2000, your Agency STRATEGY DUE DATE is:	08/23/2002
2. Has your agency developed and implemented a targeting/ marketing strategy for SINGLE-FAMILY residential water use surveys?	yes
a. If YES, when was it implemented?	6/1/2000
3. Has your agency developed and implemented a targeting/ marketing strategy for MULTI-FAMILY residential water use surveys?	no
a. If YES, when was it implemented?	

B. Water Survey Data

Survey Counts:	**Single Family Accounts**	**Multi-Family Units**
1. Number of surveys offered:	17070	0
2. Number of surveys completed:	350	0
Indoor Survey:		
3. Check for leaks, including toilets, faucets and meter checks	yes	no
4. Check showerhead flow rates, aerator flow rates, and offer to replace or recommend replacement, if necessary	yes	no
5. Check toilet flow rates and offer to install or recommend installation of displacement device or direct customer to ULFT replacement program, as necessary; replace leaking toilet flapper, as necessary	yes	no
Outdoor Survey:		
6. Check irrigation system and timers	yes	no
7. Review or develop customer irrigation schedule	yes	no
8. Measure landscaped area (Recommended but not required for surveys)	yes	no
9. Measure total irrigable area (Recommended but not required for surveys)	yes	no
10. Which measurement method is typically used (Recommended but not required for surveys)	Odometer Wheel	
11. Were customers provided with information packets that included evaluation results and water savings recommendations?	yes	no

12. Have the number of surveys offered and completed, survey results, and survey costs been tracked?	yes	no

a. If yes, in what form are surveys tracked? database

b. Describe how your agency tracks this information.
The program is managed by the Municipal Water District of Orange County.

C. Water Survey Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	20000	40000
2. Actual Expenditures	19110	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Residential surveys were previously done informally and not tracked. In 2001 and 2002 we began a 300 survey/year pilot program to determine cost effectiveness.

BMP 02: Residential Plumbing Retrofit

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

1. Is there an enforceable ordinance in effect in your service area requiring replacement of high-flow showerheads and other water use fixtures with their low-flow counterparts? — no

    a. If YES, list local jurisdictions in your service area and code or ordinance in each:

2. Has your agency satisfied the 75% saturation requirement for single-family housing units? — no

3. Estimated percent of single-family households with low-flow showerheads: — 68%

4. Has your agency satisfied the 75% saturation requirement for multi-family housing units? — no

5. Estimated percent of multi-family households with low-flow showerheads: — 60%

6. If YES to 2 OR 4 above, please describe how saturation was determined, including the dates and results of any survey research.

B. Low-Flow Device Distribution Information

1. Has your agency developed a targeting/ marketing strategy for distributing low-flow devices? — yes

    a. If YES, when did your agency begin implementing this strategy? — 6/1/2000

    b. Describe your targeting/ marketing strategy.
    The program is done as part of the residential survey program noted in BMP #1.

Low-Flow Devices Distributed/ Installed	SF Accounts	MF Units
2. Number of low-flow showerheads distributed:	143	0
3. Number of toilet-displacement devices distributed:	37	0
4. Number of toilet flappers distributed:	40	0
5. Number of faucet aerators distributed:	440	0

6. Does your agency track the distribution and cost of low-flow devices? — yes

    a. If YES, in what format are low-flow devices tracked? — Database

    b. If yes, describe your tracking and distribution system :
    The cost and distribution were tracked through a formal survey program. Showerhead cost was kept by the program vendor and showerhead distribution was tracked by address of the participant

C. Low-Flow Device Distribution Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Expenditures are included in the residential survey program shown in BMP #1.

BMP 03: System Water Audits, Leak Detection and Repair

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

1. Has your agency completed a pre-screening system audit for this reporting year?	no
2. If YES, enter the values (AF/Year) used to calculate verifiable use as a percent of total production:	
a. Determine metered sales (AF)	32167
b. Determine other system verifiable uses (AF)	96.7
c. Determine total supply into the system (AF)	34679.6
d. Using the numbers above, if (Metered Sales + Other Verifiable Uses) / Total Supply is < 0.9 then a full-scale system audit is required.	0.93
3. Does your agency keep necessary data on file to verify the values used to calculate verifiable uses as a percent of total production?	yes
4. Did your agency complete a full-scale audit during this report year?	no
5. Does your agency maintain in-house records of audit results or the completed AWWA audit worksheets for the completed audit?	yes
6. Does your agency operate a system leak detection program?	no
a. If yes, describe the leak detection program:	

B. Survey Data

1. Total number of miles of distribution system line.	520
2. Number of miles of distribution system line surveyed.	0

C. System Audit / Leak Detection Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No
a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."	

E. Comments

BMP 04: Metering with Commodity Rates for all New Connections and Retrofit of Existing

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

1. Does your agency require meters for all new connections and bill by volume-of-use?	yes
2. Does your agency have a program for retrofitting existing unmetered connections and bill by volume-of-use?	no
a. If YES, when was the plan to retrofit and bill by volume-of-use existing unmetered connections completed?	
b. Describe the program:	
3. Number of previously unmetered accounts fitted with meters during report year.	0

B. Feasibility Study

1. Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	no
a. If YES, when was the feasibility study conducted? (mm/dd/yy)	
b. Describe the feasibility study:	
2. Number of CII accounts with mixed-use meters.	0
3. Number of CII accounts with mixed-use meters retrofitted with dedicated irrigation meters during reporting period.	0

C. Meter Retrofit Program Expenditures

	This Year	**Next Year**
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

The City has no unmetered connections.

BMP 05: Large Landscape Conservation Programs and Incentives

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Water Use Budgets

1. Number of Dedicated Irrigation Meter Accounts:	1025
2. Number of Dedicated Irrigation Meter Accounts with Water Budgets:	0
3. Budgeted Use for Irrigation Meter Accounts with Water Budgets (AF):	0
4. Actual Use for Irrigation Meter Accounts with Water Budgets (AF):	0
5. Does your agency provide water use notices to accounts with budgets each billing cycle?	yes

B. Landscape Surveys

1. Has your agency developed a marketing / targeting strategy for landscape surveys?	no
a. If YES, when did your agency begin implementing this strategy?	
b. Description of marketing / targeting strategy:	
2. Number of Surveys Offered.	0
3. Number of Surveys Completed.	0
4. Indicate which of the following Landscape Elements are part of your survey:	
a. Irrigation System Check	yes
b. Distribution Uniformity Analysis	yes
c. Review / Develop Irrigation Schedules	yes
d. Measure Landscape Area	yes
e. Measure Total Irrigable Area	yes
f. Provide Customer Report / Information	yes
5. Do you track survey offers and results?	yes
6. Does your agency provide follow-up surveys for previously completed surveys?	no
a. If YES, describe below:	

C. Other BMP 5 Actions

1. An agency can provide mixed-use accounts with ETo-based landscape budgets in lieu of a large landscape survey program. Does your agency provide mixed-use accounts with landscape budgets?	no
2. Number of CII mixed-use accounts with landscape budgets.	0
3. Do you offer landscape irrigation training?	no
4. Does your agency offer financial incentives to improve landscape water use efficiency?	no

Type of Financial Incentive:	Budget (Dollars/ Year)	Number Awarded to Customers	Total Amount Awarded
a. Rebates	0	0	0
b. Loans	0	0	0
c. Grants	0	0	0

5. Do you provide landscape water use efficiency information to new customers and customers changing services?	No
a. If YES, describe below:	
6. Do you have irrigated landscaping at your facilities?	yes
a. If yes, is it water-efficient?	yes
b. If yes, does it have dedicated irrigation metering?	yes
7. Do you provide customer notices at the start of the irrigation season?	no
8. Do you provide customer notices at the end of the irrigation season?	no

D. Landscape Conservation Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

E. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

F. Comments

The City recently began participation in MWDOC's Landscape Certification Program. Included in this program is an informal survey process. Since it is informal, under B above #2 and #3 are listed as zero, while the components of the informal process are marked as yes in #4.

BMP 06: High-Efficiency Washing Machine Rebate Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

1. Do any energy service providers or waste water utilities in your service area offer rebates for high-efficiency washers?	yes

a. If YES, describe the offerings and incentives as well as who the energy/waste water utility provider is.
Edison, PG&E and SDG&E offer rebates

2. Does your agency offer rebates for high-efficiency washers?	yes
3. What is the level of the rebate?	100
4. Number of rebates awarded.	114

B. Rebate Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The rebate program is offered by the City's wholesaler, MWDOC.

BMP 07: Public Information Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

1. Does your agency maintain an active public information program to promote and educate customers about water conservation? — yes

a. If YES, describe the program and how it's organized.
The City offers a number of brochures and informational pamphlets at various facilities. A Water Conservation page is included in the City's web site. It offers information and links to a number of sites, including CUWCC.

2. Indicate which and how many of the following activities are included in your public information program.

Public Information Program Activity	Yes/No	Number of Events
a. Paid Advertising	no	0
b. Public Service Announcement	yes	0
c. Bill Inserts / Newsletters / Brochures	yes	0
d. Bill showing water usage in comparison to previous year's usage	no	
e. Demonstration Gardens	no	0
f. Special Events, Media Events	yes	0
g. Speaker's Bureau	no	
h. Program to coordinate with other government agencies, industry and public interest groups and media	yes	

B. Conservation Information Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	11000	11000
2. Actual Expenditures	4765	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? — No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

"Number of events" was not tracked. The City will begin tracking for the next reporting period. A new billing system is being implemented that will allow for messages on bills, including consumption history.

BMP 08: School Education Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

1.Has your agency implemented a school information program to promote water conservation? yes

2. Please provide information on your school programs (by grade level):

Grade	Are grade-appropriate materials distributed?	No. of class presentations	No. of students reached	No. of teachers' workshops
Grades K-3rd	yes	34	2750	0
Grades 4th-6th	yes	20	2069	0
Grades 7th-8th	yes	4	622	0
High School	yes	0	0	0

3. Did your Agency's materials meet state education framework requirements? yes

4. When did your Agency begin implementing this program? 1/1/1989

B. School Education Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The City participates in a program run by MWDOC.

BMP 09: Conservation Programs for CII Accounts

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

1. Has your agency identified and ranked COMMERCIAL customers according to use?	no
2. Has your agency identified and ranked INDUSTRIAL customers according to use?	no
3. Has your agency identified and ranked INSTITUTIONAL customers according to use?	no

Option A: CII Water Use Survey and Customer Incentives Program

4. Is your agency operating a CII water use survey and customer incentives program for the purpose of complying with BMP 9 under this option?	no

CII Surveys	Commercial Accounts	Industrial Accounts	Institutional Accounts
a. Number of New Surveys Offered	0	0	0
b. Number of New Surveys Completed	0	0	0
c. Number of Site Follow-ups of Previous Surveys (within 1 yr)	0	0	0
d. Number of Phone Follow-ups of Previous Surveys (within 1 yr)	0	0	0

CII Survey Components	Commercial Accounts	Industrial Accounts	Institutional Accounts
e. Site Visit	no	no	no
f. Evaluation of all water-using apparatus and processes	no	no	no
g. Customer report identifying recommended efficiency measures, paybacks and agency incentives	no	no	no

Agency CII Customer Incentives	Budget ($/Year)	No. Awarded to Customers	Total $ Amount Awarded
h. Rebates	0	1	0
i. Loans	0	0	0
j. Grants	0	0	0
k. Others	0	0	0

Option B: CII Conservation Program Targets

5. Does your agency track CII program interventions and water savings for the purpose of complying with BMP 9 under this option?	yes
6. Does your agency document and maintain records on how savings were realized and the method of calculation for estimated savings?	yes
7. Estimated annual savings (AF/yr) from site-verified actions taken by agency since 1991.	0
8. Estimated annual savings (AF/yr) from non-site-verified actions taken by agency since 1991.	0

B. Conservation Program Expenditures for CII Accounts

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The City participates in a Metropolitan Water District of Southern California (MWD)program. The number of rebates, but no the dollar amount is shown. MWD tracks this.

BMP 09a: CII ULFT Water Savings

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

1. Did your agency implement a CII ULFT replacement program in the reporting year?
If No, please explain why on Line B. 10.

A. Targeting and Marketing

1. What basis does your agency use to target customers for participation in this program? Check all that apply.

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

We found CII sectors and sub sectors most effective because we were able to version our marketing efforts appropriately.

2. How does your agency advertise this program? Check all that apply.

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

For the purposes of this program, Trade Allies have proven to be the most effective overall marketing tool, as well as the most effective per dollar expended. Trade Allies include plumbers, distributors, retail home improvement stores and product manufacturers.

B. Implementation

1. Does your agency keep and maintain customer participant information? (Read the Help information for a complete list of all the information for this BMP.)

2. Would your agency be willing to share this information if the CUWCC did a study to evaluate the program on behalf of your agency?

3. What is the total number of customer accounts participating in the program during the last year ?

CII Subsector	Number of Toilets Replaced			
4.	**Standard Gravity Tank**	**Air Assisted**	**Valve Floor Mount**	**Valve Wall Mount**
a. Offices				
b. Retail / Wholesale				
c. Hotels				
d. Health				
e. Industrial				
f. Schools: K to 12				
g. Eating				
h. Government				
i. Churches				
j. Other				

5. Program design.

6. Does your agency use outside services to implement this program?

a. If yes, check all that apply. t

7. Participant tracking and follow-up. it

8. Based on your program experience, please rank on a scale of 1 to 5, with 1 being the least frequent cause and 5 being the most frequent cause, the following reasons why customers refused to participate in the program.

a. Disruption to business

b. Inadequate payback

c. Inadequate ULFT performance

d. Lack of funding

e. American's with Disabilities Act

f. Permitting

g. Other. Please describe in B. 9.

9. Please describe general program acceptance/resistance by customers, obstacles to implementation, and other issues affecting program implementation or effectiveness.

Customers are generally more willing to participate in the program if the cost of the retrofit is in balance with the amount of the rebate, and the projected water savings is significant. Resistance occurs if the out-of-pocket expense for the retrofit is too costly and the rebate amounts too low.

10. Please provide a general assessment of the program for this reporting year. Did your program achieve its objectives? Were your targeting and marketing approaches effective? Were program costs in line with expectations and budgeting?

Either Metropolitan or its Agencies to provide this response.

C. Conservation Program Expenditures for CII ULFT

1. CII ULFT Program: Annual Budget & Expenditure Data

	Budgeted	Actual Expenditure
a. Labor		
b. Materials		
c. Marketing & Advertising		
d. Administration & Overhead		
e. Outside Services		
f. Total	0	0

2. CII ULFT Program: Annual Cost Sharing

a. Wholesale agency contribution	
b. State agency contribution	
c. Federal agency contribution	
d. Other contribution	
e. Total	0

D. Comments

BMP 11: Conservation Pricing

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

Rate Structure Data Volumetric Rates for Water Service by Customer Class

1. Residential

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Non-volumetric Flat Rate
c. Total Revenue from Volumetric Rates	$11187308
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$11560023

2. Commercial

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Non-volumetric Flat Rate
c. Total Revenue from Volumetric Rates	$2328359
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$928943

3. Industrial

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Non-volumetric Flat Rate
c. Total Revenue from Volumetric Rates	$375419
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$217394

4. Institutional / Government

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$55106
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$351473

5. Irrigation

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$1387523
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$400229

6. Other

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$45947
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$0

B. Conservation Pricing Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

A sewer charge was instituted in 2002.

BMP 12: Conservation Coordinator

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

1. Does your Agency have a conservation coordinator?	yes
2. Is this a full-time position?	no
3. If no, is the coordinator supplied by another agency with which you cooperate in a regional conservation program ?	yes
4. Partner agency's name:	Municipal Water District of Orange County
5. If your agency supplies the conservation coordinator:	
a. What percent is this conservation coordinator's position?	10%
b. Coordinator's Name	Kenneth J. Dills
c. Coordinator's Title	Senior Administrative Analyst
d. Coordinator's Experience and Number of Years	Level I Water Conservation Practitioner - 3 years
e. Date Coordinator's position was created (mm/dd/yyyy)	3/1/1999
6. Number of conservation staff, including Conservation Coordinator.	1

B. Conservation Staff Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	7500	7725
2. Actual Expenditures	7500	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 13: Water Waste Prohibition

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Requirements for Documenting BMP Implementation

1. Is a water waste prohibition ordinance in effect in your service area?	yes
a. If YES, describe the ordinance: 14.16.020 of the Huntington Beach Municipal Code states that no person shall waste water or allow it to be wasted from improper fixtures.	
2. Is a copy of the most current ordinance(s) on file with CUWCC?	yes
a. List local jurisdictions in your service area in the first text box and water waste ordinance citations in each jurisdiction in the second text box:	
N/A	N/A

B. Implementation

1. Indicate which of the water uses listed below are prohibited by your agency or service area.	
a. Gutter flooding	yes
b. Single-pass cooling systems for new connections	no
c. Non-recirculating systems in all new conveyor or car wash systems	no
d. Non-recirculating systems in all new commercial laundry systems	no
e. Non-recirculating systems in all new decorative fountains	no
f. Other, please name	no

2. Describe measures that prohibit water uses listed above:
Visual inspections and citations where warranted

Water Softeners:

3. Indicate which of the following measures your agency has supported in developing state law:	
a. Allow the sale of more efficient, demand-initiated regenerating DIR models.	yes
b. Develop minimum appliance efficiency standards that:	
i.) Increase the regeneration efficiency standard to at least 3,350 grains of hardness removed per pound of common salt used.	yes
ii.) Implement an identified maximum number of gallons discharged per gallon of soft water produced.	yes
c. Allow local agencies, including municipalities and special districts, to set more stringent standards and/or to ban on-site regeneration of water softeners if it is demonstrated and found by the agency governing board that there is an adverse effect on the reclaimed water or groundwater supply.	yes
4. Does your agency include water softener checks in home water audit programs?	yes

5. Does your agency include information about DIR and exchange-type water softeners in educational efforts to encourage replacement of less efficient timer models?	no

C. Water Waste Prohibition Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Any expenditures are not tracked separately.

BMP 14: Residential ULFT Replacement Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2002**

A. Implementation

	Single-Family Accounts	Multi-Family Units
1. Does your Agency have program(s) for replacing high-water-using toilets with ultra-low flush toilets?	yes	yes

Number of Toilets Replaced by Agency Program During Report Year

Replacement Method	SF Accounts	MF Units
2. Rebate	390	138
3. Direct Install	0	0
4. CBO Distribution	0	0
5. Other	1649	521
Total	**2039**	**659**

6. Describe your agency's ULFT program for single-family residences.

Huntington Beach participates in a region wide ULFT rebate program for both SF and MF. Our regional wholesaler, MWDOC administers the program on our behalf. They contract with a vendor to market the program and facilitate the rebate process for our customers. The "Other" program is a distribution program that MWDOC administers on our behalf. They contract with a separate vendor that facilitates the free distribution of ULFTs to our customers.

7. Describe your agency's ULFT program for multi-family residences.

see # 6

8. Is a toilet retrofit on resale ordinance in effect for your service area? no

9. List local jurisdictions in your service area in the left box and ordinance citations in each jurisdiction in the right box:

n/a	n/a

B. Residential ULFT Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Water Supply & Reuse

Reporting Unit:
City of Huntington Beach

Year:
2001

Water Supply Source Information		
Supply Source Name	**Quantity (AF) Supplied**	**Supply Type**
OCWD	18243	Groundwater
MWDOC	16756	Imported

Total AF: 34999

Accounts & Water Use

Reporting Unit Name:
City of Huntington Beach

Submitted to CUWCC
11/18/2002

Year:
2001

A. Service Area Population Information:

1. Total service area population 192000

B. Number of Accounts and Water Deliveries (AF)

Type	**Metered**		**Unmetered**	
	No. of Accounts	Water Deliveries (AF)	No. of Accounts	Water Deliveries (AF)
1. Single-Family	42915	15252	0	0
2. Multi-Family	4118	7713	0	0
3. Commercial	2369	4907	0	0
4. Industrial	339	1026	0	0
5. Institutional	546	128	0	0
6. Dedicated Irrigation	753	3203	0	0
7. Recycled Water	1	0	0	0
8. Other	0	119	0	0
9. Unaccounted	NA	2977	NA	0
Total	51041	35325	0	0
	Metered		**Unmetered**	

BMP 01: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Implementation

1. Based on your signed MOU date, 08/23/2000, your Agency STRATEGY DUE DATE is:	08/23/2002
2. Has your agency developed and implemented a targeting/ marketing strategy for SINGLE-FAMILY residential water use surveys?	yes
a. If YES, when was it implemented?	6/1/2000
3. Has your agency developed and implemented a targeting/ marketing strategy for MULTI-FAMILY residential water use surveys?	no
a. If YES, when was it implemented?	

B. Water Survey Data

Survey Counts:	**Single Family Accounts**	**Multi-Family Units**
1. Number of surveys offered:	17070	0
2. Number of surveys completed:	243	0
Indoor Survey:		
3. Check for leaks, including toilets, faucets and meter checks	yes	no
4. Check showerhead flow rates, aerator flow rates, and offer to replace or recommend replacement, if necessary	yes	no
5. Check toilet flow rates and offer to install or recommend installation of displacement device or direct customer to ULFT replacement program, as neccesary; replace leaking toilet flapper, as necessary	yes	no
Outdoor Survey:		
6. Check irrigation system and timers	yes	no
7. Review or develop customer irrigation schedule	yes	no
8. Measure landscaped area (Recommended but not required for surveys)	yes	no
9. Measure total irrigable area (Recommended but not required for surveys)	yes	no
10. Which measurement method is typically used (Recommended but not required for surveys)	Odometer Wheel	
11. Were customers provided with information packets that included evaluation results and water savings recommendations?	yes	no

12. Have the number of surveys offered and completed, survey results, and survey costs been tracked?	yes	no

a. If yes, in what form are surveys tracked? database

b. Describe how your agency tracks this information.
The program is managed by the Municipal Water District of Orange County, our water wholesaler.

C. Water Survey Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	20000	20000
2. Actual Expenditures	19500	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Residential surveys were previously done informally and not tracked. In 2001 and 2002 we began a 300 survey/year pilot program to determine cost effectiveness.

BMP 02: Residential Plumbing Retrofit

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Implementation

1. Is there an enforceable ordinance in effect in your service area requiring replacement of high-flow showerheads and other water use fixtures with their low-flow counterparts?	no
a. If YES, list local jurisdictions in your service area and code or ordinance in each:	
2. Has your agency satisfied the 75% saturation requirement for single-family housing units?	no
3. Estimated percent of single-family households with low-flow showerheads:	68%
4. Has your agency satisfied the 75% saturation requirement for multi-family housing units?	no
5. Estimated percent of multi-family households with low-flow showerheads:	60%
6. If YES to 2 OR 4 above, please describe how saturation was determined, including the dates and results of any survey research.	

B. Low-Flow Device Distribution Information

1. Has your agency developed a targeting/ marketing strategy for distributing low-flow devices?	yes
a. If YES, when did your agency begin implementing this strategy?	6/1/2000

b. Describe your targeting/ marketing strategy.
The program is done in conjunction with our Residential Survey Program implemented through MWDOC and noted in BMP #1.

Low-Flow Devices Distributed/ Installed	**SF Accounts**	**MF Units**
2. Number of low-flow showerheads distributed:	94	0
3. Number of toilet-displacement devices distributed:	25	0
4. Number of toilet flappers distributed:	17	0
5. Number of faucet aerators distributed:	203	0

6. Does your agency track the distribution and cost of low-flow devices?	yes
a. If YES, in what format are low-flow devices tracked?	Database

b. If yes, describe your tracking and distribution system :
The cost and distribution was tracked through a formal survey program. Showerhead cost was kept by the program vendor and showerhead distribution was tracked by address of the participant.

C. Low-Flow Device Distribution Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

The expenditures for the program are included in the residential survey expenditures shown in BMP #1.

BMP 03: System Water Audits, Leak Detection and Repair

Reporting Unit: **City of Huntington Beach**	BMP Form Status: **100% Complete**	Year: **2001**

A. Implementation

1. Has your agency completed a pre-screening system audit for this reporting year?	no
2. If YES, enter the values (AF/Year) used to calculate verifiable use as a percent of total production:	
a. Determine metered sales (AF)	32229
b. Determine other system verifiable uses (AF)	119
c. Determine total supply into the system (AF)	35325
d. Using the numbers above, if (Metered Sales + Other Verifiable Uses) / Total Supply is < 0.9 then a full-scale system audit is required.	0.92
3. Does your agency keep necessary data on file to verify the values used to calculate verifiable uses as a percent of total production?	yes
4. Did your agency complete a full-scale audit during this report year?	no
5. Does your agency maintain in-house records of audit results or the completed AWWA audit worksheets for the completed audit?	yes
6. Does your agency operate a system leak detection program?	no
a. If yes, describe the leak detection program:	

B. Survey Data

1. Total number of miles of distribution system line.	520
2. Number of miles of distribution system line surveyed.	0

C. System Audit / Leak Detection Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No
a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."	

E. Comments

A full scale leak detection was performed in 1998. After repairs, the City has maintained an water loss of less than 9%.

BMP 04: Metering with Commodity Rates for all New Connections and Retrofit of Existing

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Implementation

1. Does your agency require meters for all new connections and bill by volume-of-use?	yes
2. Does your agency have a program for retrofitting existing unmetered connections and bill by volume-of-use?	no
a. If YES, when was the plan to retrofit and bill by volume-of-use existing unmetered connections completed?	
b. Describe the program:	
3. Number of previously unmetered accounts fitted with meters during report year.	0

B. Feasibility Study

1. Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	no
a. If YES, when was the feasibility study conducted? (mm/dd/yy)	
b. Describe the feasibility study:	
2. Number of CII accounts with mixed-use meters.	0
3. Number of CII accounts with mixed-use meters retrofitted with dedicated irrigation meters during reporting period.	0

C. Meter Retrofit Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

The City has no unmetered connections.

BMP 05: Large Landscape Conservation Programs and Incentives

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Water Use Budgets

1. Number of Dedicated Irrigation Meter Accounts:	1025
2. Number of Dedicated Irrigation Meter Accounts with Water Budgets:	0
3. Budgeted Use for Irrigation Meter Accounts with Water Budgets (AF):	0
4. Actual Use for Irrigation Meter Accounts with Water Budgets (AF):	0
5. Does your agency provide water use notices to accounts with budgets each billing cycle?	yes

B. Landscape Surveys

1. Has your agency developed a marketing / targeting strategy for landscape surveys?	no
a. If YES, when did your agency begin implementing this strategy?	
b. Description of marketing / targeting strategy:	
2. Number of Surveys Offered.	0
3. Number of Surveys Completed.	0
4. Indicate which of the following Landscape Elements are part of your survey:	
a. Irrigation System Check	yes
b. Distribution Uniformity Analysis	yes
c. Review / Develop Irrigation Schedules	yes
d. Measure Landscape Area	yes
e. Measure Total Irrigable Area	yes
f. Provide Customer Report / Information	yes
5. Do you track survey offers and results?	yes
6. Does your agency provide follow-up surveys for previously completed surveys?	no
a. If YES, describe below:	

C. Other BMP 5 Actions

1. An agency can provide mixed-use accounts with ETo-based landscape budgets in lieu of a large landscape survey program. Does your agency provide mixed-use accounts with landscape budgets?	no
2. Number of CII mixed-use accounts with landscape budgets.	0
3. Do you offer landscape irrigation training?	no
4. Does your agency offer financial incentives to improve landscape water use efficiency?	no

Type of Financial Incentive:	Budget (Dollars/ Year)	Number Awarded to Customers	Total Amount Awarded
a. Rebates	0	0	0
b. Loans	0	0	0
c. Grants	0	0	0

5. Do you provide landscape water use efficiency information to new customers and customers changing services?	No
a. If YES, describe below:	
6. Do you have irrigated landscaping at your facilities?	yes
a. If yes, is it water-efficient?	yes
b. If yes, does it have dedicated irrigation metering?	yes
7. Do you provide customer notices at the start of the irrigation season?	no
8. Do you provide customer notices at the end of the irrigation season?	no

D. Landscape Conservation Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

E. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

F. Comments

The City recently began participation in MWDOC's Landscape Certification Program. The metering at City facilities varies. Some have dedicated irrigation meters some do not.

BMP 06: High-Efficiency Washing Machine Rebate Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Implementation

1. Do any energy service providers or waste water utilities in your service area offer rebates for high-efficiency washers?	yes

a. If YES, describe the offerings and incentives as well as who the energy/waste water utility provider is.
Edison, PG&E and SDG&E offer rebates

2. Does your agency offer rebates for high-efficiency washers?	no
3. What is the level of the rebate?	0
4. Number of rebates awarded.	0

B. Rebate Program Expenditures

	This Year	**Next Year**
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The program started in January 2002.

BMP 07: Public Information Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Implementation

1. Does your agency maintain an active public information program to promote and educate customers about water conservation? yes

   a. If YES, describe the program and how it's organized.
   The City offers a number of brochures and informational pamphlets at various facilities. A Water Conservation page is included in the City's web site. It offers information and links to a number of sites, including CUWCC

2. Indicate which and how many of the following activities are included in your public information program.

Public Information Program Activity	Yes/No	Number of Events
a. Paid Advertising	no	0
b. Public Service Announcement	yes	0
c. Bill Inserts / Newsletters / Brochures	yes	0
d. Bill showing water usage in comparison to previous year's usage	no	
e. Demonstration Gardens	no	0
f. Special Events, Media Events	yes	0
g. Speaker's Bureau	no	0
h. Program to coordinate with other government agencies, industry and public interest groups and media	yes	

B. Conservation Information Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	11000	11000
2. Actual Expenditures	3500	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

   a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

"Number of events" was not tracked.

BMP 08: School Education Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Implementation

1.Has your agency implemented a school information program to promote water conservation? yes

2. Please provide information on your school programs (by grade level):

Grade	Are grade-appropriate materials distributed?	No. of class presentations	No. of students reached	No. of teachers' workshops
Grades K-3rd	yes	25	2204	0
Grades 4th-6th	yes	11	1491	0
Grades 7th-8th	yes	2	700	0
High School	yes	0	0	0

3. Did your Agency's materials meet state education framework requirements? yes

4. When did your Agency begin implementing this program? 1/1/1989

B. School Education Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The City participates in a program run by MWDOC.

BMP 09: Conservation Programs for CII Accounts

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Implementation

1. Has your agency identified and ranked COMMERCIAL customers according to use?	no
2. Has your agency identified and ranked INDUSTRIAL customers according to use?	no
3. Has your agency identified and ranked INSTITUTIONAL customers according to use?	no

Option A: CII Water Use Survey and Customer Incentives Program

4. Is your agency operating a CII water use survey and customer incentives program for the purpose of complying with BMP 9 under this option?	no

CII Surveys	Commercial Accounts	Industrial Accounts	Institutional Accounts
a. Number of New Surveys Offered	0	0	0
b. Number of New Surveys Completed	0	0	0
c. Number of Site Follow-ups of Previous Surveys (within 1 yr)	0	0	0
d. Number of Phone Follow-ups of Previous Surveys (within 1 yr)	0	0	0

CII Survey Components	Commercial Accounts	Industrial Accounts	Institutional Accounts
e. Site Visit	no	no	no
f. Evaluation of all water-using apparatus and processes	no	no	no
g. Customer report identifying recommended efficiency measures, paybacks and agency incentives	no	no	no

Agency CII Customer Incentives	Budget ($/Year)	No. Awarded to Customers	Total $ Amount Awarded
h. Rebates	0	2	0
i. Loans	0	0	0
j. Grants	0	0	0
k. Others	0	0	0

Option B: CII Conservation Program Targets

5. Does your agency track CII program interventions and water savings for the purpose of complying with BMP 9 under this option?	yes
6. Does your agency document and maintain records on how savings were realized and the method of calculation for estimated savings?	yes
7. Estimated annual savings (AF/yr) from site-verified actions taken by agency since 1991.	0
8. Estimated annual savings (AF/yr) from non-site-verified actions taken by agency since 1991.	0

B. Conservation Program Expenditures for CII Accounts

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

The City participates in a Metropolitan Water District of Southern California (MWD)program. The number of rebates, but no the dollar amount is shown. MWD tracks this.

BMP 09a: CII ULFT Water Savings

Reporting Unit:
City of Huntington Beach

BMP Form Status:
100% Complete

Year:
2001

1. Did your agency implement a CII ULFT replacement program in the reporting year?
If No, please explain why on Line B. 10.

A. Targeting and Marketing

1. What basis does your agency use to target customers for participation in this program? Check all that apply.

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

We found CII sectors and sub sectors most effective because we were able to version our marketing efforts appropriately.

2. How does your agency advertise this program? Check all that apply.

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

For the purposes of this program, Trade Allies have proven to be the most effective overall marketing tool, as well as the most effective per dollar expended. Trade Allies include plumbers, distributors, retail home improvement stores and product manufacturers.

B. Implementation

1. Does your agency keep and maintain customer participant information? (Read the Help information for a complete list of all the information for this BMP.)

2. Would your agency be willing to share this information if the CUWCC did a study to evaluate the program on behalf of your agency?

3. What is the total number of customer accounts participating in the program during the last year ?

BMP 11: Conservation Pricing

Reporting Unit: **City of Huntington Beach**	BMP Form Status: **100% Complete**	Year: **2001**

A. Implementation

Rate Structure Data Volumetric Rates for Water Service by Customer Class

1. Residential

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$10144474
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$10590171

2. Commercial

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$2163416
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$964281

3. Industrial

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$451236
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$247248

4. Institutional / Government

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$56188
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$358852

5. Irrigation

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$1257501
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$400351

6. Other

a. Water Rate Structure	Uniform
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$49962
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$0

B. Conservation Pricing Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 12: Conservation Coordinator

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Implementation

1. Does your Agency have a conservation coordinator?	yes
2. Is this a full-time position?	no
3. If no, is the coordinator supplied by another agency with which you cooperate in a regional conservation program ?	yes
4. Partner agency's name:	Municipal Water District of Orange County
5. If your agency supplies the conservation coordinator:	
a. What percent is this conservation coordinator's position?	10%
b. Coordinator's Name	Kenneth J. Dills
c. Coordinator's Title	Senior Administrative Analyst
d. Coordinator's Experience and Number of Years	Level I Conservation Practitioner - 2 years
e. Date Coordinator's position was created (mm/dd/yyyy)	3/1/1999
6. Number of conservation staff, including Conservation Coordinator.	1

B. Conservation Staff Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	7281	7500
2. Actual Expenditures	7281	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 13: Water Waste Prohibition

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Requirements for Documenting BMP Implementation

1. Is a water waste prohibition ordinance in effect in your service area?	yes
a. If YES, describe the ordinance: 14.16.020 of the Huntington Beach Municipal Code states that no person shall waste water or allow it to be wasted from improper fixtures.	
2. Is a copy of the most current ordinance(s) on file with CUWCC?	yes
a. List local jurisdictions in your service area in the first text box and water waste ordinance citations in each jurisdiction in the second text box:	
N/A	N/A

B. Implementation

1. Indicate which of the water uses listed below are prohibited by your agency or service area.	
a. Gutter flooding	yes
b. Single-pass cooling systems for new connections	no
c. Non-recirculating systems in all new conveyor or car wash systems	no
d. Non-recirculating systems in all new commercial laundry systems	no
e. Non-recirculating systems in all new decorative fountains	no
f. Other, please name	no

2. Describe measures that prohibit water uses listed above:
Visual inspections and citations where warranted.

Water Softeners:

3. Indicate which of the following measures your agency has supported in developing state law:	
a. Allow the sale of more efficient, demand-initiated regenerating DIR models.	yes
b. Develop minimum appliance efficiency standards that:	
i.) Increase the regeneration efficiency standard to at least 3,350 grains of hardness removed per pound of common salt used.	yes
ii.) Implement an identified maximum number of gallons discharged per gallon of soft water produced.	yes
c. Allow local agencies, including municipalities and special districts, to set more stringent standards and/or to ban on-site regeneration of water softeners if it is demonstrated and found by the agency governing board that there is an adverse effect on the reclaimed water or groundwater supply.	yes
4. Does your agency include water softener checks in home water audit programs?	yes

5. Does your agency include information about DIR and exchange-type water softeners in educational efforts to encourage replacement of less efficient timer models?	no

C. Water Waste Prohibition Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Any expenditures are not tracked separately.

BMP 14: Residential ULFT Replacement Programs

Reporting Unit:	BMP Form Status:	Year:
City of Huntington Beach	**100% Complete**	**2001**

A. Implementation

	Single-Family Accounts	Multi-Family Units
1. Does your Agency have program(s) for replacing high-water-using toilets with ultra-low flush toilets?	yes	yes

Number of Toilets Replaced by Agency Program During Report Year

Replacement Method	SF Accounts	MF Units
2. Rebate	329	521
3. Direct Install	0	0
4. CBO Distribution	0	0
5. Other	2111	320
Total	**2440**	**841**

6. Describe your agency's ULFT program for single-family residences.

Huntington Beach participates in a region wide ULFT rebate program for both SF and MF. Our regional wholesaler, MWDOC, administers the program on our behalf. They contract with a vendor to market the program and facilitate the rebate process for our customers. The "Other" program is a distribution program that MWDOC administers on our behalf. They contract with a separate vendor that facilitates the free distribution of ULFTs to our customers.

7. Describe your agency's ULFT program for multi-family residences.

see # 6

8. Is a toilet retrofit on resale ordinance in effect for your service area? no

9. List local jurisdictions in your service area in the left box and ordinance citations in each jurisdiction in the right box:

n/a	n/a

B. Residential ULFT Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

BMP 01 Coverage: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Reporting Unit:
City of Huntington Beach

Reporting Period:
03-04

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

A Reporting Unit (RU) must meet three conditions to satisfy strict compliance for BMP 1.

Condition 1: Adopt survey targeting and marketing strategy on time

Condition 2: Offer surveys to 20% of SF accounts and 20% of MF units during report period

Condition 3: Be on track to survey 15% of SF accounts and 15% of MF units within 10 years of implementation start date.

Test for Condition 1

City of Huntington Beach to Implement Targeting/Marketing Program by:	2002	
	Single-Family	**Multi-Family**
Year City of Huntington Beach Reported Implementing Targeting/Marketing Program:	1676	
City of Huntington Beach Met Targeting/Marketing Coverage Requirement:	NO	NO

Test for Condition 2

			Single-Family	**Multi-Family**
Survey Program to Start by:	2001	Residential Survey Offers (%)		
Reporting Period:	03-04	Survey Offers $\geq$ 20%	NO	NO

Test for Condition 3

	Completed Residential Surveys	
	Single Family	Multi-Family
Total Completed Surveys 1999 - 2004:	593	
Past Credit for Surveys Completed Prior to 1999 (Implementation of Reporting Database):		
Total + Credit	593	
Residential Accounts in Base Year	42,449	32,311
City of Huntington Beach Survey Coverage as % of Base Year Residential Accounts	1.40%	
Coverage Requirement by Year 4 of Implementation per Exhibit 1	3.60%	3.60%
City of Huntington Beach on Schedule to Meet 10-Year Coverage Requirement	NO	NO

BMP 1 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 02 Coverage: Residential Plumbing Retrofit

Reporting Unit:	Reporting Period:
City of Huntington Beach	**03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet one of three conditions to satisfy strict compliance for BMP 2.

Condition 1: The agency has demonstrated that 75% of SF accounts and 75% of MF units constructed prior to 1992 are fitted with low-flow showerheads.

Condition 2: An enforceable ordinance requiring the replacement of high-flow showerheads and other water use fixtures with their low-flow counterparts is in place for the agency's service area.

Condition 3: The agency has distributed or directly installed low-flow showerheads and other low-flow plumbing devices to not less than 10% of single-family accounts and 10% of multi-family units constructed prior to 1992 during the reporting period.

Test for Condition 1

		Single-Family		Multi-Family	
Report Year	Report Period	Reported Saturation	Saturation ≥ 75%?	Reported Saturation	Saturation ≥ 75%?
1999	99-00				
2000	99-00				
2001	01-02	68.00%	NO	60.00%	NO
2002	01-02	68.00%	NO	60.00%	NO
2003	03-04	91.70%	YES	79.90%	YES
2004	03-04	100.00%	YES	86.60%	YES

Test for Condition 2

Report Year	Report Period	City of Huntington Beach has ordinance requiring showerhead retrofit?
1999	99-00	
2000	99-00	
2001	01-02	NO
2002	01-02	NO
2003	03-04	NO
2004	03-04	NO

Test for Condition 3

Reporting Period: 03-04

1992 SF Accounts	Num. Showerheads Distributed to SF Accounts	Single-Family Coverage Ratio	SF Coverage Ratio > 10%
41,283			NO
1992 MF Accounts	Num. Showerheads Distributed to MF Accounts	Multi-Family Coverage Ratio	MF Coverage Ratio > 10%
25,785			NO

BMP 2 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 03 Coverage: System Water Audits, Leak Detection and Repair

Reporting Unit:	Reporting Period:
City of Huntington Beach	**03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet one of two conditions to be in compliance with BMP 3:

Condition 1: Perform a prescreening audit. If the result is equal to or greater than 0.9 nothing more needs be done.

Condition 2: Perform a prescreening audit. If the result is less than 0.9, perform a full audit in accordance with AWWA's Manual of Water Supply Practices, Water Audits, and Leak Detection.

Test for Conditions 1 and 2

Report Year	Report Period	Pre-Screen Completed	Pre-Screen Result	Full Audit Indicated	Full Audit Completed
1999	99-00				
2000	99-00				
2001	01-02	NO	91.6%	No	NO
2002	01-02	NO	93.0%	No	NO
2003	03-04	NO	96.6%	No	NO
2004	03-04	NO	93.1%	No	NO

BMP 3 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 04 Coverage: Metering with Commodity Rates for all New Connections and Retrofit of Existing

Reporting Unit:	Reporting Period:
City of Huntington Beach	**03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must be on track to retrofit 100% of its unmetered accounts within 10 years to be in compliance with BMP 4.

Test for Compliance

Total Meter Retrofits Reported through 2004	
No. of Unmetered Accounts in Base Year	
Meter Retrofit Coverage as % of Base Year Unmetered Accounts	
Coverage Requirement by Year 3 of Implementation per Exhibit 1	16.5%
RU on Schedule to meet 10 Year Coverage Requirement	YES

BMP 4 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 05 Coverage: Large Landscape Conservation Programs and Incentives

Reporting Unit:	Reporting Period:
City of Huntington Beach	**03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet three conditions to comply with BMP 5.

Condition 1: Develop water budgets for 90% of its dedicated landscape meter accounts within four years of the date implementation is to start.

Condition 2: (a) Offer landscape surveys to at least 20% of its CII accounts with mixed use meters each report cycle and be on track to survey at least 15% of its CII accounts with mixed use meters within 10 years of the date implementation is to start OR (b) Implement a dedicated landscape meter retrofit program for CII accounts with mixed use meters or assign landscape budgets to mixed use meters.

Condition 3: Implement and maintain customer incentive program(s) for irrigation equipment retrofits.

Test for Condition 1

Year	Report Period	BMP 5 Implementation Year	No. of Irrigation Meter Accounts	No. of Irrigation Accounts with Budgets	Budget Coverage Ratio	90% Coverage Met by Year 4
1999	99-00	-2				NA
2000	99-00	-1				NA
2001	01-02		1,025			NA
2002	01-02	1	1,025			NA
2003	03-04	2	1,399			NA
2004	03-04	3	1,428			NA

Test for Condition 2a (survey offers)

Select Reporting Period:	03-04
Large Landscape Survey Offers as % of Mixed Use Meter CII Accounts	
Survey Offers Equal or Exceed 20% Coverage Requirement	NO

Test for Condition 2a (surveys completed)

Total Completed Landscape Surveys Reported through	
Credit for Surveys Completed Prior to Implementation of Reporting Database	
Total + Credit	
CII Accounts in Base Year	3,229
RU Survey Coverage as a % of Base Year CII Accounts	
Coverage Requirement by Year of Implementation per Exhibit 1	2.5%
RU on Schedule to Meet 10 Year Coverage Requirement	NO

Test for Condition 2b (mixed use budget or meter retrofit program)

Report Year	Report Period	BMP 5 Implementation Year	Agency has mix-use budget program	No. of mixed-use budgets
1999	99-00	-2		
2000	99-00	-1		
2001	01-02		NO	
2002	01-02	1	NO	
2003	03-04	2	NO	
2004	03-04	3	NO	

Report Year	Report Period	BMP 4 Implementation Year	No. of mixed use CII accounts	No. of mixed use CII accounts fitted with irrig. meters
1999	99-00	-2		
2000	99-00	-1		
2001	01-02			
2002	01-02	1		
2003	03-04	2		
2004	03-04	3		

Test for Condition 3

Report Year	Report Period	BMP 5 Implementation Year	RU offers financial incentives?	No. of Loans	Total Amt. Loans
1999	99-00	-2			
2000	99-00	-1			
2001	01-02		NO		
2002	01-02	1	NO		
2003	03-04	2	YES		
2004	03-04	3	YES		

Report Year	Report Period	No. of Grants	Total Amt. Grants	No. of rebates	Total Amt. Rebates
1999	99-00				
2000	99-00				
2001	01-02				
2002	01-02				
2003	03-04				
2004	03-04				

BMP 5 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 06 Coverage: High-Efficiency Washing Machine Rebate Programs

Reporting Unit:	Reporting Period:
City of Huntington Beach	**03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet one condition to comply with BMP 6.

Condition 1: Offer a cost-effective financial incentive for high-efficiency washers if one or more energy service providers in service area offer financial incentives for high-efficiency washers.

Test for Condition 1

Year	Report Period	BMP 6 Implementation Year	Rebate Offered by ESP?	Rebate Offered by RU?	Rebate Amount
1999	99-00	-2			
2000	99-00	-1			
2001	01-02		YES	NO	
2002	01-02	1	YES	YES	100.00
2003	03-04	2	YES	YES	100.00
2004	03-04	3	YES	YES	100.00

Year	Report Period	BMP 6 Implementation Year	No. Rebates Awarded	Coverage Met?
1999	99-00	-2		
2000	99-00	-1		
2001	01-02			NO
2002	01-02	1	114	YES
2003	03-04	2	486	YES
2004	03-04	3	857	YES

BMP 6 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 07 Coverage: Public Information Programs

Reporting Unit:	Reporting Period:
City of Huntington Beach	**03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet one condition to comply with BMP 7.

Condition 1: Implement and maintain a public information program consistent with BMP 7's definition.

Test for Condition 1

Year	Report Period	BMP 7 Implementation Year	RU Has Public Information Program?
1999	99-00	-1	
2000	99-00		
2001	01-02	1	YES
2002	01-02	2	YES
2003	03-04	3	YES
2004	03-04	4	YES

BMP 7 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 08 Coverage: School Education Programs

Reporting Unit: Reporting Period:
City of Huntington Beach **03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period? No

An agency must meet one condition to comply with BMP 8.

Condition 1: Implement and maintain a school education program consistent with BMP 8's definition.

Test for Condition 1

Year	Report Period	BMP 8 Implementation Year	RU Has School Education Program?
1999	99-00	-1	
2000	99-00		
2001	01-02	1	YES
2002	01-02	2	YES
2003	03-04	3	YES
2004	03-04	4	YES

BMP 8 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 09 Coverage: Conservation Programs for CII Accounts

Reporting Unit:
City of Huntington Beach

Reporting Period:
03-04

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period? No

An agency must meet three conditions to comply with BMP 9.

Condition 1: Agency has identified and ranked by use commercial, industrial, and institutional accounts.

Condition 2(a): Agency is on track to survey 10% of commercial accounts, 10% of industrial accounts, and 10% of institutional accounts within 10 years of date implementation to commence.
OR
Condition 2(b): Agency is on track to reduce CII water use by an amount equal to 10% of baseline use within 10 years of date implementation to commence.
OR
Condition 2(c): Agency is on track to meet the combined target as described in Exhibit 1 BMP 9 documentation.

Test for Condition 1

Year	Report Period	BMP 9 Implementation Year	Ranked Com. Use	Ranked Ind. Use	Ranked Inst. Use
1999	99-00	-2			
2000	99-00	-1			
2001	01-02		NO	NO	NO
2002	01-02	1	NO	NO	NO
2003	03-04	2	YES	YES	YES
2004	03-04	3	NO	YES	YES

Test for Condition 2a

	Commercial	Industrial	Institutional
Total Completed Surveys Reported through 2004			
Credit for Surveys Completed Prior to Implementation of Reporting Databases			
Total + Credit			
CII Accounts in Base Year	2,365	338	526
RU Survey Coverage as % of Base Year CII Accounts			
Coverage Requirement by Year 3 of Implementation per Exhibit 1	1.7%	1.7%	1.7%
RU on Schedule to Meet 10 Year Coverage Requirement	NO	NO	NO

Test for Condition 2a

Year	Report Period	BMP 9 Implementation Year	Performance Target Savings (AF/yr)	Performance Target Savings Coverage	Performance Target Savings Coverage Requirement	Coverage Requirement Met
1999	99-00	-2				YES
2000	99-00	-1				YES
2001	01-02					YES
2002	01-02	1			0.5%	NO
2003	03-04	2			1.0%	NO
2004	03-04	3	5	0.1%	1.7%	NO

Test for Condition 2c

Total BMP 9 Surveys + Credit	
BMP 9 Survey Coverage	
BMP 9 Performance Target Coverage	0.1%
BMP 9 Survey + Performance Target Coverage	0.1%
Combined Coverage Equals or Exceeds Coverage Requirement?	NO

BMP 9 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 11 Coverage: Conservation Pricing

Reporting Unit: **City of Huntington Beach**

Reporting Period: **03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet one condition to comply with BMP 11.

Agency shall maintain rate structure consistent with BMP 11's definition of conservation pricing. Implementation methods shall be at least as effective as eliminating non-conserving pricing and adopting conserving pricing. For signatories supplying both water and sewer service, this BMP applies to pricing of both water and sewer service. Signatories that supply water but not sewer service shall make good faith efforts to work with sewer agencies so that those sewer agencies adopt conservation pricing for sewer service.

a) Non-conserving pricing provides no incentives to customers to reduce use. Such pricing is characterized by one or more of the following components: rates in which the unit price decreases as the quantity used increases (declining block rates);rates that involve charging customers a fixed amount per billing cycle regardless of the quantity used; pricing in which the typical bill is determined by high fixed charges and low commodity charges.

b) Conservation pricing provides incentives to customers to reduce average or peak use, or both. Such pricing includes: rates designed to recover the cost of providing service; and billing for water and sewer service based on metered water use. Conservation pricing is also characterized by one or more of the following components: rates in which the unit rate is constant regardless of the quantity used (uniform rates) or increases as the quantity used increases (increasing block rates); seasonal rates or excess-use surcharges to reduce peak demands during summer months; rates based upon the longrun marginal cost or the cost of adding the next unit of capacity to the system.

Test for Condition 1

Year	Report Period	RU Employed Non Conserving Rate Structure	RU Meets BMP 11 Coverage Requirement
1999	99-00	NO	YES
2000	99-00	NO	YES
2001	01-02	NO	YES
2002	01-02	YES	NO
2003	03-04	YES	NO
2004	03-04	YES	NO

BMP 11 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 12 Coverage: Conservation Coordinator

Reporting Unit: **City of Huntington Beach**

Reporting Period: **03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

Agency shall staff and maintain the position of conservation coordinator and provide support staff as necessary.

Test for Compliance

Report Year	Report Period	Conservation Coordinator Position Staffed?	Total Staff on Team (incl. CC)
1999	99-00		
2000	99-00		
2001	01-02	YES	1
2002	01-02	YES	1
2003	03-04	YES	1
2004	03-04	YES	1

BMP 12 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 13 Coverage: Water Waste Prohibition

Reporting Unit: Reporting Period:
City of Huntington Beach **03-04**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period? No

An agency must meet one condition to comply with BMP 13.

Implementation methods shall be enacting and enforcing measures prohibiting gutter flooding, single pass cooling systems in new connections, non-recirculating systems in all new conveyer car wash and commercial laundry systems, and non-recycling decorative water fountains.

Test for Condition 1

Agency or service area prohibits:

Year	Gutter Flooding	Single-Pass Cooling Systems	Single-Pass Car Wash	Single-Pass Laundry	Single-Pass Fountains	Other	RU has ordinance that meets coverage requirement
1999							
2000							
2001	yes	no	no	no	no	no	NO
2002	yes	no	no	no	no	no	NO
2003	yes	no	no	no	no	no	NO
2004	yes	no	no	no	no	no	NO

BMP 13 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 14 Coverage: Residential ULFT Replacement Programs

Reporting Unit: **City of Huntington Beach**

MOU Exhibit 1 Coverage Requirement

A Reporting Unit (RU) must meet one of the following conditions to be in compliance with BMP 14.

Condition 1: Retrofit-on-resale (ROR) ordinance in effect in service area.

Condition 2: Water savings from toilet replacement programs equal to 90% of Exhibit 6 coverage requirement. An agency with an exemption for BMP 14 is not required to meet one of the above conditions. This report treats an agency with missing base year data required to compute the Exhibit 6 coverage requirement as out of compliance with BMP 14.

Status: Water supplier is meeting coverage requirements for this BMP. as of 2004

Coverage Year	BMP 14 Data Submitted to CUWCC	Exemption Filed with CUWCC	ROR Ordinance in Effect	Exhibit 6 Coverage Req'mt (AF)	Toilet Replacement Program Water Savings* (AF)
2001	Yes	No	No	121.31	1984.77
2002	Yes	No	No	348.39	2463.34
2003	Yes	No	No	667.25	3046.66
2004	Yes	No	No	1065.36	3663.69
2005	No	No	No	1531.47	
2006	No	No	No	2055.50	
2007	No	No	No	2628.43	
2008	No	No	No	3242.21	
2009	No	No	No	3889.63	
2010	No	No	No	4564.29	

*NOTE: Program water savings listed are net of the plumbing code. Savings are cumulative (not annual) between 1991 and the given year. Residential ULFT count data from unsubmitted forms are NOT included in the calculation.

BMP 14 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 14 Coverage: Residential ULFT Replacement Programs

Reporting Unit: **City of Huntington Beach**

BMP 14 Coverage Calculation Detail: Retrofit on Resale (ROR) Ordinance Water Savings

	Single Family	Multi-Family
1992 Housing Stock		
Average rate of natural replacement (% of remaining stock)	04	04
Average rate of housing demolition (% of remining stock)	005	.005
Estimated Housing Units with 3.5+ gpf Toilets in 1997	29830.80	18632.05
Average resale rate	0578	.0333
Average persons per unit		
Average toilets per unit		
Average savings per home (gpd; from Exhibit 6)	47 2	51 6

Single Family Housing Units

Coverage Year	Unretrofitted Houses	Houses Sold	Houses Unsold	Sold and Retrofitted	Sold and Already Retrofitted	Unsold and Retrofitted	Gross ROR Savings (AFY)	Nat'l Replacement Only Savings (AFY)	Net ROR Savings (AFY)
2001	26996.56	1715.60	27966 04	1715 60		1118 64	755 22	668 16	87 06
2002	24431.60	1707.02	27826.21	1552 60	154 42	1012 36	890 81	728 42	162 39
2003	22110.34	1698 49	27687.08	1405 09	293 40	916.17	1013 52	786 29	227 23
2004	20009 62	1689 99	27548 65	1271.59	418 41	829.13	1124 57	841 85	282.72
2005	18108 50	1681 54	27410 90	1150.77	530 77	750.35	1225 07	895 20	329.87
2006	16388 00	1673 14	27273 85	1041 44	631 70	679 06	1316 02	946 43	369 59
2007	14830 97	1664 77	27137 48	942 49	722 28	614 54	1398 33	995 62	402 71
2008	13421 87	1656 45	27001 79	852 94	803.50	556 15	1472 82	1042.85	429 97
2009	12146.65	1648.16	26866 78	771 91	876.26	503 31	1540.23	1088.20	452 03
2010	10992.59	1639.92	26732.45	698 57	941.36	455 49	1601.24	1131.75	469 49

Multi Family Housing Units

Coverage Year	Unretrofitted Houses	Houses Sold	Houses Unsold	Sold and Retrofitted	Sold and Already Retrofitted	Unsold and Retrofitted	Gross ROR Savings (AFY)	Nat'l Replacement Only Savings (AFY)	Net ROR Savings (AFY)
2001	17297 85	617 35	17921 55	617 35		716.86	490 48	456 23	34.25
2002	16059.18	614 26	17831 94	573 14	41 12	665 53	562 06	497 38	64.68
2003	14909.21	611.19	17742.78	532 10	79.09	617.87	628 52	536 89	91 63
2004	13841.59	608.13	17654.07	493 99	114.14	573 63	690 22	574 83	115 39
2005	12850 42	605.09	17565.80	458.62	146 47	532 55	747.50	611 26	136 24
2006	11930 23	602 07	17477 97	425.78	176 29	494.42	800 68	646 24	154 44
2007	11075 92	599 05	17390 58	395.29	203 76	459.01	850.05	679 82	170 22
2008	10282 80	596 06	17303 63	366 98	229 08	426.14	895 88	712 07	183 81
2009	9546 46	593 08	17217 11	340 71	252 37	395.63	938 44	743 04	195 40
2010	8862 86	590.11	17131 02	316 31	273 81	367 30	977 94	772.78	205 17

BMP 01 Coverage: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Reporting Unit:
City of Huntington Beach

Reporting Period:
01-02

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

A Reporting Unit (RU) must meet three conditions to satisfy strict compliance for BMP 1.

Condition 1: Adopt survey targeting and marketing strategy on time

Condition 2: Offer surveys to 20% of SF accounts and 20% of MF units during report period

Condition 3: Be on track to survey 15% of SF accounts and 15% of MF units within 10 years of implementation start date.

Test for Condition 1

City of Huntington Beach to Implement Targeting/Marketing Program by:	2002	
	Single-Family	**Multi-Family**
Year City of Huntington Beach Reported Implementing Targeting/Marketing Program:		
City of Huntington Beach Met Targeting/Marketing Coverage Requirement:	NO	NO

Test for Condition 2

			Single-Family	**Multi-Family**
Survey Program to Start by:	2001	Residential Survey Offers (%)	80.43%	
Reporting Period:	01-02	Survey Offers $\geq$ 20%	YES	NO

Test for Condition 3

	Completed Residential Surveys	
	Single Family	Multi-Family
Total Completed Surveys 1999 - 2002:	593	
Past Credit for Surveys Completed Prior to 1999 (Implementation of Reporting Database):		
Total + Credit	593	
Residential Accounts in Base Year	42,449	32,311
City of Huntington Beach Survey Coverage as % of Base Year Residential Accounts	1.40%	
Coverage Requirement by Year 2 of Implementation per Exhibit 1	1.50%	1.50%
City of Huntington Beach on Schedule to Meet 10-Year Coverage Requirement	NO	NO

BMP 1 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 02 Coverage: Residential Plumbing Retrofit

Reporting Unit: Reporting Period:

City of Huntington Beach **01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period? No

An agency must meet one of three conditions to satisfy strict compliance for BMP 2.

Condition 1: The agency has demonstrated that 75% of SF accounts and 75% of MF units constructed prior to 1992 are fitted with low-flow showerheads.

Condition 2: An enforceable ordinance requiring the replacement of high-flow showerheads and other water use fixtures with their low-flow counterparts is in place for the agency's service area.

Condition 3: The agency has distributed or directly installed low-flow showerheads and other low-flow plumbing devices to not less than 10% of single-family accounts and 10% of multi-family units constructed prior to 1992 during the reporting period.

Test for Condition 1

		Single-Family		Multi-Family	
Report Year	Report Period	Reported Saturation	Saturation ≥ 75%?	Reported Saturation	Saturation ≥ 75%?
1999	99-00				
2000	99-00				
2001	01-02	68.00%	NO	60.00%	NO
2002	01-02	68.00%	NO	60.00%	NO
2003	03-04	91.70%	YES	79.90%	YES
2004	03-04	100.00%	YES	86.60%	YES

Test for Condition 2

Report Year	Report Period	City of Huntington Beach has ordinance requiring showerhead retrofit?
1999	99-00	
2000	99-00	
2001	01-02	NO
2002	01-02	NO
2003	03-04	NO
2004	03-04	NO

Test for Condition 3

Reporting Period: 01-02

1992 SF Accounts	Num. Showerheads Distributed to SF Accounts	Single-Family Coverage Ratio	SF Coverage Ratio > 10%
41,283	237	0.6%	NO
1992 MF Accounts	**Num. Showerheads Distributed to MF Accounts**	**Multi-Family Coverage Ratio**	**MF Coverage Ratio > 10%**
25,785			NO

BMP 2 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 03 Coverage: System Water Audits, Leak Detection and Repair

Reporting Unit: Reporting Period:
City of Huntington Beach **01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period? No

An agency must meet one of two conditions to be in compliance with BMP 3:

Condition 1: Perform a prescreening audit. If the result is equal to or greater than 0.9 nothing more needs be done.

Condition 2: Perform a prescreening audit. If the result is less than 0.9, perform a full audit in accordance with AWWA's Manual of Water Supply Practices, Water Audits, and Leak Detection.

Test for Conditions 1 and 2

Report Year	Report Period	Pre-Screen Completed	Pre-Screen Result	Full Audit Indicated	Full Audit Completed
1999	99-00				
2000	99-00				
2001	01-02	NO	91.6%	No	NO
2002	01-02	NO	93.0%	No	NO
2003	03-04	NO	96.6%	No	NO
2004	03-04	NO	93.1%	No	NO

BMP 3 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 04 Coverage: Metering with Commodity Rates for all New Connections and Retrofit of Existing

Reporting Unit:	Reporting Period:
City of Huntington Beach	**01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must be on track to retrofit 100% of its unmetered accounts within 10 years to be in compliance with BMP 4.

Test for Compliance

Total Meter Retrofits Reported through 2002	
No. of Unmetered Accounts in Base Year	
Meter Retrofit Coverage as % of Base Year Unmetered Accounts	
Coverage Requirement by Year 1 of Implementation per Exhibit 1	4.5%
RU on Schedule to meet 10 Year Coverage Requirement	YES

BMP 4 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 05 Coverage: Large Landscape Conservation Programs and Incentives

Reporting Unit:	Reporting Period:
City of Huntington Beach	**01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet three conditions to comply with BMP 5.

Condition 1: Develop water budgets for 90% of its dedicated landscape meter accounts within four years of the date implementation is to start.

Condition 2: (a) Offer landscape surveys to at least 20% of its CII accounts with mixed use meters each report cycle and be on track to survey at least 15% of its CII accounts with mixed use meters within 10 years of the date implementation is to start OR (b) Implement a dedicated landscape meter retrofit program for CII accounts with mixed use meters or assign landscape budgets to mixed use meters.

Condition 3: Implement and maintain customer incentive program(s) for irrigation equipment retrofits.

Test for Condition 1

Year	Report Period	BMP 5 Implementation Year	No. of Irrigation Meter Accounts	No. of Irrigation Accounts with Budgets	Budget Coverage Ratio	90% Coverage Met by Year 4
1999	99-00	-2				NA
2000	99-00	-1				NA
2001	01-02		1,025			NA
2002	01-02	1	1,025			NA
2003	03-04	2	1,399			NA
2004	03-04	3	1,428			NA

Test for Condition 2a (survey offers)

Select Reporting Period:	01-02
Large Landscape Survey Offers as % of Mixed Use Meter CII Accounts	
Survey Offers Equal or Exceed 20% Coverage Requirement	NO

Test for Condition 2a (surveys completed)

Total Completed Landscape Surveys Reported through	
Credit for Surveys Completed Prior to Implementation of Reporting Database	
Total + Credit	
CII Accounts in Base Year	3,229

RU Survey Coverage as a % of Base Year CII Accounts	
Coverage Requirement by Year of Implementation per Exhibit 1	0.7%
RU on Schedule to Meet 10 Year Coverage Requirement	NO

Test for Condition 2b (mixed use budget or meter retrofit program)

Report Year	Report Period	BMP 5 Implementation Year	Agency has mix-use budget program	No. of mixed-use budgets
1999	99-00	-2		
2000	99-00	-1		
2001	01-02		NO	
2002	01-02	1	NO	
2003	03-04	2	NO	
2004	03-04	3	NO	

Report Year	Report Period	BMP 4 Implementation Year	No. of mixed use CII accounts	No. of mixed use CII accounts fitted with irrig. meters
1999	99-00	-2		
2000	99-00	-1		
2001	01-02			
2002	01-02	1		
2003	03-04	2		
2004	03-04	3		

Test for Condition 3

Report Year	Report Period	BMP 5 Implementation Year	RU offers financial incentives?	No. of Loans	Total Amt. Loans
1999	99-00	-2			
2000	99-00	-1			
2001	01-02		NO		
2002	01-02	1	NO		
2003	03-04	2	YES		
2004	03-04	3	YES		

Report Year	Report Period	No. of Grants	Total Amt. Grants	No. of rebates	Total Amt. Rebates
1999	99-00				
2000	99-00				
2001	01-02				
2002	01-02				
2003	03-04				
2004	03-04				

BMP 5 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 06 Coverage: High-Efficiency Washing Machine Rebate Programs

Reporting Unit:	Reporting Period:
City of Huntington Beach	**01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet one condition to comply with BMP 6.

Condition 1: Offer a cost-effective financial incentive for high-efficiency washers if one or more energy service providers in service area offer financial incentives for high-efficiency washers.

Test for Condition 1

Year	Report Period	BMP 6 Implementation Year	Rebate Offered by ESP?	Rebate Offered by RU?	Rebate Amount
1999	99-00	-2			
2000	99-00	-1			
2001	01-02		YES	NO	
2002	01-02	1	YES	YES	100.00
2003	03-04	2	YES	YES	100.00
2004	03-04	3	YES	YES	100.00

Year	Report Period	BMP 6 Implementation Year	No. Rebates Awarded	Coverage Met?
1999	99-00	-2		
2000	99-00	-1		
2001	01-02			NO
2002	01-02	1	114	YES
2003	03-04	2	486	YES
2004	03-04	3	857	YES

BMP 6 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 07 Coverage: Public Information Programs

Reporting Unit:	Reporting Period:
City of Huntington Beach	**01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet one condition to comply with BMP 7.

Condition 1: Implement and maintain a public information program consistent with BMP 7's definition.

Test for Condition 1

Year	Report Period	BMP 7 Implementation Year	RU Has Public Information Program?
1999	99-00	-1	
2000	99-00		
2001	01-02	1	YES
2002	01-02	2	YES
2003	03-04	3	YES
2004	03-04	4	YES

BMP 7 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 08 Coverage: School Education Programs

Reporting Unit:	Reporting Period:
City of Huntington Beach	**01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet one condition to comply with BMP 8.

Condition 1: Implement and maintain a school education program consistent with BMP 8's definition.

Test for Condition 1

Year	Report Period	BMP 8 Implementation Year	RU Has School Education Program?
1999	99-00	-1	
2000	99-00		
2001	01-02	1	YES
2002	01-02	2	YES
2003	03-04	3	YES
2004	03-04	4	YES

BMP 8 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 09 Coverage: Conservation Programs for CII Accounts

Reporting Unit: **City of Huntington Beach**

Reporting Period: **01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

An agency must meet three conditions to comply with BMP 9.

Condition 1: Agency has identified and ranked by use commercial, industrial, and institutional accounts.

Condition 2(a): Agency is on track to survey 10% of commercial accounts, 10% of industrial accounts, and 10% of institutional accounts within 10 years of date implementation to commence.
OR
Condition 2(b): Agency is on track to reduce CII water use by an amount equal to 10% of baseline use within 10 years of date implementation to commence.
OR
Condition 2(c): Agency is on track to meet the combined target as described in Exhibit 1 BMP 9 documentation.

Test for Condition 1

Year	Report Period	BMP 9 Implementation Year	Ranked Com. Use	Ranked Ind. Use	Ranked Inst. Use
1999	99-00	-2			
2000	99-00	-1			
2001	01-02		NO	NO	NO
2002	01-02	1	NO	NO	NO
2003	03-04	2	YES	YES	YES
2004	03-04	3	NO	YES	YES

Test for Condition 2a

	Commercial	Industrial	Institutional
Total Completed Surveys Reported through 2002			
Credit for Surveys Completed Prior to Implementation of Reporting Databases			
Total + Credit			
CII Accounts in Base Year	2,365	338	526
RU Survey Coverage as % of Base Year CII Accounts			
Coverage Requirement by Year 1 of Implementation per Exhibit 1	0.5%	0.5%	0.5%
RU on Schedule to Meet 10 Year Coverage Requirement	NO	NO	NO

Test for Condition 2a

Year	Report Period	BMP 9 Implementation Year	Performance Target Savings (AF/yr)	Performance Target Savings Coverage	Performance Target Savings Coverage Requirement	Coverage Requirement Met
1999	99-00	-2				YES
2000	99-00	-1				YES
2001	01-02					YES
2002	01-02	1			0.5%	NO
2003	03-04	2			1.0%	NO
2004	03-04	3	5	0.1%	1.7%	NO

Test for Condition 2c

Total BMP 9 Surveys + Credit	
BMP 9 Survey Coverage	
BMP 9 Performance Target Coverage	
BMP 9 Survey + Performance Target Coverage	
Combined Coverage Equals or Exceeds Coverage Requirement?	NO

BMP 9 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 11 Coverage: Conservation Pricing

Reporting Unit: Reporting Period:
City of Huntington Beach **01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period? No

An agency must meet one condition to comply with BMP 11.

Agency shall maintain rate structure consistent with BMP 11's definition of conservation pricing. Implementation methods shall be at least as effective as eliminating non-conserving pricing and adopting conserving pricing. For signatories supplying both water and sewer service, this BMP applies to pricing of both water and sewer service. Signatories that supply water but not sewer service shall make good faith efforts to work with sewer agencies so that those sewer agencies adopt conservation pricing for sewer service.

a) Non-conserving pricing provides no incentives to customers to reduce use. Such pricing is characterized by one or more of the following components: rates in which the unit price decreases as the quantity used increases (declining block rates);rates that involve charging customers a fixed amount per billing cycle regardless of the quantity used; pricing in which the typical bill is determined by high fixed charges and low commodity charges.

b) Conservation pricing provides incentives to customers to reduce average or peak use, or both. Such pricing includes: rates designed to recover the cost of providing service; and billing for water and sewer service based on metered water use. Conservation pricing is also characterized by one or more of the following components: rates in which the unit rate is constant regardless of the quantity used (uniform rates) or increases as the quantity used increases (increasing block rates); seasonal rates or excess-use surcharges to reduce peak demands during summer months; rates based upon the longrun marginal cost or the cost of adding the next unit of capacity to the system.

Test for Condition 1

Year	Report Period	RU Employed Non Conserving Rate Structure	RU Meets BMP 11 Coverage Requirement
1999	99-00	NO	YES
2000	99-00	NO	YES
2001	01-02	NO	YES
2002	01-02	YES	NO
2003	03-04	YES	NO
2004	03-04	YES	NO

BMP 11 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 12 Coverage: Conservation Coordinator

Reporting Unit: Reporting Period:
City of Huntington Beach **01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period?	No

Agency shall staff and maintain the position of conservation coordinator and provide support staff as necessary.

Test for Compliance

Report Year	Report Period	Conservation Coordinator Position Staffed?	Total Staff on Team (incl. CC)
1999	99-00		
2000	99-00		
2001	01-02	YES	1
2002	01-02	YES	1
2003	03-04	YES	1
2004	03-04	YES	1

BMP 12 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 13 Coverage: Water Waste Prohibition

Reporting Unit: Reporting Period:
City of Huntington Beach **01-02**

MOU Exhibit 1 Coverage Requirement

No exemption request filed

Agency indicated "at least as effective as" implementation during report period? No

An agency must meet one condition to comply with BMP 13.

Implementation methods shall be enacting and enforcing measures prohibiting gutter flooding, single pass cooling systems in new connections, non-recirculating systems in all new conveyer car wash and commercial laundry systems, and non-recycling decorative water fountains.

Test for Condition 1

Agency or service area prohibits:

Year	Gutter Flooding	Single-Pass Cooling Systems	Single-Pass Car Wash	Single-Pass Laundry	Single-Pass Fountains	Other	RU has ordinance that meets coverage requirement
1999							
2000							
2001	yes	no	no	no	no	no	NO
2002	yes	no	no	no	no	no	NO
2003	yes	no	no	no	no	no	NO
2004	yes	no	no	no	no	no	NO

BMP 13 COVERAGE STATUS SUMMARY:
Water supplier has not met one or more coverage requirements for this BMP.

BMP 14 Coverage: Residential ULFT Replacement Programs

Reporting Unit: **City of Huntington Beach**

MOU Exhibit 1 Coverage Requirement

A Reporting Unit (RU) must meet one of the following conditions to be in compliance with BMP 14.

Condition 1: Retrofit-on-resale (ROR) ordinance in effect in service area.

Condition 2: Water savings from toilet replacement programs equal to 90% of Exhibit 6 coverage requirement. An agency with an exemption for BMP 14 is not required to meet one of the above conditions. This report treats an agency with missing base year data required to compute the Exhibit 6 coverage requirement as out of compliance with BMP 14.

Status: Water supplier is meeting coverage requirements for this BMP. as of 2004

Coverage Year	BMP 14 Data Submitted to CUWCC	Exemption Filed with CUWCC	ROR Ordinance in Effect	Exhibit 6 Coverage Req'mt (AF)	Toilet Replacement Program Water Savings* (AF)
2001	Yes	No	No	121.31	1984.77
2002	Yes	No	No	348.39	2463.34
2003	Yes	No	No	667.25	3046.66
2004	Yes	No	No	1065.36	3663.69
2005	No	No	No	1531.47	
2006	No	No	No	2055.50	
2007	No	No	No	2628.43	
2008	No	No	No	3242.21	
2009	No	No	No	3889.63	
2010	No	No	No	4564.29	

*NOTE: Program water savings listed are net of the plumbing code. Savings are cumulative (not annual) between 1991 and the given year. Residential ULFT count data from unsubmitted forms are NOT included in the calculation.

BMP 14 COVERAGE STATUS SUMMARY:
Water supplier is meeting coverage requirements for this BMP.

BMP 14 Coverage: Residential ULFT Replacement Programs

Reporting Unit: **City of Huntington Beach**

BMP 14 Coverage Calculation Detail: Retrofit on Resale (ROR) Ordinance Water Savings

	Single Family	Multi-Family
1992 Housing Stock		
Average rate of natural replacement (% of remaining stock)	04	.04
Average rate of housing demolition (% of remining stock)	.005	.005
Estimated Housing Units with 3.5+ gpf Toilets in 1997	29830.80	18632 05
Average resale rate	.0578	.0333
Average persons per unit		
Average toilets per unit		
Average savings per home (gpd; from Exhibit 6)	47 2	51 6

Single Family Housing Units

Coverage Year	Unretrofitted Houses	Houses Sold	Houses Unsold	Sold and Retrofitted	Sold and Already Retrofitted	Unsold and Retrofitted	Gross ROR Savings (AFY)	Nat'l Replacement Only Savings (AFY)	Net ROR Savings (AFY)
2001	26996 56	1715 60	27966.04	1715 60		1118 64	755 22	668.16	87 06
2002	24431 60	1707 02	27826.21	1552 60	154 42	1012 36	890 81	728 42	162 39
2003	22110 34	1698.49	27687 08	1405 09	293 40	916 17	1013 52	786 29	227 23
2004	20009 62	1689.99	27548.65	1271.59	418 41	829 13	1124 57	841.85	282 72
2005	18108 50	1681.54	27410.90	1150.77	530 77	750 35	1225 07	895.20	329 87
2006	16388 00	1673.14	27273.85	1041.44	631 70	679 06	1316 02	946 43	369 59
2007	14830.97	1664.77	27137.48	942.49	722 28	614 54	1398 33	995 62	402 71
2008	13421.87	1656.45	27001 79	852.94	803 50	556 15	1472 82	1042 85	429 97
2009	12146.65	1648.16	26866 78	771.91	876 26	503 31	1540 23	1088 20	452 03
2010	10992.59	1639 92	26732 45	698 57	941 36	455 49	1601 24	1131 75	469 49

Multi Family Housing Units

Coverage Year	Unretrofitted Houses	Houses Sold	Houses Unsold	Sold and Retrofitted	Sold and Already Retrofitted	Unsold and Retrofitted	Gross ROR Savings (AFY)	Nat'l Replacement Only Savings (AFY)	Net ROR Savings (AFY)
2001	17297 85	617 35	17921 55	617 35		716 86	490 48	456 23	34 25
2002	16059 18	614 26	17831 94	573 14	41.12	665 53	562 06	497 38	64 68
2003	14909 21	611 19	17742 78	532 10	79 09	617 87	628 52	536 89	91 63
2004	13841 59	608 13	17654 07	493 99	114.14	573 63	690 22	574 83	115 39
2005	12850 42	605 09	17565 80	458 62	146 47	532 55	747 50	611 26	136 24
2006	11930 23	602 07	17477.97	425 78	176 29	494.42	800 68	646 24	154 44
2007	11075 92	599 05	17390.58	395 29	203 76	459 01	850 05	679 82	170 22
2008	10282 80	596 06	17303.63	366 98	229 08	426.14	895.88	712 07	183 81
2009	9546 46	593 08	17217.11	340 71	252 37	395.63	938.44	743 04	195 40
2010	8862 86	590 11	17131.02	316 31	273 81	367 30	977.94	772 78	205.17

APPENDIX F

CITY OF HUNTINGTON BEACH WATER MANAGEMENT PROGRAM ORDINANCE - CH. 14.16 WATER USE REGULATIONS; CH. 14.18 WATER MANAGEMENT PROGRAM; CH. 14.52 WATER EFFICIENT LANDSCAPE REQUIREMENTS

Chapter 14.16

WATER USE REGULATIONS

(674-12/57, 1996-8/75, 2404-1/80, 2966-11/88)

Sections:

14.16.010 During fire. No person shall use any water for irrigation or any steady flow during the progress of any fire in the city unless for protection of property, and all irrigation and sprinkling shall immediately be stopped when an alarm of fire is sounded in any part of the city, and shall not be begun until the fire is extinguished. (674-12/57)

14.16.020 Waste from improper fixtures. No person shall waste water or allow it to be wasted by imperfect or leaking stops, valves, pipes, closets, faucets or other fixtures, or use water closets without self-closing valves, or use the water for purposes other than those named in the application upon which rates for water are based, or use it in violation of any of the provisions of any ordinance of this city, provided further that no person shall drain or permit water to drain upon any public street or alley, or over any private property not owned by such person. (674-12/57)

14.16.030 Meters--Property of city. All water service and water meters installed or required to be installed by the City Water Department shall remain at all times the property of the city and shall be maintained, repaired and renewed by the City Water Department when rendered unserviceable by normal wear and tear. (674-12/57)

14.16.040 Meters--Replacement or repair. Where replacements, repairs or adjustments of any meter are rendered necessary by an act resulting from malice, carelessness or neglect of the consumer or any member of his family, or any one employed by him, and any damage which may result from hot water, or steam from water heater, boiler or otherwise, shall be charged to and paid for by such consumer to the Water Department on presentation of a bill therefor; and in case such bill is not paid, the water shall be shut off from such premises and shall not be turned on again until all charges are paid. No person shall interfere with or remove from any service any water meter which has been so attached. (674-12/57)

14.16.050 Meters--Accuracy tests. Where the accuracy of record of a water meter is questioned, it shall be removed at the consumer's request and shall in his presence be tested in the shops of the Water Department by means of the apparatus there provided, and a report thereon duly made. Both parties to the test must accept the findings so made. If the test discloses an error against the consumer of more than 3 percent of the meter's registry, the excess of the consumption on the 3 percent readings shall be credited to the consumer's meter account, and the Water Department will bear the entire expenses of the test, and the deposit required as hereinafter prescribed shall be returned. On the other hand, where no such error is found, the person who has requested the test shall pay the charge fixed for such test. (674-12/57)

14.16.060 Meters--Test deposit. Before making a test of any meter, the person requesting such a test shall, at the time of filing his request, make a deposit with the Water Department of the amount charged for such a test, subject to the conditions herein stated, which charges are fixed as follows:

for testing 5/8 inch meters	$10
for testing l inch meters	$10
for testing 1 1/2 inch meters	$20
for testing 2 inch meters	$20
for testing 3 inch meters	$80
for testing 4 inch meters	$105

No meter shall be removed, or in any way disturbed, nor the seal broken except in the presence of or under the direction of the Superintendent. (674-12/57, 1996-8/75)

14.16.070 Meters--Placement. All meters of the Water Department shall be placed at the curb line of the street or near the property line in alleys, whenever and wherever practicable, and be protected and maintained as a part of the operation of the department. (674-12/57)

14.16.080 Meters--Inside premises. Where a water meter is placed inside the premises of a consumer, for the convenience of the consumer, provisions shall be made for convenient meter reading and repairing by representatives of the department. Failure to make such provisions by the consumer shall be sufficient cause for removal of such meter at the option of the Superintendent of the department and the withholding of service until installation is made at the curb line as herein provided. (674-12/57)

14.16.090 Consumer's responsibility. The city shall in no way whatsoever be responsible for any damage to person or property because of any leakage, breakage or seepage from, or accident or damage to any meter or pipe situated within any private premises, and the city shall not be responsible for any leakage, breakage or seepage for any pipe situated between any meter properly installed at the curb and the private premises served thereby nor shall the city be responsible for or on account of any damage, injury or loss occasioned directly or indirectly by the existence of any meter or pipe situated upon private property. (674-12/57)

14.16.100 Fire hydrants--Maintenance. Public fire hydrants shall be placed, maintained and repaired by the Water Department. Any damage thereto by persons or agency other than representatives of the Fire and Water Departments, shall be a claim against the person or agency committing such damage, and the Superintendent shall take such action as may be necessary to collect the same. (674-12/57)

14.16.110 Fire hydrants--Use. Fire hydrants are provided for the sole purpose of extinguishing fires and shall be used otherwise only as herein provided for, and shall be opened and used only by the Water and Fire Departments or such persons as may be authorized to do so by the Chief of the Fire Department, or the Superintendent of the Water Department as herein provided. (674-12/57)

14.16.120 Fire hydrants--Permits for special use. All persons desiring to use water through fire hydrants, or other hydrants, owned or controlled by the city, shall be required to obtain a permit first from the Chief of the Fire Department; second, from the Superintendent of the Water Department, who shall issue no such permit to any person who has violated any of the provisions of this title or whose indebtedness to the city of water used or damage to hydrants or equipment is delinquent. All such persons having permit for use of water from the fire hydrants must provide hydrant wrenches for the operation of such fire hydrants. (674-12/57)

14.16.130 Fire hydrant--Use permit cancellation. Permit for the use of water through the fire hydrants of the city may be cancelled at the will of the Superintendent on evidence that the holder thereof is or has violated the privileges conveyed thereunder. Such notice of cancellation shall be in writing delivered or mailed to the persons to be notified and shall be immediately effective and enforced. (674-12/57)

14.16.140 Fire hydrants--Obstructing access. No person shall obstruct the access to any fire hydrant by placing around or thereon any stone, brick, lumber, dirt or other material or wilfully or carelessly injure the same, or open or operate any fire hydrant, or draw or attempt to draw water therefrom, except as provided in section 14.16.120. (674-12/57)

14.16.150 Pressure maintenance or shutoff. The Water Department shall not accept any responsibility for the maintenance of pressure and it reserves the right to shut off the water from any premises, or from any part of the distributing system, as long as necessary without notice to consumers, at any time of emergency, but in all cases of extensions or connections, the department shall notify occupants of the premises of the necessity of shutting off water and the probable length of time the water shall be so shut off before taking such action. (647-12/57)

14.16.160 Drawing water into steam boilers. No stationary steam boiler shall be connected directly with the water distribution system of the city, but in each and every case a suitable tank of storage capacity sufficient for a twelve (12) hour supply for said boiler shall be provided and the service pipe supplying the tank shall discharge directly into the top of the tank. (674-12/57)

14.16.170 Violations reported. It shall be the duty of the employees of the Police, fire and street departments to give vigilant aid to the Superintendent in the enforcement of the provisions of this chapter and to this end they shall report all violations thereof which come to their knowledge to the Water Department, and it shall be the duty of the Chief of the Fire Department to report immediately to the Superintendent, in case of fire in premises having metered service for fire protection purposes, that fire has occurred there. (674-12/57)

14.16.180 Sale of water outside city. It is unlawful for the City Water Department to sell water to consumers outside the city, or to allow any consumer outside the city to use any water furnished by the city system unless the City Council shall by resolution determine and declare a surplus of water exists in excess of that required by the inhabitants of the city. (674-12/57)

14.16.190 Protecting cross connections. The city shall maintain a Cross-Connection Control Program throughout the Huntington Beach Water System service area. Such program shall be established by the City Council pursuant to Resolution No. 5921, titled "A Resolution of the City Council of the City of Huntington Beach Establishing a Cross-Connection Control Program for the Huntington Beach Water System." (674-12/57, 2404-1/80, 2966-11/88)

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Chapter 14.18

WATER MANAGEMENT PROGRAM

(3104-4/91)

Sections:

14.18.010 Declaration of policy. California Water Code Section 375 et seq. permit public entities which supply water at retail to adopt and enforce a Water Management Program to reduce the quantity of water used by the people therein for the purpose of conserving the water supplies of such public entity. The City Council hereby establishes a comprehensive Water Management Program pursuant to California Water Code Section 375 et seq., based upon the need to conserve water supplies and to avoid or minimize the effects of any future shortage. (3104-4/91)

14.18.020 Findings. The City Council finds and determines that a water shortage could exist based upon the occurrence of one or more of the following conditions:

(a) A general water supply shortage due to increased demand or limited supplies. (3104-4/91)

(b) A major failure of the supply, storage and distribution facilities of the Metropolitan Water District of Southern California, or of the City occurs. (3104-4/91)

(c) A local or regional disaster which limits the water supply. (3104-4/91)

The City Council also finds and determines that the conditions prevailing in the Huntington Beach area require that the water resources available be put to maximum beneficial use to the extent to which they are capable, and that the waste or unreasonable use, or unreasonable method of use, of water be prevented and that the conservation of such water encourage with a view to the maximum reasonable and beneficial use thereof in the interests of the people of the City and for the public welfare. (3104-4/91)

14.18.030 CEQA exemption. The City finds that this chapter and actions taken hereafter pursuant to this chapter are exempt from the California Environmental Quality Act as specific actions necessary to prevent or mitigate an emergency pursuant to Public Resources Code Section 21080 (b)(4) and the California Environmental Quality Act Guidelines Section 15269(c). The City Administrator of the City is hereby authorized and directed to file a Notice of Exemption as soon as possible following adoption of this chapter. (3104-4/91)

14.18.040 Application. The provisions of this chapter shall apply to all persons, customers, and property served by the City. (3104-4/91)

14.18.050 Authorization. The City's Director of Public Works and the City Administrator, or their designated representative, are hereby authorized and directed by the City Council to implement the provisions of this chapter as specifically set forth in the Water Management Program; provided however that, any actions taken by them pursuant herewith shall be confirmed at the earliest practicable time by the City Council. (3104-4/91)

14.18.060 Mandatory conservation phase implementation. The City shall monitor the projected supply and demand for water by its customers. The Director of Public Works shall determine the extent of the conservation required through the implementation and/or terminat of particular conservation stages in order for the City to prudently plan for and supply water t its customers. The City Council shall direct the City Administrator to order that the appropria stage of water conservation be implemented or terminated at any time it determines appropria in accordance with the applicable provision of this chapter. However, in case of local emergencies as defined under the Huntington Beach Municipal Code, the City Administrator shall have the authority to order the implementation of the appropriate stage of water conservation subject to ratification by the City Council within seven (7) days thereafter or suc order of the Director of Public Works shall have no further force or effect. (3104-4/91)

14.18.070 Penalty. Any violation of this chapter is a misdemeanor. In addition to any other remedies which the City may have for the enforcement of this Ordinance, service of water sha be discontinued or appropriately limited to any customer who willfully uses water in violatior any provision hereof. (3104-4/91)

Chapter 14.52

WATER EFFICIENT LANDSCAPE REQUIREMENTS

(3183-2/93)

Sections:

14.52.010 Purpose and intent. The purpose of this chapter is to: (3183-2/93)

(a) Promote the values and benefits of landscapes while recognizing the need to invest water and other resources as efficiently as possible; (3183-2/93)

(b) Establish a structure of designing, installing, and maintaining water efficient landscapes in new projects; (3183-2/93)

(c) Establish provisions for water management practices and water waste prevention for established landscapes; (3183-2/93)

(d) Establish a long range goal of water efficiency through proper planning and design, the use of technologically current equipment with proper installation, continued maintenance and monitoring of water use through the designed systems; (3183-2/93)

(e) When used in conjunction with the "Arboricultural and Landscape Standards and Specifications" Resolution Number 4545, to give the Landscape Architect and/or owner the tools to provide an individualized landscape improvement to suit the needs of the owner and the requirements of the city; and (3183-2/93)

(f) To provide standards for a finished landscape that is physically attractive, conserves water and is easy to maintain. (3183-2/93)

14.52.020 Definitions. The words used in this chapter shall have the meaning set forth below: (3183-2/93)

(a) "anti-drain valve" or "check valve" means a valve located under a sprinkler head to hold water in the system so it minimizes drainage from the lower elevation sprinkler heads. (3183-2/93)

(b) "application rate" means the depth of water applied to a given area, usually measured in inches per hour. (3183-2/93)

(c) "applied water" means the portion of water supplied by the irrigation system to the landscape. (3183-2/93)

(d) "automatic controller" means a mechanical or solid state timer, capable of operating valve stations to set the days and length of time of a water application. (3183-2/93)

(e) "backflow prevention device" means a safety device used to prevent pollution or contamination of the water supply due to the reverse flow of water from the irrigation system. (3183-2/93)

(f) "conversion factor (0.62)" means a number that converts the maximum applied water allowance from acre-inches per acre per year to gallons per square foot per year. The conversion factor is calculated as follows: (3183-2/93)

(325,850 gallons/43,560 square feet)/12 inches	=	(0.62)
325,850 gallons	=	one acre foot
43,560 square feet	=	one acre
12 inches	=	one foot

To convert gallons per year to 100-cubic feet per year, the city's billing unit for water, divide gallons per year by 748. (748 gallons = 100 cubic feet.) (3183-2/93)

(g) "drought tolerant" means plant material which, when established in the landscape, is able to grow and survive on little or no additional water than is provided by rainfall. (3183-2/93)

(h) "ecological restoration project" means a project where the site is intentionally altered to establish a defined, indigenous, historic ecosystem. (3183-2/93)

(i) "effective precipitation" or "usable rainfall" means the portion of total precipitation that is used by the plants. (3183-2/93)

(j) "emitter" means drip irrigation fittings or devices that deliver water slowly from the system to the soil. (3183-2/93)

(k) "established landscape" means the point at which plants in the landscape have developed roots into the soil adjacent to the root ball. (3183-2/93)

(l) "establishment period" means the first year after installing the plant in the landscape. (3183-2/93)

(m) "estimated applied water use" means the portion of the estimated total water use that is derived from applied water. The estimated applied water use shall not exceed the maximum applied water allowance. The estimated applied water use may be the sum of the water recommended through the irrigation schedule, as referenced in this chapter. (3183-2/93)

(n) "estimated total water use" means the annual total amount of water estimated to be needed to keep the plants in the landscaped area healthy. It is based upon such factors as the local evapotranspiration rate, the size of the landscaped area, the types of plants and the efficiency of the irrigation system, as described in this chapter. (3183-2/93)

(o) "ET adjustment factor" means a factor of 0.8, that, when applied to reference evapotranspiration, adjusts for plant factors and irrigation efficiency, two (2) major influences upon the amount of water that needs to be applied to the landscape. (3183-2/93)

This ET adjustment factor of 0.8 is an average. It is determined by combining the total plant palate mix of a project to determine the plant factor, in this case an average of 0.5, and dividing this by the irrigation efficiency, in this case the minimum of 0.625. (3183-2/93)

Therefore, the ET adjustment factor (0.8) = plant factor average (0.5)/irrigation efficiency minimum (0.625). (3183-2/93)

(p) "evapotranspiration" ET means the quantity of water evaporated from adjacent soil surfaces and transpired by plants during a specific time. (The City of Huntington Beach reference evapotranspiration is approximately forty-three (43) inches per year.) (3183-2/93)

(q) "flow rate" means the rate at which water flows through pipes and valves (gallons per minute or cubic feet per second). (3183-2/93)

(r) "hydrozone" means a portion of the landscaped area having plants with similar water needs that are served by a valve or set of valves with the same schedule. A hydrozone may be irrigated or non-irrigated. For example, a naturalized area planted with native vegetation that will not need supplemental irrigation once established is a non-irrigated hydrozone. (3183-2/93)

(s) "infiltration rate" means the rate of water entry into the soil expressed as a depth of water per unit of time (inches per hour). (3183-2/93)

(t) "irrigation efficiency" means the measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices. The minimum irrigation efficiency for purposes of this ordinance is 0.625. Greater irrigation efficiency can be expected from well designed and maintained systems. (3183-2/93)

(u) "landscape irrigation audit" means a process to perform site inspection, evaluate irrigation systems, and develop efficient irrigation schedules. (3183-2/93)

(v) "landscaped area" means the entire parcel less the building footprint, driveways, non-irrigated portions of parking lots, hardscapes such as decks and patios, and other non-porous areas. Water features are included in the calculation of the landscaped area. Areas dedicated to edible plants, such as orchards or vegetable gardens are not included. (3183-2/93)

(w) "lateral line" means the water delivery pipeline that supplies water to the emitters or sprinklers from the valve. (3183-2/93)

(x) "main line" means the pressurized pipeline that delivers water from the water source to the valve or outlet. (3183-2/93)

(y) "maximum applied water allowance" means, for design purposes, the upper limit of annual applied water for the established landscaped area as specified in this chapter. It is based upon the areas reference evapotranspiration, the ET adjustment factor, and the size of the landscaped area. The estimated applied water use shall not exceed the maximum applied water allowance. (3183-2/93)

(z) "mined-land reclamation projects" means any surface mining operation with a reclamation plan approved in accordance with the Surface Mining and Reclamation Act of 1975. (3183-2/93)

(aa) "mulch" means any material such as sawdust, bark or other materials left loose and applied to the soil surface to reduce evaporation. (3183-2/93)

(bb) "operating pressure" means the pressure at which a system of sprinklers is designed to operate, usually referenced to the base of a sprinkler. (3183-2/93)

(cc) "overspray" means the water which is delivered beyond the landscaped area, wetting pavements, walks, structures, or other non-landscaped areas. (3183-2/93) (dd) "plant factor" means a factor that when multiplied by reference evapotranspiration, estimates the amount of water used by plants. For purposes of this ordinance, the average plant factor of low water using plants ranges from 0 to 0.3, for average water using plants the range is 0.4 to 0.6, and for high water using plants the range is 0.7 to 1.0. (3183-2/93)

(ee) "rain sensing device" means a system which automatically shuts off the irrigation system when it rains. (3183-2/93)

(ff) "reclaimed water,""recycled water," or "treated sewage effluent water" means treated or recycled waste water of a quality suitable for nonpotable uses such as landscape irrigation; not intended for human consumption. (3183-2/93)

(gg) "record drawing" or "as-builts" means a set of reproducible drawings which show significant changes in the work made during construction and which are usually based on drawings marked up in the field and other data furnished by the contractor. (3183-2/93)

(hh) "recreational area" means areas of active play or recreation such as sports fields, school yards, picnic grounds, or other areas with intense foot traffic. (3183-2/93)

(ii) "reference evapotranspiration" or "ETo" means a standard measurement of environmental parameters which affect the water use of plants. ETo is given in inches per day, month, or year as represented in this chapter and is an estimate of the evapotranspiration of a large field of four (4)- to seven (7)-inch tall, cool-season grass that is well watered. Reference evapotranspiration is used as the basis of determining the maximum applied water allowance so that regional differences in climate can be accommodated. (3183-2/93)

(jj) "rehabilitated landscape" means any relandscaping project public or private that requires city processing, or is a condition of approval for a specific project. (3183-2/93)

(kk) "run off" means water which is not absorbed by the soil or landscape to which it is applied and flows from the area. For example, run off may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or when there is a severe slope. (3183-2/93)

(ll) "soil moisture sensing device" means a device that measures the amount of water in the soil. (3183-2/93)

(mm) "soil texture" means the classification of soil based on the percentage of sand, silt, and clay in the soil. (3183-2/93)

(nn) "sprinkler head" means a device which sprays water through a nozzle. (3183-2/93)

(oo) "static water supply pressure" means static water supply pressure when water is not flowing. (3183-2/93)

(pp) "station" means an area served by one valve or by a set of valves that operate simultaneously. (3183-2/93)

(qq) "turf" means a surface layer of earth containing mowed grass with its roots. Annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and Tall fescue are cool-season grasses. Bermuda grass, Kikuyugrass, Seashore paspalum, St. Augustine grass, Zoysiagrass, and Buffalo grass are warm-season grasses. (3183-2/93)

(rr) "valve" means a device used to control the flow of water in the irrigation system. (3183-2/93) (ss) "water conservation concept statement" means a checklist and a narrative summary of the project as depicted in Section 14.52.100(a). (3183-2/93)

(tt) "water efficient" means a combination of landscape features and watering techniques that in the aggregate reduce the demand for and consumption of water. Water efficient also means the result of selecting plant materials that require low amounts of water as opposed to plant materials which require tropical amounts of water. (3183-2/93)

(uu) "Xeriscape," a registered trademark of the National Xeriscape Council, Inc., means plantings which require little or no additional water than is provided by normal rainfall. (3183-2/93)

14.52.030 Amendments. As technology, situations, products and procedures change, the Director of Public Works may recommend adjustments or modifications to the Water Efficient Landscape requirements and the City Standard Plans. (3183-2/93)

14.52.040 Applicability. The provisions of this Chapter shall apply to all new and rehabilitated landscaping for public agency projects and private development projects. These provisions are in addition to entitlement conditions of approval for specific projects, unless exempt by approval of the governing body or specified elsewhere in the ordinance code. (3183-2/93)

14.52.050 Exceptions. Except as noted otherwise by special circumstances or by public hearing, the provisions of this chapter shall not apply to: (3183-2/93)

(a) Interior remodels, tenant improvements, demolitions and changes of use; (3183-2/93)

(b) Cemeteries; (3183-2/93)

(c) Registered historical sites; (3183-2/93)

(d) Ecological restoration projects that do not require a permanent irrigation system; (3183-2/93)

(e) Mined-land reclamation projects that do not require a permanent irrigation system; (3183-2/93)

(f) Any project with a landscaped area less than 2500 square feet; or (3183-2/93)

(g) Replacement or repair of existing plant material or irrigation systems in conjunction with routine maintenance. (3183-2/93)

14.52.060 Plan submittal requirements. (3183-2/93)

(a) "Conceptual Landscape Plan." All projects that are designated by the Community Development Department as applicable to the provisions of this ordinance will require a submittal of a conceptual landscape plan. This plan will be reviewed by the Community Development and Public Works Departments to ascertain if the design complies with this chapter of the ordinance. The conceptual landscape plan shall be prepared by a California licensed Landscape Architect and shall indicate the design intent. It shall show and quantify the areas to be hydrozoned, indicate the proposed plant palate as it relates to each separate hydrozone area, provide an area estimate in square feet for each hydrozone and the percentage of each as it relates to the total landscaped area. (3183-2/93)

Other information relating to the compliance of the project to this chapter shall be submitted with the conceptual landscape plan, including but not limited to a water conservation statement and the type of irrigation system proposed for each hydrozone. (3183-2/93)

(b) "Working Drawings" or "Landscape Documentation Package" shall include, but not be limited to, a landscape design plan which incorporates the following elements: (3183-2/93)

(1) The landscaped design plan shall be drawn on 24" x 36" sized project base sheets at an approved scale that accurately and clearly identifies the proposed work to be done, including a north arrow, indication of scale, and any off-site design influencing features; (3183-2/93)

(2) Designation of all separate hydrozones; (3183-2/93)

(3) Type, location and quantity of all species of plant materials utilized such as trees, shrubs, groundcover, turf and other vegetation. Planting symbols shall be clearly drawn and plants labeled by botanical name, common name, container size spacing and quantities of each group of plants indicated. If abbreviations or symbols are utilized for call outs, a legend shall be provided on each page of the planting plans; (3183-2/93)

(4) A calculation of the total turf area and its percentage of the total landscaped area; (3183-2/93)

(5) The location, percentage of the total landscaped area and types of mulch utilized; (3183-2/93)

(6) A plant materials legend that contains both scientific and common names, quantity size, descriptive remarks and the percentage of low water use plants; (3183-2/93)

(7) Planting notes, tree staking, plant installation and soil preparation details, specifications and the provision for agricultural soil tests to determine soil amendments for both surface areas and plant backfill; (3183-2/93)

(8) A calculation of the total landscaped area; (3183-2/93)

(9) Natural features, including but not limited to, rock outcroppings, existing trees, shrubs that will remain; (3183-2/93)

(10) Those items listed in the Arboricultural and Landscape Standards/Specifications; (3183-2/93)

(11) Designation of recreational area; (3183-2/93)

(12) Property lines and street names; (3183-2/93)

(13) Streets, driveways, walkways, and other paved areas; (3183-2/93)

(14) Pools, ponds, water features, fences, and retaining walls; (3183-2/93)

(15) Existing and proposed buildings and structures including finish floor elevations and pad elevations if applicable. (3183-2/93)

(c) The "Irrigation Design Plan" shall be drawn on project base sheets. It shall conform to Arboricultural and Landscape Standards and Specifications. It shall be separate from, but use the same format as, the landscape design plan. The scale shall be the same as that used for the landscape design plan, and the irrigation design plan shall accurately and clearly identify all of the following items: (3183-2/93)

(1) Location and size of separate water meters for the landscape; (3183-2/93)

(2) Irrigation systems shall be designed to be consistent with hydrozones; (3183-2/93)

(3) Irrigation plans indicating the layout of each system with the location, type and size of all components of the irrigation system including automatic controllers, main and lateral lines, points of connection, data on valve sizes, gallons per minute (G.P.M.), valve locations, the size and location of sleeves, all moisture sensing devices, flow controls, rain sensing devices, quick couplers, backflow prevention equipment, filters, pressure regulators, spray heads, drip heads, bubblers, etc., for both conventional and drip or microspray systems; (3183-2/93)

(4) Static water pressure at the point of connection to the public water supply. (3183-2/93)

(5) Flow rate (gallons per minute), application rate (inches per hour), and design operating pressure (PSI) for each station; (3183-2/93)

(6) Reclaimed water irrigation system as specified in this chapter; (3183-2/93)

(7) An irrigation legend indicating all utilized equipment including adaptors, nozzle sizes, G.P.M., P.S.I., radius and other specific information; (3183-2/93)

(8) Irrigation notes, contruction details of all assemblies and components and specifications; (3183-2/93)

(9) A recommended irrigation schedule and maintenance schedule; (3183-2/93)

(10) Grading design plan. (3183-2/93)

(d) "Water Conservation Concept Statement." Each landscape documentation package shall include on the cover sheet a "Water Conservation Concept Statement," as depicted in Section 14.52.100(a). In addition, a copy of the calculations clearly identifying all elements of the formula shall be submitted concurrently for maximum applied water allowance, estimated applied water use, and estimated total water use. (3183-2/93)

14.52.070 Water efficient design guidelines. (3183-2/93)

(a) The Maximum Applied Water Allowance. (3183-2/93)

(1) A project's Maximum Applied Water Allowance shall be calculated using the following formula: (3183-2/93)

MAWA =	(ETo) (0.8) (LA) (0.62) where:
MAWA =	Maximum Applied Water Allowance (gallons per year)
ETo =	Reference Evapotranspiration (inches per year) (43 inches per year in Huntington Beach)
0.8 =	ET adjustment factor
LA =	Landscaped Area (square feet)
0.62 =	Conversion factor (to gallons per square foot)

(2) An example for calculations of the Maximum Applied Water Allowance is: (3183-2/93)

Project Site:	Landscaped area of 50,000 sq. ft. in Huntington Beach.
MAWA =	(ETo) (.8) (LA) (.62)
	(43 inches) (.8) (50,000 sq. ft.) (.62)

Maximum Applied Water Allowance (for this example) = 1,066,400 gallons per year (or 1,426 hundred-cubic-feet per year: 1,066,400 divided by 748 = 1425.7).

(3) Portions of landscaped areas in public and private projects such as parks, playgrounds, sports fields, golf courses, or school yards where turf provides a playing surface or serves other recreational purposes may require water in addition to the Maximum Applied Water Allowance. A statement shall be included with the landscape design plan, designating areas to be used for such purposes and specifying any needed amount of additional water above the Maximum Applied Water Allowance. (3183-2/93)

(b) Estimated Applied Water Use. (3183-2/93)

(1) The Estimated Applied Water Use shall not exceed the Maximum Applied Water Allowance. (3183-2/93)

(2) A calculation of the Estimated Applied Water Use shall be submitted with the Landscape Documentation Package. It may be calculated by summing the amount of water recommended in the irrigation schedule. (3183-2/93)

(c) Estimated Total Water Use. (3183-2/93)

(1) A calculation of the Estimated Total Water Use shall be submitted with the Landscape Documentation Package. The Estimated Total Water Use may be calculated by summing the amount of water recommended in the irrigation schedule and adding any amount of water expected from effective precipitation (not to exceed 25 percent of the local annual mean precipitation) or may be calculated from a formula such as the following: (3183-2/93)

The Estimated Total Water Use for the entire landscaped area equals the sum of the Estimated Water Use of all hydrozones in that landscaped area. (3183-2/93)

EWU (hydrozone) =	$\frac{\text{(ETo) (PF) (HA) (.62)}}{\text{(IE)}}$
EWU (hydrozone) =	Estimated Water Use (gallons per year)
ETo =	Reference Evapotranspiration (inches per year)
PF =	Plant Factor
HA =	Hydrozone Area (square feet)
(.62) =	Conversion Factor
IE = (0.625)	Irrigation Efficiency (0.625 as a minimum)

(2) If the Estimated Total Water Use is greater than the Estimated Applied Water Use due to the precipitation being included as a source of water, an Effective Precipitation Disclosure Statement, as depicted in Section 14.52.100(b), shall be included in the Landscape Documentation Package. (3183-2/93)

(d) Landscape Design Plan. A landscape design plan meeting the following requirements shall be submitted as part of the landscape documentation package. (3183-2/93)

(1) Plant Selection and Grouping. Any plants may be used in the landscape, providing the Estimated Applied Water Use recommended does not exceed the Maximum Applied Water Allowance and that the plants meet the specifications set forth in the following three paragraphs and the Arboricultural and Landscape Standards and Specifications; (3183-2/93)

Plants having similar water use shall be grouped together in distinct hydrozones; (3183-2/93)

Plants shall be selected appropriately based upon their adaptability to the climatic, geologic, and topographic conditions of the site. Protection and preservation of native species and natural areas is encouraged. The planting of trees is encouraged wherever it is consistent with the other provisions of this ordinance; (3183-2/93)

Fire prevention needs shall be addressed in areas that are fire prone. Information about fire prone areas and appropriate landscaping for fire safety is available from the Fire Department. (3183-2/93)

(2) Water Features. Recirculating water shall be used for decorative water features; pool and spa covers are encouraged. (3183-2/93)

(e) Irrigation Design Plan. An irrigation design plan meeting the following conditions shall be submitted as part of the Landscape Documentation Package. (3183-2/93)

(1) Irrigation Design Criteria. (3183-2/93)

(a) Runoff and Overspray. Soil types and infiltration rate shall be considered when designing irrigation systems. All irrigation systems shall be designed to avoid runoff, low head drainage, overspray, or other similar conditions where water flows onto adjacent property, non-irrigated areas, walks, roadways, or structures. Proper irrigation equipment and schedules, including features such as repeat cycles, shall be used to closely match application rates to infiltration rates therefore minimizing runoff. (3183-2/93)

Special attention shall be given to avoid runoff on slopes and to avoid overspray in plant areas with a width less than ten (10) feet and in median strips. (3183-2/93)

(b) Irrigation Efficiency. For the purpose of determining the maximum water allowance, irrigation efficiency is assumed to be 0.625. Irrigation systems shall be designed, maintained, and managed to meet or exceed 0.625 efficiency. (3183-2/93)

(c) Water Meters. Separate landscape water meters shall be installed for all projects except for single family homes. However, single family homes with reclaimed water systems require a separate meter and additional preventative safety measures. (3183-2/93)

(d) Controllers. Automatic control systems shall be required for all irrigation systems and must be able to accommodate all aspects of the design, including dual programs and/or multiple repeat features. (3183-2/93)

(e) Valves. Plants which require different amounts of water shall be irrigated by separate valves. If one valve is used for a given area, only plants with similar water use shall be used in that area. Anti-drain (check) valves shall be installed in strategic points to minimize or prevent low-head drainage. (3183-2/93)

(f) Sprinkler Heads. Heads and emitters shall have consistent application rates within each control valve circuit. Sprinkler heads shall be selected for proper area coverage, application rate, operating pressure, adjustment capability, and ease of maintenance. (3183-2/93)

(g) Rain Sensing Override Devices. Rain sensing override devices shall be required on all irrigation systems. An irrigation system with functional soil moisture sensing devices on each control valve is not required to have a rain sensing override device. (3183-2/93)

(h) Soil Moisture Sensing Devices. Soil moisture sensing devices are required to be used in lawn areas for projects with a total of 5,000 square feet and greater of total landscaped area. A minimum of one (1) moisture sensing device shall be utilized per turf area. Soil moisture sensing devices shall be considered where appropriate for shrub areas. (3183-2/93)

(i) Flow Control Sensing Devices. Projects with 10,000 square feet or more of landscaped area are required to have one (1) flow control valve per point of connection. (3183-2/93)

(2) Reclaimed Water. The installation of reclaimed water irrigation systems (dual distribution systems) shall be required to allow for the current and future use of reclaimed water, unless a written exemption has been granted by the Public Works Water Division, stating that reclaimed water meeting all health standards is not available and will not be available in the foreseeable future. (3183-2/93)

The reclaimed water irrigation system shall be designed and operated in accordance with all codes, and shall include but not be limited to the use of purple pipe and fittings for the total reclaimed water system. Refer to the "Rules and Regulations for the Use of Reclaimed Water" (available at the Water Department) for more information. (3183-2/93)

For single family residential lots with reclaimed water, there shall be no hose bibbs, loose key or otherwise and no quick couplers installed on the reclaimed system. (3183-2/93)

(f) Irrigation Schedules. Irrigation schedules satisfying the following conditions shall be submitted as part of the Landscape Documentation package. (3183-2/93)

(1) An annual irrigation program with monthly irrigation schedules shall be required for the plan establishment period, for the established landscape, and for any temporarily irrigated areas. (3183-2/93)

(2) The irrigation schedule shall: (3183-2/93)

(a) include run time (in minutes per cycle), suggested number of cycles per day, and frequency of irrigation for each station, and; (3183-2/93)

(b) indicate the amount of applied water (in hundred cubic feet, or gallons) recommended on a monthly and annual basis. (3183-2/93)

(3) The total amount of water for the project shall include water designated in the estimated total water use calculation plus water needed for any water features, which shall be considered as a high water using hydrozone. (3183-2/93)

(4) Recreational areas designated in the landscape design plan shall be highlighted and the irrigation schedule shall indicate if any additional water is needed above the maximum applied water allowance because of high plant factors (but not due to irrigation inefficiency). (3183-2/93)

(5) Irrigation scheduling shall incorporate the use of evapotranspiration data as available, such as those from the California Irrigation Management Information System (CIMIS) weather stations to apply the appropriate levels of water for different climates. (3183-2/93)

(6) Landscape irrigation shall be primarily scheduled between 2:00 a.m. and 10:00 a.m. to avoid irrigating during times of high wind or high temperature. (3183-2/93)

(g) Maintenance Schedules. A regular maintenance schedule satisfying the following conditions shall be submitted as part of the Landscape Documentation Package: (3183-2/93)

(1) Landscapes shall be maintained to ensure water efficiency. A regular maintenance schedule shall include but not be limited to checking, adjusting, and repairing irrigation equipment; resetting the automatic controller; aerating and dethatching turf areas; replenishing mulch; fertilizing; pruning, and weeding in all landscaped areas. (3183-2/93)

(2) Whenever possible, repair of irrigation equipment shall be done with the originally specified materials or their equivalents. (3183-2/93)

(h) Landscape Irrigation Audit Schedules. A schedule of landscape irrigation audits, for all projects with a landscaped area of 10,000 square feet and larger, satisfying the following conditions shall be submitted to the city as part of the Landscape Documentation Package. (3183-2/93)

(1) Refer to (k) Certification. (3183-2/93)

(2) At a minimum, audits shall be in accordance with the State of California Landscape Water Management Program as described in the Landscape Irrigation Auditor Handbook, the entire document, which is hereby incorporated by reference. (See Landscape Irrigation Auditor Handbook (June 1990) version 5.5 (formerly Master Auditor Training.) (3183-2/93)

(3) It is recommended that landscape irrigation audits be conducted by certified landscape irrigation auditors at least once every five years. (3183-2/93)

(i) Grading Design Plan. Grading design plans satisfying the following conditions shall be submitted as part of the Landscape Documentation Package. (3183-2/93)

(1) A grading design plan shall be drawn on project base sheets. It may be separate from but use the same format as the landscape design plan. (3183-2/93)

(2) The grading design plan shall indicate finished configurations and elevations of the landscaped area, including the height of graded slopes, drainage patterns, pad elevations, and finish grade. (3183-2/93)

(j) Soils. (3183-2/93)

(1) A soil analysis satisfying the following conditions shall be included as a part of the specifications that requires a soil test after the grading operation and the recommendations from said test be followed for the soil preparation. (3183-2/93)

(a) Determination of soil texture, indicating the percentage of organic matter. (3183-2/93)

(b) An approximate soil infiltration rate (either measured or derived from soil texture/infiltration rate tables). A range of infiltration rates should be noted where appropriate. (3183-2/93)

(c) A soil fertility and an agricultural suitability analysis shall be provided which includes but is not limited to a description analysis for half saturation percentage, ph, salinity, nitrate, nitrogen, ammonium nitrogen, phosphate phosphorus, potassium, calcium, magnesium, salinity boron and sodium absorption ratio. A descriptive narrative shall indicate procedures and provide soil recommendations for both general soil preparation; and backfill mixes, and continuing maintenance fertilizer applications. (3183-2/93)

(2) A mulch of at least three (3) inches shall be applied to all planting areas except turf and living ground coverings. (3183-2/93)

(k) Certification. Certification of Landscape planting and irrigation installations as described herein, shall be required for approval and acceptance. (3183-2/93)

(1) Upon completing the installation of the landscaping and the irrigation system, on project landscape installations totaling 10,000 square feet or greater, an irrigation audit shall be conducted by a certified landscape irrigation auditor prior to the final field inspection and acceptance. (See Landscape Irrigation Auditor Handbook as referenced in this section, paragraph 8.) (3183-2/93)

(2) A licensed landscape architect and, if applicable, a certified/licensed irrigation designer, shall conduct a final field observation and shall provide a certificate of substantial completion of the entire landscaped area (per city approved plans) to the city prior to acceptance. The certificate shall specifically indicate that plants were installed as specified, that the irrigation system was installed as designed, and that an irrigation audit (if project size warrants it) has been performed, along with a list of any observed deficiencies. (3183-2/93)

(3) Certification shall be accomplished by completing the Certificate of Substantial Completion as depicted in Section 14.52.100(c) and delivering it to the City Public Works Department, Park, Tree and Landscape Division and to the Owner of Record. (3183-2/93)

(l) Public Education. Signs shall be used to identify all model home complexes as an example of a water efficient landscape and featuring elements such as hydrozones, irrigation equipment and others which contribute to the overall water efficient theme. Information shall be provided about designing, installing, and maintaining water efficient landscapes. (3183-2/93)

14.52.080 Statutory authority in case of conflicting provisions. Nothing in this chapter shall be deemed to affect, annul or abrogate any other laws or ordinances pertaining or applicable to the properties and areas affected by this chapter. (3183-2/93)

14.52.090 Effective precipitation. If effective precipitation is included in the calculation of the Estimated Total Water Use, the Effective Precipitation Disclosure Statement, as depicted in section 14.52.100(b) shall be completed, signed, and submitted with the Landscape Documentation Package. No more than twenty-five (25) percent of the local annual mean precipitation shall be considered effective precipitation in the calculation of the Estimated Total Water Use. (3183-2/93)

14.52.100 Required forms.

(a)

LANDSCAPE WATER CONSERVATION CONCEPT STATEMENT

Project: ________________________________ **Planning Entitlement Number:** _______
Project Location: ________________________________
Tentative Tract Number: ________________________________
Landscape Architect/Irrigation Designer/Contractor:

____
____
____
____

Included in this project submittal package are:
(Check to indicate completion and circle descriptive amount)

- ☐ 1. Maximum Applied Water Allowance:
  ______ gallons or cubic feet/year

- ☐ 2. Estimated Applied Water Use:
  ______ gallons or cubic feet/year

- ☐ 2.(a) Estimated Amount of Water Expected from Effective Precipitation:
  ______ gallons or cubic feet/year

- ☐ 3. Estimated Total Water Use:
  ______ gallons or cubic feet/year

Note: If the design assumes that a part of the Estimated Total Water Use will be provided by precipitation, the Effective Precipitation Disclosure Statement Exhibit "B" shall be completed and submitted. The Estimated Amount of Water Expected from Effective Precipitation shall not exceed twenty-five (25) percent of the local annual mean precipitation (average rainfall).

- ☐ 4. Landscape Design Plan
- ☐ 5. Irrigation Design Plan
- ☐ 6. Irrigation Schedules
- ☐ 7. Maintenance Schedule
- ☐ 8. Landscape Irrigation Audit Schedule
- ☐ 9. Grading Design Plan
- ☐ 10. Soil Analysis

Description of Project
(Briefly describe the planning and design actions that are intended to achieve conservation and efficiency in water use.)

____
____
____
____

Prepared by: ________________________________
Title: ________________________________
CA License No.: ________________________________

Date: ______________

2/93

(b)

EFFECTIVE PRECIPITATION DISCLOSURE STATEMENT

Project: ______________________________________ Planning Entitlement Number: ________

Project Location: ____

Tentative Tract Number: ____

I certify that I have informed the project owner and developer that this project depends on ___ (gallons or cubic feet) of effective precipitation per year. This represents _______ percent of the local mean precipitation of _____ inches per year.

I have based my assumptions about the amount of precipitation that is effective upon: ____________

____
____
____

I certify that I have informed the project owner and developer that in times of drought, there may not be enough water available to keep the entire landscape alive.

____
Licensed Landscape Architect/Irrigation Designer License No. Date

I certify that I have been informed by the licensed or certified landscape professional that this project depends upon ____ (gallons or cubic feet) of effective precipitation per year. This represents ____ percent of the local mean precipitation of ____ inches per year.

I certify that I have been informed that in times of drought, there may not be enough water available to keep the entire landscape alive.

______________________________ ______________________________
Owner Developer

____
Title

Date: _____________

2/93

(c)

CERTIFICATE OF SUBSTANTIAL COMPLETION (page 1 of 2)

Project Site: ___________________________________ **Planning Entitlement No.:** _______
Project Location: ____
Tentative Tract No.: ____
Total Project Landscaped Area in Square Feet: _______________
Preliminary project Documentation Submitted: (check indicating submittal)

- ❑ 1. Maximum Applied Water Allowance:
  ___ gallons or cubic feet/year
  ___ percent of the local annual mean precipitation

- ❑ 2. Estimated Applied Water Use:
  ___ gallons or cubic feet/year

- ❑ 2.(a) Estimated Amount of Water Expected from Effective Precipitation:
  ___ gallons or cubic feet/year

- ❑ 3. Estimated Total Water Use:
  ___ gallons or cubic feet/year

Note: If the design assumes that a part of the Estimated Total Water Use will be provided by precipitation, the Effective Precipitation Disclosure Statement, Exhibit "B", shall be completed and submitted. The Estimated Amount of Water Expected from Effective Precipitation shall not exceed twenty-five (25) percent of the local annual mean precipitation (average rainfall).

- ❑ 4. Landscape Design Plan
- ❑ 5. Irrigation Design Plan
- ❑ 6. Irrigation Schedules
- ❑ 7. Maintenance Schedule
- ❑ 8. Landscape Irrigation Audit Schedule
- ❑ 9. Grading Design Plan
- ❑ 10. Soil Analysis

Post-Installation Inspection: (Check indicating substantial completion)

- ❑ A. Plants installed as specified
- ❑ B. Irrigation system installed as designed
  - ❑ dual distribution system for recycled water
  - ❑ minimal run off or overspray
- ❑ C. Landscape Irrigation Audit performed

- ❑ Project submittal package and a copy of this certification has been provided to owner/manager and local water agency.

Comments:

____

I/we certify that based upon periodic site observations, the work has been substantially completed in accordance with the Water Efficient Landscape Ordinance and that the landscape planting and irrigation installation substantially conform with the city approved plans and specifications.

____
Landscape Architect Signature Date State License No.

2/93

CERTIFICATE OF SUBSTANTIAL COMPLETION (page 2 of 2)

I/we certify that based upon periodic site observations, the work has been substantially completed in accordance with the Water Efficient Landscape Ordinance and that the landscape irrigation installation substantially conforms with the city approved plans and specifications.

Irrigation Design/Consultant Signature Date State License No.

I/we certify that I/we have received all of the contract documents and that it is our responsibility to see that the project is maintained in accordance with the contract documents and the City of Huntington Beach Arboricultural and Landscape Standards, Specifications and the Water Efficient Landscape Ordinance.

Owner/Developer Signature Date Title

2/93

City of Huntington Beach

Public Works, Utilities Division, 19001 Huntington Street, Huntington Beach, CA 92648

(714) 375-5055

Table of Contents

Appendices

Section 1 - Introduction

Urban Water Management Planning Act

Water Code Section 10620 (a) of the Urban Water Management Act, states "Every urban water supplier shall prepare and adopt an urban water management plan in the manner set fourth in Article 3 (commencing with section 10640). These plans are to be updated every five years and submitted to the Department of Water Resources (DWR). Urban water management plans for 2005 are due to DWR on December 31, 2005.

Requirement for the urban water management plans include:

- Assessment of current and projected water supplies
- Evaluation of Demand and Customer Types
- Evaluation of the reliability of water supplies
- Description of conservation measures implemented by the urban water supplier
- Response plan for in the event of water shortage
- Comparison of demand and supply projections.

This report has been prepared to comply with the Urban Water Planning Act. In addition to meeting the requirements of the Act, this report will be used to support water supply assessment and verification required by Senate Bills 610 and 221 of 2001. These bills require that water supply information be provided to counties and cities for projects of a certain size prior to project approval. Both bills allow an Urban Water Management Plan to be used as a source document that may be used to fulfill these legislative requirements.

Public Participation

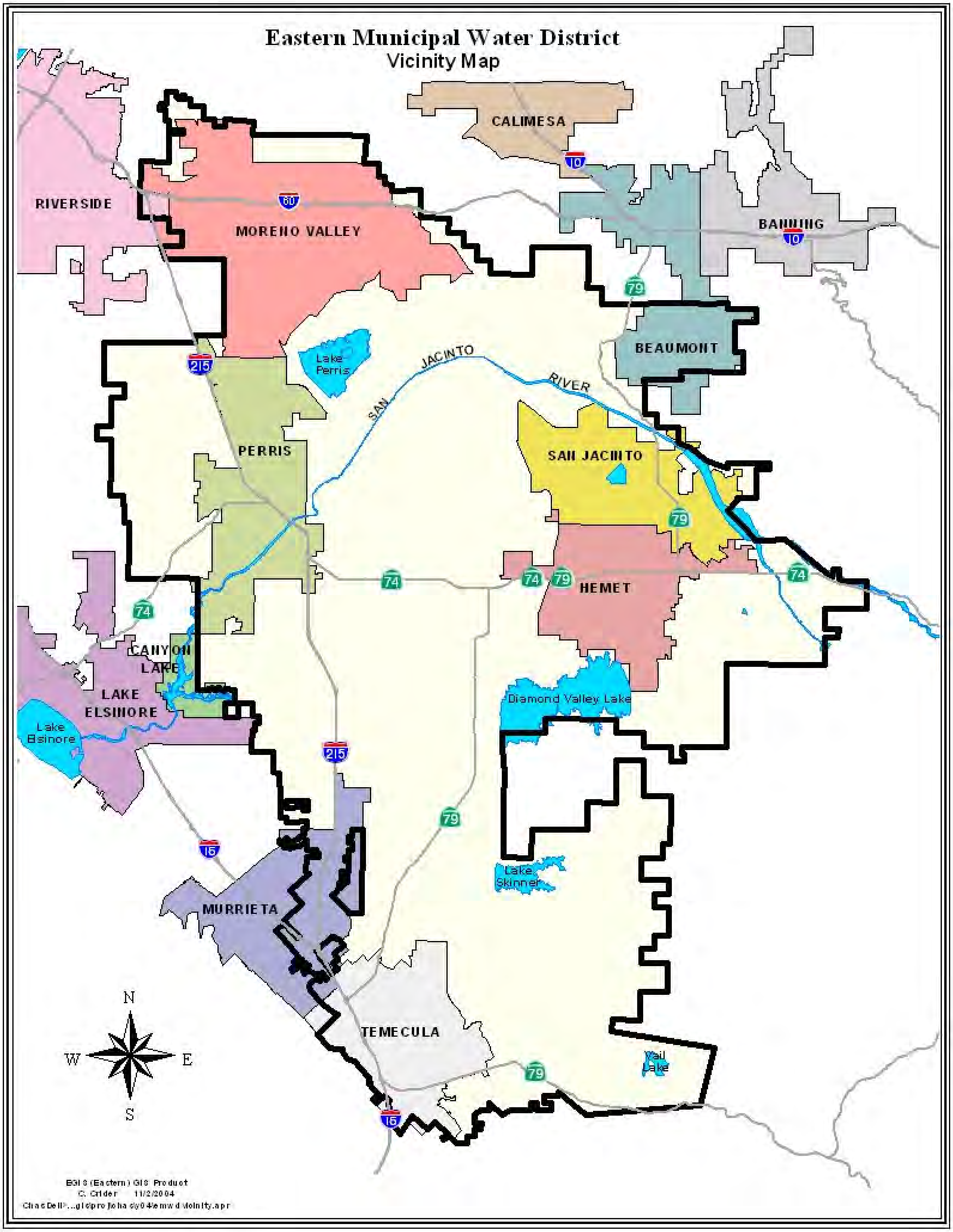
Article 3, Section 10642 of the Urban Water Management Plan Act requires that each urban water supplier shall encourage the active involvement of diverse social, cultural and economic elements of the population within the service area. EMWD has encouraged the participation of sub agencies, cities and the County of Riverside and other public groups. Public participation and coordination efforts are detailed in Appendix A.

Eastern Municipal Water District

Eastern Municipal Water District (EMWD, District) is a public water agency formed in 1950 by popular vote. In 1951, it was annexed into the Metropolitan Water District of Southern California (MWD) and gained a supply of imported water from the Colorado River Aqueduct (CRA). Today, EMWD remains one of MWD's twenty-six member agencies and receives water from Northern California through the State Water Project (SWP) in addition to its deliveries through the CRA.

EMWD's initial mission was to deliver imported water to supplement local groundwater for a small, mostly agricultural, community. Over time, EMWD has evolved to include groundwater production, desalination, water filtration, wastewater collection and treatment, and regional water recycling to the list of products and services it offers to its over 100,000 customers. Located in one of the most rapidly growing regions in the

Figure 1.1 Areas Within EMWD Boundaries



Nation, EMWD has a mission "to provide safe and reliable water and wastewater management services to our community in an economical, efficient, and responsible manner, now and in the future."

A five-member Board of Directors governs EMWD. Each director serves an area of equivalent population size within EMWD's boundaries and is elected to office every four years. As a member agency of MWD, EMWD also has a board member appointed to the MWD Board of Directors.

EMWD is located in western Riverside County, approximately 75 miles east of Los Angeles. The 555 square mile service area includes six incorporated cities in addition to the unincorporated areas of the County of Riverside.

The areas within EMWD's boundary are:

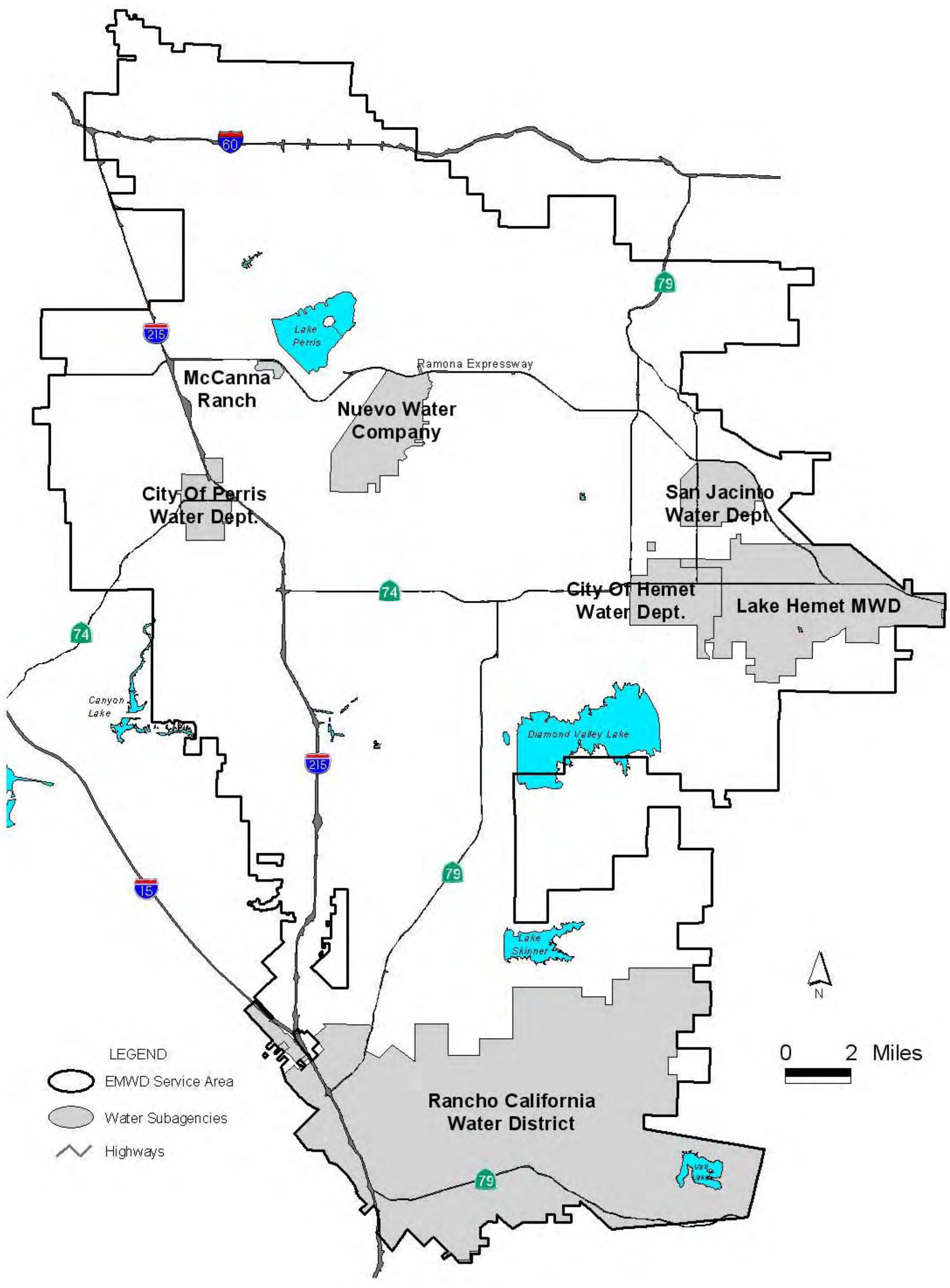
City of Hemet
City of Moreno Valley
City of Murrieta
City of Perris
City of San Jacinto
City of Temecula
Homeland
Lakeview
Murrieta Hot Springs
Nuevo
Quail Valley
Romoland
Sun City
Valle Vista
Winchester

In most of the listed areas, EMWD provides both water and sewer service. However in some places, EMWD provides only sewer or water service, or provides wholesale water to a sub agency.

EMWD is a wholesale provider to the following sub agencies:

City of Hemet Water Department
City of Perris Water Department
City of San Jacinto Water Department
Lake Hemet Municipal Water District (LHMWD)
McCanna Ranch Water Company
Nuevo Water Company
Rancho California Water District (RCWD)

Figure 1.2 - EMWD Sub Agencies



Several of these agencies have or will prepare their own Urban Water Management Plan (UWMP). With the exception of RCWD and McCanna Ranch Water Company, EMWD has discussed and reviewed the supplemental water demand required by each agency with representatives of that agency. The demand requirements and water supply are discussed in this plan. RCWD, while an EMWD sub agency, receives water directly from a connection to MWD. RCWD is preparing its own UWMP that will address their water supply issues. RCWD's population, demand and supply is not analyzed nor discussed in this plan. McCanna Ranch Water Agency depends on EMWD for emergency purposes and does not have any annual projected demand. The Murrieta Water Company was a subagency at the beginning of 2005, but merged with Western Municipal Water District in November and is not anticipated to demand water form EMWD after 2005.

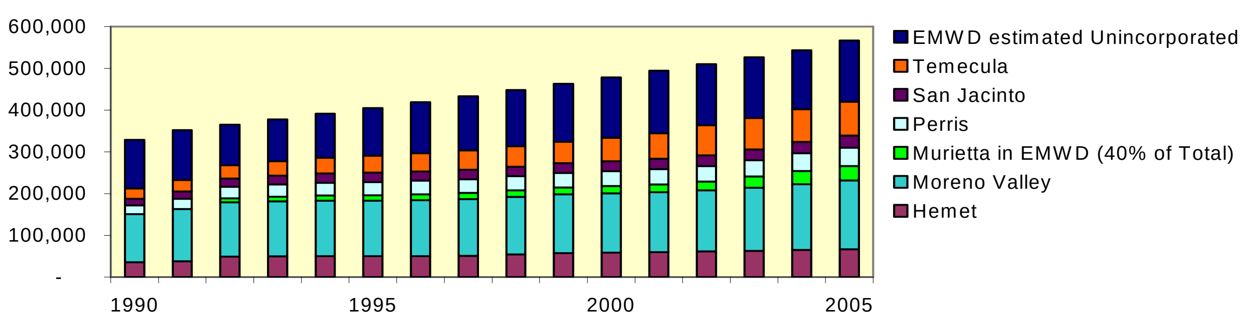
Population

EMWD is located in one of the most rapidly growing regions in the United States. Since 1990, over 230,000 people have been added to the service area of EMWD, nearly doubling the population. Table 1.1 and Figure 1.3 show the estimated population of various EMWD areas from 1990 to 2005. These estimates are taken from the California Department of Finance Report 90-E4, Population Estimated for California State and Counties.

Table 1.1 - Population Within EMWD's Boundary

	1-1-90	1-Apr-90	1-Jan-95	1-Jan-00	1-Jan-05
Population		CENSUS		CENSUS	
Hemet	35,350	36,094	50,100	58,500	66,455
Moreno Valley	115,500	118,779	132,700	142,000	165,328
Murrieta in EMWD (40% of Total)	-	-	13,040	17,540	34,041
Perris	21,050	21,500	32,050	35,900	44,594
San Jacinto	15,500	16,210	22,250	23,400	28,437
Temecula	25,300	27,099	40,850	56,600	81,397
Total EMWD Cities	212,700	219,682	290,990	333,940	420,252
EMWD Estimated Unincorporated	UNK	120,075	114,033	144,716	146,483
Estimated EMWD Total Population	UNK	339,757	405,023	478,656	566,735

Figure 1.3 - Population Growth Within EMWD Boundary Population Projections



Growth Projections

EMWD uses several tools to assist in planning for new development and the new demand for water that comes with them. A database of proposed projects, regional projections, socioeconomic studies and the Riverside County Integrated Plan are all used to develop growth projections.

To track new construction in the District, EMWD developed a Geographic Information Systems (GIS) database of new developments. This database contains information about size, location and status of new projects within EMWD's boundaries. New projects are tracked from the initial planning stage until construction is complete and new meters are installed. This database allows the District to anticipate where new demand for water will be concentrated and estimate when new projects will require water and sewer service. Projects that have engineered design plans in plan check or where construction is initiated are anticipated to impact the District within one to five years. For projects still in the planning stages, anticipating a construction date can be difficult. Planned projects can be delayed or expedited based on the economy, environmental constraints, infrastructure requirements or any number of additional factors.

To insure that planning efforts for future growth are comprehensive, EMWD incorporates regional projections to calculate future growth. Projections from the Southern California Association of Governments (SCAG) 2004 Transportation Plan are used as a guideline to approximate what the long-term growth rates will be for EMWD.

In addition to the new project information collected by EMWD and projections by SCAG, EMWD uses an economic consultant to develop housing projections. In May of 2003, Empire Economics completed a socioeconomic study that resulted in a most probable demand projection for new homes for each of the 1990 Census Tracts in the District. Since EMWD did not have a comprehensive database of new projects in 2003, that study was based largely on SCAG projections published in 2000. In 2004 and 2005, the same consultant returned performing a detailed analysis of growth in several small portions of the District. By doing field studies and economic analysis of the study area, the consultant was able to develop most probable demand projections for new homes within each of 30 sub areas covering much of EMWD's service area.

Using these housing projections, SCAG projections and persons per household data, EMWD has developed its population projection as seen in Table 1.2. The projection provided does not include the population of any portion of the District served water through Rancho California Water District including Temecula.

Table 1.2 - Current and Projected Population

	2005	2010	2015	2020	2025	2030
Service Area Population	493,960	583,050	674,550	759,155	830,020	889,230

Climate

EMWD has a semi-arid climate characterized by hot, dry summers and cooler winters. The average rainfall is between 11 and 12 inches occurring mostly in December through March. The region experiences wide variation in rainfall and periodic local drought. Table 1.3 has a summary of temperature and precipitation for EMWD's service area taken from local climate stations.

Table 1.3 - EMWD Climate

	Jan	Feb	Mar	Apr	May	June
Standard Monthly Average Et°	2.47	2.65	3.79	5.05	5.78	11.50
Average Rainfall (inches)	2.54	3.16	2	0.68	0.32	0.05
Average Max. Temperature (Fahrenheit)	66.1	38.4	69.6	76.7	82.1	91.9
Average Min. Temperature (Fahrenheit)	36.3	38.7	41.1	44.4	49.6	54

Table 1.3 - EMWD Climate (Continued)

	July	Aug	Sept	Oct	Nov	Dec	Annual
Standard Monthly Average Et°	6.89	6.68	5.29	4.01	3.01	2.46	54.56
Average Rainfall (inches)	0.03	0.24	0.15	0.25	0.66	1.02	11.09
Average Max. Temperature (Fahrenheit)	97.4	98	92.6	84.2	73.8	67.6	80.7
Average Min. Temperature (Fahrenheit)	58.9	59.4	57.5	39.8	34.5	34.5	46.9

In dry years, potable water demand increases slightly during the months when rainfall usually occurs, but peak demand during hot summer months remains fairly constant. Even in wet years, the demand may decrease during winter months, but still remains high during peak summer months.

The recycled water system, which serves agricultural and landscape demand, is slightly more sensitive to climate fluctuation. In dry years, there may be a small increase in demand during typically wet months to make up for the lack of rainfall, but summer's demand remains consistent. Wet years actually cause greater concern than dry years for the operation of the recycled water system. Excessive rainfall reduces the demand of customers during the rainy season and increases the supply of recycled water. This forces EMWD to find other means of disposing excess recycled water.

Other Demographic Factors

As the population within EMWD continues to grow, the characteristics of the service area are continually changing. District-wide, tract homes, commercial centers and new industrial warehouses are replacing acres of agriculture and open space. The average household size is becoming smaller and the medium income is increasing. Over the next 25 years, EMWD's population is projected to grow by over 400,000 people, nearly doubling its current population.

The area has a history of rapid growth followed by major declines in the housing market. From the mid-1980's to 1990, population growth in EMWD routinely exceeded 10% per year. In the early 1990's, growth slowed during an economic recession. During the late 1990's, growth began to steadily increase, and the first five years of the 2000's brought accelerated growth in the housing market. This growth has challenged EMWD to develop new sources of supply and construct new facilities and infrastructure to bring water to hundreds of new customers each month.

Some indicators suggest that growth within EMWD's service area may have reached its peak rate in 2004, but others suggest that 2005 may see just as much growth as the past year. However, what is certain is that EMWD is still a growing water agency. Ultimate demand estimates indicate that before EMWD reaches build out, the population will nearly triple its current size. Land will continue to be developed in western Riverside County as more and more people are added. Just as it has in the past, EMWD will continue to meet the challenges of new development with innovation, efficiency and responsibility.

Section 2 – Water Sources

EMWD has three sources of water supply: imported water from MWD, local groundwater production, and recycled water. Water sources can be divided into two types - potable and non-potable. Sources of potable water supply, suitable for all uses including human consumption, include:

- Groundwater within the San Jacinto Watershed
- Desalination plants that treat groundwater with a high salt content through reverse osmosis until it is acceptable for drinking
- Microfiltraion plants owned and operated by EMWD, filtered water from the Colorado River or State Water Project (SWP) through membranes to remove particulate contaminants to potable water standards
- The Henry J. Mills Filtration Plant (Mills), owned and operated by MWD, which treats water from northern California and provides it for sub agency purchase
- The Robert F. Skinner Filtration Plant (Skinner), owned and operated by MWD. This plant treats a blend of Colorado River Water (CRW) and water from northern California for potable use.

See Table 2.1 for the amount of potable water projected to be supplied by each source for 2005 to 2030.

In addition to potable water supplies, EMWD has several sources that supply water that may not be suitable for drinking but can be used for agriculture, landscape irrigation and industrial processes. These sources include:

- Recharge water from MWD. This untreated water from MWD is percolated into the ground through the soil, adding water to the aquifer below. EMWD and others can extract this water at a later date for beneficial uses.
- Untreated water from MWD for agricultural purposes. Water imported from MWD does not often need additional filtration to be used to irrigate crops.
- Recycled water. This highly treated wastewater can be used for many purposes including agriculture, landscape irrigation, and industrial use.

The projected amount of non-potable water supplied by each source from 2005 to 2030 is summarized in Table 2.2.

The location of each potable water source can be seen in Figure 2.1. Groundwater is the major supply of water in the Hemet/San Jacinto area portion of EMWD. This area includes the Cities of both Hemet and San Jacinto as well as surrounding unincorporated areas. The desalination plant serves the middle portion of the District including Menifee, Sun City, north Canyon Lake and Quail Valley. The micro filtration plant in Perris currently serves Perris, Romoland, Lakeview and Nuevo. The Hemet Micro filtration Plant will supplement supply to the Hemet/San Jacinto area. Mills serves Moreno Valley, Menifee, Perris, Sun City, Good Hope, Mead Valley, Lakeview, Nuevo, Romoland, north Canyon Lake, and Quail Valley, while Skinner in the southeast, serves Murrieta, Murrieta Hot Springs, and, occasionally, Menifee, and southern Sun City. In times of peak demand, Skinner is also available to serve demand in the Hemet/San Jacinto area. The limits of services for each source of supply often vary due to demand level and operation procedures and constraints.

Table 2.1 - Potable Water Supply by Source (AFY)

	2005	2010	2015	2020	2025	2030
EMWD Groundwater Production in the San Jacinto Basin						
West San Jacinto Area	6,000	6,000	6,000	6,000	6,000	6,000
Hemet/San Jacinto Basin Area – Native Groundwater	12,000	7,200	7,200	7,200	7,200	7,200
Hemet/San Jacinto Recovery of Recharged Groundwater		5,600	6,600	6,400	6,200	6,200
EMWD Groundwater Desalination Program in the San Jacinto Basin						
Menifee	1,600	3,000	3,000	3,000	3,000	3,000
Perris	2,000	4,500	4,500	4,500	4,500	4,500
Perris II		-	4,500	4,500	4,500	4,500
EMWD Micro-filtration Plants (MWD Full Service Untreated EM –4 & 14)						
Perris FP	8,000	10,900	16,000	16,000	16,000	16,000
Hemet FP		5,400	8,000	8,000	8,000	8,000
MWD Full Service Treated Water Deliveries (EM 12 & 17)						
Mills	55,900	58,600	62,200	76,700	86,800	94,800
Skinner	18,000	14,000	16,000	18,000	20,000	22,000
Total	103,500	115,200	134,000	150,300	162,200	172,000

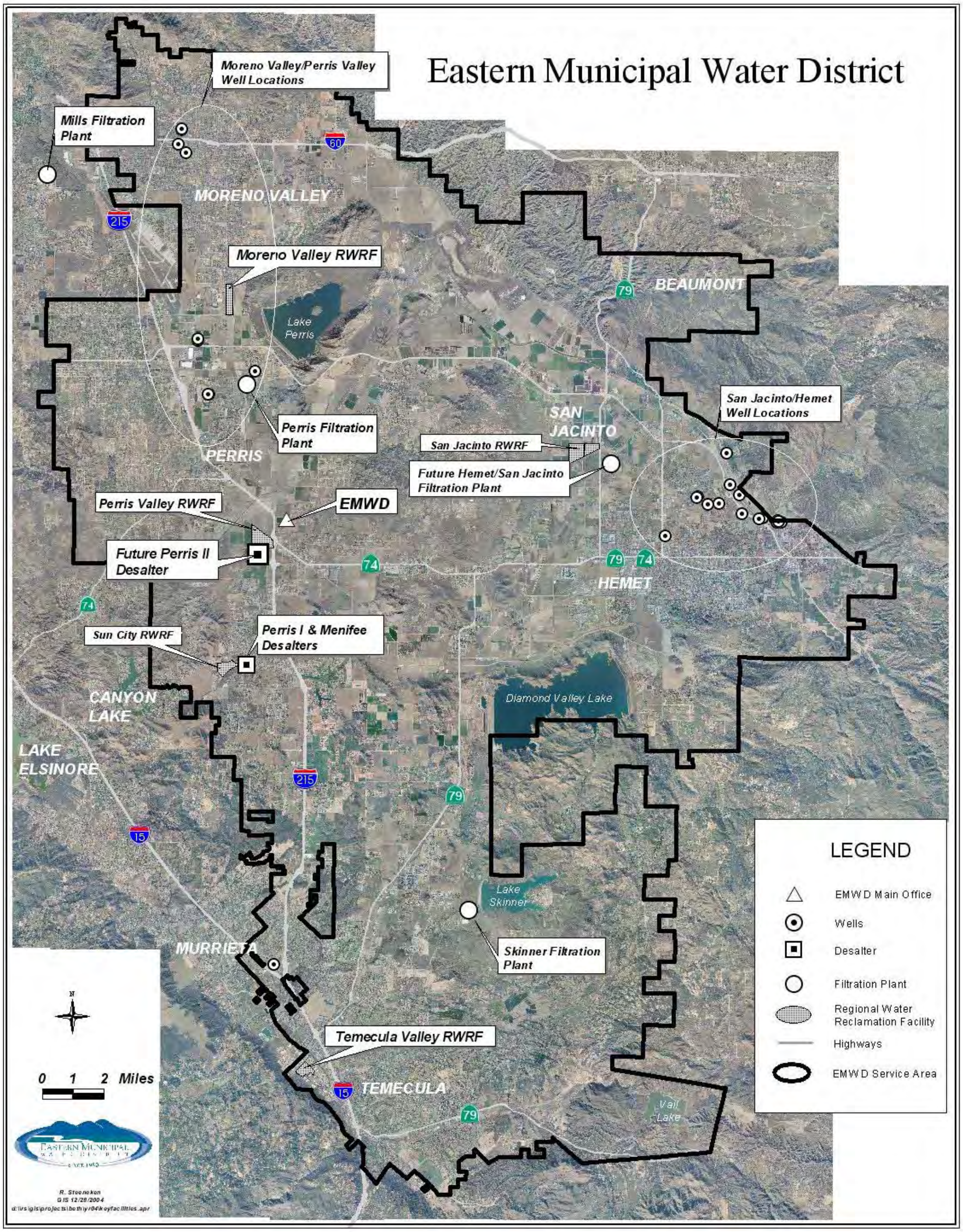
Table 2.2 - Non-Potable Water Supply by Source (AFY)

	2005	2010	2015	2020	2025	2030
Groundwater Recharge (MWD Untreated EM-14)						
Recharge Water into the San Jacinto Basin	8,000	20,000	22,200	22,600	22,600	22,500
MWD Untreated Agricultural Water Deliveries (EM 14)						
MWD Untreated AG	2,500	1,200	2,100	2,600	3,100	3,500
Recycled Water						
Recycled M&I Use	3,500	7,700	10,950	13,300	15,750	17,500
Industrial Enterprise & Aesthetic Improvement	0	7,000	8,250	9,500	10,750	12,000
Recycled Water – Agricultural Use/Wildlife Habitat	21,500	17,700	17,500	17,500	17,500	17,500
RW Total	25,000	32,400	36,700	40,300	44,000	47,000
Total	35,500	53,600	61,000	65,500	69,700	73,000

Table 2.3 - Total Water Supply (AFY)

	2005	2010	2015	2020	2025	2030
Total	139,000	168,800	195,000	215,800	231,900	245,200

Figure 2.1 - Location of Supply Sources



Imported Water

EMWD relies on MWD for 80% of its potable water supply. Treated water ready for potable use is supplied from two sources through separate MWD water treatment facilities. The two sources of water are the SWP and the Colorado River. The two water treatment facilities are Mills and Skinner.

The SWP is California's state-built water and power development and conveyance system. It includes pumping and power plants; reservoirs, lakes, and storage tanks; and canals, tunnels, and pipelines—that capture, store, and convey water from northern California to southern California. Water from the Colorado River is delivered into MWD's service area via the Colorado River Aqueduct (CRA). The water treated at Mills is SWP water and the water treated at Lake Skinner is a blend of Colorado River water and SWP water.

In addition to treated water, EMWD utilizes untreated or non-potable water imported from MWD. This water needs purification and further treatment before it is available for potable use. This water is imported by MWD through the SWP pipeline running through EMWD's service area. Currently, EMWD treats raw water at a single microfiltration plant in Perris. That plant currently has an expansion under construction. In Hemet, construction has begun on another microfiltration plant to add a supply source in that portion of EMWD. These small micro filtration plants allow EMWD to meet the needs of local customers when MWD's treated water resource may be stretched to their limit, especially during peak summer months. Raw water from MWD is also used for agricultural customers and for recharging the groundwater basins EMWD and others rely on.

Groundwater

In an effort to reduce dependency on imported water supplied by MWD, EMWD has developed several programs designed to take advantage of local resources. High-quality groundwater has long been a source of water supply for local customers in the Hemet/San Jacinto area. In Perris, groundwater is blended with imported water for use in the western portion of EMWD. Protecting and developing local groundwater resources to reduce dependency on imported water, is an important objective in EMWD's Strategic Plan.

EMWD's service area encompasses all or part of two different watersheds. The southern portion of the District is tributary to the Santa Margarita River Watershed. The use of all surface and sub-surface waters within the watershed of the Santa Margarita River is under the jurisdiction of the United States District Court for the Southern District of California. The court appointed a Watermaster and Steering Committee to provide recommendations to the court regarding the watershed. EMWD is represented on the Steering Committee. Currently, EMWD does not produce any groundwater in the Santa Margarita Watershed and there are no plans to do so in the future.

The northern part of EMWD's service area covers the San Jacinto Watershed. To the west, the West San Jacinto Groundwater Management Plan was adopted in 1995 under the auspices of Assembly Bill 3030 now codified in the California Water Code. Annual reports on the status of groundwater and water resources efforts in the area have been published since 1996. To the east, the Hemet/San Jacinto Water Management plan is in process. EMWD is working with other agencies, the cities, and private groundwater producers in the area to develop and implement a management plan that should be complete and adopted in the coming year. The first annual report for the Hemet/San Jacinto Water Management Plan area was published in June 2005. The groundwater EMWD produces and is considered in this Urban Water Management Plan, is pumped from the San Jacinto Watershed.

Part of the plan being developed for the Hemet/San Jacinto Groundwater Management area will expand the current use of raw or untreated water from MWD to recharge portions of the San Jacinto basin. In 2004 and 2005, EMWD, LHMWD and the Cities of Hemet and San Jacinto addressed deteriorating groundwater levels in the area and reduced the historical impact of overdraft caused by past groundwater production by implementing a cooperative groundwater recharge program. In 2004, 6,000 AF of SWP water was recharged at two existing recharge pond sites in the San Jacinto riverbed and, for 2005, the recharge goal is 8,000 AF. EMWD is now developing the Hemet/San Jacinto Recharge and Recovery Program – a groundwater replenishment and recovery program that will be implemented in two phases. The first phase will entail construction of six recharge basins in the San Jacinto riverbed. Phase II involves nine additional recharge basins and a 7.7 mile pipeline. Both phases include construction of recovery or extraction wells as well as monitoring wells. This regional effort, funded partially by a $5 million grant from the California Department of Water Resources, is expected to cost $13.7 million and will protect and optimize the use of local resources.

EMWD constructed the Menifee Desalter to recover and treat high total dissolved solids (TDS) groundwater and manages the salinity in the West San Jacinto Groundwater Basin Management Plan area. This facility treats high TDS groundwater from the Menifee and south Perris areas and produced 1,441 AF of potable water in 2004. Construction of a second desalter, the Perris I Desalter next to the Menifee Desalter is complete and the new plant will expand the capacity of desalinated water production from 3 to 7 MGD. Test wells are being drilled for a third desalter, and an iron and manganese removal facility, initiated in 2004, will be constructed at the Sun City Regional Water Reclamation Facility next to the existing and planned desalters.

Recycled Water

In addition to groundwater and imported water, EMWD is dedicated to expanding and maximizing the use of recycled water produced at four regional water reclamation facilities. Demographic changes in EMWD’s service area are increasing the amount of recycled water available while reducing the traditional demand by agricultural customers. This has challenged EMWD to improve reliability and provide recycled water to a growing market of commercial, industrial and institutional customers.

Section 3 - Groundwater

EMWD's only locally produced potable water is the groundwater extracted from the basins below the San Jacinto Watershed. This water accounts for approximately 20% of EMWD's supply and with the use of new technology and in partnership with others in the region; EMWD is working to ensure the quality and reliability of the basins for now and into the future.

Basin Description

San Jacinto Watershed - Groundwater Management Zones in EMWD's Service Area

The San Jacinto Watershed covers an area of approximately 728 square miles, measured above a point just downstream from Railroad Canyon Dam. All of the streams and rivers in the watershed are ephemeral; they flow only when precipitation occurs and much of this flow infiltrates to groundwater. When storms are unusually intense and prolonged, the ground saturates quickly and most of the precipitation runs off to streams. The San Jacinto River rises in and drains the western slopes of the San Jacinto Mountains. Waterways tributary to the river include the North and South Forks, Strawberry, Indian, Poppet, and Bautista Creeks. The river recharges the groundwater basin in the area southeast of the City of San Jacinto. It then flows northwest past the Lakeview Mountains before turning southwest to flow across the Perris Valley floor. The San Jacinto River ultimately flows into Lake Elsinore via Railroad Canyon and Canyon Lake. Lake Elsinore, when full, overflows into Temescal Wash, which joins the Santa Ana River near Prado Dam.

The San Jacinto groundwater basin lies within alluvium-filled valleys carved into the elevated bedrock plateau of the Perris Block. Collectively, the basins are nearly surrounded by impermeable bedrock mountains and hills. Internally, island-like masses of granite and metamorphic bedrock rise above the valley floor.

The San Jacinto and Casa Loma fault zones are the major geologic features that bound and/or crosscut many of the groundwater basins, and typically are effective barriers to groundwater flow. The area between the San Jacinto and Casa Loma faults is a deep, alluvium-filled graben of tectonic origin, commonly referred to as the San Jacinto Graben. The effective base of freshwater in the graben is known to be quite deep but has not been precisely determined. The San Jacinto Graben consists of a fore bay area in the southeast where surface water recharge primarily occurs and a pressure area in the northwest where deep aquifers exist under confined conditions. To the east, the San Jacinto mountain range is the dominant geographic feature of the region, rising to a height of 10,805 feet.

Groundwater management zones were delineated based on major impermeable boundaries, constrictions in impermeable bedrock, groundwater divides, and internal flow systems. The eight-groundwater management zones in the San Jacinto Watershed within EMWD's service area are:

1. Canyon
2. San Jacinto Upper Pressure
3. San Jacinto Lower Pressure
4. Lakeview/Hemet North
5. Hemet South

6. Perris South
7. Perris North
8. Menifee

Canyon Management Zone - The Canyon, San Jacinto Upper Pressure, and San Jacinto Lower Pressure Management Zones lie along a northwest to southeast axis in the northern part of the San Jacinto Valley. The boundaries of the Canyon Management Zone include the San Jacinto Mountains to the east and the San Jacinto fault to the west. The San Jacinto Mountains are composed of consolidated crystalline bedrock and semi-consolidated sedimentary rocks. These rocks are virtually impermeable and bound the water-bearing, alluvium-filled canyons within this management zone.

San Jacinto Upper Pressure Management Zone - The San Jacinto Upper Pressure Management Zone is bounded by the San Jacinto fault to the northeast, the Casa Loma and Bautista Creek fault zones to the southwest, and the flow system boundary with the San Jacinto Lower Pressure Management Zone to the northwest. The San Jacinto fault is a known barrier to groundwater flow, and separates the San Jacinto Graben from the San Timoteo Badlands and the San Jacinto Mountains. East of the City of San Jacinto, a branch of the San Jacinto fault zone cuts the alluvial fill by extending southeast across the San Jacinto River and along the channel of Bautista Creek until it intersects the Park Hill fault. This branch of the San Jacinto fault zone separates the San Jacinto Upper Pressure Management Zone from the Canyon Management Zone.

A branch of the San Jacinto fault zone extends southeast along the channel of Bautista Creek until it intersects the Park Hill fault. In the early 1900s, the barrier effect of the fault resulted in rising groundwater within the San Jacinto River upstream of the fault. This area is known as the Cienega and is an area of significant municipal groundwater production. The Casa Loma and Bautista Creek fault zones are known barriers to groundwater flow. However, groundwater leaks across the fault zones as underflow to the Hemet South and Lakeview/Hemet North Management Zones.

San Jacinto Lower Pressure Management Zone - Boundaries of the San Jacinto Lower Pressure Management Zone include the San Jacinto fault to the northeast; the Casa Loma fault and its northwestward extension; various crystalline bedrock outcrops to the north and west; and the flow system boundary with the San Jacinto Upper Pressure Management Zone to the southeast.

Lakeview/Hemet North Management Zone - Boundaries of the Lakeview/Hemet North Management Zone include the Casa Loma fault zone to the east; the groundwater divide near Esplanade Avenue to the south; the Lakeview Mountains to the west and south; the Bernasconi Hills to the north; and a bedrock constriction/saddle to the west. The Casa Loma fault zone is a known barrier to groundwater flow. However, groundwater leaks across the fault zone as underflow from the Upper San Jacinto Management Zone. Impermeable, crystalline bedrock outcrops that compose the Bernasconi Hills and the Lakeview Mountains to the north and south, respectively, are hard rock barriers to groundwater flow. To the west, the gap between the Bernasconi Hills and the Lakeview Mountains becomes narrow and the buried bedrock surface forms a saddle. This area of constriction in the water-bearing alluvium is the boundary between the Perris South and Lakeview/Hemet North Management Zones.

Hemet South Management Zone - The boundaries include the Casa Loma and Bautista Creek fault zones to the east; the groundwater divide near Esplanade Avenue to the north; the groundwater divide in the Winchester area to the west; and various crystalline bedrock outcrops to the south. The Casa Loma and Bautista Creek fault zones are known barriers to groundwater. However, groundwater leaks across the fault zones as underflow from the San Jacinto Upper Pressure Management Zone.

Perris South Management Zone - Boundaries of the Perris South Management Zone include a groundwater divide in the Winchester area; bedrock constrictions/saddles bordering the Menifee Management Zone; a bedrock constriction/saddle bordering the Lakeview/Hemet North Management Zone; a bedrock constriction bordering the Perris North Management Zone; and the surrounding bedrock mountains and hills. A groundwater high exists in the Winchester area near Highway 79. The divide is likely an artifact of natural and artificial recharge and groundwater production patterns. As such, the position (or the very existence) of this groundwater divide may vary with changing artificial recharge and/or production patterns.

Southwest of EMWD's Winchester Ponds, a narrow constriction in the bedrock coincides with a buried bedrock saddle surface. This area of constriction in the water-bearing alluvium is a boundary between the Perris South and Menifee Management Zones. Groundwater can flow through this bedrock gap from the Winchester area into the Menifee Management Zone; this is especially true during times of high groundwater levels. Southeast of Sun City, a similar narrow constriction in the bedrock coincides with a buried bedrock saddle surface. This area of constriction in the water-bearing alluvium also is a boundary between the Perris South and Menifee Management Zones. Groundwater flows through this bedrock gap from the Sun City area into the Menifee Management Zone.

To the northeast, the gap between the Bernasconi Hills and the Lakeview Mountains becomes narrow and the buried bedrock surface forms a saddle. This area of constriction in the water-bearing alluvium is the boundary between the Perris South and Lakeview Management Zones. Under original flow conditions, groundwater flowed westward from Lakeview into Perris South. However, groundwater now flows from Perris South eastward into Lakeview toward a “pumping depression” in the groundwater table.

Perris North Management Zone - North of the San Jacinto River in the Perris area, the gap between the Bernasconi Hills and the bedrock hills to the west narrows. This area of constriction in the water-bearing alluvium is a boundary between the Perris South and the Perris North Management Zones.

Impermeable, crystalline bedrock outcrops that compose the surrounding mountains and hills are hard rock barriers to groundwater flow.

Menifee Management Zone - Boundaries of the Menifee Management Zone include the bedrock constrictions/saddles bordering the Perris South Management Zone, a bedrock constriction to the east, and the surrounding bedrock mountains and hills. Southwest of the Winchester Ponds, a narrow constriction in the bedrock coincides with a buried bedrock saddle surface. This area of constriction in the water-bearing alluvium is a boundary between the Perris South and Menifee Management Zones. Groundwater can flow through this bedrock gap from the Winchester area into the Menifee Management Zone, especially during times of high groundwater levels.

Southeast of Sun City, a similar narrow constriction in the bedrock coincides with a buried bedrock saddle surface. This area of constriction in the water-bearing alluvium also is a boundary between the Perris South and Menifee Management Zones. Groundwater flows through this bedrock gap from the Sun City area into the Menifee Management Zone.

Groundwater Management

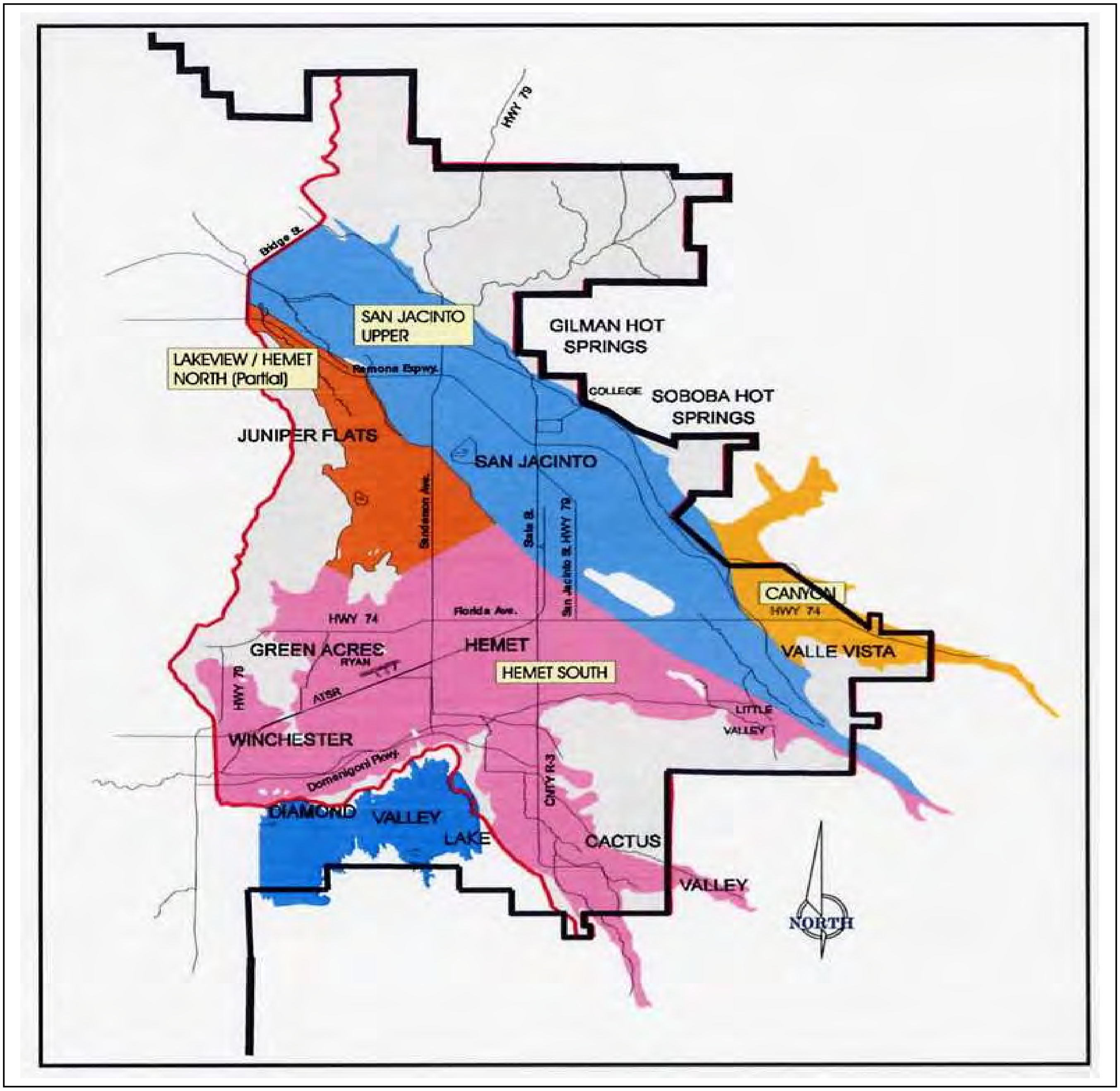
EMWD extracts groundwater from multiple management zones in the San Jacinto Watershed. These zones are covered by one of two groundwater management plans. The Hemet South, Canyon, San Jacinto Upper Pressure, and the Hemet North part of the Lakeview/Hemet North Management Zones are covered by the Hemet/San Jacinto Water Management Plan. This plan is currently being developed and should be finalized in 2005 or early 2006. The Perris North, Perris South, San Jacinto Lower Pressure, and Menifee Management Zones, and the Lakeview portion of the Lakeview/Hemet North Management Zone are covered by the West San Jacinto Groundwater Basin Management Plan. That Plan has been in place since 1995 and a copy is attached as Appendix B.

Hemet/San Jacinto Water Management Area

History of the Hemet/San Jacinto Basin Water Management Plan

Developing and implementing comprehensive water resources management programs to protect, optimize, and enhance the use of all available resources is a strategic goal at EMWD. Groundwater levels in the Hemet and San Jacinto sub-basins steadily declined during a 40-year span from the early 1940's to the end of the 1970's. The 1987-1992 drought quickly followed with similar impact. Recent years with below average rainfall and increased groundwater production have caused water levels to continue to decline. Therefore, groundwater resources need to be responsibly managed and protected. EMWD and local municipal and private groundwater producers are working together to develop and implement a groundwater management plan for the eastern portion of the Hemet/San Jacinto area.

Figure 3.1 - Hemet/San Jacinto Water Management Area



In 1995, the Soboba Band of Luiseno Indians (Tribe) entered into negotiations with EMWD and the Lake Hemet Municipal Water District (LHMWD) to settle groundwater claims. In 2000, the Tribe filed a lawsuit against MWD alleging MWD interfered with Tribal water rights when it constructed the San Jacinto Tunnel along the Colorado River Aqueduct. Since then, negotiations and numerous discussions have lead to the development of the Principles of Settlement. One of the main provisions of the Principles of Settlement is the development of a groundwater management plan.

In June of 2001, the Department of Water Resources (DWR) and local agencies executed a Memorandum of Understanding (MOU) to formulate a groundwater management plan for the Hemet/San Jacinto area. A groundwater policy committee was formed with elected officials from the Cities of Hemet and San Jacinto, LHMWD, EMWD and representatives of private groundwater producers. DWR acts as an impartial mediator to the policy committee. Since it was formed, the policy committee has discussed and resolved several controversial issues, including San Jacinto Tunnel seepage water, the Fruitvale Judgment, export of groundwater from the basins, and how to maximize the use of reclaimed water. It has formed a technical committee to provide guidance and has participated in public outreach meant to share information and encourage cooperation.

In September of 2003, an agreement was made between EMWD, LHMWD and the cities of Hemet and San Jacinto to develop a groundwater monitoring program. Under this agreement monitoring began in 2004, and the first report was published in June of 2005. EMWD, LHMWD and the Cities of Hemet and San Jacinto are all participating in the funding and implementation of the monitoring program. Once the groundwater management plan is in place, future annual reports will be submitted to the Watermaster.

EMWD, LHMWD and the Cities of Hemet and San Jacinto also agreed on the Interim Principles of Groundwater Management in 2003 and then the Principles of Groundwater Management in February 2004. These principles establish the framework for a Water Management Plan for the Hemet/San Jacinto area.

There were two additional MOU's in 2004. The first addressed the deteriorating situation in the sub-basins by providing interim stabilization through recharge and was executed in April. The second, executed in June, describes the funding mechanism for developing the groundwater management plan.

Successful implementation of the Hemet/San Jacinto Water Management Plan will help insure that:

- The Hemet/ San Jacinto area will have a reliable and adequate source of future water supply.
- The settlement claims by the Soboba Band of Luiseno Indians are facilitated and accommodated.
- Existing water production and water services system will be expanded to meet future urban growth.
- Water quality in the management plan area will be protected and/or enhanced.
- Cost-effective water supplies and treatment by the public agencies is supported.
- Groundwater overdraft is eliminated and basin yield enhanced.
- A monitoring program is implemented to promote and provide for best management and engineering principles to protect water resources.

The final Water Management Plan will be a part of a Stipulated Judgment that should be approved by the courts in 2005 or early 2006. The plan should be finalized and implemented in 2006. It will limit the amount of water being extracted from the basin to a sustainable yield and implement continued recharge of the basin using imported water. The Cooperative Agreements for the Water Management Plan are available in Appendix G of this plan.

Water Quality

In 2007, 137 wells were sampled for water quality. One hundred and eleven of the wells were sampled by EMWD while others sampled 26 wells and reported the results to EMWD. In general, the best quality of water occurs in the Canyon Management Zone in the Cienega area and along the river. There is significant municipal production there. Table 3.1 shows the high and low TDS and NO_3 –N concentrations for each management zone. Water quality can be effected by mineral content of sediments, recharge and drainage patterns, historic land use factors, screening intervals and depth of wells sampled and other factors. Water quality monitoring will continue as part of the water management plan and results will be submitted to the Watermaster.

Table 3.1 - TDS and NO_3 –N by Management Zone for 2004

Management Zone	No. of Wells	TDS (mg/L)		NO_3 –N (mg/L)	
		High	Low	High	Low
Canyon	19	1,410	210	10.0	<0.1
S.J.U.P.	66	1,500	200	25.0	<0.1
Hemet North	25	1,010	360	5.4	<0.1
Hemet South	27	1,490	220	30.0	0.6
Total	137				

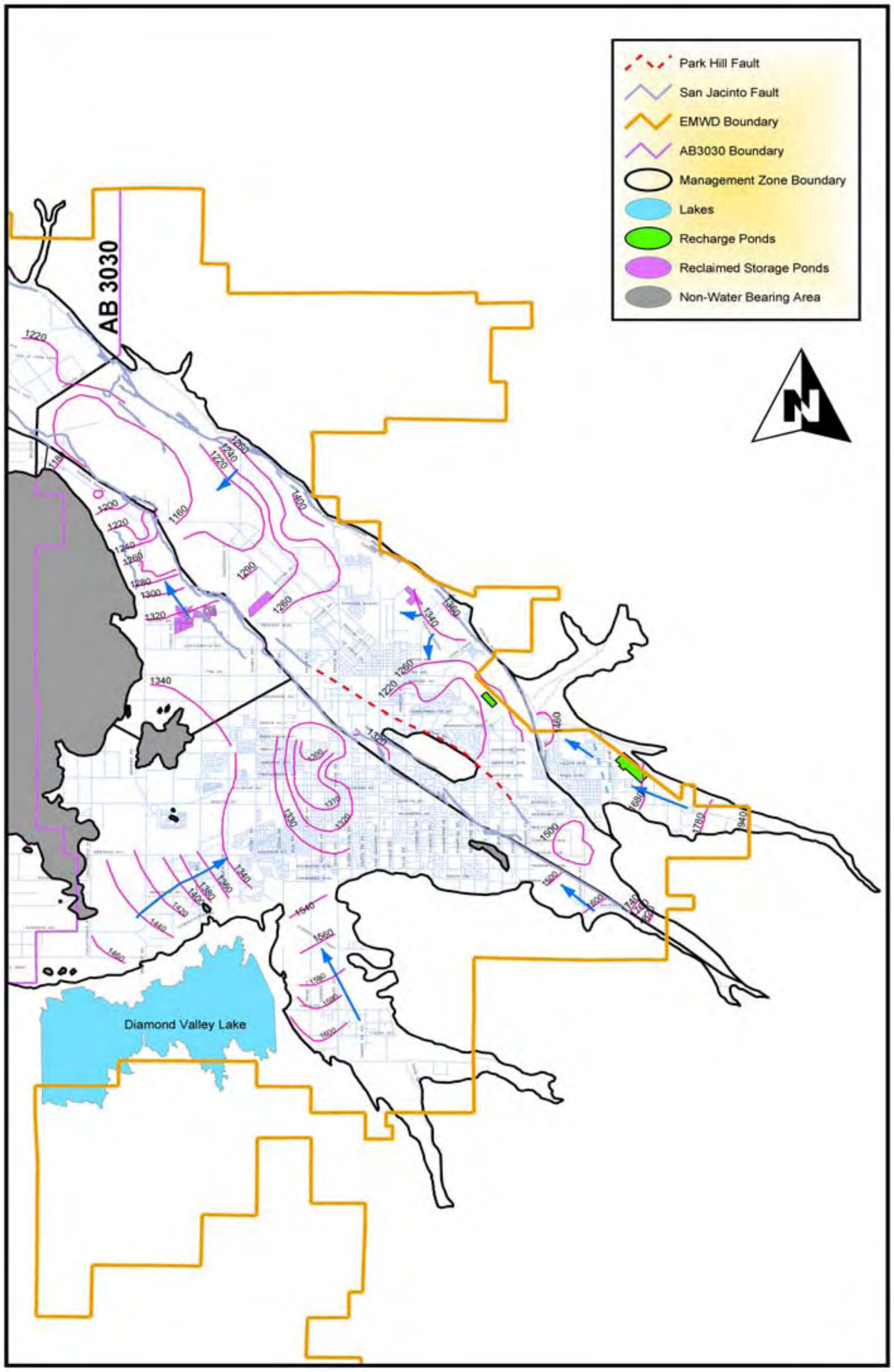
Water Levels

EMWD and others measured over 170 wells in both the spring and fall of 2004. These measures were used to help determine the direction of flow. Water levels taken in the fall of 2004 were also compared to levels measured in fall of 2003 to determine the change in storage. In three out of the four management zones, there was a decrease in groundwater storage, only in Hemet North portion of the Lakeview/Hemet Management Zone showed an increase in groundwater storage. Table 3.2 gives the average change in groundwater storage for 2003 to 2004. Figure 3.2 shows the water level contours for the Hemet/San Jacinto Water Management Area.

Table 3.2 - Average Changes in Groundwater in Storage, 2003 to 2004

Management Zone	Change	Acre Feet
Canyon	Decrease	-1,700
San Jacinto Upper Pressure	Decrease	-3,000
Hemet North (partial)	Increase	600
Hemet South	Decrease	-5,900
Total		-10,000

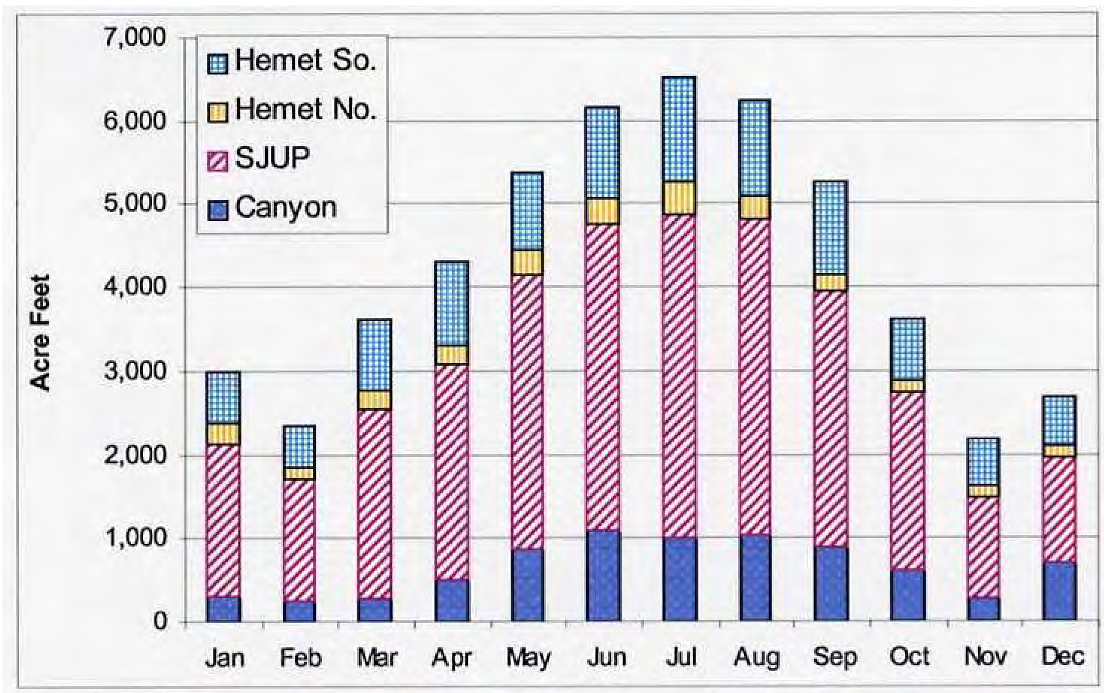
Figure 3.2 – Hemet/San Jacinto Water Management Area Water Level Contour Map



Water Extraction

One hundred and eighty-two wells have been identified in the Hemet/San Jacinto Water Management area. One hundred and forty-nine of these wells are metered, the remaining are estimated based on land use, size, or the number of cows in the case of dairies. In 2004, 51,387 AF of water was produced by all of the users in the basin area. Of the total, nearly 60% of the water was produced between May and September. The water production by month is summarized in the chart below.

Figure 3.3 - Monthly Production by Management Zone



Operational Yield

According to *the Operational Yield Study, Hemet/San Jacinto Groundwater Management Area* (WRIME, Inc., 2003), the operational yield of the groundwater system ranges from approximately 30,000 AFY to 64,000 AFY, with an average of about 41,000 AFY. The operational yield is the long-term withdrawal from the groundwater system not exceeding natural and artificial recharge to the system. From 1958 - 2001 there was an average production of about 50,000 AFY. However, production from 1994 to 2001 was about 68,000 AFY. This is about 27,000 AFY above the average long-term yield estimate. As part of the groundwater management plan, imported water will be added to the basin and the production will be limited to the operational yield.

Recharge

In April of 2004, EMWD, LHMWD and the Cities of Hemet and San Jacinto executed a MOU for an Interim Water Supply Plan. The purpose of the plan was to address the deteriorating situation in the Hemet/ San Jacinto area by providing about 6,000 AF of recharge during the 2004 calendar year. Then, between January 20 and October 24 of 2004, 5,998 AF of imported water from the State Water Project (SWP) was recharged into the basin at two sites – the Conjunctive Use Ponds in the Intake portion of the San Jacinto Upper Pressure Management Zone and the Grant Avenue Ponds in the Canyon Management Zone.

In November of 2004, a second recharge effort was initiated with the goal of recharging 8,000 AF in 2005. For the 2004 recharge effort, EMWD, LHMWD, and the City of Hemet contributed funding to the purchase and recharge of the SWP, and the City of San Jacinto agreed to reduce groundwater production from the basin to help offset recharge costs. For the 2005 recharge effort, all parties are contributing funds to the program. Under the Water Management Plan, any future conjunctive use projects will be done with the approval of the Watermaster.

Currently, preparation is underway to implement the Hemet/San Jacinto Recharge and Recovery Program. This project will involve 100 acres of ponds, eight recovery wells, and a 60-inch diameter pipeline from EMWD's EM-14 connection to the ponds. The objectives of the project:

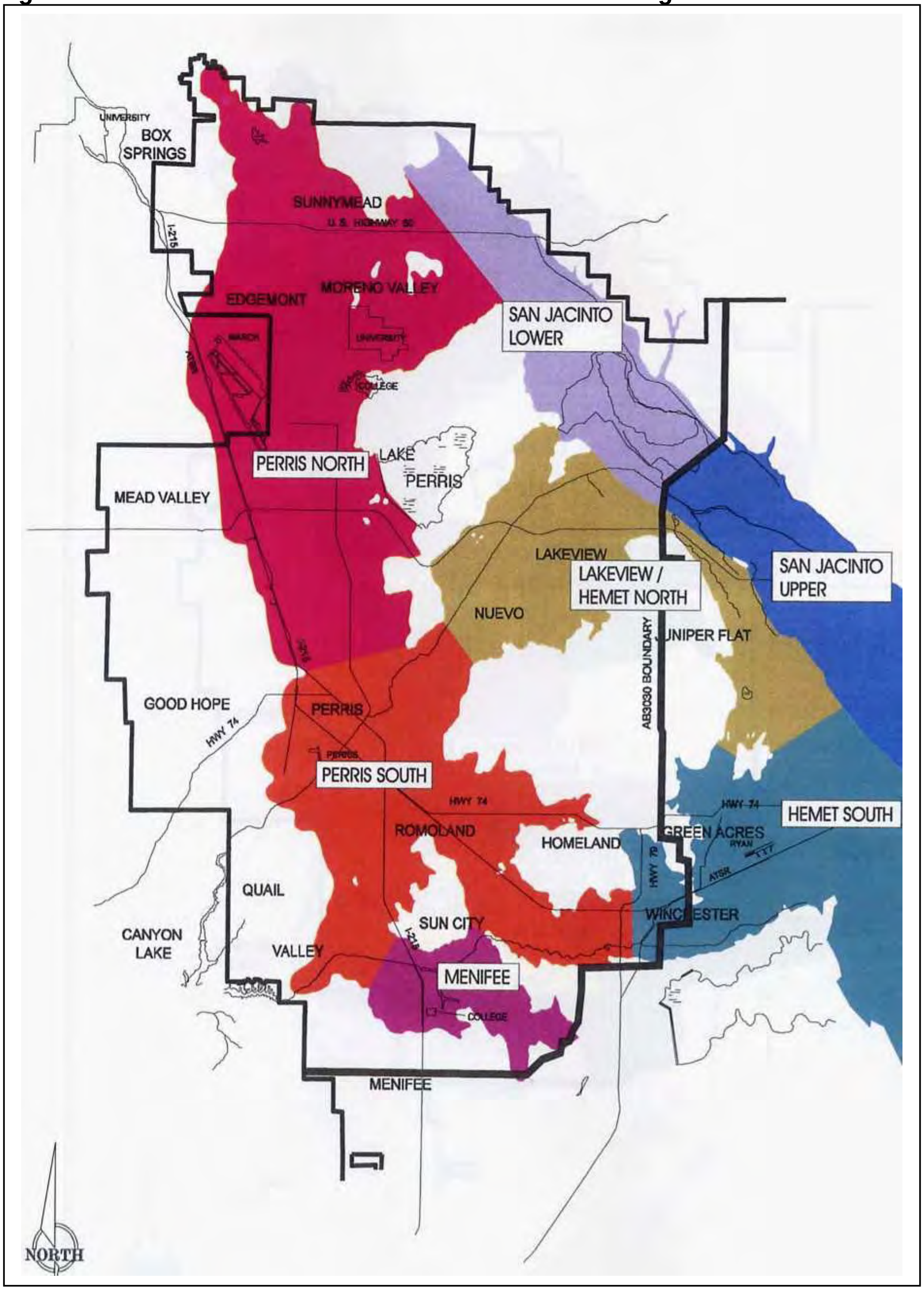
- Provide Tribal Settlement Water - 7,500 AFY
- Elimination of Groundwater Overdraft – 10,000 AFY
- Additional Long-term Supply – 15,000 AFY
- Water Storage for Drought Years – 45,000 AFY

EMWD is currently working with the US Army Corp of Engineers to complete a federal Environment Impact Statement (EIS) in order to obtain a Section 404 Permit and a Section 7 Permit under the Endangered Species Act. The EIS and permitting are both scheduled to be complete in November of 2005. EMWD will also be required to obtain a Streambed Alteration Permit from the California Department of Fish and Game and a 401 Certificate from the Regional Water Quality Control Board.

In addition to the recharge of SWP, there is some incidental recharge of recycled water from a storage pond EMWD has in the area and the MWD San Jacinto Reservoir.

EMWD also has the right to divert surface water from the San Jacinto River to recharge the Canyon sub-basin. Because the San Jacinto River is an ephemeral river, the river does not flow every year. During 2004, flows were insufficient for EMWD to divert water.

Figure 3.4 - West San Jacinto Groundwater Basin Management Plan



History of the West San Jacinto Groundwater Basin Management Plan

In the west San Jacinto area, a cooperative groundwater management plan is already in place to insure the reliability and quality of the water supply. In June 1995, EMWD adopted the West San Jacinto Groundwater Basin Management Plan in accordance with the statutes in the State Water Code resulting from the passage of Assembly Bill 3030

(AB 3030). The plan was adopted after extensive public outreach and meetings with interested individuals and agencies. Implementation of the plan began directly after its adoption. Initial efforts to implement the plan included establishing an advisory committee; prioritizing the sub-basins; evaluating groundwater resources including establishing groundwater quality, level, and extraction monitoring programs; and conducting hydro-geophysical investigations. There have been nine annual reports resulting from the West San Jacinto Groundwater Management Plan, each documenting the implementation of the plan and activities in the sub-basins.

The most recent report was published in April of 2005. It has a thorough accounting of the status of the sub-basins or management zones. Topics covered by the report include the results from EMWD's groundwater quality, water level, and extraction monitoring programs, progress in capping and sealing inactive wells, development of a Regional Water Resources Database, existing and proposed desalters, and other activities in the sub-basins.

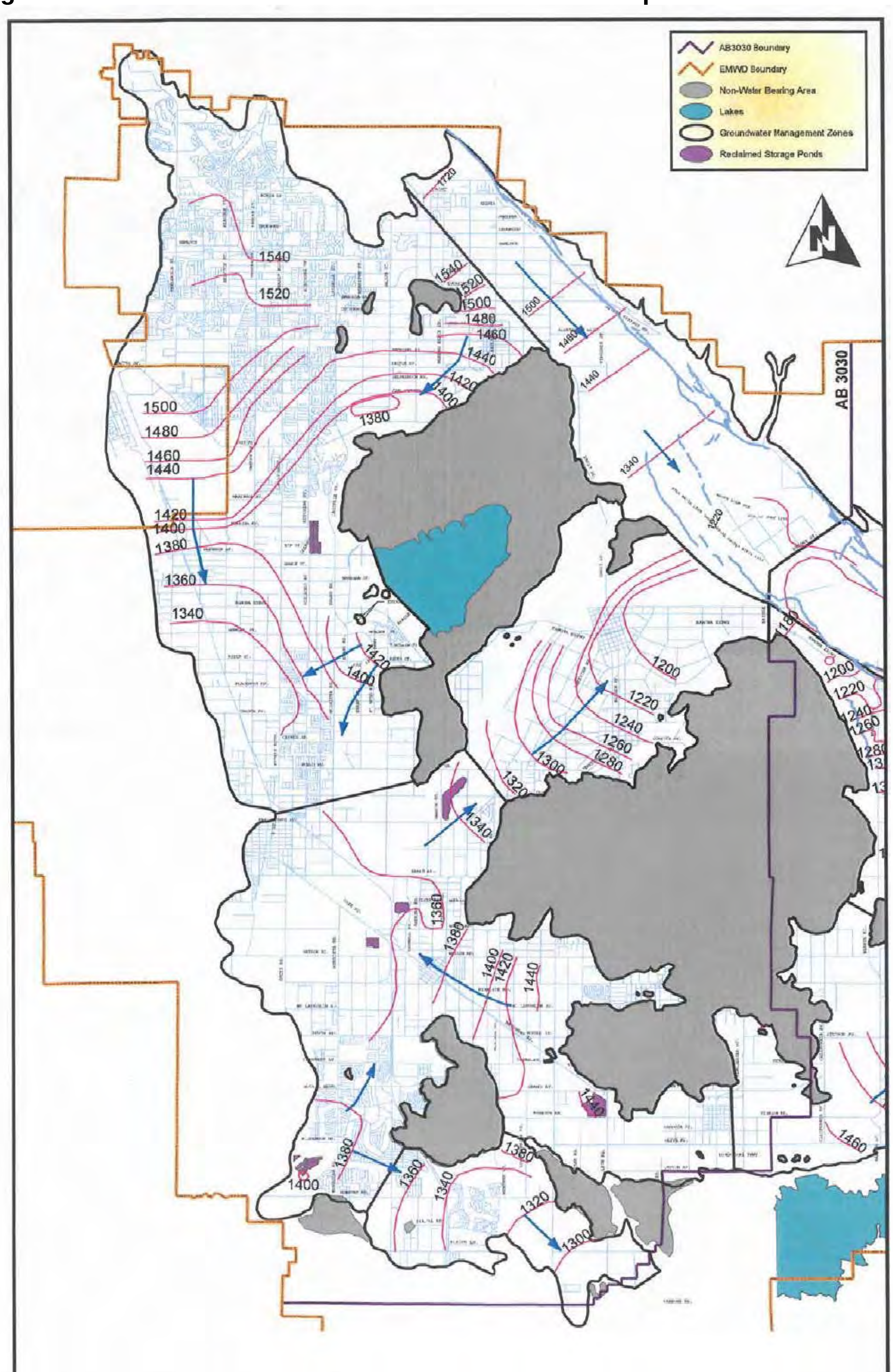
Water Quality

During 2004, as part of the groundwater monitoring efforts, 115 water quality samples were taken from wells in the West San Jacinto Groundwater Management Plan area. The water with the highest TDS level was found in the southwest portion of the Perris South Management Zone. The highest level was 10,300 mg/L. The lowest TDS level of 270 mg/L was found in the northwest portion of Perris North Management Zone. Measurements from 135 wells were sampled and in 2003 and 2004 were used to calculate the statistical volume weighted averages for TDS and NO_3 –N in mg/L for each management zone in 2003 and 2004. The Lakeview portion of the Lakeview/Hemet North Management Zone and in the Perris North and Menifee Management zones show an increase in volume weighted average TDS concentrations. The Perris South Management Zone showed a significant decrease in the volume-weighted average NO_3 –N. Water quality and the character of groundwater are determined by a number of factors including: type and mineral content of sediments; recharge and drainage patterns; historic land use patterns; and screening interval and depth of wells sampled. Fluctuation in high and low values for water quality can also occur because the same wells are not sampled each year. See Chapter 3 of the West San Jacinto Groundwater Basin Management Plan 2004 Annual Report for more information about the water quality of the basin.

Water Levels

In spring 2004, water levels were measured in 150 wells. In addition to giving information on the water levels from year to year, these measurements provide information on the direction of flow. The direction of flow has remained fairly consistent from year to year in the West San Jacinto Basin. There were 135 wells with groundwater level measurement in both 2003 and 2004. These measurements are used to estimate the changes in storage from year to year. In 2004, the Lakeview Portion of the Lakeview/Hemet North Management Zone showed a significant increase in groundwater storage. The Perris North Management Zone showed a minor increase, while the Perris South and Menifee Management Zone showed a slight increase in groundwater shortage. The San Jacinto Lower Pressure Management Zone displayed a slight decrease in groundwater storage. See Figure 3.5 for a water level contour map.

Figure 3.5 – West San Jacinto Basin Water Contour Map



In addition to monitoring water quality and water levels, the basin management plan monitors groundwater production in the basin. Groundwater production in the basin totaled 18,742 AF in 2004 only 13 feet more than in 2003. This production is measured in 54 wells and estimated in 21 wells as part of the Groundwater Extraction Monitoring Program. Table 3.3 shows the extraction from the basin from 2000 to 2004. This extraction accounts for all of the groundwater extracted from the basin, not just the extraction by EMWD.

Table 3.3 - Groundwater Extraction West San Jacinto Groundwater Management Area

Management Zone	No. of Wells Metered	No. of Wells Estimated	Total No. of Wells	GW (AF) Production Metered	GW (AF) Production Estimated	Total GW Production (AF)
Lakeview/Hemet North (partial)	22	1	23	3,923	20	3,943
Perris North	14	8	22	5,609	1,900	7,509
Perris South	10	1	11	2,286	30	2,316
S.J. Lower Pressure	3	3	6	275	70	345
Menifee	4	7	11	719	3,820	4,539
Hemet South (partial)*	1	1	2	80	10	90
Total	54	21	75	12,892	5,850	18,742

*Only a small portion of the Hemet South Management Zone is within the West San Jacinto Groundwater management Area. The remaining portion is within the Hemet/San Jacinto Management Zone and included in figure 3.2.

Desalters

As part of the West San Jacinto Groundwater Management Plan, EMWD has implemented a Groundwater Salinity Management Program. This program consists of three desalination facilities, two that are constructed and one that is in planning and design. These facilities recover high TDS water in the Menifee and Perris South Groundwater Management Zones for potable use. In addition to being a source of water, the main role of the desalter is to play a part in managing the groundwater sub-basins by addressing the migration of brackish groundwater into areas of good quality groundwater.

The Menifee Desalter was the first of three desalters to be built. This facility began producing potable water in 2003. In 2004, the Menifee Desalter produced 1,441 AF of potable water using water from two production wells. A third well began production and will increase the output of the desalter in 2005.

The second desalter, the Perris Desalter, is located next to the Menifee Desalter at the Sun City Regional Water Reclamation Facility. This plant was completed in spring of 2005 and will increase production of desalinated water from 3 to 7 MGD.

The final desalter, currently under design, is the Perris II Desalter. As part of design, four test wells have been drilled. Initial tests of the wells indicate production rates between 750 and 1,000 GPM with TDS concentrations between 2,000 and 3,000 mg/L. It is anticipated that the test wells and transmission lines for the Perris II Desalter will be completed in spring of 2006.

Groundwater Pumping Rights

In the eastern portion of the Hemet/San Jacinto area, EMWD's groundwater production is currently constrained by the 1954 Fruitvale Judgment and Decree. Under that Judgment and Decree, EMWD, as successor-in-interest to the Fruitvale Mutual Water Company, may extract the subsurface waters of the Canyon Basin for use over or outside the Entire Basin without restriction as long as the static water level in a specific well is not over 25 feet below a specific elevation. If the water level in the well is more than 25 feet below the specified elevation, EMWD's extraction is limited to 4,500 AFY. The District may extract from the entire basin a total of not more than 12,000 AFY for use outside the basin for use over the entire basin, subject to the 4,500 AFY Canyon Basin extraction limit. The perimeters of the areas of the Canyon and entire basins are defined in the Judgment and Decree. The Hemet/San Jacinto area contains good quality water and is a major source of municipal as well as private production, although water levels are in serious decline. Once the Hemet/San Jacinto Stipulated Judgment is in effect, it will supercede the Fruitvale Judgment and Decree.

West of the Hemet/San Jacinto area, the West San Jacinto Groundwater Basin Management Plan was adopted in 1995. This 250 square mile area is experiencing increasing water levels due to high TDS groundwater and decreased production. The high TDS groundwater is migrating into the Lakeview portion of the Lakeview/Hemet North management zone, an area of good quality groundwater. Lowering groundwater levels and removal of saline groundwater is an integral element in the West San Jacinto Groundwater Basin Management Plan. Continued operation of the Menifee Desalter and construction of the Perris I and Perris II Desalters was recommended in the West San Jacinto Groundwater Basin Management Plan 2003 Annual Report on the Status of the Sub Basins. Increasing production of usable groundwater, and production of brackish groundwater for desalination, and blending continue to be elements of the management plan.

EMWD is committed to maintaining the stability of the basins through cooperative groundwater management programs that provide a forum and mechanism whereby local groundwater producers may jointly work to ensure basin quality and quantity.

Past Production
Water Code 10910 (f)(3)

Table 3.4 depicts the total potable groundwater pumped by EMWD from 2000 to 2004. The majority of EMWD's groundwater is pumped from the Hemet and San Jacinto area. The remaining groundwater is pumped from the area covered by the West San Jacinto Groundwater Basin Management Plan. Production from the desalter did not begin until 2003. The location of wells used to pump groundwater and the desalters can be seen on Figure 2.1

Table 3.4 - Amount of Groundwater Pumped – AFY

Basin Names	2000	2001	2002	2003	2004
Hemet/San Jacinto Basin EMWD	17,458	17,717	15,126	15,370	12,516
Hemet/San Jacinto Basin Watermaster	0	0	0	0	0
West San Jacinto Basin	3,381	3,262	3,487	3,880	4,049
West San Jacinto Basin Desalters	0	0	0	282	1,441
Total	20,839	20,979	18,613	19,532	18,006

Projected Production
Water Code 10910 (f) (4)

Table 3.5 lists the amount of potable groundwater that EMWD is projecting will be supplied. Groundwater production in the San Jacinto Valley, some of which is currently covered by the Fruitvale Judgment and Decree, will decrease when the water management plan is put into place. The Perris/Moreno Valley wells are projected to continue to produce 6,000 AF. The desalters will decrease salinity in the basin with the added benefit of providing a source of potable water. The well locations shown in Figure 2.1 should remain consistent in the future.

Table 3.5 - Amount of Groundwater Projected to be Pumped - AFY

Basin Names	2005	2010	2015	2020	2025	2030
Hemet/San Jacinto Basin EMWD	12,000	7,200	7,200	7,200	7,200	7,200
Hemet/San Jacinto Basin Recovered Water	0	5,600	6,600	6,400	6,200	6,200
West San Jacinto Basin	6,000	6,000	6,000	6,000	6,000	6,000
West San Jacinto Basin Desalters	3,600	7,500	12,000	12,000	12,000	12,000
	23,605	28,310	33,815	33,620	33,425	33,430
Total	**17%**	**17%**	**17%**	**15%**	**14%**	**13%**

Section 4 – Reliability of Supply

EMWD delivers water to its customers from three sources; imported water from MWD, groundwater from the San Jacinto Basin and recycled water. The Regional Urban Water Management Plan developed by MWD assures the reliability of imported water supply to its member agencies through a multiple-year drought or single dry year through 2030. The management plans and recharge efforts help insure that the San Jacinto basin remains reliable, and the supply of recycled water will only grow as the population increases. The tables below display the anticipated available water supply in normal, dry and multiple dry years.

Table 4.1 - Supply Reliability Average Year - AFY

	2005	2010	2015	2020	2025	2030
Current Supplies						
Local Water Sources						
Groundwater- Hemet/San Jacinto Basin Native Groundwater	12,000	7,200	7,200	7,200	7,200	7,200
Groundwater -West San Jacinto	6,000	6,000	6,000	6,000	6,000	6,000
Groundwater Desalter –Menifee	1,600	3,000	3,000	3,000	3,000	3,000
Groundwater Desalter –Perris	2,000	4,500	4,500	4,500	4,500	4,500
Recycled Water - M& I Use	3,500	7,700	10,950	13,300	15,750	17,500
Recycled Water - Agricultural Use	21,500	17,700	17,500	17,500	17,500	17,500
Imported Water Sources						
Perris FP	8,000	8,000	8,000	8,000	8,000	8,000
Mills and Skinner	73,900	72,600	78,200	94,700	88,800	116,800
MWD Untreated AG	2,500	1,200	2,100	2,600	3,100	3,500
Supplies Under Development						
Local Water Sources						
Groundwater Desalter -Perris II	0	0	4,500	4,500	4,500	4,500
Recycled Water - Industrial Enterprise and Aesthetic Improvement	0	7,000	8,250	9,500	10,750	12,000
Hemet/San Jacinto Watermaster	0	5,600	6,600	6,400	6,200	6,200
Imported Water Sources						
Hemet FP -MWD Raw Water Treated by EMWD	0	5,400	8,000	8,000	8,000	8,000
Perris FP Expansion -MWD Raw Water Treated by EMWD	0	2,900	8,000	8,000	8,000	8,000
Recharge Water into the San Jacinto Basin	8,000	20,000	22,200	22,600	22,600	22,500
Total	139,000	168,800	195,000	215,800	213,900	245,200
% of Normal	100%	100%	100%	100%	100%	100%

Table 4.2 - Supply Reliability Single Dry Year (AFY)

	2005	2010	2015	2020	2025	2030
Local Water Sources						
Groundwater- Hemet/San Jacinto Basin Native Groundwater	12,000	7,200	7,200	7,200	7,200	7,200
Groundwater -West San Jacinto	6,000	6,000	6,000	6,000	6,000	6,000
Groundwater Desalter –Menifee	1,600	3,000	3,000	3,000	3,000	3,000
Groundwater Desalter –Perris	2,000	4,500	4,500	4,500	4,500	4,500
Recycled Water - M& I Use	3,500	7,800	11,100	13,400	15,900	17,700
Recycled Water - Agricultural Use	23,700	19,500	19,300	19,300	19,300	19,300
Imported Water Sources	0	0	0	0	0	0
Perris FP	8,000	8,000	8,000	8,000	8,000	8,000
Mills and Skinner	74,700	73,700	79,500	96,100	108,300	118,400
MWD Untreated AG	2,800	1,300	2,300	2,900	3,400	3,900
Supplies Under Development						
Local Water Sources						
Groundwater Desalter -Perris II	0	0	4,500	4,500	4,500	4,500
Recycled Water - Industrial Enterprise and Aesthetic Improvement	0	7,100	8,300	9,600	10,900	12,100
Hemet/San Jacinto Watermaster	0	5,600	6,600	6,400	6,200	6,200
Imported Water Sources	0	0	0	0	0	0
Hemet FP -MWD Raw Water Treated by EMWD	0	5,400	8,000	8,000	8,000	8,000
Perris FP Expansion -MWD Raw Water Treated by EMWD	0	2,900	8,000	8,000	8,000	8,000
Recharge Water into the San Jacinto Basin	6,900	20,000	22,200	22,600	22,600	22,500
Total	141,100	171,900	198,400	219,400	235,800	249,200
% of Normal	101%	102%	102%	102%	102%	102%

Table 4.3 - Multiple Dry Years Supply Reliability (AFY)

Ending in	2005	2010	2015	2020	2025	2030
Current Supplies						
Local Water Sources						
Groundwater- Hemet/San Jacinto Basin Native Groundwater	12,000	7,200	7,200	7,200	7,200	7,200
Groundwater -West San Jacinto	6,000	6,000	6,000	6,000	6,000	6,000
Groundwater Desalter –Menifee	1,600	3,000	3,000	3,000	3,000	3,000
Groundwater Desalter –Perris	2,000	4,500	4,500	4,500	4,500	4,500
Recycled Water - M& I Use	3,500	7,800	11,100	13,400	15,900	17,700
Recycled Water - Agricultural Use	23,700	19,500	19,300	19,300	19,300	19,300
Imported Water Sources						
Perris FP	8,000	8,000	8,000	8,000	8,000	8,000
Mills and Skinner	74,700	73,700	79,500	96,100	108,300	118,400
MWD Untreated AG	2,800	1,300	2,300	2,900	3,400	3,900
Supplies Under Development						
Local Water Sources						
Groundwater Desalter -Perris II	0	0	4,500	4,500	4,500	4,500
Recycled Water - Industrial Enterprise and Aesthetic Improvement	0	7,100	8,300	9,600	10,900	12,100
Hemet/San Jacinto Watermaster	0	5,600	6,600	6,400	6,200	6,200
Imported Water Sources	0	0	0	0	0	0
Hemet FP -MWD Raw Water Treated by EMWD	0	5,400	8,000	8,000	8,000	8,000
Perris FP Expansion -MWD Raw Water Treated by EMWD	0	2,900	8,000	8,000	8,000	8,000
Recharge Water into the San Jacinto Basin	5,600	20,000	22,200	22,600	22,600	22,500
Total	139,800	171,900	198,400	219,400	235,800	249,200
% of Normal	101%	102%	102%	102%	102%	102%

Imported Water

As EMWD prepares its 2005 UWMP, MWD is preparing a Regional UWMP (RUWMP). This document provides information about MWD supply reliability and demand calculations. The information supplied in the RUWMP provides assurance that MWD will have a reliable water supply available to deliver to EMWD through 2025, even during dry periods mimicking historical patterns. The RUWMP is available through contacting MWD or on MWD's website.

MWD's Board of Directors has developed the following mission statement **"***To provide its service area with adequate and reliable supplies of high quality water to meet present and future needs in an environmentally and economically responsible way."* To fulfill their mission, MWD has taken a coordinated approach to regional planning through the Integrated Resources Plan (IRP). The IRP 2003 Update is available through contacting MWD or on MWD's website.

The IRP was first implemented in 1996. MWD and member agencies worked together to first gather and analyze data to determine demand and supply alternatives, then to use the information gathered to develop a diverse mix of resources. The plan ensured MWD and member agencies would meet all full-service demands without interruption through 2020. It set targets for conservation, local supplies, SWP supplies, CRA supplies, groundwater banking, and water transfers. Using a diverse mix of resources, MWD and its agencies reduced dependency on any single water supply resource.

In 2001, MWD began the process of updating its IRP. The goal was to review and measure achievements since 1996, to identify changed conditions and make adjustments and to extend the planning period to 2025. After extensive cooperation with member agencies and other organizations, the plan was adopted in July of 2004. The update found several changed conditions and extended the reliability to 2025.

Significantly changed conditions listed in the 2003 Update were higher conservation savings, Board-revised goals for the SWP and the CRA, more stringent water quality laws and risk in resource implementation. Two areas of concern are the increasingly stringent water quality regulations and the risk associated with implementing planned projects. To manage those and other areas of concern, the IRP Update institutes a planning buffer of up to 10% of regional demands. This buffer calls for MWD to develop 500,00 AF of supply in addition to resource targets by 2025. This supply buffer is developed through increased targets for local supply and an increase of supply from Central Valley transfers. The supply buffer is part of MWD's practice of developing supply at least ten years in advance of need. More information on the IRP is included in Section II.1 of the RUWMP.

To evaluate the reliability of the supply, MWD has developed a computer model named IRPSIM. This model uses historic hydrologic data from 1922 to 1991 to develop estimates of water surplus and shortage over a 20-year planning horizon. The model assists staff in developing a strategy that balances risk and cost and allows them to manage water supplied from multiple sources. There are two basic types of supply. Core supplies include recycled water projects, safe-yield groundwater extraction, and CRA base supplies. These sources supply water to MWD every year. Flexible supplies only provide water when needed. Examples of flexible supplies are voluntary water transfers and storage. Tables 4.4 to 4.6 summarize the results from the IRPSIM model studies performed to test the supply reliability of the resources mix adopted in the IRP. The results are given for a multiple dry year's scenario using hydraulic data from 1990-92, a single worst case dry year using 1977 historic hydraulic data, and for an average year. The IRPSIM analyze shows that MWD is 100% reliable under dry conditions for the period from 2010 to 2030.

More information on the IRPSIM Modeling is Section 2 of the IRP Update. Water supply reliability is also discussed in Section II.3 and appendix A-3 of the RUWMP.

Table 4.4 – Basis of Water Year Data

Water Year Type	Base Year	Historical Sequence
Normal Water Year		1992-2004
Singe-Dry Water Year	1977	
Multiple –Dry Water Year	1990-1992	

Table 4.5 – Average Supply Capability & Projected Demands (AFY)

	2005	2010	2020	2025	2030
Current Supplies					
Colorado River Aqueduct	711,000	678,000	677,000	677,000	677,000
California Aqueduct	1,772,000	1,772,000	1,772,000	1,772,000	1,772,000
In-Basin Storage	0	0	0	0	0
Supplies Under Development					
Colorado River Aqueduct	0	0	0	0	0
California Aqueduct	185,000	185,000	240,000	240,000	240,000
In-Basin Storage	0	0	0	0	0
Transfers to Other Agencies	0	(35,000)	(35,000)	(35,000)	(35,000)
Metropolitan Supply Capability	2,668,000	2,600,000	2,654,000	2,654,000	2,654,000
Metropolitan Supply Capability w/CRA Maximum of 1.25 MAF	2,668,000	2,600,000	2,654,000	2,654,000	2,654,000
Firm Demands on Metropolitan	2,040,000	2,053,000	1,989,000	2,115,000	2,249,000
Potential Reserve & Replenishment Supplies	628,000	547,000	665,000	539,000	405,000

Table 4.6 - Dry Year Supply Capability & Projected Demands (AFY)

	2005	2010	2020	2025	2030
Current Supplies					
Colorado River Aqueduct	722,000	699,000	699,000	699,000	699,000
California Aqueduct	777,000	777,000	777,000	777,000	777,000
In-Basin Storage	840,000	838,000	808,000	784,000	784,000
Supplies Under Development					
Colorado River Aqueduct	95,000	460,000	400,000	400,000	400,000
California Aqueduct	330,000	259,000	350,000	350,000	350,000
In-Basin Storage	78,000	103,000	103,000	103,000	103,000
Transfers to Other Agencies	0	(35,000)	(35,000)	(35,000)	(35,000)
Metropolitan Supply Capability	2,842,000	3,101,000	3,102,000	3,078,000	3,078,000
Metropolitan Supply Capability w/CRA Maximum of 1.25 MAF	2,842,000	3,033,000	3,002,000	2,970,000	2,970,000
Firm Demands on Metropolitan	2,293,000	2,301,000	2,234,000	2,363,000	2,489,000
Potential Reserve & Replenishment Supplies	549,000	732,000	768,000	607,000	481,000

Table 4.7 - Multiple Dry Year Supply Capability & Projected Demands (AFY)

	2005	2010	2020	2025	2030
Current Supplies					
Colorado River Aqueduct	722,000	699,000	699,000	699,000	699,000
California Aqueduct	912,000	912,000	912,000	912,000	912,000
In-Basin Storage	482,000	480,000	463,000	449,000	449,000
Supplies Under Development					
Colorado River Aqueduct	95,000	460,000	400,000	400,000	400,000
California Aqueduct	330,000	215,000	299,000	299,000	299,000
In-Basin Storage	78,000	103,000	103,000	103,000	103,000
Transfers to Other Agencies	0	(35,000)	(35,000)	(35,000)	(35,000)
Metropolitan Supply Capability	2,619,000	2,834,000	2,841,000	2,827,000	2,827,000
Metropolitan Supply Capability w/CRA Maximum of 1.25 MAF	2,619,000	2,741,000	2,741,000	2,719,000	2,719,000
Firm Demands on Metropolitan	2,376,000	2,389,000	2,317,000	2,454,000	2,587,000
Potential Reserve & Replenishment Supplies	243,000	377,000	424,000	265,000	132,000

In April of 1999, MWD adopted the Water Surplus and Drought Management Plan (WSDM Plan). This plan provides guidelines for managing water resources to achieve the reliability goals of the IRP. The guiding principle of the WSDM Plan is to manage MWD's water resources and programs to maximize management of supplies in wet years and minimize adverse impacts of water shortages to retail customers. MWD does this, in part, through encouraging efficient water use and economical local resource programs, coordinating with sub agencies to make surplus water available in dry years, pursuing transfer and banking options, and increasing public awareness about water supply issues. MWD fully expects to be 100% reliable for delivery of non-discounted, non-interrupted demands through 2025. If any allocations should become necessary, those allocations will be based on need, as opposed to any historical purchases. Further discussion of the WSDM Plan is included in Section 11.4 of the RUWMP.

EMWD participates and supports MWD's efforts to ensure reliability. One of the resource programs EMWD is constructing, Reach 16, is co-funded by MWD. Reach 16 is a recycled water pipeline that will remove 720 AF of potable water demand from the system and replace it with recycled water. EMWD is also using surplus SWP water to recharge the San Jacinto Basin so that there will be groundwater available to meet demands during dry years.

Based on the information detailed in MWD's RUWMP, EMWD is confident that MWD will provide EMWD with enough non-discounted, non-interrupted water supplies to meet demands through 2030. EMWD's only interruptible supply is discounted agricultural water, which accounts for approximately 4% of the District total supply, and the recharge water used for the San Jacinto Basin. It is anticipated that recharge water may not be available in one out every five years. If there is a shortage of imported water that cannot be supplemented by local supplies, EMWD will make up the deficiency by implementing the water shortage contingency plan.

Groundwater

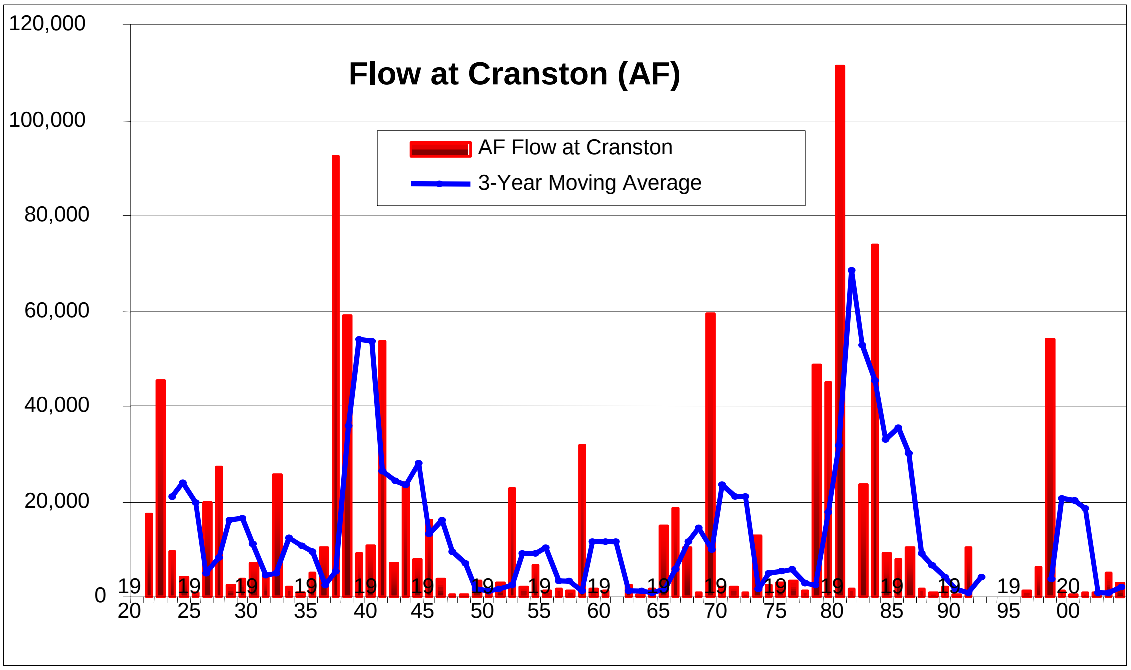
EMWD's 550-square mile service area spans two watersheds, the San Jacinto in the north and the Santa Margarita River in the south. In the San Jacinto Watershed, the Hemet/San Jacinto area to the east occupies about 23% of the District, and the West San Jacinto Groundwater Management Plan area to the west occupies approximately 49% of the District. The Santa Margarita River watershed portion of the District to the south covers approximately 28%.

Hemet/San Jacinto Area

Groundwater is, and historically has been, the primary source of supply in the Hemet/San Jacinto area. In 2004, 83% of EMWD's demand in the area was supplied by groundwater, while 17% was supplied by imported water. Twelve of sixteen active wells in the Hemet/San Jacinto area produced more than 12,500 AF of water during 2004.

Groundwater supplies are dependent upon precipitation locally, as well as in the mountains, to provide flow in the San Jacinto River to recharge the basins. The U.S. Geological Survey has maintained a gauging station at Cranston Ranger Station on the San Jacinto River for all but four years since 1920. The following figure shows annual San Jacinto River flow along with a three-year moving average.

Figure 4.1: - Annual San Jacinto River Flow



Based on data from the USGS gauging station, the following have been identified and defined:

Table 4.8 - Normal, Single-Dry, and Multiple-Dry Years

Term	Definition	Year(s)	Flow (AF)
Normal Year	Median Runoff Level (1920 through 2004)	1946	3,775.53
Single-dry Year	Lowest Annual Runoff for Watershed	1920	73.19
Multiple-dry Year Period	Lowest Average Runoff for three Consecutive Years	2000/02	714.69

During both Single- and Multiple-dry years, EMWD met customer demands without interruption of service.

An analysis of hydrologic reliability was conducted based on the 2000-2002 Multiple-Dry Year Period using data from three EMWD production wells in the Canyon and three in the Intake portion of San Jacinto Upper Pressure Management Zone. The results are shown in the following table:

Table 4.9 - Results of Hydrologic Reliability Analysis (Decline in Water Levels is in Feet and Depths to Water or Screens are in Feet Below Ground Surface)

	Area:	Canyon			SJUP Intake		
	Well:	# 17	# 26	# 34	# 18	# 27	# 28
1	Decline in Water Levels (Depth to Water) following 2000/02 Dry Period	142	152	144	85	64	86
2	Depth to Water as of June 2005	194	196	198	419	359	430
3	Projected Depth to Water Following Another Dry Period Similar to 2000/02	336	348	342	504	423	516
4	Depths of Lower Limit of Well Screens	1,122	1,460	1,050	1,000	1,676	1,480

Given current conditions, even if another multiple-dry year period produces a decline in water levels similar to that produced in 2000-2002, the wells will still be operable and capable of producing. The basin may become over drafted, but production would continue.

Groundwater management is an important element in maintaining water reliability. In the Hemet/San Jacinto area, the water purveyors and local groundwater producers have been working to put a water management plan in place. In the Principles for Water Management, each agency - EMWD, Lake Hemet Municipal Water District, and the Cities of Hemet and San Jacinto - agreed to a methodology for determining their base production rights. It is the goal of the Management Plan to adjust base production rights over time to a level consistent with the calculation of the agencies' share of safe-yield for the management area. After plan implementation, the agencies will be subject to replenishment of water pumped in excess of their adjusted base production right.

In the meantime, prior to plan implementation, the agencies agreed to address the deteriorating situation in the sub-basins and to reduce the historical impact of overdraft caused by past groundwater production. The Interim Groundwater Recharge Program involved the application of approximately 6,000 AF of SWP recharge during 2004 at two existing recharge pond sites located in the San Jacinto Riverbed. The water was recharged and funded under the 2004 Interim Water Supply Plan. An additional 778 AF was recharged in 2004 in anticipation of the execution of a similar MOU for 2005. That MOU was executed and provides for up to 8,000 AF of recharge, which is currently underway.

West San Jacinto Groundwater Management Plan Area

Groundwater plays a lesser role in the West San Jacinto Groundwater Management Plan area. In addition, groundwater supplies in the West San Jacinto area are not dependent upon San Jacinto River flows. Imported water accounted for 53,000 AF or more than 90% of the area's demands. During 2004, five production wells produced 4,050 AF of water and three desalter wells produced 1,990 AF of brackish groundwater for the desalination plant. If, due to drought or some other cause, groundwater supplies were not available, EMWD would first try to meet its customer's demands through imported water. If imported water were not available, then the Water Shortage Contingency Plan would be implemented.

Santa Margarita Watershed

EMWD serves and wholesales imported water in the portion of the Santa Margarita River Watershed that falls within District boundaries. Groundwater does not play a role in EMWD's efforts in this area.

Recycled Water

EMWD operates and maintains four regional water reclamation facilities and all are currently undergoing or planning an expansion. These facilities treat water collected in EMWD's wastewater system for use as recycled water. As the service area population grows, the supply of recycled water continues and as land becomes less available for agriculture, there is a greater supply of recycled water available for municipal and industrial purposes. EMWD's recycled water supply is not dependent on weather patterns and may actually increase slightly in dry years. Wet years, at times, will pose a greater operational challenge as storage facilities fill and customer demand decreases.

Section 5 - Transfers and Exchanges

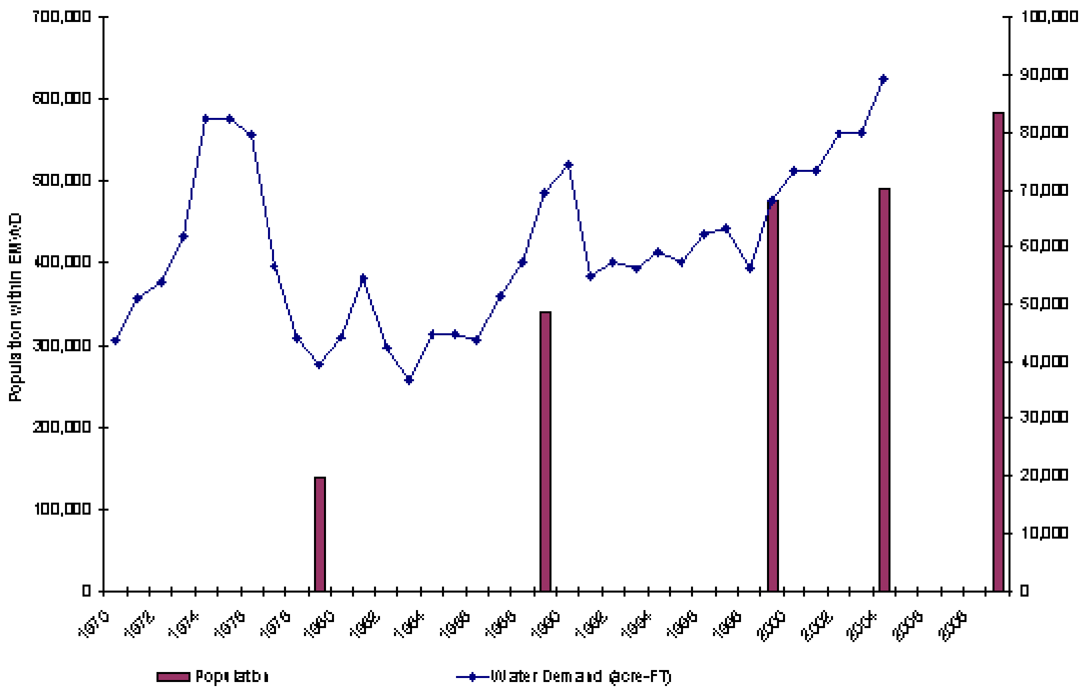
EMWD currently relies on Metropolitan Water District of Southern California (MWD) for any transfers or exchanges. As a member agency, EMWD benefits from MWD's efforts to improve supply reliability through transfers and exchanges detailed in the 2005 Regional Urban Water Management Plan.

In addition to relying on MWD, EMWD is investigating opportunities for independent transfers and exchanges. A consultant has been hired and is actively researching the possibility of cost-effective transfers and exchanges for EMWD. Since there is no guarantee that exchanges or transfers will be feasible for EMWD, and its impossible to quantify the amount of water that could be made available, transfers and exchanges are not listed as part of EMWD water supply.

Section 6 - Water Use by Customer Type

Since the last UWMP published in 2000, EMWD has experienced a period of accelerated growth. The number of customer meters has jumped to over 100,000, the majority of them in new single-family homes. In the past, water demand has remained relatively constant despite large jumps in population growth. Declining agricultural demand has offset the increasing domestic demand. Now, agricultural demand is relatively stable and the domestic market continues to grow. Even the recycled market is starting to shift from agricultural to other uses. For the last five years, population growth has driven up water use and it is expected to do so for the foreseeable future. The chart below tracts water sales compared to population from 1970 to 2004.

Figure 6.1 – Population Growth vs. Water Demand



More and more of the land in EMWD's service area is shifting away from open space and agriculture. EMWD maintains a Database of Proposed Projects (DOPP). This data base tracts major developments from planning through construction. The database is continually updated and revised as projects reach different stages of development. Currently, there are approximately 651 proposed projects on over 56 thousand acres within EMWD's service area. These projects would create nearly 150,000 new residential units and over 10,000 acres of commercial, industrial, institutional, parks, open space or other non-residential development. This database contains projects that may not be developed for years or even decades. EMWD uses population projections from the Southern California Association of Governments 2004 Transportation Analysis study to determine local absorption studies and information contained in the DOPP to determine its population growth from 2005 to 2025.

Retail Market Segments

EMWD has several different water markets. EMWD's primary customers are retail purchasers of potable water. These customers can be divided into residential, commercial, industrial, institutional and landscape sectors. Although the residential section is by far EMWD's largest customer segment, each market segment plays a role in the growth and development of EMWD's service area. See table below for the water use by various customer types.

Table 6.1 - Water Use by Customer Type-AFY

Year	Water Use Sectors	Single Family	Multi-Family	Com-mercial	Indus-Trial	Instit-Gov	Land-scape	Agri-Cultural	Total
2000	# of accounts	82,459	831	978	101	229	1041	413	86,051
	Deliveries	45,536	4,458	3,018	433	2,250	5,675	7,029	68,399
2005	# of accounts	108,956	1,098	1,292	133	302	1,375	185	113,341
	Deliveries	65,951	6,456	4,372	627	3,,258	8,220	3,152	92,036
2010	# of accounts	128,575	1,312	1,525	157	357	1,623	165	133,715
	Deliveries	74,764	7,414	4,957	710	3,695	9,321	2,776	103,637
2015	# of accounts	149,105	1,548	1,768	182	413	1,881	143	155,039
	Deliveries	87,419	8,814	5,792	830	4,317	10,891	2,403	120,466
2020	# of accounts	166,950	1,754	1,974	203	461	2,101	122	173,565
	Deliveries	98,535	10,058	6,512	933	4,853	12,244	2,048	135,183
2025	# of accounts	180,753	1,917	2,131	219	498	2,268	122	187,907
	Deliveries	106,503	10,970	7,017	1,006	5,230	13,194	2,048	145,968
2030	# of accounts	191,804	2,052	2,255	232	527	2,400	122	199,392
	Deliveries	112,958	11,737	7,423	1,064	5,533	13,957	2,048	154,720

In addition to potable sales to retail customers, EMWD also sells water to agricultural customers and wholesales water to other agencies. Although agricultural sales have greatly declined from historical numbers, agriculture remains an important part of EMWD's market. Water sales to other agencies are one of EMWD's most volatile demands. The need for EMWD's water can fluctuate every year due to a number of factors.

In addition to potable water sales, EMWD has an active and growing recycled water market. Using recycled water for landscaping and agricultural uses whenever possible allows EMWD to reduce its dependence on imported potable water.

Although their needs and size vary, EMWD is committed to providing water to support the people living and working within the District's 555 square mile service area.

Retail Sales of Potable Water

Residential

Residential use is, and will continue to be, the dominant demand for EMWD. According to the Riverside County Integrated Plan (RCIP), the ultimate land use will be primarily residential. Residential land use can be divided between low, medium and high residential development. Land use with between 0.05 and 3 structures per acre is considered low-density. Low-density residential accounts for over half of the residential land use. Low-density is focused in areas with steep terrain and geographical limitations to higher density land use. Although low-density accounts for over half of the residential land use, it only accounts for 20% of the total demand for water.

Medium-density residential is the second highest residential land use. Medium-density land use has between 4 and 8 dwelling units per acre and will account for more than half of the water demand at build out. Although there is less land dedicated for medium-density residential use in EMWD, the higher rate of water use per acre leads to higher water demand for medium-density residential customers. Much of the development currently occurring in EMWD's boundary is medium-density residential. Large tracts and specific plans are replacing rows of agricultural crops with rows of new housing throughout EMWD.

High-density residential accounts for the smallest area of residential land use. High-density residential has more that eight dwellings per acre and is usually multi-family. High-density residential includes apartments, town homes and condominiums. EMWD is starting to see an increase in the number of high-density projects being built in areas that are already densely populated. As land use within EMWD's services area continues to move from open space and agriculture, high-density residential development will continue to grow.

Commercial Sector

The commercial sector will also continue to grow as the population increases, according to the RCIP. Commercial development will be focused along the major transportation highways through EMWD's boundary - Interstate Highway 15, Interstate Highway 215, Highway 79, and Highway 74. Currently, commercial demands account for about 5% of EMWD's retail sales. According to the RCIP, ultimately, commercial demand will account for 8% of retail sales. This indicates that the commercial sector will continue to grow at nearly the same rate as the population.

Industrial Sector

EMWD has a very small industrial sector, less then 1% of retail demand. As the District grows, there may be a higher rate of industrial growth. The RCIP indicates that ultimate industrial demand may account for up to 4% of EMWD's retail market. Industrial growth will be focused mainly around Interstate Highway 215, when it occurs. As much as possible, EMWD will try to meet the needs of any industrial customers with a very high demand for water using recycled water.

Institutional/Governmental Sector

EMWD has a stable institutional sector that will grow with the population. Currently, the demand from institutional customers accounts for about 4% of retail demand for potable water. The RCIP predicts about 3% of the ultimate water demand will be for public facilities. Whenever possible, recycled water is used for landscape irrigation for schools and other government facilities.

Agricultural Sales – Potable Water

When EMWD was formed, it was primarily to serve the agricultural community with imported water from MWD. Since then, the District has gone through a major transformation from a farming community to a residential community. Currently, agricultural sales account for only about 4% of EMWD's potable water market. This is expected to remain relatively stable for the next twenty years with some fluctuations from year to year due to changes in weather or crop rotations.

Reduction of Retail Demand through Conservation

As EMWD's demographics change and the population grows it is important that every effort is made to reduce water demand through conservation. Already the amount of water needed for the thousands of new homes being built is reduced through plumbing codes implemented in the early 1990's. Low flow toilets and showerheads are mandatory in all new construction. As seen in table 6.2 below, this passive conservation through plumbing codes has already reduced EMWD's demand significantly and will continue to do so in the future. In addition to passive programs, EMWD has implemented all of the California Urban Water Conservation Council (CUWCC) Best Management Practices (BMP). The BMPs and other active conservation programs also reduce EMWD's current demand and will continue to decrease it in the future. These existing practices and laws allow EMWD to project demand lower then it would without these conservation measures.

The demand projected in Table 6.1 assumes that existing conservation laws and programs will remain in place or be replaced with similar efforts. However, EMWD is not content to rely on the existing conservation programs and law. One of EMWD's strategic objectives is to "Promote efficient use of water and implement a structured conservation plan." EMWD is currently developing a conservation plan to reduce water consumption per capita and participating in pilot protects and programs. The continued promotion of conservation through new rebates, programs and education will only continue to reduce demand.

Table 6.2 – Conservation Savings – AFY

	2000	2005	2010	2015	2020	2025	2030
Retail Demand	61,400	92,000	10,3600	120,500	135,200	146,000	154,700
Active Conservation	1,100	1,800	2,600	3,300	4,000	4,700	5,000
Passive Conservation	600	2,800	5,000	7,200	9,200	10,600	11,300
Demand without Conservation	63,100	96,700	111,200	131,000	148,300	161,300	171,000

Wholesale to Other Agencies

EMWD wholesales water to six different agencies. The demand for each agency differs based on its need each year. These demands can be unstable at times as other water districts use water from EMWD to supplement their system when local facilities are inadequate or fail. The majority of wholesale water is delivered to agencies in the Hemet/San Jacinto area. This demand should decrease while needs are met through the recharge and recovery plan. As the population continues to grow and native groundwater production is curtailed, imported water through EMWD will become the supplemental supply for all new growth.

A portion of the water EMWD wholesales to Lake Hemet Municipal Water District is raw water for agricultural uses. This water is needed especially when surface water is not available in dry years. Planning is underway to meet a portion of these agricultural needs with recycled water in the future. See the table below for water sales to other agencies.

Table 6.3 - Sales to Other Agencies – AFY

Sales to Other Agencies	2000	2005	2010	2015	2020	2025	2030
Lake Hemet MWD Ag Water	1,667	2,545	1,200	2,100	2,600	3,100	3,384
Lake Hemet MWD		300	0	0	0	0	0
City of Hemet Water Dept.	591	259	0	0	0	0	0
San Jacinto Water Dept.	0	222	0	0	0	0	0
City of Perris	1,977	2,500	2,641	2,722	2,757	2,769	2,773
Murrieta Water County Dist.	0	300	0	0	0	0	0
Nuevo Water Company	36	775	1,002	1,457	1,745	1,903	1,979
Total Untreated AG	1,667	2,545	1,200	2,100	2,600	3,100	3,384
Total Potable	2,604	4,578	3,643	4,179	4,502	4,672	4,752

Other Water Uses

EMWD has several additional water uses, water used for recharge, recycled water use and water losses. See Table 6.4, for the projected use of water by each type.

Table 6.4 - Other Water Uses - AFY

	2000	2005	2010	2015	2020	2025	2030
Recharge Water	0	8,000	20,000	22,200	22,600	22,600	22,500
Recycled - Industrial Enterprise and Aesthetic Improvement			7,000	8,250	9,500	10,750	12,000
Recycled – Municipal	3,500	3,500	7,700	10,950	13,200	15,750	17,500
Recycled – Agriculture/Wildlife Habitat		21,500	17,700	17,500	17,500	17,500	17,500
System Losses	3,959	6,930	7,900	9,400	10,600	11,600	12,700
Total	7,459	39,930	60,300	68,300	73,500	78,200	82,200

Recharge Water

Under the Hemet/San Jacinto Water Management Plan, EMWD will be responsible for transporting raw water from EM-14 to ponds in the San Jacinto riverbed to recharge the groundwater basin. The SPW imported through MWD will meet the requirements of the Soboba Settlement and improve the reliability of groundwater in the area. After the water is added to the basin, individual agencies including EMWD will extract their allotted amount of water from the basin using wells already in place and new wells yet to be constructed.

Recycled Water

There are three main types of recycled water; 1) municipal customers, 2) agricultural/wildlife habitat customers, and 3) customers using recycled for industrial purposes or aesthetic impoundments. Municipal customers use recycled water for irrigating landscaping. These customers have made a financial investment in the landscape or process that requires water. Without recycled water available, these customers would pay for imported potable water or pump groundwater to protect their investment. It is anticipated that the demand from these customers will increase with population growth and system expansion. Each customer will have a fairly consistent demand each year, with minor fluctuations due to weather. Recycled water use by these customers reduces the amount of potable water that needs to be extracted from groundwater or imported through MWD.

Some agricultural customers often use recycled water to grow short-term row crops. Using potable water would not be cost-effective for these customers. Their profitability is based on the availability of low-cost recycled water and low-cost land available for lease. The location of these customers frequently changes each year depending on where there is land available. As more residential development takes place and the population grows, land is becoming less accessible. As time goes by, EMWD expects to have fewer and fewer of these types of customers. Other agricultural customers use recycled water to irrigate crops that require a long-term investment such as citrus trees. These customers would use potable water if needed to protect their investment. Because potable water has a prohibitive cost, recycled water is also used to support the San Jacinto Wildlife Area.

One final type of recycled water customer is the customer using recycled water for industrial processes or aesthetic impoundment. These customers would not use potable water either because it is not economically feasible or because EMWD policy would not allow it.

The future of EMWD's recycled water market is with municipal customers, customers using recycled water for industrial processes or aesthetic impoundment and long-term agriculture customers. To meet the needs of these customers, EMWD is taking steps to improve the reliability and quality of the recycled water system.

EMWD also sells water to the California Department of Fish and Game for the San Jacinto Wildlife Area. This wildlife refuge was one of the first in the state to use recycled water for habitat creation and recycled water is used to help maintain, enhance and improve this environmental preserve. EMWD is working with the Department of Fish and Game and other interested parties to expand and enhance the use of recycled water for environmental benefits at the San Jacinto Wildlife Area.

Water Losses

EMWD's final water use type is water losses. Water losses account for less than 7% of total water use. Through leaky pipe tracking and replacement, EMWD is continually trying to decrease the water loss rate.

All Use

The sum use of EMWD's water use is seen in the table below.

Table 6.5 - Total Water Use - AFY

	2005	2010	2015	2020	2025	2030
Total Water Use	139,000	168,800	195,000	215,800	231,900	245,200

Section 7 – Conservation

Under EMWD's Strategic Plan, the District is seeking to "*Promote efficient use of water and implement a structured conservation program*." To do this, EMWD is actively working with other agencies and its customers to reduce the amount of water demand placed on groundwater and imported sources. The goal is to reduce our per capita water use rate by 25% over the next twenty years through promoting programs, offering rebates, educating customers and minimizing water loss from EMWD facilities. Two groups that EMWD works closely with to improve conservation efforts are Metropolitan Water District of Southern California (MWD) and the California Urban Water Conservation Council (CUWCC).

Metropolitan Water District of Southern California

EMWD's work with MWD on conservation savings is important for two reasons. First, MWD uses projected conservation savings as part of its calculations when determining supply reliability. Second, MWD is a funding source for many of the conservation programs EMWD implements. Additional information about MWD's conservation program is included in Section II.2 of the RUWMP.

Projected Water Savings

A core element of MWD's water supply plan is conservation. One of the changed conditions in the 2003 Integrated Resource Plan (IRP) update was an increase in conservation savings causing a drop in demand compared to the 1996 IRP. The 2003 update to the IRP had a target for conservation of 1,107,000 AF of savings in 2025. This target was developed using specially designed computer models created to tackle the complex measurement of conservation savings.

In MWD's model, four types of conservation savings are considered:

1) **Active conservation savings** are a result of agency funded or sponsored programs.
2) **Passive conservation savings** are the result of the 1992 California Plumbing code.
3) **Price-effect conservation savings** are due to increases in retail water rates since 1990.
4) **Pre-1990 conservation savings** are from the 1980 California Plumbing code and from price effects from 1980 to 1990.

For "active" conservation savings, MWD takes a regional approach for any conservation that may be implemented in the future. There is not a specific target for each agency but MWD works with all of the sub agencies within its service area to meet conservation goals. Much of EMWD's conservation program has received supplemental funding from MWD and EMWD is continually working with MWD to find new opportunities for water use efficiency.

Because EMWD experienced so much growth after 1992, the majority of the MWD projected conservation savings in EMWD's service area is due to pre-1990 savings, price effects and passive savings from the plumbing codes. Only about 7% of the total projected conservation savings are achieved through the active conservation programs already in place. Since MWD's savings projections are based on savings from plumbing codes and programs already in place, any additional conservation activities EMWD undertakes will only decrease the reliance on the imported water supply from MWD.

California Urban Water Conservation Council

The CUWCC was created to increase efficient water use throughout the State of California through partnership with urban water agencies, public interest organizations and private entities. The goal of the council is to integrate urban water best management practices (BMPs) into the planning and management of California's water resources. In 1992, EMWD signed CUWCC's Memorandum of Understanding Regarding Water Conservation in California (MOU). By signing the MOU, EMWD committed to developing and implementing fourteen comprehensive BMP's for urban water management. EMWD submits a biennial report to CUWCC describing the status of each BMP. Included as Appendix C are the CUWCC BMP Reports for 2002/2003 and 2003/2004. The BMP's correspond to the fourteen Demand Management Measures listed in Water Code Section 10631 (f).

Best Management Practices

Water Survey Programs for Single – Family Residential and Multi-Family Customers

EMWD has offered free residential water use surveys of its customers since 1991. These surveys examine both indoor and outdoor water uses. They measure flow rates in showers and toilets, check for leaks, recommend water saving devices, check landscape areas and review or develop irrigation schedules. At the end of the survey, customers are provided survey results and water saving recommendations. From 1993 to 2004, over 2,000 water surveys were completed. Funding for the residential surveys comes from EMWD and through MWD's Conservation Credits Program. This program meets the requirements of BMP 1.

Plumbing Retrofits

Plumbing retrofits for residential customers are often recommended or installed as part of the residential surveys. In 2004, low flow showerheads, toilet displacement devices, toilet flappers and faucet aerators were distributed to EMWD customers to increase indoor water use efficiency. In addition to indoor water saving devices, several types of irrigation devices were distributed. MWD is a partner in funding retrofits. This program meets the requirements for BMP 2.

Distribution System Water Audits, Leak Detection and Repair

EMWD continually tracks the amount of water sold and the supply entering the system. Every customer has a service meter. This allows EMWD to determine the amount of water that goes unaccounted for each year. The rate of water loss is currently less than 7%; however, EMWD is continually making an effort to reduce those losses. As part of normal operation and maintenance procedures, all leaks reported are investigated and repaired if they are part of EMWD's system. Pipes with numerous leaks are tracked and replaced as part of the Capital Improvement Plan. Pipe inspection is also routinely conducted by maintenance personnel, in order to determine where leaks are occurring. Grant funding opportunities are pursued to assist in funding leaky pipe replacement when possible. This program meets the requirements for BMP 3.

Metering with Commodity Rates

EMWD is fully metered for all customer sectors and all customers pay the sector rate for each billing unit consumed. Irrigation meters are required for all Commercial, Industrial and Institutional (CII) customers with a landscaped area over 3,000 square feet. EMWD also has separate meters for recycled water meters. As new services are added, meters are installed and read. Older meters are calibrated and replaced as needed. Metered accounts may result in a 20% reduction of water demand compared to non-metered rates. This program meets the requirements for BMP 4.

Large Landscape Water Audits and Incentives

EMWD has over 1,300 dedicated landscape meters. Of these meters, nearly 400 are metered accounts with water budgets. The accounts with budgets have 3,000 square feet or more of dedicated landscaping areas. Each account receives a monthly report and graph indicating account status. If a landscaping customer's water use exceeds its budgeted limit, a fine is levied on the customer. It is estimated that approximately 500 AFY are saved through the large landscape program. This program meets the requirements for BMP 5.

High-Efficiency Wash Machine Rebates

EMWD offers its customers a rebate for purchasing high-efficiency washing machines. From 2001 through 2004, EMWD facilitated rebates for 1,079 high efficiency washing machines. In 2004, 553 rebates were issued for eligible washers purchased. Currently, a rebate of $110 is offered for applicable machines. Since July 2005, only washing machines with a water use factor of 6.0 or less are eligible for this rebate. MWD currently contributes $100 towards each washing machine rebate. This program meets the requirements for BMP 6.

Public Information

Public information is an important part of EMWD's conservation program. Information on water conservation is offered through workshops, bill inserts, EMWD's web site, brochures, community speakers, paid advertising and special events every year. EMWD is developing a survey program to track the effectiveness of its public information campaign. Although the benefits of a public information campaign may not be easily measured, EMWD believes it is in the public's best interest. A portion of the public information program is funded through MWD, especially landscape workshops. This program meets the requirements for BMP 7.

School Education

School education is an integral part of EMWD's conservation efforts. Programs are available for students in kindergarten through the twelfth grade. Full-time staff members are employed to reach out to students through educational tours of EMWD facilities, water conservation theater programs presented in an assembly, distributing free water education materials, administrating a "water-wise" poster contest, making classroom presentations and other educational programs. Over 100,000 students were reached in 2004. As the District continues to grow, so will the number of students reached. This program meets the requirements for BMP 8.

Commercial, Industrial, and Institutional Water Conservation

EMWD encourages conservation by commercial, industrial and institutional water customers in several ways. Rebates are a major part of EMWD's outreach to these water customers. Rebates are offered for ultra-low and dual-flush toilets, and urinals up to $140. There is a $100 rebate for water brooms. In addition to the water broom rebate program, EMWD donated a water broom to every school within its service area, 125 brooms in total. There is also a rebate of $500 for cooling tower conductivity controllers that will cut water use up to 40%. Replacing a kitchen sprayer with one that can save water is eligible for a $50 rebate. High-efficiency washing machines receive a rebate of $100 and an X-ray film processor recycling system that reduces water use up to 98% has a rebate of $2,000. Information about all of these rebate programs is readily available to customers on EMWD's web site.

EMWD also offers free guest towel and bed linen placards for hotels and motels, and offers water use surveys to commercial, industrial and institutional customers. For outdoor conservation, any commercial, industrial and institutional customer with landscaped areas larger than 3,000 square feet is part of the large landscape program and on a water budget. MWD provides much of the funding for the rebate offered to commercial, industrial and institutional customers and conducts periodic marketing campaigns for the program. This program meets the requirements for BMP 9.

Wholesale Agency Programs

BMP 10 concerns the actions of wholesale agencies. As a wholesale agency, EMWD encourages each of its sub agencies to participate in rebate programs, and in the past, has worked with individual agencies to promote water conservation in the region. Currently, LHMWD is receiving MWD funds through EMWD for ultra-low flush toilets and washing machines programs.

Conservation Pricing

EMWD has meters for each customer and charges a volumetric rate for water use. By charging each customer for the volume of water used, EMWD encourages customers to reduce water use and therefore the amount paid for water. This rate system meets the requirements of BMP 11.

Conservation Coordinator

BMP 12 concerns a conservation coordinator. EMWD does not have a dedicated conservation coordinator at this time. Instead, a team of three full-time and two part-time employees work together to coordinate conservation programs and BMP implementation, prepare and submit the Council BMP Implementation Report, and communicate and promote water conservation issues to senior staff.

Water Waste Prohibition

EMWD has an Ordinance that provides for special water conservation provisions. Ordinance 72.19 limits the use of potable water for golf courses and aesthetic impoundments. It also has several provisions for conservation ethics for all EMWD customers. Ordinance 72.19 meets the requirements of BMP 13.

Ultra-Low Flush Toilet Replacements

Ultra-low flush toilet replacement has occurred in EMWD since 1993. EMWD offers rebates with funding through MWD, and more than 15,742 toilets were replaced from 1993 to 2004 resulting in approximately 546.5 AF of water saved annually. Recent surveys have found that there is still a significant market for toilet replacement, and EMWD will continue to offer replacement toilets each year. This program meets the requirements of BMP 14.

Demand Management Measures (DMM)

The fourteen best management practices encouraged by CUWCC correspond to the fourteen demand management measures advocated by the State of California. EMWD's actions are detailed in the included CUWCC Reports and these reports meet the requirements set forth by law.

Evaluation of DMMs Not Implemented

EMWD has worked to implement each of the DMMS or BMPs. As detailed in the attached CUWCC reports, all of the DMMs are implemented, and in some cases EMWD has gone beyond the requirements of CUWCC and the Water Code.

Section 8 – Planned Water Supply, Projects and Programs

Proposed Supply Projects and Programs

As the population in EMWD's service area continues to increase, EMWD is planning for the future by aggressively pursuing the completion of new facilities and sources of supply. Not content to depend on MWD for potable water delivered to our boundary lines, EMWD's Capital Improvement Plan (CIP) includes projects for treating raw water and desalting groundwater. EMWD has also taken steps to increase the reliability and the output of the groundwater basins in a safe and responsible manor through integrated recharge and recovery. EMWD is also planning, or already in the process of, expanding each of its regional water reclamation facilities to treat the increased wastewater generated by the growing population thereby supplying additional recycled water. Table 8.1 shows the AFY each proposed project will supply, Table 8.2 gives the schedule for water supply expansion projects from EMWD's CIP.

Table 8.1 - Future Water Supply Projects -AFY

Project Name	Normal Year Supply (AF)	Single Dry Year Supply (AF)	Multiple Dry Years Supply		
			Year 1	Year 2	Year 3
Water					
Perris Desalter II	4,500	4,500	4,500	4,500	4,500
Hemet Microfiltration Plant	8,800	8,800	8,800	8,800	8,800
Perris Microfiltration Plant Expansion	8,800	8,800	8,800	8,800	8,800
IRRP Phase 1	7,500	7,500	7,500	7,500	7,500
IRRP Phase 2	15,000	15,000	15,000	15,000	15,000
Recycled Water					
San Jacinto Valley RWRF Expansion to 14 MGD	3,400	3,400	3,400	3,400	3,400
San Jacinto Valley RWRF Expansion to 18 MGD	4,500	4,500	4,500	4,500	4,500
Moreno Valley RWRF Expansion to 21 MGD	9,000	9,000	9,000	9,000	9,000
Temecula Valley RWRF Expansion to 18 MGD	6,700	6,700	6,700	6,700	6,700
Temecula Valley RWRF Expansion to 22 MGD	4,500	4,500	4,500	4,500	4,500
Perris Valley RWRF Expansion to 22 MGD	12,300	12,300	12,300	12,300	12,300
Perris Valley RWRF Expansion to 30 MGD	9,000	9,000	9,000	9,000	9,000

Table 8.2 - Water Supply Projects Timeline

Project Name	Projected Start Date	Projected Completion Date
Water		
Perris Desalter II	Aug. 2005	Sept. 2008
Hemet Microfiltration Plant	Jan. 2003	Aug. 2006
Perris Microfiltration Plant Expansion	Sept. 2003	Nov. 2006
IRRP PHASE 1	Jan. 2004	Sept. 2006
Recycled Water		
San Jacinto Valley RWRF Expansion to 14 MGD	Oct. 2004	Dec. 2011
San Jacinto Valley RWRF Expansion to 18 MGD	Nov. 2019	June 2024
Moreno Valley RWRF Expansion to 21 MGD	Nov. 2006	Nov. 2009
Temecula Valley RWRF Expansion to 18 MGD	Nov. 2002	June 2006
Temecula Valley RWRF Expansion to 22 MGD	Feb. 2010	March 2015
Perris Valley RWRF Expansion to 22 MGD	Jan. 2005	Feb 2013
Perris Valley RWRF Expansion to 30 MGD	Aug. 2014	Oct. 2018

Desalters

EMWD currently has one desalter producing potable water from high TDS groundwater threatening to contaminate the potions of the West San Jacinto area, and has finished construction and is preparing to begin production at a second desalter. The completion of a third desalter in 2006 will put EMWD at the sustainable capacity of groundwater desalination and supply an increased supply of 4,500 AFY. Currently, the Perris II Desalter is in design and completion is anticipated for April of 2006.

Because the groundwater levels in the basins that supply groundwater for the desalter are rising, a single or even multiple-dry year event would have insignificant effects on the desalter production. Production is projected to remain at the 4,500 AFY rate.

Hemet Microfiltration Plant

In the Hemet/San Jacinto area, the population has outgrown the ability of groundwater alone to meet demand. To offset that demand, EMWD is in the process of constructing a microfiltration plant that will treat unfiltered raw water from the State Water Project (SWP) for potable use in the area. This 8,800 AF plant will depend on MWD for a source of water to treat. MWD has assured its member agencies of its ability to meet demand even during multiple dry years through 2020 and therefore, the production rate of the microfiltration plant will be unaffected by dry weather patterns.

Perris Microfiltration Plant Expansion

Currently, the microfiltration plant in Perris is undergoing an expansion from a capacity of 8,800 AFY to 17,600 AFY. This expansion is expected to be completed in November of 2006. Like the Hemet plant, the Perris microfiltration plant is not dependent on weather patterns and will not be limited in dry years.

Integrated Recharge and Recovery Project

Currently, EMWD uses untreated water from MWD for groundwater recharge in the Hemet/San Jacinto area. To expand that effort and as part of the Hemet/San Jacinto Water Management Plan, EMWD is developing a program of replenishment and recovery that will be implemented in two phases. The first phase will result in the ability to recover 7,500 AFY of water from the basin by 2010. Work on the integrated replenishment and recovery program has been initiated. Since much of the recharge will take place within the San Jacinto River, EMWD is working with the Army Corps of Engineers to prepare an Environmental Impact Statement for the project.

Recycled Water

EMWD owns, operates and maintains four regional water reclamation facilities (RWRF) throughout the District. Each one of these plants will be expanded over the next twenty years to meet the demand of the increasing population. Although the treatment capacity of each plant will be increased, the supply of recycled water will only increase as the population grows. In addition, due to the fluctuation in demand for recycled water throughout the year and the year-round consistent supply of recycled water, there is more recycled water available in the winter than is needed. This leads to seasonal discharges. Therefore, in estimates of available water supply, only the treated recycled water available and used to meet demand is listed as a source of supply, and not the entire capacity of the treatment plants.

San Jacinto Valley Regional Water Reclamation Facility

The San Jacinto Valley RWRF is currently under design for an expansion from secondary to tertiary treatment. This expansion will allow the recycled water from this plant to be used for more purposes than secondary treated water. The expansion to tertiary treatment will be completed in spring of 2008. In addition to the current expansion, this plant will be expanded again to increase capacity to meet new demands. Outlined in EMWD's Year 2025 Regional Water Reclamation Facilities Capital Improvement Plan (RWRF-CIP) the first expansion will take the plan from 11 MGD of capacity to 14 MGD. This expansion should be completed in 2011. The next expansion will take the plant to 18 MGD capacity and will begin in 2020 and be completed by 2024.

Moreno Valley RWRF

In April of 2005, planning began for the expansion of the Moreno Valley RWRF. This plant will be expanded from 13 MGD capacity to 21 MGD by 2009 according to the RWRF-CIP.

Temecula Valley RWRF

Located in one of the most rapidly growing areas of EMWD, the Temecula Valley RWRF just completed an expansion in 2005 and has two more scheduled before 2020. The expansion from 12 to18 MGD is in construction and is scheduled to be complete in June of 2006, and the expansion to 22 MGD will begin in 2010 and be completed in 2018.

Perris Valley RWRF Expansion

The Perris Valley Expansion to 22 MGD is in final design and will be completed in 2007. This expansion will double the capacity of the current treatment facilities. Another expansion to 30 MGD is scheduled to begin in 2013 and be completed by 2019.

Section 9 – Desalinated Water

As discussed previously, EMWD's Groundwater Desalination Program will construct three desalters, providing up to 12,000 AFY of low salinity potable water. The first two desalters are on line, and the third desalter is in the preliminary design stage.

The single greatest impediment to expanding EMWD's desalination plan is the high cost of brine disposal. As an inland agency, EMWD must purchase brine disposal capacity in a regional disposal system operated by the Santa Ana Watershed Project Authority (SAWPA). The costs of brine disposal are increasing extremely rapidly, threatening the economic viability of EMWD's program. Additionally, recent increased interest in desalination by other agencies in the region has led to a shortfall in available capacity that will limit EMWD's ability to expand its program in the future.

Because of the increased costs and limited availability of brine disposal capacity in SAWPA's regional system, EMWD has initiated several research projects to evaluate the feasibility of reducing brine volumes, including a research proposal with the U.S. Bureau of Reclamation to examine "zero-liquid discharge."

If EMWD can develop a strategy to minimize brine volumes and reduce the cost of brine disposal, expanded desalination of recycled water will become feasible. EMWD has developed groundwater management plans which call for up to 20,000 AFY of groundwater recharge using imported State Water Project water purchased from MWD. This imported water could be replaced (up to 10,000 AFY) by desalted recycled water, improving overall supply reliability and reducing EMWD's dependence upon imported water.

EMWD's preliminary research and feasibility studies into brine volume reduction will be completed late in 2007.

Table 9.1 - Opportunities for Desalinated Water

Source	Yield AFY	Start Date	Type of Use
Recycled Water	10,000	Unknown	Groundwater Recharge

Section 10 – Wholesale Water

Bringing Imported Water to EMWD

The Metropolitan Water District of Southern California (MWD) is a public agency organized in 1928 by a vote of electorates of thirteen Southern California cities. The agency was created by the original Metropolitan Water District Act (Metropolitan Act) by the California Legislature "for the purpose of developing, storing, and distributing water" to the residents of Southern California.

The first function of MWD was to build the Colorado Aqueduct bringing Colorado River water to Southern California. As MWD was constructing the San Jacinto Tunnel Portion of the project, a great amount of seepage was encountered. As the seepage began to affect local water resources, residents began to organize to protect their water supply. About the same time, the region experienced years of dry weather and the underground basin began to experience overdraft. It became clear that a source of imported water was necessary. EMWD was formed in 1950 to bring imported water into the area. In 1951, it was annexed into MWD and the first major sale of Colorado River water within EMWD, began in July of 1952.

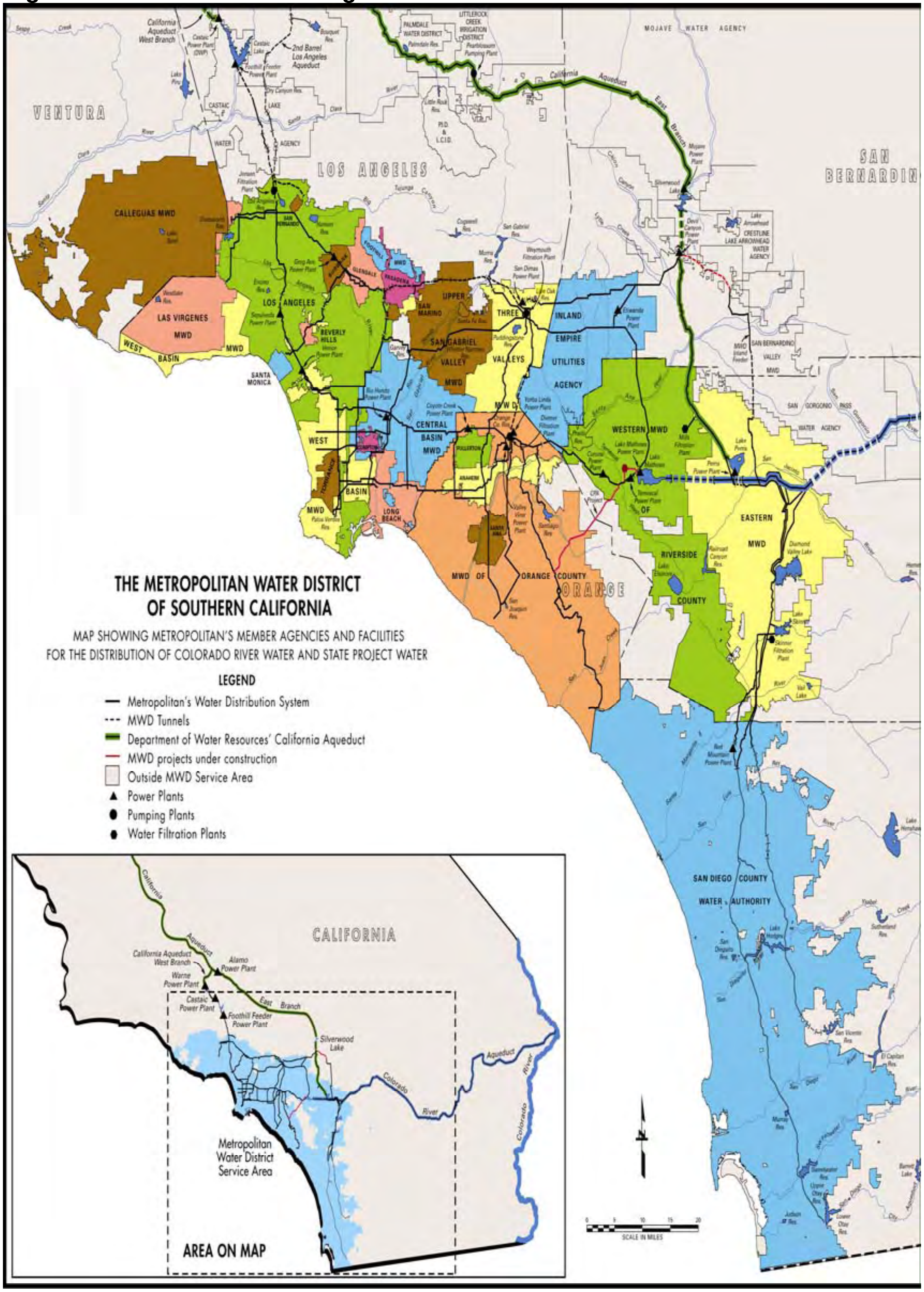
In 1960, MWD contracted for additional water supplies from the State Water Project (SWP) operated by the State of California Department of Water Resources (DWR). In 1972, the SWP began bringing water from the wet climate of northern California to the dry climate of southern California. Through the 1980's, EMWD built facilities to take advantage of the SWP water available, and today, 75% of EMWD's water supply is provided from Northern California.

Member Agencies

In addition to EMWD, MWD is composed of 25 other member agencies, including fourteen cities, ten other municipal water districts and one county water authority. MWD's service area includes the Southern California coastal plain. It extends about 200 miles along the Pacific Ocean from the City of Oxnard in the north to the Mexican Border on the south, and it reaches more than 70 miles inland. The service area includes potions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. Approximately 90% of the population within these counties is within MWD's boundaries. MWD member agencies serve more than 143 cities and 89 unincorporated areas. Figure 10.1 shows a map of MWD's service area.

Member agencies receive deliveries at different points in the system and pay for the service through a rate structure made up of multiple components. Each year member agencies advise MWD how much water they anticipate they will need during the next five years. MWD also works with member agencies to develop a forecast of future water demand.

Figure 10.1 - MWD Member Agencies



MWD is a wholesale provider only, and has no retail customers. It provides treated and untreated water directly to its member agencies. The 26 member agencies then deliver to their customers a blend of groundwater, surface water, desalinated water, recycled water and imported water from MWD. MWD has provided between 45% and 60% of the municipal and agricultural water used in its nearly 5,200-square mile service area. The remaining water is provided through local resources and imported water from other sources. More information about MWD is summarized in Section I.2 of the RUWMP.

Board of Directors

MWD's Board of Directors consists of thirty-seven directors. Each member agency is allotted at least one director with each agencies assessed value determining it's additional representation and voting rights. Currently, EMWD Board of Director's President, Randy Record, represents EMWD on MWD's Board.

Planning for the Future

MWD takes a comprehensive and proactive approach to planning for the future. Through coordination with member agencies, MWD has developed regional targets to accommodate growth and face the challenges to supply reliability. Through the past decade, MWD has undertaken several planning initiatives including the Integrated Resources Plan (IRP), the Water Surplus and Drought Management Plan (WSDMP), and the Strategic Plan and Rate Structure. Together these programs and plans provide a framework and guidelines for the future. Section II of the provides aditional information about MWD's planning efforts.

Integrated Resources Plan

In the 1990's, several years of drought and regulations requirements began to affect the reliability of MWD water supply. In response to this challenge, MWD and its member agencies began an Integrated Resource Plan (IRP) process level of supply reliability needed and to find a cost-effective way to meet the goals establish. The IRP was a collective effort drawing input from several groups including MWD's Board of Directors, an IRP workgroup (comprised of MWD staff, member agency and sub agency managers, as well as groundwater basin managers), and representatives from the environmental, agricultural, business and civic communities. It was important that the IRP process was collaborative because its viability was contingent on the success of local projects and local plans in achieving their individual target goals for resource management and development.

The outcome of the IRP process was a "Preferred Resource Mix" which would ensure MWD and its member agencies reliability through 2020. The MWD Board of Directors adopted the first IRP in January of 1996. In November of 2001, the MWD Board of Directors adopted a plan to update the IRP. The update focused on changed conditions, updated resource targets, and extending the planning horizon to 2025 and beyond. Again the process was a collaborative effort. The 2003 IRP Update was adopted in July of 2004

MWD's resource mix depends on a blend of improving the reliability and availability of imported water supplies into the region, increasing local storage and developing local resources. The 2003 IRP update demonstrated that MWD and its member agencies have moved the region toward the goal of long-term water reliability. Major achievements have been made in:

- Conservation
- Water recycling and groundwater recovery
- Storage and groundwater management programs within the Southern California region
- Storage programs related to the SWP and the Colorado River
- Other water supply management programs outside of the region.

The 2003 IRP Update includes information about programs and resources developed or identified as part of the IRP process. Below is a table from the update summarizing each program and its status.

Table 10.1 – IRP Targets

Target	Programs and Status
• Conservation	Current – Conservation Credits – 1992 Plumbing Code – Southern California Heritage Landscape Program * In Development or Identified – Innovative Conservation Program – Innovative Supply Program
• Recycling • GW Recovery • Desalination	Current – LRP Program In Development or Identified – Additional LRP Requests or Proposal – Seawater Desalination Program
• SWP	Current – SWP Deliveries – San Luis Carryover Storage (Monterey Agreement) – Environmental Water Account In Development or Identified – Sacramento Valley Water Management Agreement – CALFED Delta Improvement Program
• CRA	Current – Base Apportionment – IID/MWD Conservation Program – Coachella and All American Canal Lining Program (to SDWCA & San Luis Rey) – Hayfield Storage Program** – PVID Land Management Program In Development or Identified – Lower Coachella Storage Program – Chuckwalla Storage Program – Central Arizona Banking Program – QSA Programs & Interim Surplus Guidelines
• In Region Dry-Year Storage	Current – Diamond Valley Lake, Lake Matthews, Lake Skinner – SWP Terminal Reservoirs (Monterey Agreement)
• In Region Groundwater Conjunctive Use	Current – North Las Posas – Cyclic Storage – Replenishment Deliveries

	– Proposition 13 Programs (short-listed) In Development or Identified – Raymond Basin GSP – Proposition 13 Programs (wait-listed) – Expanding existing programs – New groundwater storage programs
Target	Programs and Status
• CVP/SWP Storage and Transfers • Spot Transfers and Options	Current – Arvin Edison Program – Semi-tropic Program – San Bernardino Valley MWD Program – Kern Delta Program – Desert Water/Coachella Valley Advanced Storage – Spot Market transfers and options – Mojave Storage Demonstration Program (pilot) In Development or Identified – San Bernardino Valley MWD Conjunctive Use Program – Kern Water Banking Program – Other San Joaquin Valley Programs

* Program savings not currently quantified

** Program has been implemented with approximately 72,000 AF in storage and extraction facilities are under construction.

Through the development and expansion of these programs, MWD has been able to insure reliable water deliveries through 2025. The 2003 IRP Update is available through MWD or on its website.

Water Surplus and Drought Management Plan

In order to insure that water needs will be met during years of drought, surplus water must be managed during years of surplus. To accomplish this task, MWD developed the Water Surplus and Drought Management Plan (WSDM). Adopted in April of 1999, this plan provides policy guidance for management of regional water to achieve the reliability goal of the IRP. The guiding principle of the WSDM plan is to “Manage Metropolitan’s water resources and management programs to maximize adverse impacts of water shortage to retail customers.” Should mandatory import water allocations be necessary, those allocations would be calculated based on need, as opposed to any type of historical purchases.

MWD has several stages from surplus to shortage and a planned response for each stage. The following section discusses the management activities to be taken, depending on the level of available supplies, starting with a large amount of surplus to extreme shortage. Under MWD’s current IRP, the measures listed for extreme shortage should not have to be implemented for the next 20 years.

Surplus Stages

Surplus Stage 5 - MWD makes deliveries to all available in-region and out of region storage resources.

Surplus Stage 4 - MWD may curtail or temporarily suspend deliveries under the Conjunctive Use and Cyclic Storage programs.

Surplus Stage 3 - MWD may curtail or temporarily suspend deliveries under the Conjunctive Use and Cyclic Storage programs; and deliveries to Semi tropic and Arvin-Edison groundwater storage programs.

Surplus Stage 2 - MWD may curtail or temporarily suspend deliveries under the Conjunctive Use and Cyclic Storage programs; deliveries to Semi tropic and Arvin-Edison groundwater storage programs and deliveries of SWP carryover water to SWP reservoirs.

Surplus Stage 1 - MWD may curtail or temporarily suspend deliveries under the Conjunctive Use and Cyclic Storage programs; deliveries to Semi tropic and Arvin-Edison groundwater storage programs; deliveries of SWP carryover water to SWP reservoirs and contractual groundwater storage deliveries.

Shortage Stages

Shortage Stage 1 - MWD may make withdraws from Diamond Valley Lake.

Shortage Stage 2 - MWD will continue Shortage Stage 1 action and may draw from out-of-region groundwater storage.

Shortage Stage 3 - MWD will continue Shortage Stage 2 actions and may curtail or temporarily suspend deliveries to Long-term Seasonal and Replenishment programs in accordance with discount rates.

Shortage Stage 4 - MWD will continue Shortage Stage 3 actions and may draw from conjunctive use groundwater storage and the SWP terminal reservoirs.

Severe Shortage Stages

Shortage Stage 5 – MWD will continue Shortage Stage 4 actions. MWD's Board of Directors may call for extraordinary conservation, may curtail Interim Agricultural Water Program Deliveries.

Shortage Stage 6 - MWD will continue Shortage Stage 5 actions and may exercise any and all water supply option contracts and/or buy water on the open market for consumptive use or for delivery to regional storage facilities for use.

Section II.4 of the RUWMP has additional information about the WSDM Plan.

EMWD Demand

MWD does not provide supply projections for each member agency. Instead MWD uses a regional approach to developing projections. MWD calculates the demand for the entire region as discussed in Appendix A.1 of the RUWMP and then using information about existing and proposed local projects, determines the amount of imported water. Through out 2005, EMWD has provided to MWD information about local supply and projects, clarification on boundary information and population projects. Based on this information and information provided by other member agencies, MWD feels it is able to meet the demands of all member agencies through 2030. Table 10.2 shows the projected water information provided to MWD by EMWD in August of 2005. The demand estimated for MWD is slightly higher than the final projections shown in Sections 2 and 6. The final projections were refined after this earlier estimation.

Table 10.2 EMWD Imported Water Demand -AFY

	2005	2010	2015	2020	2025	2030
Water for Direct Consumption (Raw and Potable)	86,630	91,300	106,500	123,900	137,000	147,500
Replenishment Water	8,000	20,000	22,200	22,600	22,600	22,500

Section 11 – Water Shortage Contingency Plan

The mission of EMWD is to provide safe and reliable water and wastewater management services to its community in an economical, efficient, and responsible manner now and in the future. Part of accomplishing that mission is to plan for the unplanned. EMWD has two tools that assist in that planning 1) the Water Shortage Contingency Plan (WSCP), included in Appendix D, and 2) the Water System Emergency Operation Procedures (WSEOP). The WSCP will guide EMWD in advising and enforcing conservation during times of water shortage, while the WSEOP is an operational guide created to avert water shortages in the EMWD service area during emergency conditions.

Stages of Action

The WSCP for EMWD was adopted in July of 2005. This plan limits water demand during times of shortage in four stages. These stages can be triggered when there is water deficiency caused by limitations on supply or limitations on EMWD's delivery system. The plan shall be implemented in case of a long or short-term water deficiency, or in case of an emergency water shortage. The stages are summarized in the table below:

Table 11.1 -Water Shortage Contingency Plan Stages of Action

<table>
<tr><th>Stage No.</th><th>Water Supply Conditions</th><th>% Shortage</th></tr>
<tr><td>1</td><td rowspan="4">Anticipated or existing water demand exceeds available supply due to any of the following:
– Shortfall at MWD's water treatment plants (Skinner or Mills)
– Reduction in availability of MWD's raw water supply
– Shortfall at EMWD microfiltration plants or desalination plants
– Reduction in availability of water from EMWD wells.
– Limitations on delivery system</td><td>5-10</td></tr>
<tr><td>2</td><td>10–20</td></tr>
<tr><td>3</td><td>25-50</td></tr>
<tr><td>4</td><td>>50</td></tr>
</table>

When implementation of the plan is triggered by anticipated limitations in supply or delivery, the Board of Directors, at the request of the General Manager, has the ability to implement appropriate water shortage contingency measures to limit the impact on EMWD customers as much as possible. When a water shortage emergency occurs, the General Manager has the authority to implement the plan if necessary.

Estimate of Minimum Supply

Metropolitan Water District of Southern California (MWD) has multiple sources of water supply. Most of them are imported, some of them are local and some of them are both (imported water treated locally). As EMWD's mission is to provide safe and reliable water, EMWD strives to ensure that customer demand can be met in all circumstances. Even under the driest three-year cycle, EMWD supply is anticipated to meet demand. With the groundwater management plans in place, the West San Jacinto area has rising water levels and wells are not anticipated to decrease production, and the Hemet/San Jacinto area will be recharged in years of surplus to prepare or recover from dry years. Since local water supplies are stable and fixed, the small increase in demand during dry years will be met through imported water form MWD. Under the Integrated Resources Plan (IRP) and Water Surplus and Drought Management Plan (WSDM) water, imported by MWD, will be available to meet 100% of member agencies' demands even during dry periods. Therefore, as seen in the table below, the available supply will be determined by the amount of water required to meet demands. In the event the next three years are not dry, surplus water supplies will be stored for future use under the guidelines the WSDM plan provides.

Table 11.2 - Three- Year Estimated Dry Year Supply AFY
(1990-1992 Hydrology)

	2006	2007	2008
Current Supplies			
Local Water Sources			
Groundwater-Hemet/San Jacinto Basin Native Groundwater	11,040	10,080	9,120
Groundwater – West San Jacinto	6,000	6,000	6,000
Groundwater Desalter – Menifee	2,000	3,000	3,000
Groundwater Desalter – Perris	2,000	4,500	4,500
Recycled Water – M&I Use	4,383	5,232	6,080
Recycled Water – Agricultural Use	22,814	21,978	21,142
Imported Water Sources			
Perris FP	8,800	8,800	8,800
Mills and Skinner	75,033	73,938	69,043
MWD Untreated AG	2,504	2,208	1,912
Supplies Under Development			
Local Water Sources			
Groundwater Desalter – Perris II	0	0	0
Recycled Water – Industrial Enterprise and Aesthetic Improvement	1,414	2,828	4,242
Hemet/San Jacinto Watermaster	2,800	3,500	4,200
Imported Water Sources			
Hemet FP – MWD Raw Water Treated by EMWD			4,400
Perris FP Expansion – MWD Raw Water Treated by EMWD			2,900
Recharge Water into the San Jacinto Basin	8,496	11,372	14,248
Total	147,284	153,436	159,587
% of Normal	100%	100%	101%

Catastrophic Supply Interruption

EMWD is dependent on MWD for the majority of its supply. As described in section 11.5 of the RUWMP, MWD has prepared for emergencies through storage, facility design and redundant power sources. Half of the capacity of Diamond Valley Lake, located within EMWD's service area, is reserved for emergency supply. Diamond Valley Lake Reservoir is designed to gravity feed in the case of an electrical failure. In addition to Diamond Valley Lake, MWD has other storage programs that are detailed in Appendix A.3-3 of the RUWMP. For treatment plants MWD has back up generators in place in case of electrical outage.

To protect EMWD customers in the case of an emergency, EMWD has developed the Water Shortage Emergency Operations Plan (WSEOP). This plan determines the operation response to any emergency. An emergency is defined as any time MWD or EMWD facilities are incapable of supplying potable water. An emergency could be caused by a natural disaster such as an earthquake or through facility failures. The operational describes the coordination required between operational staff, management, community involvement staff and other EMWD employees. In addition communication and cooperation will be required with the community and other agency such as the Department of Health Services and MWD. In the event that one or more water supply source is unavailable, remaining sources of supply will be maximized to meet demand. If needed the WSCP could be implemented to conserve water and reduce demand. If an electrical or gas power outage occurs, some of EMWD's booster facilities have back up generators. Facilities without redundant power sources may be served on a priority basis by portable generator.

Prohibition, Penalties and Consumption Reduction Methods

In order to reduce demand by EMWD customers in the case of deficiency in water supply, EMWD has developed several prohibitions and consumptive reduction methods. These methods are targeting outdoor water use, and under the most extreme deficiencies would reduce demand more than 50%.

The WSCP prohibitions and reduction methods are organized by customer groups with different limitations on each group. Stage 1 starts with voluntary measures. In the past, voluntary conservation that is the result of intense public relations costs has led to a 10% reduction in demand. As the water deficiency increases, measures become mandatory and will lead to the needed reduction in water demand. The tables below list limitations placed on customers in the event the WSCP is implemented.

Table 11.3 - Prohibitions

Prohibitions	Stage When Prohibition is Implemented
Do not hose down driveways or any other hard surfaces except for health or sanitary reasons. Use a broom or blower instead.	Voluntary Stage 1 Mandatory Stage 2
Do not allow hoses to run while washing vehicles. Use a bucket or a hose with an automatic shutoff valve.	Voluntary Stage 1 Mandatory Stage 2
No replacement water will be provided for ponds, lakes, etc.	Mandatory Stage 2
Washing of autos, trucks, trailers, motor homes, boats, airplanes or other types of mobile equipment is prohibited. However, such washings are exempted from these regulations for municipalities or commercial entities where the health, safety and welfare of the public is contingent upon frequent vehicle cleaning such as garbage trucks or vehicles used to transport food and perishables.	Mandatory Stage 3
No replacement water provided for pools and spas until such time as Stage 4 restrictions are deemed no longer in effect.	Mandatory Stage 4
No one shall cause the emptying or refilling of existing pools or spas for cleaning purposes. Current water levels will be maintained.	Mandatory Stage 4
No new lawns/turf, whether by seed or sod, shall be permitted.	Mandatory Stage 4
No person or entity shall be required to implement any new landscaping requirements of any association, developer or governing agency until the termination of Stage 4.	Mandatory Stage 4
Based on interruptible agriculture water from MWD, field and row crops may be discontinued.	Mandatory Stage 4

Table 11.4 - Consumption Reduction Methods

Consumption Reduction Method	Projected Reduction	Stage When Consumption Reduction Method is Implemented
Irrigate lawns and landscape only between midnight and 6:00 a.m. (unless hand watering).	5% of external use	Voluntary Stage 1 Mandatory Stage 2
Adjust and operate all landscape irrigation systems in a manner that will maximize irrigation efficiency and avoid over watering or watering of hardscape and the resulting runoff.	10% of external use	Voluntary Stage 1 Mandatory Stage 2
Where possible, install pool and spa covers to minimize water loss due to evaporation.	90% of water loss in pools	Voluntary Stage 1 Mandatory Stage 2
Refrain from using decorative fountains unless they are equipped with a recycling system.		Voluntary Stage 1 Mandatory Stage 2
Water used on a one-time basis for purposes such as construction and dust control shall be limited to that quantity identified in a plan submitted by the user describing water use requirements. The plan shall be submitted to the District for approval.	Varies	Mandatory Stage 3
The use of water from fire hydrants shall be limited to fire fighting and related activities.	Varies	Mandatory Stage 3
Water for municipal purposes shall be limited to activities necessary to maintain the public health, safety and welfare.	Varies	Mandatory Stage 3
Outdoor irrigation by sprinklers will only be allowed every other day.	50% of external use	Mandatory Stage 3
Irrigation of landscaping is only allowed twice per week with hand-held hose only.	72% of external use	Mandatory Stage 4
All new landscaping shall be limited to drought-tolerant plantings as determined by the District.	30% of eternal use for all new homes	Mandatory Stage 4
Use of water by all types of commercial car washes shall be reduced in volume by 50%.	50%	Mandatory Stage 4
Reference evapotranspiration (ET) factors for individually metered landscape projects will be reduced from 1.0 (100% of ET) to 0.8 (80% of ET).	20%	Voluntary Stage 1 Mandatory Stage 2
Landscape meters to 75% of ET	25%	Mandatory Stage 3
Landscape meters to 60% of ET	40%	Mandatory Stage 4

The WSCP gives EMWD the right to impose penalties for the unreasonable use or waste of water while the plan is in effect. It also allows EMWD to impose fines for individual events violating the plan, or to impose a tiered rate system that will provide for charges and/or penalties for higher consumption of water over and above the requirements for Stages 1 through 4 of the plan. The event based penalties and charges are detailed in Table 11.5.

All of EMWD's customers are metered with meters usually read once a month. If the WSCP is implemented, EMWD could monitor water use for comparison with historical data to determine water savings. EMWD could also use meter readers to report violation of the WSCP or excessive water use.

Table 11.5 - Penalties and Charges

Penalty and Charges	Stage When Penalty Takes Effect
For the first monthly violation of the provisions of the water shortage contingency plan, the District shall issue a written notice of fact of such violation to the customer.	Any stage in which the measure or provision intentionally ignored or violated is mandatory.
For the second and third month violations, a surcharge of 100% of current charges.	Any stage in which the measure or provision intentionally ignored or violated is mandatory.
For the fourth and succeeding month(s) violation, a surcharge of 200% of current water bill commodity charge shall be added to the customer's water bill.	Any stage in which the measure or provision intentionally ignored or violated is mandatory.
Thereafter, the District may install a flow restricting device of one gallon per minute (1 GPM) capacity for services up to 1 ½" size and comparatively sized restrictors for larger services.	Any stage in which the measure or provision intentionally ignored or violated is mandatory.
The District may also terminate a customer's irrigation/landscape meter service.	Any stage in which the measure or provision intentionally ignored or violated is mandatory.

Analysis of Revenue

As a result of a water shortage or emergency situation, there may be a reduction of revenue from water sales. To protect EMWD from financial hardship in such a situation, a financial reserve account has been established to meet the fixed cost associated with water delivery that may not be met in the case of reduced water sales. In the tables below, the revenue impacts of implementing the WSCP are analyzed.

Table 11.6 - Actions and Conditions that Impact Revenue

Type	Anticipated Revenue Reduction
Reduced Water Sales	Water sales are approximately 40% of EMWD's annual revenue. A reduction in the demand of water by 50% would also mean a reduction in revenue from water sales of 50% leaving a shortfall of approximately 20% of EMWD annual revenue.

Table 11.7 - Actions and Conditions that Impact Expenditures

Category	Anticipated Cost
Increased Staff Cost	Staff costs for implementing the WSCP could vary depending on the stage trigger by a deficiency in water supply. Stage 1 and 2 would probably be implemented with only current staff members. Stage 3 or 4 of the plan may require additional staff to implement. The amount and level of staff will vary greatly depending on the public's response to the plan.
O & M Cost	Operations and maintenance cost may be minimally impacted by the implementation of the WSCP, but these costs are projected to have minimal impact on EMWD's total revenue.
Cost of Supply and Treatment	Cost of supply would decrease due to a decrease in demand and would offset some of the costs associated with reduced water sales.
Public Outreach Costs	Costs associated with informing the public about implementing the WSCP will vary based on the public's response and the stage of the plan implemented.

Table 11.8 - Proposed Measures to Overcome Revenue Impacts and Increased Expenditures

Name of Measure	Summary of Effect
Rate Adjustment	Part of the WSCP is the ability to implement a tiered rate. This may offset some of the lost revenue due to a decrease in water sales.
Reserve Policy	EMWD, as a matter of policy, keeps a reserve of funds equivalent to 90 days of operational expenses. This reserve fund could be used to mitigate revenue shortfalls.
Rate Stabilization Fund	EMWD also has a rate stabilization fund with approximately $7 million available to offset increased costs and decreased sales.

Section 12 - Water Recycling

Planning Coordination

As a full-spectrum provider of water, wastewater collection, and treatment and recycled water services, EMWD has been active in developing local and regional plans for expanded water recycling in its service area. EMWD's first Recycled Water Facilities Master Plan was developed in 1990 and formally updated in 1997. EMWD's local water recycling plan is also incorporated into the Integrated Regional Water Management Plan developed by the Santa Ana Watershed Planning Authority for the San Jacinto and Santa Ana Watersheds.

The District has worked closely with the Santa Ana Regional Water Quality Control Board in updating local basin plans and developing a long-term salinity management plan to support and ensure compliance with local basin objectives for salinity and nitrogen. EMWD is also participating in the development of a Total Maximum Daily Load (TMDL) analysis for impacted surface waters in the Santa Ana Watershed.

EMWD has been involved with a variety of local agencies and public interest groups in recycled water planning efforts:

Table 12.1 – Participating Agencies

Group/Agency	Role
1) Santa Ana Watershed Planning Authority	Regional Cooperative Planning
2) Santa Ana Regional Water Quality Control Board	Basin Planning/Salinity Mgmt
3) Rancho California Water District	Facility Planning/Market Dev.
4) West San Jacinto Groundwater Management Plan Advisory Board	Plan Review/Public Oversight
5) Hemet/San Jacinto Groundwater Management Plan Policy Committee (Cities of Hemet, and San Jacinto and Lake Hemet Municipal Water District)	Plan Review/Public Oversight
6) Elsinore Valley Municipal Water District	Facility Planning/Market Dev.
7) EMWD Recycled Water Adv. Comm.	Plan Review/public Oversight
8) San Jacinto Watershed Council	Plan Review/Public Oversight
9) Lake Elsinore/San Jacinto Watershed Authority	Plan Review/Water Quality
10) Metropolitan Water District of Southern California	Regional Urban Water Mgmt. Planning

Wastewater Quantity, Quality and Current Uses

The District is responsible for all wastewater collection and treatment in its service area. Wastewater collection and treatment facilities include:

- 1,534 miles of gravity sewer
- 53 sewage lift stations
- 5 regional water reclamation facilities (RWRF)

Inter-connections between the local collections systems serving each treatment plant allow for operational flexibility, improved reliability, and expanded deliveries of recycled water.

Table 12.2 - EMWD Treatment Facilities – AFY

Treatment Plant	Level of Treatment	Capacity	*2000* Flow	*Current* Flow
San Jacinto Val. RWRF	Secondary	12,300	7,800	9,400
Moreno Valley RWRF	Tertiary	17,900	12,200	14,200
Perris Valley RWRF	Tertiary	12,300	8,600	12,200
Sun City RWRF	Tertiary	3,400	Not in Service	Not in Service
Temecula Valley RWRF	Tertiary	15,700	8,500	14,200
Total System		61,600	37,100	50,000

With the exception of the San Jacinto Valley RWRF, all of EMWD's RWRF's produce tertiary effluent, suitable for all Department of Health Services permitted uses, including irrigation of food crops and full-body contact. The secondary effluent produced by the San Jacinto Valley RWRF is used locally for the irrigation of fodder, feed, and seed crops. However, tertiary treatment capacity will be added to the plant in 2006.

EMWD's recycled water delivery system includes:

- 135 miles of large diameter transmission pipeline,
- 6,000 AF of surface storage reservoirs (10 separate sites),
- 4 regional pumping plants.

EMWD currently has 91 recycled water customers and sells up to 26,000 AFY of recycled water. The majority of recycled water sold is used for agricultural irrigation. However, sales to municipal customers are increasing rapidly as residential and urban development replaces irrigated farmland. EMWD also sells recycled water to the California Department of Fish and Game for habitat creation and environmental enhancement at the San Jacinto Wildlife Area.

EMWD is able to sell 90% - 100% of the recycled water produced by its treatment plants during the peak demand months (June – September). During the cooler, wetter parts of the year, surplus recycled water is stored in unlined surface impoundments, resulting in extensive groundwater recharge. If storage capacity is full, surplus recycled water is disposed through a regional outfall pipeline to Temescal Creek and the Santa Ana River.

Table 12.3 - Wastewater Collected and Treated – AFY

	2000	2005	2010	2015	2020	2025
Wastewater Collected & Treated	36,572	49,976	61,051	69,817	78,177	85,785
Quantity Meeting Recycling Standards	36,572	49,976	61,051	69,817	78,177	85,785

Table 12.4 - Disposal of Wastewater (Non-Recycled) – AFY

Name of Disposal	Treatment	2000	2005	2010	2015	2000	2025
Livestream Discharge	Tertiary	0	9,976	13,651	18,117	22,977	26,785

Table 12.5 - Recycled Water Uses – Projected AFY

Type of Use	Treatment Level	2005 AFY
Agriculture	Secondary/Tertiary	17,037
Landscape	Tertiary	3,500
Wildlife Habitat	Secondary/Tertiary	2,000
Wetlands/Lake	Tertiary	2,463
Industrial	Tertiary	0
Groundwater Recharge *	Secondary/Tertiary	15,000
Total		40,000

* Note – From a regulatory viewpoint, this recharge is permitted as being incidental to storage.

Potential and Projected Use, Optimization Plan with Incentives

As mentioned previously, EMWD's extensive water recycling distribution system will maintain the current high level of operation as agricultural customers are replaced by municipal customers. EMWD is planning additional pipelines that will expand municipal use of recycled water over time and is planning several innovative projects to provide recycled water to long-term agricultural customers (citrus orchards) in-lieu of over drafted groundwater. The District will maintain current levels of groundwater recharge to sustain project yields for the Perris Basin Desalination Program, and will work with the California Department of Fish and Game to expand the use of recycled water at the San Jacinto Wildlife Area.

Table 12.6 - Recycled Water Use Potential - AFY

Type of Use	Treatment Level	2010	2015	2020	2025
Agriculture	Tertiary	13,400	13,200	13,200	13,200
Landscape	Tertiary	7,700	10,950	13,200	15,750
Wildlife Habitat	Tertiary	4,300	4,300	4,300	4,300
Wetlands/Lakes/Supply Augmentation	Tertiary	2,000	3,250	4,500	5,750
Industrial	Tertiary	5,000	5,000	5000	5,000
Groundwater Recharge	Tertiary	15,000	15,000	15,000	15,000
Total		47,400	51,700	55,200	59,000

EMWD is committed to maximizing recycled water uses wherever possible. Within the framework of known and potential projects, Table 12.7 lists potential recycled water use also includes projections for future recycled water use.

EMWD's year 2000 projection for recycled water use in 2005 was based upon the following assumptions:

- Continued strong agricultural sales
- Rapid expansion of municipal markets
- Stable habitat sales
- Expanded sales to Elsinore Valley Municipal Water District

A comparison of projected reclaimed water use versus actual sales for 2005 shows that the projections were fairly accurate.

Table 12.7 - Recycled Water Use – 2000 Projection Compared to 2005 Actual-AFY

Type of Use	2000 Projections for 2005	2005 Actual Use
Agriculture	19,495	17,037
Landscape	10,680	3,500
Wildlife Habitat	2,213	2,180
Wetlands/Lake Supply Augmentation	2,000	2,463
Industrial	0	0
Groundwater Recharge	8,726	15,118
Total	43,114	40,298

Due to land use changes and wet winter conditions, 2005 agricultural sales were lower than projected. Municipal sales were lower than projected due to operational issues, which limited the connection of new customers in portions of EMWD's service area. These problems have been corrected and growth in municipal sales should increase sharply over the next five years.

Methods to Encourage Recycled Water Use

EMWD uses a variety of methods to expand the use of recycled water within its service area. These methods include:

Mandatory Recycled Water Use Ordinance – The District has adopted an ordinance requiring new and existing customers to use recycled water for appropriate permitted uses when it is available. This ordinance provides a basis for denying potable water service to customers refusing to utilize available recycled water for permitted uses.

Rate Incentives – Tertiary recycled water is currently priced at approximately one third of the cost of potable water for municipal use and at one quarter of the cost of potable agricultural deliveries for crop-irrigation.

Water Supply Assessments – EMWD's SB 610 and 221 Water Supply Assessments condition all major new developments to use recycled water as a condition of service where it is available and permitted.

Public Education – EMWD actively promotes the public use of recycled water in several elements of its water education program. EMWD also places prominent signage at public recycled water use sites promoting the benefits of water recycling.

Market Surveys – EMWD periodically hires market firms to survey businesses in its service area in order to identify potential recycled water customers.

Facilities Financing – EMWD will work with private parties to arrange or provide financing for construction of facilities needed to convert existing customers from potable water to recycled water.

EMWD does not have any data to support a projection of how much increased recycled water sales will result from each of the listed methods of encouraging recycled water use. Historically, the low cost of recycled water was the primary inducement for agricultural customers to use recycled water in-lieu of groundwater. However, as municipal customers continue to replace agriculture, it is reasonable to assume that the mandatory provisions of the District's Recycled Water Use Ordinance will play a major role in program expansion.

Section 13 - Water Quality Reliability

Water quality is large part of EMWD's strategic goal to "Provide a safe and reliable supply of water at a reasonable cost." Planning and monitoring for water quality are important for protecting public health, controlling costs and insuring reliability for the future. EMWD has identified eleven contaminants that do not currently meet public health guidelines and several other concerns that may limit EMWD supplies in the future. Tables 13.1 and 13.2 list these areas of concern and give information about each one.

In addition to EMWD's concerns, MWD has identified several areas of regional concern in the 2005 MWD Regional Urban Water Management Plan. Although MWD anticipates no significant reduction in water supply reliability for the next 20 years, water quality affecting local water supplies may increase demand on MWD's water supply beyond what had been projected.

Public Heath Goals

A Public Health Goal (PHG) is the level of a contaminant in drinking water, which there is no known or expected risk to health. The California Office of Environmental Health Hazard Assessment (OEHHA) based these goals on the best available toxicological data in the scientific literature. These are goals and not regulations.

The Maximum Contaminant Level (MCL) is the highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs as is economically and technologically feasible. If MCLs are lowered for the eleven contaminants listed in Table 13.1, further treatment or blending may be required. If the MCL cannot be met using blending or treatment, a portion of EMWD's water supply may be unavailable.

Other Concerns

Table 13.2-3.4 lists future regulations that may affect EMWD's water supply and the risk it may pose to EMWD's water supply reliability. These are regulations that will be in place or may be in place in the future.

MWD Water Quality

As part of the Integrated Resource Plan, MWD has concentrated on maintaining the quality of source water and developing management programs that protect and enhance water quality. MWD has two water supply sources and each one has water quality issues. To date, MWD has not identified any water quality issues that cannot be mitigated. Salinity may decrease the amount of water available if membrane treatment is required. MWD could experience a loss of up to 15 percent of the water processed. Since only a small portion of the total water supply would be treated and blended with the remaining unprocessed water, there is no significant risk to MWD's water supply availability. Additional information and analysis of water quality is included in Section IV of the RUWMP.

Table 13.1 – EMWD Present PHG Violations

Contaminant	Bromate	Chromium	Coliform	Copper
Year(s)	2003	1998-2000	2001-2003	2002-2003
Units	Ug/L	ug/L	monthly percent	ug/L
PHG (MCLG)	(0)	2.5	(0)	170
MCL	10	50	5	AL = 1300
Source	Mills	Well 44 Well 56 Well 57	Distribution system samples	Distribution system samples
% of Potable Water Supply in 2005	54.0%	0.7% 0.1% 1.1%	Unknown	Unknown
Range	4.5 - 10.4	1.1-10	0 - 2.1	90th % = 230
Range Category of risk to public health	Carcinogenicity (Cancer)	Carcinogenicity (Cancer)	Unknown: coliforms are not harmful in of themselves, but an indicator of poor water quality	Acute Toxicity (Gastrointestinal effects in children, Human data)
Cancer Risk @ PHG or MCLG	0	1×10^{-6}	NA	NA
Best Available Treatment	Optimize Ozone treatment	Reverse Osmosis	Optimize chlorine residuals, programs for flushing, cross connections, monitoring,	Optimize Corrosion Control
Cost estimate per 1000 gallons (in dollars)*	NA		NA	0.008
Action taken by EMWD	EMWD supports MWD to optimize the Ozone treatment at the Mills Plant.	These wells blend in the distribution system, and no chromium has been detected downstream.	EMWD has programs for flushing, cross connection, extensive monitoring for coliform, chlorine residuals and HPCs. EMWD also works toward the optimal use of chlorine to reduce the formation of disinfection by products.	East Valley has 48% of Cu problem, EMWD is looking into altering addition of polyphosphates for Fe and Mn sequestration to enhance corrosion control.

Table 13.1 – EMWD Present PHG Violations Continued

Contaminant	Dibro-mochloro-propane (DBCP)	Lead	Nickel			Nitrate
Year(s)	2001-2002	2002-2003	2003			2001-2003
Units	ng/L (ppt)	Ug/L	ug/L			mg/L
PHG (MCLG)	1.7	2	12			10
MCL	200	AL = 15	100			10
Source	Well 44	Distribution system samples	Well 11	Well 34	Well 56	Well 44**
			Well 28	Well 35	Well 76	Well 49**
			Well 33	Well 55		

Table 13.1 – EMWD Present PHG Violations Continued

Contaminant	Dibro-mochloro-propane (DBCP)	Lead	Nickel			Nitrate
Percent of Potable Water Supply in 2005	0.7%	Unknown	0.0%	0.4%	0.8%	0.7%
			1.0%	1.6%	1.7%	0.3%
			0.9%	0.7%		
Range	ND - 70	90th percentile = 7	48	38	62	12.9 - 16
			11-14	20	16 - 88	21 - 24
			40	53		
Range Category of risk to public health	Carcinogenicity (Cancer)	Chronic Toxicity (Neurobehavioral effects in children, Hypertension in adults) and Carcinogenicity (Cancer)	Developmental Toxicity (Increased Neonatal Deaths)			Acute Toxicity (Methemoglobinemia)
Cancer Risk @ PHG or MCLG	1×10^{-6}	NA	NA			NA
Best Available Treatment	Granular Activated Carbon	Optimize Corrosion Control	Ion Exchange, Lime softening, Reverse Osmosis			Blending, Ion Exchange, Reverse Osmosis, Electrodialysis
Cost estimate per 1000 gallons (in dollars)*	0.43	Unknown	0.43 - 0.56			0
Action taken by EMWD	EMWD blends at this well to reduce nitrates, therefore the actual numbers at POE are less, although not less than the PHG. No further action has been taken.	Continue to investigate corrosion control in system.	None			EMWD blends at these wells to reduce nitrates to less than MCL

Table 13.1 – EMWD Present PHG Violations Continued

Contaminant	Tetrachloroethylene (PCE)	Trichloroethylene (TCE)	Uranium
Year(s)	2001-2003	2001-2003	2001-2003
Units	ug/L	ug/L	pCi/L
PHG (MCLG)	0.06	0.8	0.5
MCL	5	5	20
Source	Well 44 Well 49	Well 56	Skinner San Jacinto West Portal Well 75
Percent of Potable Water Supply in 2005	0.7% 0.3%	0.8%	17.4% 0.2%
Range	1.4 - 1.5 2.5 - 2.7	0.5 - 1.9	ND – 3.18 ND - 3.92 8.96

Table 13.1 – EMWD Present PHG Violations Continued

Contaminant	Tetrachloroethylene (PCE)	Trichloroethylene (TCE)	Uranium
Range Category of risk to public health	Carcinogenicity (Cancer)	Carcinogenicity (Cancer)	Carcinogenicity (Cancer)
Cancer Risk @ PHG or MCLG	1×10^{-6}	1×10^{-6}	1×10^{-6}
Best Available Treatment	Granular Activated Carbon, Packed Tower Aeration	Granular Activated Carbon, Packed Tower Aeration	Ion Exchange, Enhanced coagulation/ filtration, Lime softening, RO
Cost estimate per 1000 gallons (in dollars)*	0.43	0.43	0.43 - 0.56
Action taken by EMWD	EMWD blends at these wells to reduce nitrates, therefore the actual numbers at POE are less. No further action has been taken.	None	Skinner plant uses enhanced coagulation/filtration, Well 75 feeds the Menifee Desalter using RO. Water from the San Jacinto Portal is treated at the Perris WFP by ultrafiltration.

Table 13.2 – EMWD Potential PHG & MCL Violations

Constituent	Arsenic	Groundwater Rule
Year(s) sampled	2004	
Units	ug/L	
PHG (MCLG)	NA	
MCL	10	
Source	Well 17	all EMWD wells are absent for E. coli
Percent of Potable Water Supply in 2005	0.7%	17.4%
Range	5-10	
Risk to public health	Cancer risk	
Status of Constituent or Rule	Arsenic Rule is promulgated and will start in June, 2005	Groundwater Rule due by end of 2005: fecal contamination
Risk to EMWD water supply	May lose this source if arsenic rises to >10 ug/L unless EMWD treats at the wellhead.	Low level of risk, if contamination is found, EMWD will have to prove 4 log virus inactivation.

Table 13.3 – EMWD Potential PHG & MCL Violations, UCMR

Constituent	Perchlorate	Radon	1,2,3-TCP, Trichloro-propane	Chromium VI	CCL microbes
Year(s) sampled	2004	2002-03 2002 2002 2002 2003	2003	2003	Adenovirus, Aeromonas hydrophila, Calciviridae, Coxsackievirus, Cyannobacteria, Echovirus, Helicobacter pylori, Microsporidia, Mycobacterium avium Complex
Units	ug/L	pCi/L	ug/L	ug/L	
PHG (MCLG)	6	>300 proposed	NL= 0.005 ug/L		
MCL	NA		NA		
Source	Well 44 Well 49 Well 57	Well 44 Well 49 Well 56 Well 57 Well 76	Well 23	Well 35	Unknown levels in wells
Percent of Potable Water Supply in 2005	0.7% 0.3% 1.4%	0.7% 0.3% 0.8% 1.4% 1.7%	0.0%	1.6%	17.4%
Range	ND-5 9.6-11 ND	1250-1440 606 778-914 918-1090 361	0.053	1.5	
Risk to public health	Possible endocrine disruptor	cancer risk	cancer risk	Cancer risk	Gastrointestinal disease, meningitis, Hand, foot and mouth disease, conjunctivitis, unspecified febrile illness, dermatitis, hepatitis, respiratory illness, peptic ulcer, gastric cancer, wasting syndrome
Status of Constituent or Rule	PHG promulgated in 2004, MCL is pending	Radon Rule is pending	No action at this time, future regulation possible	No action at this time, future regulation possible, needs a PHG to determine MCL which was due in 2004	No action at this time, future regulation possible
Risk to EMWD water supply	Low risk, since these three wells are already treated for nitrates by blending	Rule is pending, no PHG or MCL has been established	Well 23 is off line due to other water quality and operational problems	Level of 1.5 ug/L is very low, probably not going to be regulated at this level.	Unknown

Table 13.4 – EMWD Potential PHG & MCL Violations, Contaminant Candidate List (CCL) Chemicals

Constituent	Fluoride	Tetrachloroethylene (PCE)	Trichloroethylene (TCE)
Year(s) sampled	2004	2004	2004
Units	mg/L	ug/L	ug/L
PHG (MCLG)	2	0.06	0.8
MCL	1	5	5
Source	All EMWD wells and surface waters are <= 0.7 mg/L	Well 44 Well 49	Well 56
Percent of Potable Water Supply in 2005		0.8% 0.3%	0.8%
Range		1.2-2 3.6-7.9	1.5-1.7
Risk to public health	fluoridosis	cancer risk	cancer risk
Status of Constituent or Rule	On CCL, EPA will request NAS to update the Risk Assessment	On CCL, EPA has requested NAS to update the Risk Assessment	On CCL, EPA has requested NAS to update the Risk Assessment
Risk to EMWD water supply	Probably a low risk, since all of our waters are below the recommended level of fluoride to prevent dental caries.	These wells are already blended to treat nitrate, however the blended waters are still above the PHG. EPA will continue to reassess this chemical until the PHG equals the MCL. If this happens, treatment will be required.	EPA will continue to reassess this chemical until the PHG equals the MCL. If this happens, treatment will be required.

Colorado River

The most serious threat to the Colorado River supplies is salinity levels. Colorado River supplies must be blended with State Water Project (SWP) water to meet the adopted salinity standards. MWD is working to reduce current salinity level and protect salinity levels from rising in the Colorado River. In addition, MWD is also working to protect the Colorado River from uranium, perchlorate and hexavalent chromium. MWD fully expects its source protection efforts to be successful. Therefore, the only water quality constraint on the use of Colorado River Water is salinity levels.

State Water Project

The water quality issues on the SWP include total organic carbon, bromides and salinity. MWD is working to protect the water quality of this source, but has also seen the need for upgraded treatment to deal adequately with water quality concerns. Total organic carbon and bromide levels are producing disinfection byproducts that current water treatment plants may be inadequate to deal with. MWD expects this treatment limitation to be overcome over the next few years by implementing ozone as the primary disinfectant, and does not expect water quality to limit SWP supplies over the RUWMP study period.

Regional Water Quality

New standards for contaminants may add cost to the use of groundwater storage and may affect reliability of local agency groundwater sources. These standards are not expected to effect MWD's water supply, but may increase dependence on MWD. MWD has not analyzed the effect local water quality issues may have on total supply reliability.

The major water quality concerns MWD has identified for the region are:

- Salinity
- Perchlorate
- Total Organic Carbon and Bromide
- Methyl Teriary Butyl Ether (MTBE) and Tertiary Butanol (TBA) in groundwater and local surface reservoirs
- Arsenic
- Radon
- Uranium
- N-nitrsodimethylamine (NDMA) in groundwater and treated surface waters
- Hexavalent chromium in groundwater
- Pharmaceuticals and personal care products

Salinity

High salinity can reduce operational flexibility and increase the cost of water. Membrane treatment can result in water losses of up to 15 percent of the treated water. High total dissolved solids (TDS) in water also leads to high TDS in wastewater and therefore, recycled water, limiting the use of recycled water. Imported water with high salinity could also limit use of local groundwater basins for storage because of water quality standards set for the basin. For all of these reasons, MWD's Board of Directors approved a Salinity Management Policy that set a specified salinity objective and identified the need to manage both imported and local water sources comprehensively.

For EMWD, salinity management is part of groundwater management. Included in efforts to control salinity in the groundwater basins used to supply water, is the construction of EMWD's desalination plants. Other efforts to control or reduce salinity levels included monitoring of recharge source water salinity levels and recycled water use in the basins. At this time, EMWD does not expect salinity levels to reduce local water source reliability, and the desalination efforts will actually improve and protect the quality of the groundwater.

Perchlorate

Ammonium perchlorate has also been identified as a regional water quality concern. Perchlorate has been found in MWD's Colorado River water supply, and has contaminated groundwater basins, limiting local supply. In response to concerns over perchlorate in drinking water, MWD adopted a Perchlorate Action Plan in 2002. Today, the concentrations of perchlorate in Colorado River Water are less than California's detection limit.

Assessing the impact of perchlorate in local groundwater basins is part of the Perchlorate Action Plan. Total well production lost to well closures because of perchlorate is 57,000 AFY. Although treatment is available for perchlorate, it can be costly. Local agencies may not pursue treatment because of cost considerations.

EMWD had detected perchlorate in three potable production wells located adjacent to the March Air Reserve Base. Positive test values range from 5-11 ug/L. Regulatory agencies have not characterized a perchlorate plume associated with EMWD wells. These wells also show elevated levels of nitrate and trace levels of Dichlorobromophenol (DCB), a nematocide. These contaminants likely result from past agricultural use of the surrounding properties. The combined output of these wells is approximately 2.4% of EMWD's total water supply. Production from the wells is blended with imported water from MWD Mills Filtration Plant under permit by the State Department of Health Services. Treatment is not required, and monitoring indicates no increase in contaminant levels over time.

Total Organic Carbon and Bromide

When source water containing high levels of total organic carbon (TOC) and bromide is treated with disinfectants such as chlorine or chloramines, disinfection byproducts (DBP) form. In studies, DBPs have been linked to cancer and chlorinated water has been associated with reproductive and developmental effects. In 1998, the Environmental Protection Agency adopted more stringent regulations for DBPs and is expected to promulgate even more stringent requirements in the near future.

The existing levels of TOC and bromide in SWP water present concerns for MWD's ability to maintain safe drinking water supplies. Although CALFED has adopted water quality goals for TOC and bromide and called for a wide arrangement of actions to improve SWP water quality, MWD would like CALFED to adopt more stringent water quality improvement milestones.

In addition to efforts to protect source water, MWD has committed to installing ozone treatment systems in each of MWD's treatment plants by 2011. Currently TOC levels can be managed by blending.

EMWD has treated 100% SWP water at the existing microfiltration plant in Perris. Since conventional methods to treat water were not used, instead, membrane technology was employed. DBP's were not over the limit. It is anticipated that the proposed plant at Hemet/San Jacinto will see similar results. Therefore, DBP's are not anticipated to be a threat to EMWD's water supply.

Methyl Tertiary Butyl Ether and Tertiary Butanol

Until recently, Methyl Tertiary Butyl Ether (MTBE) was the primary oxygenate in nearly all of the gasoline used in California. MTBE, used to reduce air pollution, has caused a serious water contaminant. MTBE is very soluble in water and has a low affinity for soil particles allowing the chemical to move quickly in groundwater. MTBE is also resistant to chemical and microbial degradation, making contamination treatment difficult.

MWD monitors its water supply for MTBE and other oxygenates contamination regularly. MTBE testing results have ranged from non-detectable to 3.9 ug/L, below the primary PHG of 12 ug/L. At Diamond Valley Lake and Lake Skinner, MWD has limited recreational use to reduce the potential for MTBE.
MTBE presents a problem to local groundwater basins. A gallon of gasoline (11% MTBE by volume) can contaminate 16.5 million gallons of water at 5 ug/L. Within MWD's service area, local groundwater producers have been forced to close some wells. Although improved underground storage requirements and monitoring and the phasing out of MTBE as a fuel additive, which should decrease the contamination of groundwater, it is difficult to determine how large the MTBE problem may be. Treatment methods have been found to reduce contaminant levels 80 to 90 percent, but increasing the use of imported water may prove to be more cost effective to some agencies.

EMWD has not found MTBE or TBA contamination in any local sources of water.

Arsenic

The new federal MCL for arsenic in domestic water supplies is 10 ug/L with an effective date of 2006. MWD water supplies have low levels of arsenic and will not require treatment to comply with this new standard. However, some member agencies may face greater problems with arsenic compliance. The cost of arsenic removal may cause some member agencies to increase use of imported water.

EMWD has a well that has arsenic detected in it, and may exceed the arsenic regulations and have to be taken out of service if treatment is not put in place at the wellhead.

Radon

The United States Environmental Agency has proposed a radon MCL of 300 pCi/L. MWD's water supplies have a radon level less than the proposed level, but some sub agencies may need to treat local water sources. Since there is a cost-effective method of treating radon, water supply reliability may not be affected by radon regulations.

EMWD has five wells that violate the 300 pCi/L levels for radon and may require further treatment.

Uranium

There is a 10.5 million ton pile of uranium mine tailings at Moab, Utah that lies 600 feet from the Colorado River. Rainwater has seeped through the pile and contaminated the local groundwater, causing contaminants to flow into the river. There is also a threat that million of tons of material containing uranium will be washed into the Colorado River by a flood. Currently, operations and maintenance activities include intercepting some of the groundwater before it discharges into the river, and the Department of Energy has agreed to move the tailings. Remediating the site will require Congressional appropriations, and maintaining Congressional support for a cleanup will require close coordination and cooperation with other Colorado River users.

Uranium levels in at MWD's intake range from 1 to 5 pCi/L, below the California drinking water standard which is 20 pCi/L. EMWD has found levels close to 9 pCi/L at Well 75 that will be treated with reverse osmosis at the Menifee Desalter.

N-nitrosodimethylamine

N-nitrosodimethylamine (NDMA) is a by-product of water and wastewater treatment and has been detected in MWD's water supply system. MWD's RUWMP states that some NDMA control measures, or removal may be required to avoid impacting Southern California's water supply.
NDMA has not been detected in EMWD's local water sources.

Hexavalent Chromium

Hexavalent Chromium or Chromium VI is a possible contaminant in groundwater and surface water. Chromium VI enters water sources through industrial discharges, leaching form hazardous waste sites and erosion of natural deposits. The California OEHHA is currently reviewing a maximum contaminant level for total chromium and has not determined a MCL for Chromium VI.

There are no proven technologies for reducing Chromium VI in water supplies to low levels. However, the American Water Works Association Research Foundation has initiated a research program in Chromium VI removal.

EMWD has very low levels of Chromium VI detected in one well.

Pharmaceuticals and Personal Care Products

Pharmaceuticals and personal care products are a source of concern in both source and recycled water. Monitoring and treatment of these contaminants would have an unknown effect on the cost of water and wastewater treatment. It is difficult to predict the effect pharmaceuticals and personal care products will have on water supply reliability based on the limited information available.

MWD's RUWMP

Additional information on water quality issues and concerns and mitigation efforts can be found in MWD's RUWMP in Section IV..

Section 14 - Water Service Reliability - Normal Water Year

As discussed previously in this report, EMWD has the supply needed to meet the demand of its customers through 2030. This conclusion is based on the assurances of MWD that it will be able to supply member agency demands, the reliability of local groundwater supplies achieved through groundwater management plans and the development of recycled water resources. Tables 14.1 through 14.3 compare the water supply and demand for normal water years through 2030.

Tables 14.1 through 14.3

Table 14.1 – Projected Normal Water Year Supply – AFY

	2010	2015	2020	2025	2030
Supply	168,800	195,000	215,800	231,900	245,200
% of Normal Year	100%	100%	100%	100%	100%

Table 14.2 – Projected Normal Water Year Demand – AFY

	2010	2015	2020	2025	2030
Demand	168,800	195,000	215,800	231,900	245,200
% of Normal Year	100%	100%	100%	100%	100%

Table 14.3 – Projected Normal Water Year Supply and Demand Comparison - AFY

	2010	2015	2020	2025	2030
Supply Total	168,800	195,000	215,800	231,900	245,200
Demand Total	168,800	195,000	215,800	231,900	245,200
Difference	0	0	0	0	0
Difference % of Supply	0%	0%	0%	0%	0%
Difference % of Demand	0%	0%	0%	0%	0%

Section 15 - Water Service Reliability - Single Dry Water Year

In addition to meeting the demand for a normal dry year, the law requires that water suppliers meet the need of its customers during a single dry year. For EMWD, meeting the small increase in demand due to a dry winter is accomplished through increasing imports from MWD and utilizing groundwater production. MWD assures its member agencies that, even in dry years, their needs will be met. The groundwater management plans assure that water recharged into the basins in wet years will be available in dry years. Tables 15.1 through 15.3 compare the water supply and demand for single dry water years through 2030.

Tables 15.1 through 15.3

Table 15.1 – Projected Single Dry Water Year Supply – AFY

	2010	2015	2020	2025	2030
Supply	171,900	198,400	219,400	235,800	249,200
% of Normal Year	102%	102%	102%	102%	102%

Table 15.2 – Projected Single Dry Water Year Demand – AFY

	2010	2015	2020	2025	2030
Demand	171,900	198,400	219,400	235,800	249,200
% of Normal Year	100%	100%	100%	100%	100%

Table 15.3 – Projected Single Dry Water Year Supply and Demand Comparison – AFY

	2010	2015	2020	2025	2030
Supply Total	171,900	198,400	219,400	235,800	249,200
Demand Total	171,900	198,400	219,400	235,800	249,200
Difference	0	0	0	0	0
Difference % of Supply	0%	0%	0%	0%	0%
Difference % of Demand	0%	0%	0%	0%	0%

Section 16 - Water Service Reliability - Multiple Dry Water Years

In the case of multiple dry years, resource planning by EMWD and MWD insures that consumer demands for water will be met. Since local resources are stable during a multiple dry year event and MWD resources are affected by weather fluctuations, the 1990-1992 hydrology was considered. These are the dry years considered by MWD in planning for the worst case multiple dry year scenarios.

Tables 16.1 through 16.3 compare the water supply and demand for multiple dry years ending in 2010.

Tables 16.1 through 16.3

Table 16.1 – Projected Supply During a Multiple Dry Year Period Year Ending in 2010 - AFY

	2006	2007	2008	2009	2010
Supply	147,200	153,400	159,600	165,700	171,900
% of Normal Year	102%	102%	102%	102%	102%

Table 16.2 – Projected Demand During a Multiple Dry Year Period Year Ending in 2010 – AFY

	2006	2007	2008	2009	2010
Demand	147,200	153,400	159,600	165,700	171,900
% of Normal Year	102%	101%	101%	101%	101%

Table 16.3 – Projected Supply & Demand Comparison During a Multiple Dry Year Period Year Ending in 2010 – AFY

	2006	2007	2008	2009	2010
Supply Total	147,200	153,400	159,600	165,700	171,900
Demand Total	147,200	153,400	159,600	165,700	171,900
Difference	0	0	0	0	0
Differences % of Supply	0%	0%	0%	0%	0%
Differences % of Demand	0%	0%	0%	0%	0%

Tables 16.4 through 16.6 compare the water supply and demand for multiple dry years ending in 2015.

Tables 16.4 through 16.6

Table 16.4 – Projected Supply During a Multiple Dry Year Period Year Ending in 2015 - AFY

	2011	2012	2013	2014	2015
Supply	211,000	215,200	219,400	222,700	226,000
% of Normal Year	102%	102%	102%	102%	102%

Table 16.5 – Projected Demand During a Multiple Dry Year Period Year Ending in 2015 – AFY

	2011	2012	2013	2014	2015
Demand	177,200	182,500	187,800	193,100	198,400
% of Normal Year	102%	101%	101%	101%	101%

Table 16.6 – Projected Supply & Demand Comparison During a Multiple Dry Year Period Year Ending in 2015 – AFY

	2011	2012	2013	2014	2015
Supply Total	211,000	215,200	219,400	222,700	226,000
Demand Total	177,200	182,500	187,800	193,100	198,400
Difference	0	0	0	0	0
Differences % of Supply	0%	0%	0%	0%	0%
Differences % of Demand	0%	0%	0%	0%	0%

Tables 16.7 through 16.9 compare the water supply and demand for multiple dry years ending in 2020.

Tables 16.7 through 16.9

Table 16.7 – Projected Supply During a Multiple Dry Year Period Year Ending in 2020 - AFY

	2016	2017	2018	2019	2020
Supply	20,600	206,800	211,000	215,200	219,400
% of Normal Year	102%	102%	102%	102%	102%

Table 16.8 – Projected Demand During a Multiple Dry Year Period Year Ending in 2020 – AFY

	2016	2017	2018	2019	2020
Demand	20,260	20,600	211,000	215,200	219,400
% of Normal Year	102%	101%	101%	101%	101%

Table 16.9 – Projected Supply & Demand Comparison During a Multiple Dry Year Period Year Ending in 2020 – AFY

	2016	2017	2018	2019	2020
Supply Total	202,600	206,800	211,000	215,200	219,400
Demand Total	202,600	206,800	211,000	215,200	219,400
Difference	0	0	0	0	0
Differences % of Supply	0%	0%	0%	0%	0%
Differences % of Demand	0%	0%	0%	0%	0%

Tables 16.10 through 16.12 compare the water supply and demand for multiple dry years ending in 2025.

Tables 16.10 through 16.12

Table 16.10 – Projected Supply During a Multiple Dry Year Period Year Ending in 2025 - AFY

	2021	2022	2023	2024	2025
Supply	222,700	226,000	229,200	232,500	235,800
% of Normal Year	102%	102%	102%	102%	102%

Table 16.11 – Projected Demand During a Multiple Dry Year Period Year Ending in 2025 – AFY

	2021	2022	2023	2024	2025
Demand	222,700	226,000	229,200	232,500	235,800
% of Normal Year	102%	101%	101%	101%	101%

Table 16.12 – Projected Supply & Demand Comparison During a Multiple Dry Year Period Year Ending in 2025 – AFY

	2021	2022	2023	2024	2025
Supply Total	222,700	226,000	229,200	232,500	235,800
Demand Total	222,700	226,000	229,200	232,500	235,800
Difference	0	0	0	0	0
Differences % of Supply	0%	0%	0%	0%	0%
Differences % of Demand	0%	0%	0%	0%	0%

Tables 16.13 through 16.15 compare the water supply and demand for multiple dry years ending in 2030.

Tables 16.13 through 16.15

Table 16.13 – Projected Supply During a Multiple Dry Year Period Year Ending in 2030 - AFY

	2026	2027	2028	2029	2030
Supply	238,400	241,100	243,800	246,500	249,200
% of Normal Year	0%	101%	101%	101%	101%

Table 16.14 – Projected Demand During a Multiple Dry Year Period Year Ending in 2030 – AFY

	2026	2027	2028	2029	2030
Demand	238,400	241,100	243,800	246,500	249,200
% of Normal Year	0%	101%	101%	101%	101%

Table 16.15 – Projected Supply & Demand Comparison During a Multiple Dry Year Period Year Ending in 2030 – AFY

	2026	2027	2028	2029	2030
Supply Total	238,400	241,100	243,800	246,500	249,200
Demand Total	238,400	241,100	243,800	246,500	249,200
Difference	0	0	0	0	0
Differences % of Supply	0%	0%	0%	0%	0%
Differences % of Demand	0%	0%	0%	0%	0%

With the assurance of MWD and the reliability of EMWD's groundwater and recycled water, EMWD is confident of its ability to meet demand through 2030.

WARREN D. WILLIAMS
General Manager-Chief Engineer

ORIGINAL DO NOT REMOVE

ADP CFD JCFA

1995 MARKET STREET
RIVERSIDE, CA 92501
951.955.1200
951.788.9965 FAX
www.floodcontrol.co.riverside.ca.us
117402_5

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

January 3, 2008

RECEIVED
JAN 08 2008
By

Mr. Dennis Chapman
Homeland/Romoland ADP, Inc.
1522 Brookhollow Drive, Suite 1
Santa Ana, CA 92705

Dear Mr. Chapman:

Re: Joint Community Facilities Agreement
Community Facilities District No. 05-1

Enclosed please find your fully executed original copy of the above referenced agreement that was executed by the Board of Supervisors on December 18, 2007.

Thank you for your assistance.

Very truly yours,

Imad M. Guirguis

IMAD M. GUIRGUIS
Senior Civil Engineer

Enclosure

AAM:blj

JOINT COMMUNITY FACILITIES AGREEMENT
(Street Crossing Improvements)

by and among

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT,

COUNTY OF RIVERSIDE,

CITY OF PERRIS

and

HOMELAND/ROMOLAND ADP INC.
a Delaware corporation

Dated as of December 31, 2007

Relating to:

Community Facilities District No. 05-1 (Homeland/Romoland) of the Riverside County Flood Control and Water Conservation District

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JOINT COMMUNITY FACILITIES AGREEMENT

THIS JOINT COMMUNITY FACILITIES AGREEMENT (this "Joint Community Facilities Agreement") is made and entered into as of December 31, 2007, by and among Riverside County Flood Control and Water Conservation District, a public agency organized and existing pursuant to Chapter 48 of the Appendix to the California Water Code (the "Flood Control District"), County of Riverside, a public subdivision of the State of California (the "County"), City of Perris, an incorporated municipality (the "City") and Homeland/Romoland ADP Inc., a Delaware corporation(the "Developer").

RECITALS

A. Pursuant to an application by the Developer whose stockholders own land within the unincorporated communities of Homeland and Romoland, the Board of Supervisors of the Flood Control District (the "Board of Supervisors") has been requested to initiate proceedings to form a community facilities district that is to be identified as "Community Facilities District No. 05-1 (Homeland/Romoland) of the Riverside County Flood Control and Water Conservation District" (the "Community Facilities District") in which there are to be designated three improvement areas (each an "Improvement Area," and collectively, the "Improvement Areas") under the authority of the Mello-Roos Community Facilities Act of 1982 (the "Act") (commencing with Section 53311 of the California Government Code (the "Code")).

B. The stockholders of the Developer (the "Stockholders") and the acreage that each owns, which is not contiguous one with the other, is as follows: (i) Minor Ranch LLC, a Delaware limited liability company, owns approximately 553.57 acres; (ii) Heritage Square, L.P., a California limited partnership, as to an undivided 54.084% interest, and Daniel L. Stephenson, Trustee of the Daniel L. Stephenson Family Trust UDT 12/10/1987, as to an undivided 45.916% interest, own approximately 15.81 acres; (iii) McCall 71, a California limited liability company, owns approximately 67 acres; (iv) Emperor Estates North, LLC, a California limited liability company, owns approximately 53.37 acres; (v) Ashby Financial Company, Inc., a California corporation, owns approximately 100.76 acres; (vi) Fiesta Development, Inc., a California corporation, owns approximately 49.74 acres; (vii) R&D Land Investors, LLC, a California limited liability company, owns approximately 395.75 acres, and (viii) Fidelity Family Holdings, L.P., a Nevada limited partnership, as to an undivided 80% interest, Anthony R. Cesare, Trustee of the Solomon Trust dated March 19, 1998, as to an undivided 10% interest, and Karen A. Burrows, as to an undivided 10% interest, own approximately 17.67 acres (collectively, the "Property"). The boundaries of Property and boundaries of the Community Facilities District are to be coterminous.

C. None of the Property is located within the jurisdictional boundaries of the City.

D. The Flood Control District and the Developer have entered into an agreement entitled "Fee Deposit and Reimbursement Agreement," dated as of May 2, 2006, by the terms of which the Developer has deposited with the Flood Control District $150,000 to pay those costs incurred by the Flood Control District in forming the Community Facilities District and the sale and issuance of special tax bonds.

E. The Board of Supervisors, on March 28, 2006, adopted Resolution No. F2006-01 that approved Revision No. 1 to the Homeland Master Drainage Plan and Revision No. 1 of the

Romoland Master Drainage Plan. On the same date, the Board of Supervisors of the County adopted Resolution No. 2006-001 that approved Amendment No. 2 to the Homeland/Romoland Area Drainage Plan (the "ADP"). The boundaries of the revised Homeland Master Drainage Plan and the revised Romoland Master Drainage Plan are coterminous with the boundaries of the amended ADP.

F. The Property is located within the Line A watershed of the ADP and is intended to be developed for residential and commercial purposes. The development of the Property is conditioned upon the construction of Line A, Line A-2, Line A-3, Line A-16, Line 1, Line 1B and Line 4, Briggs Road Basin and Juniper Flats Basin, related road crossings and certain identified laterals (the "Project") which are designated in the ADP as either "local" or "regional" facilities to be funded, in part, through the collection of the fees established by the ADP to be collected on issuance of a building permit.

F. The Developer has requested and proposed that the Community Facilities District and the Improvement Areas be formed for the purpose of providing the means of financing the construction and acquisition of the Project, including but not limited to certain related road crossings to be constructed by the Developer with the purchase price therefor to be paid from the proceeds of bonds to be sold and issued by the Community Facilities District and the Improvement Areas therein. There are a total of fourteen (14) road crossing associated with the Project that are identified in Exhibit B attached hereto; nine (9) of the road crossings are within the jurisdictional boundaries of the County, two (2) of the road crossings are within the jurisdictional boundaries of the City, and the City and County share jurisdiction with regard to the road crossings of Line A at Ethanac Road, Trumble Road, and Barnett Road. It is the intent of the City and the County that once constructed and the respective portions of each have been accepted by the City and the County, the County will operate and maintain the crossings at Ethanac Road and Trumble Road. For the purposes of this Joint Community Facilities Agreement, the term "County Facilities" is to include the twelve (12) road crossings located within the County including portions of the Ethanac, Trumble, and Barnett road crossings that are to be owned, maintained and operated by the County upon the completion of the construction thereof by the Developer and the acceptance thereof by the County. Similarly, the term "City Facilities" is to include the two (2) road crossing located within the City including the portions of the Ethanac, Trumble, and Barnett road crossings to be owned by the City. The City will maintain and operate only the two road crossings located entirely within its jurisdiction.

G. Section 53313.5 of the Code provides that a community facilities district may only finance the purchase of facilities whose construction has been completed, as determined by the legislative body of the community facilities district, before the resolution of formation to establish the community facilities district is adopted pursuant to Section 53325.1 of the Code, except that a community facilities district may finance the purchase of facilities completed after the adoption of a resolution of formation if the facility is constructed as if it had been constructed under the direction and supervision, or under the authority of, the local agency.

H. Alternatively, Section 53314.9 of the Code provides that at any time either before or after the formation of a community facilities district, the legislative body may accept advances of funds or work in-kind from any source, including, but not limited to, private persons or entities, and may provide, by resolution, for the use of those funds or that work in-kind for any authorized purpose, under all of the following conditions: (a) the proposal to repay the funds or the value or cost of the work in-kind, whichever is less, is included in both the resolution of intention to establish the community facilities district adopted pursuant to Section 53321 of the Code and in the resolution to establish the community facilities district pursuant to Section 53325.1 of the Code, (b) any proposed special tax is approved by the qualified electors of the community facilities district pursuant to the Act, and (c) any work in-kind accepted pursuant to Section 53314.9 of the Code shall have been performed or constructed as if the work had been performed or constructed under the direction and supervision, or under the authority, of the local agency.

I. Pursuant to the Act, the Board of Supervisors, upon approval of this Joint Community Facilities Agreement by the Flood Control District, the County, the City and the Developer, intends to consider a resolution of intention stating that it is the intention of the Flood Control District to cause the proposed Community Facilities District to be established and the designation of the Improvement Areas therein, and if established, to reimburse the Developer all, or a portion, of the funds or value or cost of the work in-kind, whichever is less, without interest, provided all of the conditions of Section 53314.9 of the Code are satisfied and that such reimbursement shall only be from the proceeds of special tax bonds, if any are sold and issued by the proposed Community Facilities District and the Improvement Areas therein.

J. The Act provides that the proposed Community Facilities District may finance the County Facilities only pursuant to a joint community facilities agreement adopted pursuant to Sections 53316.2, 53316.4 and 53316.6 of the Code.

K. The Flood Control District, the County, the City and the Developer desire to enter in to this Joint Community Facilities Agreement prior to the adoption by the Board of Supervisors of the resolution establishing the Community Facilities District, as required by the aforementioned sections of the Code. The provisions of this Agreement are intended to apply to both the County Facilities and the City Facilities whose construction and acquisition are to be funded by bonds issued by the proposed Community Facilities District and the Improvement Areas therein

L. By entering into this Joint Community Facilities Agreement, the Flood Control District, the County and the City find that the approval of this Joint Community Facilities Agreement will be beneficial to the residents of their respective jurisdictions and to the owners of the Property within the Community Facilities District.

NOW, THEREFORE, for and in consideration of the mutual premises and covenants contained herein, the parties hereto agree as follows:

ARTICLE I

DEFINITIONS

Section 1.1 Definitions. Unless the context otherwise requires, the terms defined in this Article I shall have the meaning herein specified when used in this Joint Community Facilities Agreement:

"**Acceptable Title**" means title to land, or an easement therein, delivered free and clear of all liens, taxes, assessments, leases, easements and encumbrances, whether any such item is recorded or unrecorded, except those non-monetary items which are reasonably determined by the County and/or the City not to interfere with the intended use of such land or easement and therefore are not required to be cleared from title.

"**Acceptance Date**" means, with respect to any Facility, the date that the Facility is accepted by either the County or the City, as appropriate.

"**Act**" means the Mello-Roos Community Facilities Act of 1982, constituting Section 53311 *et seq.* of the Code, as amended.

"**Actual Cost**" means, with respect to a Facility, to the extent authorized by Law, an amount equal to the sum of (a) the Developer's actual, reasonable cost of constructing such Facility, including labor, material and equipment costs, (b) the Developer's actual reasonable cost of designing and preparing the Plans and Specifications for such Facility, including engineering services provided in connection with designing and preparing such Plans and Specifications, (c) the Developer's actual, reasonable cost of environmental evaluations required specifically for such Facility and any mitigation measures required by any governmental agency with jurisdiction with regard to such Facility, or portions thereof, (d) the amount of any fees actually paid by the Developer to governmental agencies in order to obtain permits, licenses or other necessary governmental approvals and reviews for such Facility, including but not limited to plan check and inspection fees, (e) the Developer's actual reasonable cost for professional services directly related to the construction of such Facility, including engineering, legal, inspection, construction staking, materials testing and similar professional services, (f) the Developer's actual, reasonable cost for construction management, bid administration and contract administration services which shall not exceed 5% of construction costs, (g) the Developer's actual reasonable cost of payment, performance or maintenance bonds and insurance for such Facility, (h) the Developer's actual, reasonable cost of any real property or interest therein acquired from a party other than the Developer, which real property or interest therein is either necessary for the construction, operation or maintenance of such Facility (e.g., temporary construction easements, haul roads, etc.) or is required to be conveyed with such Facility in order to convey Acceptable Title thereto, all as specified in a Payment Request that is to be reviewed and approved by the Flood Engineer; provided, however, that (x) no item of cost relating to a Facility shall be included in more than one category of cost specified in clauses (a) through (h) of this definition, and (y) each item of cost shall include only amounts actually paid by the Developer to third parties and shall not include overhead or other internal expenses of the Developer, except that, if Developer employees perform construction management, bid administration or contract administration services with respect to a Facility, the actual reasonable cost of the salaries and benefits paid by the Developer to such employees for performing such services may be included as an item of cost relating to such Facility for the category of cost specified in clause (f) of this definition and subject to the 5% limitation specified in clause (f).

"**Administrator**" means the General Manager-Chief Engineer of the Flood Control District (or any successor to the responsibilities thereof is such office is no longer in existence), or his/her designee.

"**ADP**" means the Homeland/Romoland Area Drainage Plan, as amended, by the Board of Supervisors of the County.

"**Board of Supervisors**" means, respectively, the Board of Supervisors of the Flood Control District or the Board of Supervisors of the County, as appropriate.

"**Bonds**" means the bonds that the Community Facilities District may attempt to sell and issue in one series for each Improvement Area if the Proceedings are approved, a portion of the proceeds of which will be used to acquire the Facilities.

"**Business Day**" means a day which is not a Saturday or Sunday or a day of the year on which either the Flood District, the County or the City are not required or authorized to be open.

"**CEQA**" means the California Environmental Quality Act (CEQA), constituting Section 21000 *et seq.* of the California Public Resources Code, as amended.

"**City**" means the City of Perris, an incorporated municipality, or its successors.

"**City Engineer**" means the City Engineer for the City (or any successor to the responsibilities thereof is such office is no longer in existence), or his/her designee.

"**City Facility**" or "**City Facilities**" means the five (5) road crossing located within the jurisdictional boundaries of the City including the road crossings of Line A at Ethanac Road, Trumble Road, and Barnett Road as identified and described in Exhibit B attached hereto.

"**Code**" means the California Government Code.

"**Community Facilities District**" means "Community Facilities District No. 05-1 (Homeland/Romoland) of the Flood Control District," a community facilities district to be organized and existing under the Code, and all Improvement Areas therein.

"**Construction Site**" means the sites on which the Facilities are to be constructed, including off site staging areas and material storage areas.

"**County**" means the County of Riverside, a political subdivision of the State, and its successors.

"**County Engineer**" means the Director of Transportation of the County (or any successor to the responsibilities thereof is such office is no longer in existence), or his/her designee.

"**County Facility**" or "**County Facilities**" means the twelve (12) road crossings located within the jurisdictional boundaries of the County including the road crossings within the jurisdictional boundaries of the County of Line A at Ethanac Road, Trumble Road, and Barnett Road as identified and described in Exhibit B attached hereto that are to be owned, operated and maintained by the County.

"**Developer**" means Homeland/Romoland ADP Inc, a Delaware corporation, and its successors and assigns, acting as the master developer and construction manager of the Project.

"**Developer's Representative**" means the person or persons designated as such by the Developer in a certificate signed by the Developer and delivered to the Flood Control District, the Community Facilities District, and the County, which certificate shall contain an original or specimen signature of each person so designated.

"Facility" or **"Facilities"** means either a County Facility or a City Facility as the context would indicate.

"Flood Control District" means the Riverside County Flood Control and Water Conservation District, a public agency organized and existing pursuant to Chapter 48 of the Appendix to the California Water Code.

"Flood Engineer" means the General Manager-Chief Engineer of the Flood Control District (or any successor to the responsibilities thereof if such office is no longer in existence), or his/her designee.

"Funding Agreement" means the Infrastructure Funding, Acquisition and Reimbursement Agreement entered into by the Flood Control District and Developer, dated as of May 23, 2006, as it may be amended from time to time.

"**General Prevailing Wage Rates**" means those rates as determined by the Director of the Department of Industrial Relations of the State.

"**Hazardous Material**" means any hazardous or toxic substance, material or waste which is or becomes regulated by any local governmental authority, the State or the United States Government, including, without limitation, any material or substance which is (a) designated as a "hazardous substance" pursuant to Section 311 of the Federal Water Pollution Control Act, 33 U.S.C. § 1251 *et seq.* (33 U.S.C. § 1321), (b) defined as a "hazardous waste" pursuant to Section 1004 of the Federal Resource Conservation and Recovery Act, 42 U.S.C. § 6901 *et seq.* (42 U.S.C. § 6903), (c) defined as a "hazardous substance" pursuant to Section 101 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. § 9601 *et seq.*, (d) petroleum, or (e) asbestos.

"**Improvement Area**" and "**Improvement Areas**" means, either individually or collectively, Improvement Areas 1, 2 and/or 3, as the context would indicate, that are to be established within the Community Facilities District.

"Improvement Fund" means the Fund to be established pursuant to each Indenture for an Improvement Area to hold that portion of Bond proceeds to be applied to pay the Purchase Price for the Project.

"**Indenture**" **or "Indentures"** means each indenture, trust agreement, resolution, fiscal agent agreement or similar instrument, regardless of title, pursuant to which bonds, notes or other evidences of indebtedness of the Community Facilities District have been issued for an Improvement Area and are outstanding, as originally executed or as the same may from time to time be supplemented or amended pursuant to the provisions thereof.

"**Joint Community Facilities Agreement**" means this Joint Community Facilities Agreement, dated as of December 31, 2007, by and among the Flood Control District, the County, the City and the Developer, as originally executed or as the same may be amended from time to time in accordance with its terms.

"**Legislative Body**" means the Board of Supervisors of the Flood Control District, acting *ex officio* as the legislative body of the Community Facilities District.

"**Payment Request**" means the document to be provided by the Developer to the Flood Engineer to substantiate the Purchase Price of one or more the Facilities, which shall be substantially in the form of Exhibit D attached hereto.

"**Plans and Specifications**" mean the plans and specifications for the Facilities prepared or to be prepared at the direction of the Developer pursuant to Section 4.1 hereof.

"**Proceedings**" means those proceedings to be undertaken by the Board of Supervisors to consider the formation of the Community Facilities District and the designation of Improvement Areas therein and the approval by said Board of Supervisors and the qualified electors of the Community Facilities District and each Improvement Area of the authorization to levy special taxes therein pursuant to the Rate and Method and to incur bonded indebtedness to finance the construction and acquisition of the Project and by the Legislative Body to sell and issue the Bonds.

"Project" means the construction of Line A, Line A-2, Line A-3, LineA-16, Line 1B, Line 1, Line 4, Briggs Road Basin and Juniper Flats Basin, related road crossings and certain identified laterals all located within the Line A watershed of the ADP.

"**Purchase Price**" means, subject to the provisions of Section 3.2 hereof, the Actual Cost of a Facility as determined by the Flood Engineer.

"**Rate and Method**" means the rate and method of apportionment of special taxes for each Improvement Area authorized to be levied within the Community Facilities District pursuant to the Proceedings.

"**State**" means the State of California.

ARTICLE II

CONDITIONS PRECEDENT

Section 2.1 <u>Proceedings</u>. The Developer has submitted to the Flood Control District an application requesting that the Proceedings be initiated by the Flood Control District with regard to the formation of the Community Facilities District and the designation of the Improvement Areas therein for the purpose of financing the acquisition or construction of the Project, including the Facilities, and to authorize the levy of special taxes within the Community Facilities District pursuant to the Rate and Method for each Improvement Area and the incurrence of bonded indebtedness to finance the construction and acquisition of said public facilities and for the Legislative Body to authorize the sale and issuance of the Bonds for each Improvement Area pursuant to the Act and the applicable Indenture.

Should the formation of the Community Facilities District and the designation of the Improvement Areas be approved, the Legislative Body will cause to be sold and issued the Bonds for each Improvement Area in one or more series, pursuant to the terms of the Act, the applicable Indenture and the Funding Agreement. A portion of the proceeds of the Bonds are intended to provide funds that will allow the Community Facilities District and each Improvement Area to finance all, or a portion, of the costs of constructing and acquiring the Facilities. Should the Board of Supervisors not be able to approve the formation of the Community Facilities District and/or the Legislative Body not be able to sell and issue any Bonds, the Flood Control District, the County, the City and the Developer will not be bound by the terms of this Joint Community Facilities Agreement and it shall be considered null and void by the parties to it. The Flood Control District will notify all parties to this Agreement within fifteen (15) calendar days of either event occurring.

The Developer acknowledges that the decision of the Board of Supervisors to approve the formation of the Community Facilities District and the designation of the Improvement Areas therein and of the Legislative Body to authorize the sale and issuance of the Bonds for each Improvement Area is an exercise of the legislative discretion of the Board of Supervisors and Legislative Body, respectively, and the Flood Control District may not enter into a contract or obligate either the Board of Supervisors or the Legislative Body to exercise its legislative discretion in a particular manner. This Joint Community Facilities Agreement does not, therefore, in any way create a contractual, legal or equitable obligation of or commitment by the Board of Supervisors to approve the formation of the Community Facilities District and the designation of Improvement Areas therein or the Legislative Body to authorize the sale and issuance of the Bonds for each Improvement Area.

Should the Developer elect to abandon the Proceedings, the Developer shall provide written notification of such election to the Flood Control District, the County and the City prior to the adoption by the Legislative Body of the resolution authorizing the sale and issuance of the Bonds for an Improvement Area.

The Board of Supervisors and the Legislative Body shall have the jurisdiction to and shall be solely responsible for undertaking the Proceedings consistent with the provisions of the Act, each Indenture and the Funding Agreement.

Section 2.2 Addendum to Exhibit B of this Joint Community Financing Agreement for Modification of the Facilities. Further refinement of the descriptions of the Facilities may be addressed by an addendum to Exhibit B that is to be prepared by the Flood Engineer and executed by the Administrator and the Developer and would not require further amendment to this Joint Community Facilities Agreement. Other than the modifications described in the previous sentence, should there be additional amendments deemed necessary to be made to this Joint Community Facilities Agreement, said amendments are to be made pursuant to Section 6.4, hereof, and such amendments shall be made prior to the authorization by the Legislative body to sell and issue any additional series of Bonds.

ARTICLE III

ACQUISITION OF FACILITIES

Section 3.1 **Acquisition of Facilities.** The Developer hereby agrees to transfer to the County or the City, as appropriate, each of the Facilities and the Community Facilities District hereby agrees to pay the Purchase Price thereof, subject to the terms and conditions hereof and the Funding Agreement. Acceptable Title to any parcels on which any Facility is constructed and for which title is not presently held by either the County or the City, as appropriate, as well as the Facility financed pursuant hereto shall be transferred to either the County or the City, as appropriate, as of the Acceptance Date; provided, however, that notwithstanding such transfer, as provided in Section 4.11 hereof, the Developer shall be solely responsible for the ownership, operation, and maintenance of any Facility until the Acceptance Date of said Facility.

The Purchase Price of the Facilities is to be paid solely from the amounts on deposit in the Improvement Fund established by the Indenture for an Improvement Area, and the Community Facilities District shall not be obligated to pay the Purchase Price of the Facilities except from the amounts in applicable Improvement Fund. The amount of the Bond proceeds placed in each Improvement Fund is to be determined by the Flood Control District and the Developer consistent with the terms of the Funding Agreement and each Indenture and said determination shall be binding on the County and the City. Neither the Flood Control District, the Community Facilities District, the County, nor the City make any warranty, either expressed or implied, that the amounts held in said Improvement Funds available for the payment of the Purchase Price of the Facilities will be sufficient for such purpose.

It is understood by the Developer that the net principal amount of the Bonds that will be deposited into an Improvement Fund, pursuant to the terms of the Funding Agreement and the applicable Indenture, and any investment earnings thereon, may not be sufficient to pay the full amount of the Purchase Price of any Facility at the time a Payment Request is approved by the Flood Engineer. If the amounts deposited in an applicable Improvement Fund, and any investment earnings thereon, are not sufficient to pay the Purchase Price for any Facility at the time Payment Request is approved by the Flood Engineer and submitted to the Administrator for payment, the timing of the payment of the Purchase Price and the proportionate amount of the Purchase Price to be paid will be determined consistent with the terms of the Funding Agreement. At all times, the construction of the Facilities is made with the expectation that the Purchase Price for any Facility is to be paid by the Community Facilities District, and that the conveyance of a Facility to the County or the City prior to the receipt of the Purchase Price, or any portion thereof, for said Facility shall not be construed as a dedication, gift or waiver of the payment of the Purchase Price or any unpaid balance thereof.

Notwithstanding any other provision of this Joint Community Facilities Agreement, the fact that there may not be sufficient funds available in the applicable Improvement Funds to pay the Purchase Price for one or more Facility will not relieve the Developer or its Shareholders from their respective obligations to construct the Facilities consistent with the conditions of approval that have been placed on the Property.

Failure of the Developer to comply with the terms of Articles III and IV of this Joint Community Facilities Agreement, will result in the Facilities not being accepted by the County or the City, as appropriate, and the Developer receiving no reimbursement for any costs it incurred in the design, engineering and construction of said Facility.

Section 3.2 **<u>Determination of Purchase Price</u>.** The determination of the Purchase Price and its payment shall be made consistent with the provisions of this Section 3.2.

In order for the Flood Engineer to be able to determine the Purchase Price and for the Developer to receive the Purchase Price for a completed Facility, the Developer shall deliver to the Flood Engineer:

(a) A Payment Request for said Facility, together with all attachments and exhibits to be included therewith;

(b) A copy of the documents conveying or which previously conveyed to either the County or the City, as appropriate, Acceptable Title to the real property on, in or over which such Facility is located, as described in Section 3.3, hereof, and to the Facility.

(c) A copy of the Notice of Completion for said Facility that will be filed in accordance with Section 3093 of the California Civil Code, if applicable. Final lien releases addressed to the Flood Control District, the Community Facilities District, and the County or City, as appropriate, must be received by the Flood Engineer prior to the Flood Engineer executing the authorization for the Community Facilities District to pay the Purchase Price.

(d) The Developer's civil engineer of record or construction civil engineer of record duly registered in the State shall provide to the County or the City, as appropriate, redlined "as-built" plans and profile sheets for the Facility. After the County or City's approval, as appropriate of the redlined "as-built" drawings, the Developer's engineer shall schedule with the County or the City a time to transfer the redlines onto the County's or City's original mylars at the County or City's office, after which, said engineer shall review, stamp and sign the original mylars "As-Built."

Notwithstanding anything to the contrary contained herein, no payment of the Purchase Price for any Facility shall be made unless the County Engineer or the City Engineer, as appropriate, has by written notice to the Administrator and Flood Engineer stated that the County or the City, as appropriate, is willing to accept ownership of the Facility as constructed as of the Acceptance Date.

Once the Flood Engineer has been provided with a complete Payment Request for the Purchase Price and all other documents as required by him/her to determine the Purchase Price, the Flood Engineer will sign the Payment Request, identify the Purchase Price to be paid and forward said document to the Administrator for payment consistent with the terms of the applicable indenture.

Section 3.3 **<u>Dedication of Property and Easements to County or City</u>.** Acceptable Title to all property not presently held by the County or the City, on, in or over which a Facility will be located shall be deeded over to County or City, as applicable, by way of grant deed, quitclaim, or dedication of such property, or easement thereon, if such easement is approved by the County Engineer or the City Engineer as being a sufficient interest therein to permit the County or City to properly own and operate and maintain such Facility located therein, thereon or thereover, and to permit the Developer to perform its obligations as set forth in this Joint Community Facilities Agreement.

The Developer shall furnish to the County Engineer or the City Engineer, as applicable, a title report for such property not previously dedicated or otherwise conveyed to the County or the City for review and approval at least thirty (30) calendar days prior to the notice required by Section 4.7 hereof. The County Engineer or the City Engineer shall approve the title report unless it reveals a matter that, in the sole judgment of the County Engineer or the City Engineer, could materially affect the County or City's use and enjoyment of any part of the property or easement covered by the title report. In the event the County Engineer or the City Engineer does not approve such title report, the County Engineer or the City Engineer shall notify the Administrator in writing and the County or the City shall not be obligated to accept title to said Facility, and the Community Facilities District shall not be obligated to pay any portion of the Purchase Price for said Facility until the Developer has cured such objections to title to the satisfaction of the County Engineer or the City Engineer.

Consistent with the preceding paragraph, the Developer shall obtain and provide, or cause to be obtained or provided, to the County Engineer or the City Engineer duly executed irrevocable offer(s) of dedication to the public for road and drainage purposes, including ingress and egress, for rights of way deemed necessary by the County Engineer or the City Engineer for the construction, inspection, operation and maintenance of the Facilities. The irrevocable offer(s) of dedication shall be in a form approved by the County Engineer or the City Engineer and shall be executed by all legal and equitable owners described in the offer.

ARTICLE IV

CONSTRUCTION OF THE FACILITIES

Section 4.1 <u>Preparation and Approval of Plans and Specifications</u>. To the extent that the Developer has not already done so, it shall cause Plans and Specifications to be prepared for the Facilities. The Developer shall obtain the written approval of the Plans and Specifications from the County Engineer or the City Engineer, as appropriate, and the Flood Engineer. The Developer shall provide a copy of all such Plans and Specifications to the County Engineer or the City Engineer, as appropriate, and the Flood Engineer. Once the Plans Specifications have been approved, no changes are to be made thereto without prior written consent of the County Engineer or the City Engineer, as appropriate, and the Flood Engineer.

Section 4.2 <u>Duty of Developer to Construct</u>. The Developer shall construct or cause to be constructed the Facilities in accordance with the Plans and Specifications approved by the County Engineer or the City Engineer, as appropriate, and the Flood Engineer. The Developer shall perform all of its obligations hereunder and shall conduct all operations with respect to the construction of the Facilities in a good, workmanlike and commercially reasonable manner, with the standard of diligence and care normally employed by duly qualified persons utilizing commercially reasonable efforts in the performance of comparable work and in accordance with generally accepted practices appropriate to the activities undertaken. In addition, the Developer shall obtain all necessary encroachment permits prior to commencing construction. Notwithstanding the foregoing, nothing set forth in this Joint Community Facilities Agreement shall be construed (i) to require the Developer to perform any work requiring a contractor's license, nor shall the Developer be deemed to be performing construction services pursuant to this Joint Community Facilities Agreement or (ii) require the Developer to cause the Plans and Specifications to be prepared for the County Facilities at a specific time or in a manner other than as required by the approved conditions for the development of the Property.

Section 4.3 <u>Bid and Construction Requirements</u>. In order to ensure that a Facility is constructed as if it had been constructed under the direction and supervision, or under the authority of, a public agency, so that it may be acquired pursuant to Sections 53313.5 and 53314.9 of the Code, the Developer shall comply with all of the applicable requirements set forth in the Public Contract Code regarding the notice of bidding and award of a contract for a public works project by the Flood Control District.

(a) Prior to awarding the bid for any Facilities, the Developer shall submit a bid packet, including the invitation and specifications for submitting bids and the general conditions regarding the construction of any Facility for review and approval to the Flood Engineer, and for approval as to the specific conditions, if any, to the County Engineer or the City Engineer, as appropriate. A copy of the bid packet, once approved, is to be provided to the County Engineer or the City Engineer, as appropriate, the Flood Engineer and the Administrator. The contract for construction of any Facility is to be awarded to the responsible bidder submitting the lowest responsive bid after notice inviting sealed bids. Bids are to be publicly solicited consistent with applicable provisions of the Public Contract Code dealing with the bidding of public works projects constructed by the Flood Control District. Public notice is to be given consistent with the Public Contract Code as to the date, time and place where bids will be opened. The Flood Engineer is to be provided with copies of all bids received and an executed declaration, the form of which will be provided by the Flood Engineer, that all public bidding procedures as required by the Flood Control District have been complied with.

(b) The Developer shall require, and the Plans and Specifications and contract documents shall require, all contractors, subcontractors, vendors, equipment operators and owner operators, in each such case to the extent such individuals or entities are engaged to perform work on a Facility, to pay not less than General Prevailing Wage Rates to all workers employed in the execution of the contract, as required by the California Labor Code, to post a copy of the General Prevailing Wage Rates at the Construction Site in a conspicuous place available to all employees and applicants for employment, and to otherwise comply with applicable provisions of the California Labor Code, the Code and the California Public Contract Code relating to General Prevailing Wage Rates as required by the specifications approved by the Flood Engineer. The Flood Engineer has provided the Developer with copies of tables setting forth the General Prevailing Wage Rates, and the Developer hereby acknowledges receipt thereof.

(c) The Developer shall require each principal contractor to provide proof of insurance coverage to the Flood Control District satisfying the requirements of Section 4.12, hereof, throughout the term of the construction of the Facilities. Rather than requiring its principal contractors to provide such insurance, the Developer may elect to provide the same for the benefit of its principal contractors.

(d) Each principal contractor engaged to perform work on the Facilities shall be required to furnish (i) labor and material payment bonds, and (ii) contract performance bonds, each in an amount equal to 100% of the contract price naming the Developer, the Community Facilities District, the County, the City and the Flood Control District, as obligees with an admitted surety insurer which complies with the provisions of Section 995.660 of the California Code of Civil Procedure. All such bonds shall be in a form as shown in Exhibit C. The bonds tendered pursuant to this sub-section (d) are to be accepted and held by the County Engineer.

(e) The Developer shall comply, and shall cause each contractor, subcontractor, vendor, equipment operator and owner operator, in each such case to the extent such individual or entity is engaged to perform work on the Facilities, to comply, with such other requirements relating to the construction of the Facilities as the County, the City or the Flood Control District may impose by written notification delivered to the Developer, to the extent legally required as a result of changes in applicable federal, State, County or City laws, regulations, rules or procedures.

(f) The Developer shall require, and the Plans and Specifications and contract documents shall require, all contractors, subcontractors, vendors, equipment operators and owner operators, in each such case to the extent such individuals or entities are engaged to perform work on the Facilities, to submit certified weekly payroll records or other proof of payment of General Prevailing Wage Rates to the Developer and to furnish certified payroll records or such other proof of payment of General Prevailing Wage Rates to the Flood Engineer promptly upon request.

(g) All change orders shall be reviewed and approved by the Flood Engineer for the purpose of ensuring that they comply with appropriate standards and for the work represented by the change order to be eligible for consideration in determining the Purchase Price.

(h) The Developer shall provide proof to the Administrator and the Flood Engineer, at such intervals and in such form as the Administrator or the Flood Engineer may require in order to determine that the foregoing requirements have been satisfied as to all of the Facilities.

(i) The Developer has deposited or will deposit with either the County or the City, as appropriate, an amount, as determined by the County or the City, to cover the anticipated costs, deemed necessary and reasonable, associated with the review and approval of the Plans and Specifications, the review and approval of right of way and conveyance documents and with the processing and administration of this Joint Community Facilities Agreement. The Developer, within thirty (30) calendar days after receipt of an additional billing for such costs, will forward the billed amount to the County or the City, as appropriate.

(j) At the time the Developer submits a "Notice of Intent" to commence construction as set forth in Section 4.7, below, the Developer shall deposit with County or the City, as appropriate, the estimated cost of providing construction inspection for the Facility, in an amount as determined and approved by County or the City, as appropriate, in accordance with its Ordinances, rules or regulations, including any amendments thereto, based upon the bonded value of Facilities to be inspected by the County or the City, as appropriate.

Section 4.4 Licenses and Regulatory Permits. The Developer shall secure all necessary licenses, agreements, permits, rights of entry and temporary construction easements (collectively "Licenses") that may be needed for the construction, inspection, operation and maintenance of the Facilities. The Developer is to secure all permits approvals or agreements, if any, required by the various Federal and State resource and/or regulatory agencies (collectively, the "Regulatory Permits") for the construction, operation and maintenance of the Facilities. The Regulatory Permits include, but are not limited to, those permits issued by the U.S. Army Corps of Engineers, the State Water Resources Control Board ("SWRCB"), California State Department of Fish and Game and the Regional Water Quality Control Board. All Licenses and Regulatory Permits secured by the Developer shall be reviewed by the Flood Engineer and the County Engineer or the City Engineer, as appropriate, prior to execution or acceptance by the Developer to determine whether the conditions they specified therein are satisfactory to either the County or the City to allow either entity to operate and maintain the Facilities.

Section 4.5 NPDES Compliance. The Developer shall prepare and implement, or cause to be prepared and implemented, a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the requirement of the State's National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction Activity (SWRCB Order No. 99-08 DWQ) and any amendments thereto (the "General Permit"). The General Permit regulates both stormwater and non-stormwater discharges associated with construction activities required by this Joint Community Facilities Agreement.

The SWPPP shall identify site specific "Best Management Practices" ("BMP's") to be implemented during and after construction to control pollution of Stormwater runoff and receiving waters. The identified BMP's shall include, but not be limited to, "good housekeeping" practices for the Construction Site such as establishing stabilized construction access points, providing adequate sanitary/septic waste management, designating vehicle and equipment cleaning/maintenance areas, employing proper material handling and storage practices, maintaining adequate soil stabilization and erosion control practices to control the discharge of pollutants from the Construction Site and any activities thereon. The SWPPP shall also stipulate to an ongoing program for monitoring and maintenance of all BMP's.

The Developer shall be solely responsible throughout the duration of constructing the Facilities for placing, installing, constructing, inspecting and maintaining all BMP's identified in the SWPPP and amendments thereto and for removing and disposing of temporary BMP's.

The Developer shall become fully informed of and comply with the applicable provisions of the General Permit, Federal, State and local regulations that govern the Developer's activities and operations pertaining to both stormwater and non-stormwater discharges from the Construction Site associated with the Facilities and any area of disturbance outside said Construction Site relating to the Facilities. The Developer shall, at all times, keep copies of the General Permit, approved SWPPP and all amendments at the Construction Site. The SWPPP shall be made available upon request of a representative of the SWRCB, Santa Ana Regional Water Quality Control Board, or the United States Environmental Protection Agency. The Developer shall, at reasonable times, allow authorized agents of the above cited agencies, upon the presentation of credentials to: (i) enter upon the Construction Site; (ii) have access to and copy any records required to be kept as specified in the General Permit, (iii) inspect the Construction Site and determine whether related soil stabilization and sediment control BMP's have been implemented and maintained, and (iv) sample or monitor stormwater or non-stormwater runoff for purposes of ensuring compliance with the General Permit.

The Developer shall be solely and exclusively responsible for any arrangements made between it and other property owners or entities that result in disturbance of land at the Construction Site.

The Developer shall be responsible for all costs and for any liability imposed by law as a result of the its failure to comply with the requirements set forth in this Section, including but not limited to, compliance with the applicable provisions of the General Permit and Federal, State and local regulations. For the purpose of this Section, costs and liabilities include, but are not limited to, fines, penalties and damages whether assessed against the County, the City, the Flood Control District, the Community Facilities District or the Developer, including those levied under the Federal Clean Water Act and the State's Porter-Cologne Water Quality Act.

Section 4.6 Cal/OSHA, Confined Space Entry. At all times during the construction of the Facilities, the Developer shall require all contractors to comply with all Cal/OSHA safety regulations including regulations concerning confined space and maintenance of a safe working environment for the County, the City, the Flood Control District and their respective employees on the site. This will include the preparation of a confined space procedure specific for all underground storm drain facilities. The procedure shall comply with requirements contained in Sections 5157 and 5158 of Title 8 of the California Code of Regulations and the Flood Control District's "Confined Space Procedure, SOM-18." The confined space procedure is to be reviewed and approved by the Flood Engineer before proceeding with construction of the Facilities.

Section 4.7 **<u>Notice of Intent to Commence Construction</u>.** Not less than twenty (20) calendar days prior to the date on which it intends to commence construction on a Facility, the Developer is to provide written "Notice of Intent" to the Flood Engineer. Construction on the Facility may not proceed until the Flood Engineer issues a "Notice to Proceed" to the Developer. The "Notice of Intent" is to include the following documents:

(a) Copies of all Licenses and Regulatory Permits secured pursuant to Sections 4.4 and 4.5, above, including a copy of the Notice of Intent ("NOI") and waste discharge identification number ("WDID No.") received from the SWRCB pursuant to Section 4.5, above.

(b) Copies of the bonds required by Section 4.3(d), above.

(c) Construction Inspection Deposit required by Section 4.3(j) above.

(d) Duly executed irrevocable offer(s) of dedication to the public for road and drainage purposes, including ingress and egress, for the rights of way deemed necessary by the County or the City, as appropriate, for the construction, inspection, operation and maintenance of the Facility.

(e) Preliminary title reports dated not more than thirty (30) days prior to date of submission for all property described in the irrevocable offer(s) of dedication.

(f) A complete list of all contractors and subcontractors to be performing work on the Facility, including the corresponding license number and license classification of each. On said list, the Developer shall also identify its designated superintendent for construction of the Facility.

(g) A construction schedule which shall show the order and dates in which the Developer and the Developer's contractor proposes to carry on the various parts of work, including estimated start and completion dates. As the construction progresses the Developer shall update said construction schedule upon request.

(h) The final mylar plan and profile sheets for the Facility and assign their ownership to the County or the City, as appropriate, prior to the start of construction of each Facility.

(i) Certificates of insurance and endorsements as required by Section 4.12., below.

(j) The confined space procedure as required by Section 4.6, above.

(k) The written designation of representative as required by Section 6.14., below, are provided to all parties to this Joint Community Facilities Agreement

Section 4.8 **<u>Bonding Requirements</u>.** The Developer or the Stockholders shall post such subdivision bonds as are required by the County in connection with the recording of all subdivision maps for each tract within the Community Facilities District. The Developer's or the Stockholders' obligations pursuant to this Section will be considered satisfied, in part, through the contract performance bonds to be provided by the Developer's contractors pursuant to Section 4.3.(d) hereof.

Section 4.9 <u>Additional Conditions to be Satisfied during Construction</u>. Construction of the Facilities shall be on a five (5) day, forty (40) hour workweek with no work on Saturday, Sundays or days designated by the Flood Control District, County, or the City as legal holidays, unless otherwise approved by the Flood Engineer and the County Engineer or the City Engineer, as appropriate. If the Developer feels it is necessary to work more than normal forty (40) hour workweek or on holidays, the Developer shall make a written request for permission from the Flood Control District and the County or the City, as appropriate, to work the additional hours. The request shall be submitted to the applicable entities at least 72 hours prior to the request date for additional work hours and state the reasons for the overtime and the specific time frames required. The decision granting permission for overtime work shall be made by the Flood Control District and the County or City, as appropriate, at their sole discretion and shall be final. If permission is granted, the Developer will be charged the cost incurred at the overtime rates for additional inspection time required in connection with the overtime work in accordance with Ordinances Nos. 671 and 749 of the County, including any amendments thereto.

Section 4.10 <u>Inspection; Completion of Construction</u>. The County Engineer or the City Engineer, as appropriate, shall have primary responsibility for providing inspection of the work of construction of the Facilities to ensure that the work of construction is accomplished in accordance with the approved Plans and Specifications. County or City staff, as appropriate, shall have access to the Construction Site at all reasonable times for the purpose of accomplishing such inspection.

The Developer is to provide the County Engineer or the City Engineer with written notice that it considers construction of a Facility to have been completed consistent with the Plans and Specifications and, upon receipt of said notice, the County or City's staff will provide written confirmation that construction of the Facility is complete consistent with the approved Plans and Specifications and the provisions of this Joint Community Facilities Agreement. Upon receipt of both written notices, the County Engineer or the City Engineer will in a timely manner notify the Developer the Flood Engineer and the Administrator that the Facility has been satisfactorily completed and that the Developer is to proceed with the recording of a Notice of Completion with respect to such construction pursuant to Section 3093 of the California Civil Code. The Developer is to provide a duplicate copy of the recorded Notice of Completion to the Administrator, the Flood Engineer and the County Engineer or the City Engineer, as appropriate. Within a reasonable time following receipt of the duplicate copy of the recorded Notice of Completion and the Developer's compliance with other provisions of Section 3.2 hereof, the County Engineer or the City Engineer will issue the written notice required by said Section 3.2 that it will accept the Facility.

Section 4.11 <u>Maintenance of Facilities; Warranties</u>. The Developer shall maintain the Facilities in good and safe condition until the Acceptance Date of the Facilities. Prior to the Acceptance Date, the Developer shall be responsible for maintaining the Facilities in proper operating condition, and shall perform such maintenance on the Facilities as the County Engineer or City Engineer, as appropriate, reasonably determines to be necessary. As of the Acceptance Date, the performance bond pursuant to Section 4.3(d) hereof shall be reduced to an amount equal to 10% of the original amount thereof and shall serve as a warranty bond to guarantee that the Facilities will be free from defects due to faulty workmanship or materials for a period of 12 months from the Acceptance Date, or the Developer may elect to provide a new warranty bond or cash in such an amount. As of the Acceptance Date, the Developer shall assign to County or the City, as appropriate, all of the Developer's rights in any warranties, guarantees, maintenance obligations or other evidence of contingent obligations of third persons with respect to the Facilities.

Upon acceptance of the road crossings of Line A at Ethanac Road, Trumble Road, and Barnett Road by the City and the County for their respective portions of said road crossing, the County shall be responsible for the maintenance of those Facilities consistent with the provisions set forth in Section 4.13., below provided that the City reimburse County for the maintenance cost for the Facilities within City's jurisdiction.

Section 4.12 **Insurance Requirements.** Without limiting or diminishing the Developer's obligation to indemnify or hold the Flood Control District, the Community Facilities District, the County and the City harmless pursuant to Section 5.5., hereof, the Developer shall procure and maintain or cause to be maintained, at its sole cost and expense the following insurance coverages, or alternate coverages acceptable to the County's Risk Manager and the City's Risk Manager, during the term of this Joint Community Facilities Agreement:

(a) *Commercial General Liability*: Commercial General Liability insurance overage, including but not limited to, premises liability, contractual liability, products and completed operations, explosion, collapse, use of cranes, and other heavy equipment and underground hazards, personal and advertising injury covering claims which may arise from or out of the Developer's performance of its obligations hereunder. Policy shall name by endorsement the Flood Control District, the Community Facilities District, the County, the City, their respective directors, officers, Board of Supervisors, City Council, Legislative Body, elected officials, employees, agents or representatives as "Additional Insureds." Policy's limit of liability shall not be less than $2,000,000 per occurrence combined single limit. If such insurance contains a general aggregate limit, it shall apply separately to this Joint Community Facilities Agreement or be no less than two (2) times the occurrence limit.

(b) *Vehicle Liability*: The Developer shall maintain liability insurance for all owned, non-owned or hired vehicles in an amount not less than $1,000,000 per occurrence combined single limit. If such insurance contains a general aggregate limit, it shall apply separately to this Joint Community Facilities Agreement or be no less than two (2) times the occurrence limit. Policy shall name by endorsement the Flood Control District, the Community Facilities District, the County, the City, their respective directors, officers, Board of Supervisors, City Council, Legislative Body, elected officials, employees, agents or representatives as "Additional Insureds."

(c) *Worker's Compensation Insurance*: The Developer shall maintain Workers' Compensation Insurance (Coverage A) as prescribed by the laws of the State of California. Policy shall include Employers' Liability (Coverage B) including Occupation Disease with limits not less than $1,000,000 per person per accident. Policy shall be endorsed to waive subrogation in favor of the Flood Control District, the Community Facilities District, the County and the City; and if applicable, to provide a Borrowed Servant/Alternate Employer Endorsement.

General Insurance Provisions - all lines:

(i) Any insurance carrier providing insurance coverage hereunder shall be admitted to the State of California and have an A.M. Best rating of not less than an

A:VIII (A:8) unless such requirements are waived, in writing, by the County's Risk Manager and the City's Risk Manager.

(ii) The Developer's insurance carrier(s) must declare its insurance deductibles or self-insured retentions. If such deductibles or self-insured retentions exceed $500,000 per occurrence such deductibles and/or retentions shall have the prior written consent of the County's Risk Manager and the City's Risk Manager before the commencement of operations under this Joint Community Facilities Agreement. Upon notification of deductibles or self-insured retentions which are deemed unacceptable to the Flood Control District, at the election of the County's Risk Manager and the City's Risk Manager, the Developer's carriers shall either: (i) reduce or eliminate such deductibles or self-insured retentions as respects this Agreement with the Flood Control District, or (ii) procure a bond which guarantees payment of losses and related investigations, claims administration, defense costs and expenses.

(iii) The Developer shall cause its insurance carrier(s) to furnish the Flood Control District, the Community Facilities District, the County, and the City with (i) a properly executed original certificate(s) of insurance and certified original copies of endorsements effecting coverage as required herein; or (ii) evidence of coverage acceptable to the County's Risk Manager and the City's Risk Manager that may include original certified copies of policies including all endorsements and all attachments thereto, showing such insurance is in full force and effect.

(iv) Further, said certificate(s) and endorsements to policies of insurance shall contain the covenant of the insurance carrier(s) that it shall provide no less than sixty (60) days written notice be given to the Flood Control District, the Community Facilities District, the County and the City prior to any material modification or cancellation of such insurance. In the event of a material modification or cancellation of coverage, this Joint Community Facilities Agreement shall terminate forthwith, unless the Flood Control District, the Community Facilities District, the County and the City receives, prior to such effective date, another properly executed original certificate of insurance and original copies of endorsements or certified original policies, including all endorsements and attachments thereto evidencing coverages and the insurance required herein is in full force and effect. Individual(s) authorized by the insurance carrier to do so on its behalf shall sign the original endorsements for each policy and the certificate of insurance.

(v) The Developer shall not commence construction of the Facilities until the Flood Control District, the Community Facilities District, the County, and the City have been furnished either original certificate(s) of insurance and certified original copies of endorsement, policies of insurance including all endorsements and any and all other attachments as required in this Section, or other evidence of coverage acceptable to County's Risk Manager and the City's Risk Manager.

(vi) It is understood and agreed by the parties hereto and the Developer's insurance company(s) that the certificate(s) of insurance and policies shall so covenant and shall be construed as primary insurance, and that the Flood Control District's, County's, and City's insurance and/or deductibles and/or self-insured retentions or self-insured programs shall not be construed as contributory.

(vii) The Developer may pass down to its principal contractors the insurance obligations contained herein and will require it principal contractors to name on their insurance policies by endorsement the Flood Control District, the Community Facilities District, the County, the City, their respective directors, officers, Board of Supervisors, City Council, Legislative Body, elected officials, employees, agents or representatives as "Additional Insureds." Copies of such certificates and endorsements shall be provided to the Flood Control District.

Section 4.13 **Ownership of Facilities.** (a) Notwithstanding the fact that some or all of the Facilities are to be constructed in dedicated street rights of way or on property which is owned by or has been or will be dedicated to the County or the City, a Facility shall be and remain the property of the Developer until Acceptable Title to parcels not owned by the County or the City, as appropriate, with respect to such Facility is conveyed to the County or the City, as appropriate, as provided herein and such Facility has been formally accepted by the County or the City, as appropriate, for ownership. Ownership of said parcels by the Developer or other third parties shall likewise not be affected by any agreement that the Developer may have entered into or may enter into with the County pursuant to the provisions of the Subdivision Map Act, Section 66410 *et seq.* of the Code and the provisions of this Section shall control.

(b) Aside from the Facilities, the remaining public improvements comprising the Project are to be owned, maintained and operated by the Flood Control District (the "Flood Control Facilities"). The County, by execution of this Agreement, grants to the Developer the right to construct the Flood Control Facilities and to the Flood Control District the right to inspect, operate and maintain the Flood Control Facilities located within those County rights-of-way in which the Flood Control Facilities are located. Nevertheless, the County may require Developer to obtain encroachment permits prior to construction.

(c) The City, by execution of this Joint Community Facilities Agreement, grants to the Developer the right to construct the Flood Control Facilities and to the Flood Control District the right to inspect, operate and maintain the Flood Control Facilities located within those City rights-of-way in which the Flood Control Facilities are located. It also grants to the County the right to inspect and maintain those portions of the road crossings of Line A at Ethanac Road, Trumble Road, and Barnett Road within City's jurisdiction. Nevertheless, the City may require Developer to obtain encroachment permits prior to construction.

(d) The County is to maintain the structural integrity of the Facilities located within its road rights-of-way and those portions of the road crossings of Line A at Ethanac Road, Trumble Road, and Barnett Road that are within the City's jurisdiction provided that the City reimburses County for the cost of maintenance of the portions of the Facilities within the City's jurisdiction and grants to the Flood Control District the right to remove silt and debris from the Facilities that are located within the County's rights-of-way.

(e) The City is to maintain the structural integrity of the Facilities located within its right-of-way and grants to the Flood Control District the right to remove silt and debris from the Facilities that are located within the City's rights-of-way.

ARTICLE V

REPRESENTATIONS, WARRANTIES AND COVENANTS; INDEMNIFICATION

Section 5.1 Representations, Warranties and Covenants of the Developer. The Developer makes the following representations, warranties and covenants for the benefit of the Flood Control District, the County and the City, as of the date hereof:

(a) Organization. The Developer represents and warrants that it is a corporation duly organized and validly existing under the laws of the State of Delaware, is in good standing under the laws of the State, and has the power and authority to carry on its business as now being conducted and as now contemplated with respect to the Facilities.

(b) Authority. The Developer represents and warrants that it has the power and authority to enter into this Joint Community Facilities Agreement, and has taken all action necessary to cause this Joint Community Facilities Agreement to be executed and delivered, and this Joint Community Facilities Agreement has been duly and validly executed and delivered on behalf of the Developer.

(c) Binding Obligation. The Developer represents and warrants that this Joint Community Facilities Agreement is a valid and binding obligation of the Developer and is enforceable against the Developer in accordance with its terms, subject to bankruptcy, insolvency, reorganization or other similar laws affecting the enforcement of creditors' rights in general and by general equity principles.

(d) Completion of the Facilities. The Developer covenants that it will use its reasonable and diligent efforts to do all commercially reasonable things that may be lawfully required of it in order to cause the Facilities to be completed in accordance with this Joint Community Facilities Agreement.

(e) Compliance with Laws. The Developer covenants that, while the Facilities are owned by the Developer or required pursuant to this Joint Community Facilities Agreement to be maintained by the Developer, it will not commit, suffer or permit any of its agents, employees or contractors to commit any act to be done in, upon or to the Facilities in violation in any material respect of any law, ordinance, rule, regulation or order of any governmental authority or any covenant, condition or restriction now or hereafter affecting the Facilities.

(f) Payment Requests. The Developer represents and warrants that (i) it will not request payment from the Community Facilities District under this Joint Community Facilities Agreement for the acquisition of any improvements that are not part of a Facility, and (ii) it will diligently follow all procedures set forth in this Joint Community Facilities Agreement and provide to the Flood Engineer all information requested by the Flood Engineer in order for the Flood Engineer to complete a Payment Request and determine the Purchase Price of a Facility.

(g) Financial Records. Until the final Acceptance Date of all Facilities, the Developer covenants to maintain proper books of record and account for the Facilities and all costs related thereto. The Developer covenants that such accounting books will be maintained in accordance with generally accepted accounting principles, and will be available for inspection by the Community Facilities District, the Flood Control District, the County, the City and their respective agents, at any reasonable time during regular business hours on two (2) Business Days' prior written notice, subject to mutually acceptable arrangements regarding the confidentiality of proprietary data.

(h) Hazardous Materials. The Developer represents and warrants that neither the Developer, nor its principal contractors or any subcontractor, agent or employee thereof will use, generate, manufacture, procure, store, release, discharge or dispose of any Hazardous Material on, under or about the Construction Site or the Facilities or transport any Hazardous Material to or from the Construction Site or the Facilities in violation of any federal, state or local law, ordinance, regulation, rule, decision or policy statement regulating Hazardous Material.

(i) Permits. The Developer covenants that it will pursue in a commercially reasonable manner all governmental or other permits or licenses required to proceed with the construction of the Facilities and that it will pay all fees relating thereto. The Developer represents and warrants that to the best of the Developer's knowledge, as of the date hereof, there is no material legal impediment to the Developer's proceeding with and completing the construction of the Facilities, except for government or other permits and licenses to be obtained.

Section 5.2 Representations, Warranties and Covenants of the Flood Control District. The Flood Control District makes the following representations, warranties and covenants for the benefit of the County, the City and the Developer:

(a) Authority. The Flood Control District represents and warrants that the Flood Control District has the power and authority to enter into this Joint Community Facilities Agreement and has taken all actions necessary to cause this Joint Community Facilities Agreement to be executed and delivered, and this Joint Community Facilities Agreement has been duly and validly executed and delivered on behalf of the Flood Control District.

(b) Binding Obligation. The Flood Control District represents and warrants that this Joint Community Facilities Agreement is a valid and binding obligation of the Flood Control District and is enforceable against the Flood Control District in accordance with its terms, subject to bankruptcy, insolvency, reorganization or other similar laws affecting the enforcement of creditors' rights in general and by general equity principles.

(c) Completion of Facilities. The Flood Control District covenants that it will use its reasonable and diligent efforts to take expeditiously all actions that may be lawfully required of it in issuing permits and processing and approving Plans and Specifications for the Facilities in accordance with this Joint Community Facilities Agreement.

(d) Payment Requests. The Flood Control District represents and warrants that it will cause the Community Facilities District to process, in a timely manner, all completed and approved Payment Requests submitted to the Administrator and follow all procedures applicable to it as set forth in this Joint Community Facilities Agreement and the Funding Agreement.

(e) Financial Records. Until the final Acceptance Date of the Project, the Flood Control District covenants to maintain, or cause to be maintained, books of record and account for the proceeds of the Bonds, levy and collection of special taxes and the payment of principal of and interest on the Bonds in accordance with the requirements of Indentures and the Act. The Flood Control District covenants that such accounting books will be maintained in accordance with generally accepted accounting principles applicable to governmental entities, and will be available for inspection by the Developer, the County, the City and its agents at any reasonable time during regular business hours on two (2) Business Days' prior written notice.

Section 5.3 Representations, Warranties and Covenants of the County. The County makes the following representations, warranties and covenants for the benefit of the Flood Control District, the City and the Developer:

(a) Authority. The County represents and warrants that the County has the power and authority to enter into this Joint Community Facilities Agreement, and has taken all action necessary to cause this Joint Community Facilities Agreement to be executed and delivered, and this Joint Community Facilities Agreement has been duly and validly executed and delivered on behalf of County.

(b) Binding Obligation. The County represents and warrants that this Joint Community Facilities Agreement is a valid and binding obligation of the County and is enforceable against the County in accordance with its terms, subject to bankruptcy, insolvency, reorganization or other similar laws affecting the enforcement of creditors' rights in general and by general equity principles.

(c) Completion of the County Facilities. The County covenants that it will use its reasonable and diligent efforts to take expeditiously all actions that may be lawfully required of it in issuing permits, processing and approving Plans and Specifications and inspecting the County Facilities in accordance with this Joint Community Facilities Agreement.

Section 5.4 Representations, Warranties and Covenants of the City. The City makes the following representations, warranties and covenants for the benefit of the Flood Control District, the County and the Developer:

(a) Authority. The City represents and warrants that the City has the power and authority to enter into this Joint Community Facilities Agreement, and has taken all action necessary to cause this Joint Community Facilities Agreement to be executed and delivered, and this Joint Community Facilities Agreement has been duly and validly executed and delivered on behalf of City.

(b) Binding Obligation. The City represents and warrants that this Joint Community Facilities Agreement is a valid and binding obligation of the City and is enforceable against the City in accordance with its terms, subject to bankruptcy, insolvency, reorganization or other similar laws affecting the enforcement of creditors' rights in general and by general equity principles.

(c) Completion of the City Facilities. The City covenants that it will use its reasonable and diligent efforts to take expeditiously all actions that may be lawfully required of it in issuing permits, processing and approving Plans and Specifications and inspecting the City Facilities in accordance with this Joint Community Facilities Agreement.

Section 5.5 The Developer Indemnification. The Developer agrees to protect, indemnify, defend and hold the Flood Control District, the Community Facilities District, the County, the City and their respective directors, officers, Board of Supervisors, City Council, Legislative Body, elected officials, employees, representatives and agents (the "Indemnified Parties"), and each of them, harmless from and against any and all claims, losses, liabilities, expenses, suits, actions, decrees, judgments, awards, reasonable attorney's fees, and court costs which the Indemnified Parties, or any combination thereof, may suffer or which may be sought against or recovered or obtained from the Indemnified Parties, or any combination thereof, as a result of or by reason of or arising out of or in consequence of (a) the approval of this Joint Community Facilities Agreement, (b) the acquisition, construction, or installation of the Facilities, (c) the design, construction, or failure of the Facilities, (d) the untruth or inaccuracy of any representation or warranty made by the Developer in this Joint Community Facilities Agreement or in any certifications delivered by the Developer hereunder, or (e) any act or omission of the Developer or any of its contractors, subcontractors, or their respective officers, employees or agents, in connection with the Facilities or its responsibilities or obligations under this Agreement. If the Developer fails to do so, the Indemnified Parties, or each of them, shall have the right, but not the obligation, to defend the same and charge all of the direct or incidental costs of such defense, including reasonable attorney's fees or court costs, to and recover the same from the Developer.

No indemnification is required to be paid by the Developer as to an Indemnified Party for any claims, losses, liabilities, expenses, suits, actions, decrees, judgments, awards, reasonable attorney's fees, and court costs (a) arising directly from the willful misconduct or sole or active negligence of that Indemnified Party or (b) arising from the use or operation of a Facility after the Acceptance Date of the Facility, unless such claim, loss or expense results from the defective or improper design, construction or installation of such Facility by the Developer or its contractors, subcontractors, or respective officers, employees or agents.

The provisions of this Section shall survive the termination of this Joint Community Facilities Agreement.

Section 5.6 Mutual Indemnification. In contemplation of the provisions of Section 895.2 of the California Government Code (the "Code") imposing certain tort liability jointly upon public entities solely by reason of such entities being parties to an agreement as defined by Section 895 of the Code, the Flood Control District, the County, and the City, pursuant to the authorization contained in Section 895.4 and 895.6 of the Code, agree that each of the Flood Control District, the County, and the City shall be individually liable for any damages including, but not limited to, claims, demands, losses, liabilities, costs and expenses including reasonable attorneys fees resulting from the negligent or wrongful acts or omissions of their respective employees or agents in the performance of this Joint Community Facilities Agreement; and each of the Flood Control District, the County, and the City shall indemnify defend and hold harmless the others from such claims, demands, damages, losses or liabilities resulting the negligent or wrongful acts or omissions of its respective employees or agents.

The provisions of this Section shall survive the termination of this Joint Community Facilities Agreement.

ARTICLE VI

MISCELLANEOUS

Section 6.1 **<u>The Developer as Independent Contractor</u>.** In performing under this Joint Community Facilities Agreement, it is understood that the Developer is acting as an independent contractor, and not as an agent of the Flood Control District, the Community Facilities District, the County or the City. Neither the Flood Control District, the County nor the City shall have any responsibility for payment to any contractor, subcontractor or supplier of the Developer. The Community Facilities District shall not have any responsibility for payment to any contractor, subcontractor or supplier of the Developer unless such entity or individual is specifically listed as a payee on a Payment Request submitted by the Developer pursuant to this Joint Community Facilities Agreement in which case the Community Facilities District shall be responsible for making such payment only if such Payment Request is approved pursuant to the provisions of this Joint Community Facilities Agreement and only from funds available in the applicable Improvement Fund.

Section 6.2 **<u>Other Agreements</u>.** Nothing contained herein shall be construed as affecting the Flood Control District, County, the City or the Developer's respective duty to perform its respective obligations under other agreements, land use regulations or subdivision requirements relating to the development of Property, which obligations are and shall remain independent of the Flood Control District's rights and obligations, the County's rights and obligations, the City's rights and obligations and the Developer's rights and obligations under this Joint Community Facilities Agreement; provided, however, that the Developer shall use its reasonable and diligent efforts to perform each and every covenant to be performed by it under any lien or encumbrance, instrument, declaration, covenant, condition, restriction, license, order, or other agreement, the nonperformance of which could reasonably be expected to materially and adversely affect the acquisition, construction and installation of the Facilities.

Section 6.3 **<u>Binding on Successors and Assigns</u>.** Neither this Joint Community Facilities Agreement nor the duties and obligations of the Developer hereunder may be assigned to any person or legal entity other than an affiliate of the Developer without the written consent of the Flood Control District, the Community Facilities District, the County and the City which consent shall not be unreasonably withheld or delayed. Neither this Joint Community Facilities Agreement nor the duties and obligations of the Flood Control District, the Community Facilities District, the County or the City hereunder may be assigned to any person or legal entity, without the written consent of the Developer, which consent shall not be unreasonably withheld or delayed. The agreements and covenants included herein shall be binding on and inure to the benefit of any partners, permitted assigns, and successors-in-interest of the parties hereto.

Section 6.4 **<u>Amendments</u>.** This Joint Community Facilities Agreement can only be amended by an instrument in writing executed and delivered by the Flood Control District, the County, the City and the Developer, except that no amendment is required for transfer of title to a purchaser of an individual dwelling unit.

Section 6.5 **Waivers.** No waiver of, or consent with respect to, any provision of this Joint Community Facilities Agreement by a party hereto shall in any event be effective unless the same shall be in writing and signed by such party, and then such waiver or consent shall be effective only in the specific instance and for the specific purpose for which it was given.

Section 6.6 **No Third Party Beneficiaries.** Other than the Community Facilities District when formed, no person or entity shall be deemed to be a third party beneficiary hereof, and nothing in this Joint Community Facilities Agreement (either expressed or implied) is intended to confer upon any person or entity, other than the Flood Control District, the Community Facilities District, the County, the City and the Developer (and its respective successors and assigns), any rights, remedies, obligations or liabilities under or by reason of this Joint Community Facilities Agreement.

Section 6.7 **Notices.** Any written notice, statement, demand, consent, approval, authorization, offer, designation, request or other communication to be given hereunder shall be given to the party entitled thereto at its address set forth below, or at such other address as such party may provide to the other party in writing from time to time, namely:

Flood Control District:	Riverside County Flood Control and Water Conservation District Attn: Administrative Services 1995 Market Street Riverside, California 92501 Telephone: (951) 955-1200 Fax: (951) 955-788-9965
County:	Director of Transportation County of Riverside 4080 Lemon Street, 8th Floor Riverside, California 92501 Telephone: (951) 955-6740 Fax: (951) 955-3198
City:	City Engineer City of Perris 101 N. "D" Street Perris, California 92570 Telephone: (951) 956-2120 Fax: (951) 956-2931
Developer:	Homeland/Romoland ADP Inc Attn: Dennis Chapman 1522 Brookhollow Drive, Suite 1 Santa Ana, California 92705 Telephone: (714) 979-2456 Facsimile: (714) 241-5937

Each such notice, statement, demand, consent, approval, authorization, offer, designation, request or other communication hereunder shall be deemed delivered to the party to whom it is addressed (a) if personally served or delivered, upon delivery, (b) if given by electronic communication, whether by telex, telegram or telecopier, upon the sender's receipt of a document confirming satisfactory transmission, (c) if given by registered or certified mail, return receipt requested, deposited with the United States mail postage prepaid, 72 hours after such notice is deposited with the United States mail, (d) if given by overnight courier, with courier charges prepaid, 24 hours after delivery to said overnight courier, or (e) if given by any other means, upon delivery at the address specified in this Section.

Section 6.8 **Jurisdiction and Venue.** Each of the Flood Control District, the Community Facilities District, the County, the City and the Developer (a) agrees that any suit action or other legal proceeding arising out of or relating to this Joint Community Facilities Agreement shall be brought in state or local court in the County of Riverside or in the Courts of the United States of America in the district in which said County is located, (b) consents to the jurisdiction of each such court in any suit, action or proceeding, and (c) waives any objection that it may have to the laying of venue or any suit, action or proceeding in any of such courts and any claim that any such suit, action or proceeding has been brought in an inconvenient forum. Each of the Flood Control District, the Community Facilities District, the County, the City and the Developer agrees that a final and non-appealable judgment in any such action or proceeding shall be conclusive and may be enforced in other jurisdictions by suit on the judgment or in any other manner provided by law.

Section 6.9 **Attorneys' Fees.** If any action is instituted to interpret or enforce any of the provisions of this Joint Community Facilities Agreement, the party prevailing in such action shall be entitled to recover from the other parties thereto reasonable attorney's fees and costs of such suit (including both prejudgment and postjudgment fees and costs) as determined by the court as part of the judgment.

Section 6.10 **Governing Law.** This Joint Community Facilities Agreement and any dispute arising hereunder shall be governed by and interpreted in accordance with the laws of the State applicable to contracts made and performed in the State.

Section 6.11 **Usage of Words.** As used herein, the singular of any word includes the plural, and terms in the masculine gender shall include the feminine.

Section 6.12 **Counterparts.** This Joint Community Facilities Agreement may be executed in counterparts, each of which shall be deemed an original.

Section 6.13 **Interpretation.** The parties to this Joint Community Facilities Agreement and their counsel have reviewed and revised this Joint Community Facilities Agreement, and the normal rule of construction to the effect that any ambiguities in an agreement are to be resolved against the drafting parties shall not be employed in the interpretation of this Joint Community Facilities Agreement.

Section 6.14 **Designation of Party's Representative.** Each party is to prepare a certificate designating the person or persons that are to serve as the liaison between the Flood Control District, the Community Facilities District, the County and the City regarding design, engineering and construction of the Facilities. The certificates are to contain an original and specimen signature of each designated person. The certificates are to be provided to the Flood

Control District, the Community Facilities District, the County and the City at the time the Notice of Intent, as required by Section 4.7., above, is submitted to the Flood Engineer.

Section 6.15. Nature of Agreement; Allocation of Special Taxes. This Joint Community Facilities Agreement shall constitute a joint community facilities agreement entered into pursuant to Sections 53316.2, 53316.4 and 53316.6 of the Code. The entire amount of the proceeds of the special taxes levied pursuant to each Rate and Method shall be allocated and distributed to the Community Facilities District.

[Balance of Page Intentionally Left Blank]

IN WITNESS WHEREOF, the parties hereto have executed this Joint Community Facilities Agreement as of the day and year first hereinabove written.

RECOMMEND FOR APPROVAL:

By: ______________________
WARREN D. WILLIAMS
General Manager-Chief Engineer

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

By: ______________________
JEFF STONE
Vice-Chairman, Board of Supervisors of the Flood Control and Water Conservation District

ATTEST:
NANCY ROMERO, Clerk to the
Riverside County Flood Control and
Water Conservation District Board of Supervisors

By: ______________________
Deputy Clerk

APPROVED AS TO FORM:
JOE S. RANK,
County Counsel

By: ______________________
Deputy County Counsel

RECOMMEND FOR APPROVAL:

Juan C. Perez
Deputy Director of Transportation
By: ______________________ for
GEORGE A. JOHNSON
Director of Transportation

COUNTY OF RIVERSIDE

By ______________________
JOHN TAVAGLIONE
Chairman, Board of Supervisors

ATTEST:
NANCY ROMERO, Clerk to the
Board of Supervisors

By: ______________________
Deputy Clerk

[Signatures continued on next page.]

DEC 1 8 2007 11.2

CITY OF PERRIS

By: Daryl R. Busch

DARYL R. BUSCH
Mayor

ATTEST:

By: Judy L. Haughney

JUDY L. HAUGHNEY
City Clerk

APPROVED AS TO FORM:

By: ________________________

ERIC L. DUNN
City Attorney

HOMELAND/ROMOLAND ADP INC,
a Delaware corporation

By: ______________________

Name: Dennis J Chapman

Title: President

EXHIBIT A

Proposed Boundary Map of
Community Facilities District No. 05-1 (Homeland/Romoland)
of the Riverside County Flood Control and Water Conservation District

BOUNDARIES
COMMUNITY FACILITIES DISTRICT NO. F05-1
(HOMELAND / ROMOLAND)

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

FILED IN THE OFFICE OF THE CLERK OF THE BOARD OF SUPERVISORS OF RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT THIS _____ DAY OF __________ 2006.

____
CLERK OF THE BOARD OF SUPERVISORS OF RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

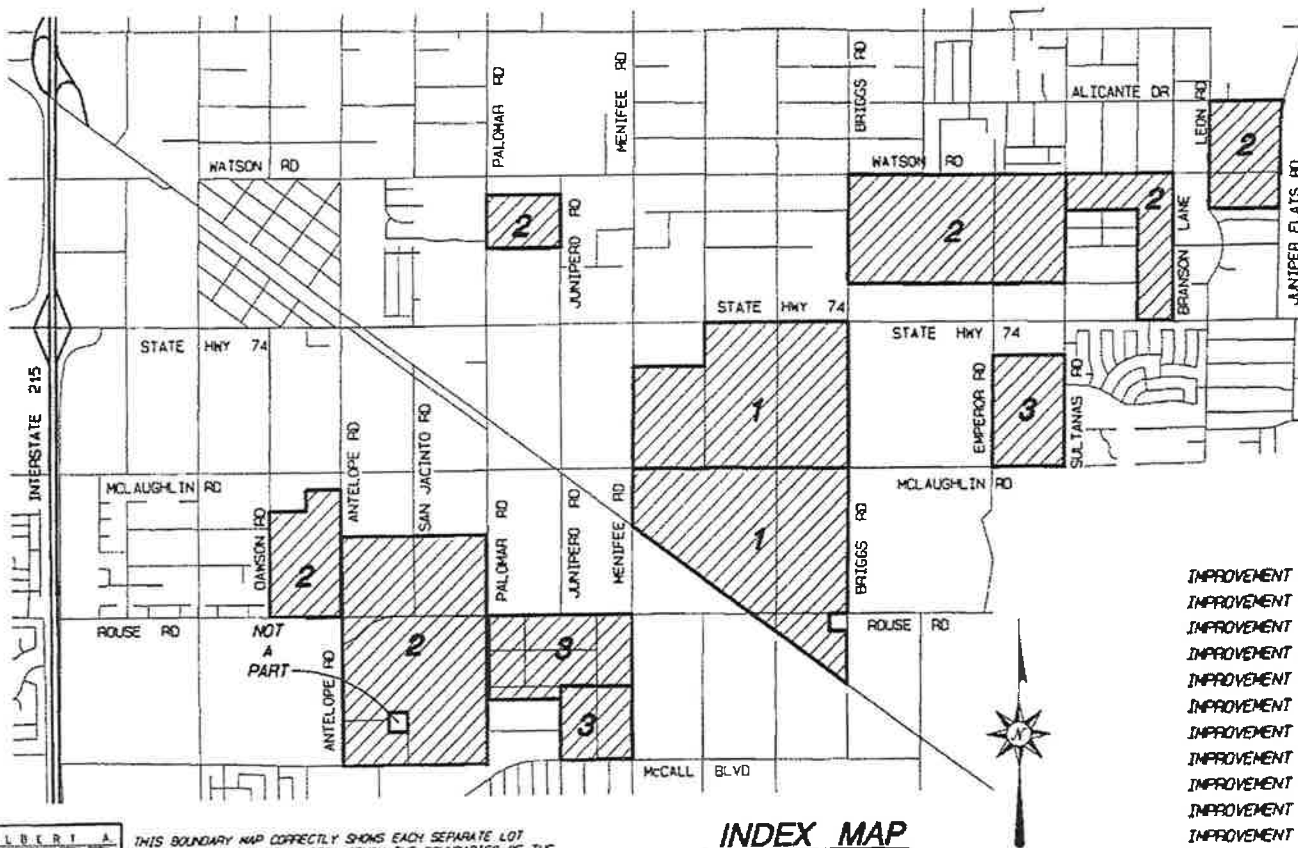
RECORDED THIS _____ DAY OF __________, 2006, AT THE HOUR OF ___ O'CLOCK __M., IN BOOK ______ OF PAGE _____ OF MAPS OF ASSESSMENT AND COMMUNITY FACILITIES DISTRICTS IN THE OFFICE OF THE COUNTY RECORDER IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA.
FEE: ________ DOCUMENT NO. ________

LARRY W. WARD, RIVERSIDE COUNTY ASSESSOR-CLERK-RECORDER

BY: ______________________________
DEPUTY

I HEREBY CERTIFY THAT THE WITHIN MAP SHOWING PROPOSED BOUNDARIES OF COMMUNITY FACILITIES DISTRICT NO. F05-1, (HOMELAND/ROMOLAND) OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, WAS APPROVED BY THE BOARD OF SUPERVISORS AT A REGULAR MEETING THEREOF, HELD ON THE _____ DAY OF __________, 2006 BY ITS RESOLUTION NO. ________

____
CLERK OF THE BOARD OF SUPERVISORS OF RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT



INDEX MAP
NOT TO SCALE

LEGEND

DISTRICT BOUNDARY

2 IMPROVEMENT AREA NO.

SHEET 1 - INDEX MAP
IMPROVEMENT AREA 1 - SHEET 2 - MINOR RANCH TT-31811
IMPROVEMENT AREA 1 - SHEET 2 - MINOR RANCH TT-31812
IMPROVEMENT AREA 2 - SHEET 2 - R & D LAND INVESTORS
IMPROVEMENT AREA 2 - SHEET 2 - R & D LAND INVESTORS
IMPROVEMENT AREA 2 - SHEET 3 - R & D LAND INVESTORS
IMPROVEMENT AREA 3 - SHEET 3 - EMPEROR ESTATES
IMPROVEMENT AREA 2 - SHEET 3 - FIESTA
IMPROVEMENT AREA 2 - SHEET 3 - FIESTA
IMPROVEMENT AREA 2 - SHEET 4 - ASHBY
IMPROVEMENT AREA 3 - SHEET 4 - McCALL 71 LLC
IMPROVEMENT AREA 3 - SHEET 4 - FIDELITY AND RANCON

ALBERT A. WEBB ASSOCIATES ENGINEERING CONSULTANTS

THIS BOUNDARY MAP CORRECTLY SHOWS EACH SEPARATE LOT OR PARCEL OF LAND INCLUDED WITHIN THE BOUNDARIES OF THE COMMUNITY FACILITIES DISTRICT. FOR DETAILS CONCERNING THE LINES AND DIMENSIONS OF LOTS OR PARCELS REFER TO THE COUNTY ASSESSOR'S MAPS FOR FISCAL YEAR 2005-2006.

W.O. 05-0360

BOUNDARIES
COMMUNITY FACILITIES DISTRICT NO. F05-1
(HOMELAND/ROMOLAND)
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

LEGEND

DISTRICT BOUNDARY

123-123-123 ASSESSMENT PARCEL NUMBER

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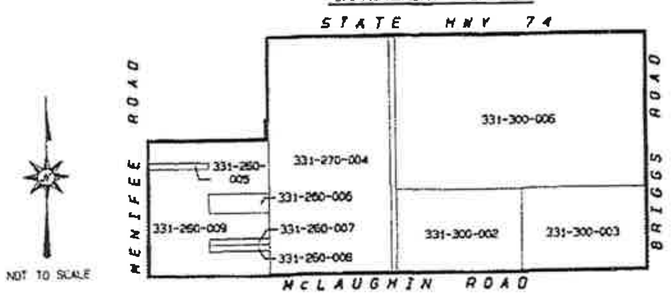

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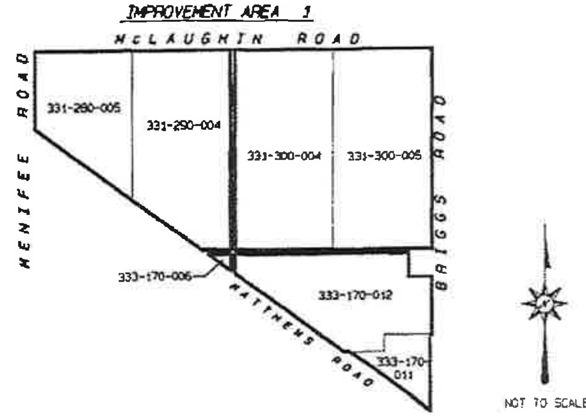

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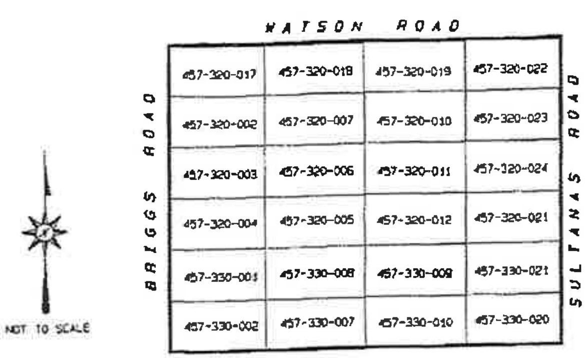

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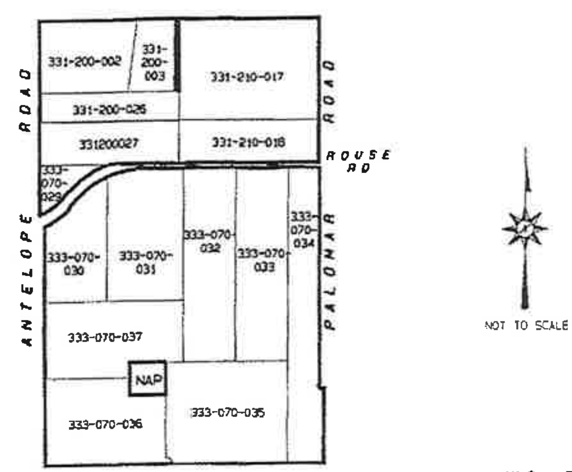

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W.O. 05-0360

BOUNDARIES
COMMUNITY FACILITIES DISTRICT NO. F05-1
(HOMELAND / ROMOLAND)
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

LEGEND

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123-123-123	ASSESSMENT PARCEL NUMBER

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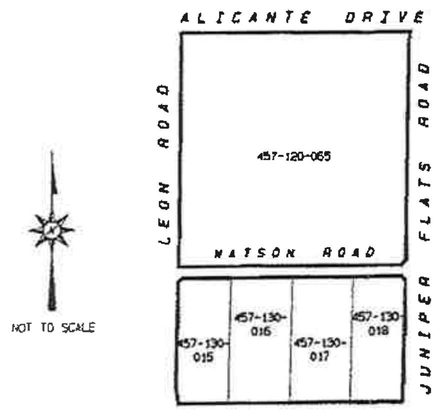

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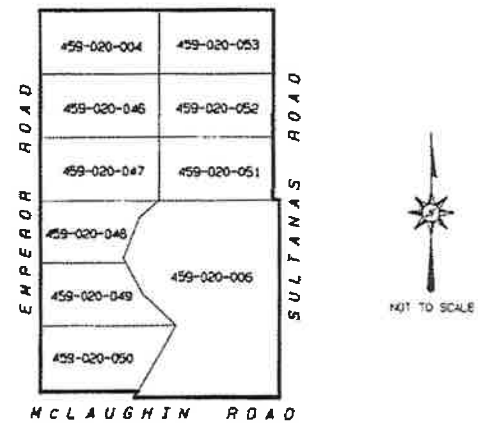

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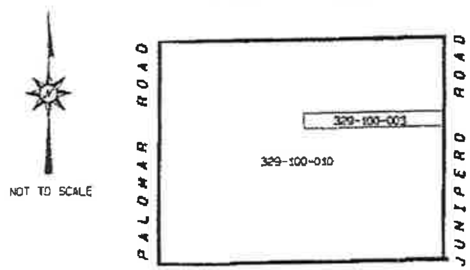

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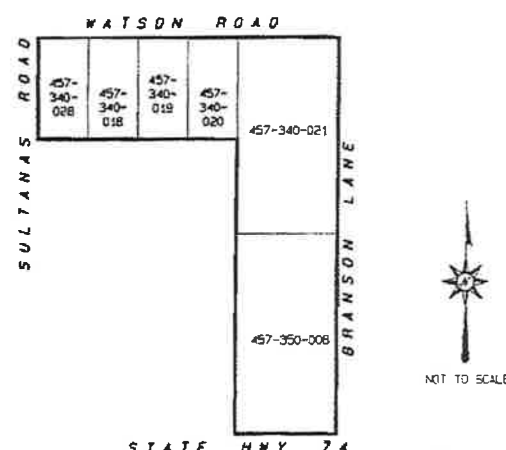

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W.O. 05-0360

BOUNDARIES
COMMUNITY FACILITIES DISTRICT NO. F05-1
(HOMELAND / ROMOLAND)
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

LEGEND

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123-123-123	ASSESSMENT PARCEL NUMBER

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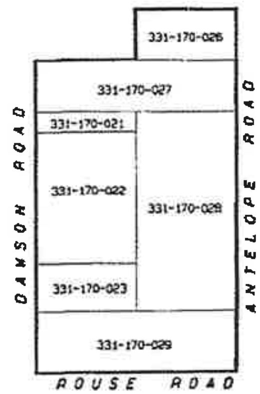

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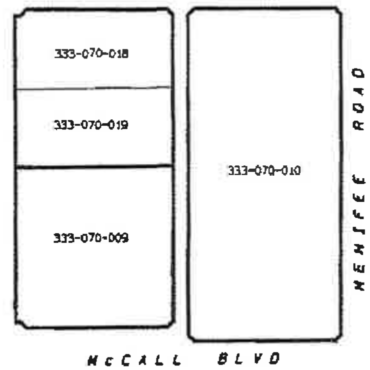
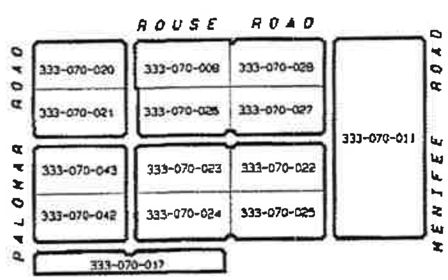


NOT TO SCALE

IMPROVEMENT AREA 3



NOT TO SCALE

ALBERT WEBB ASSOCIATES ENGINEERING CONSULTANTS

THIS BOUNDARY MAP CORRECTLY SHOWS EACH SEPARATE LOT OR PARCEL OF LAND INCLUDED WITHIN THE BOUNDARIES OF THE COMMUNITY FACILITIES DISTRICT. FOR DETAILS CONCERNING THE LINES AND DIMENSIONS OF LOTS OR PARCELS REFER TO THE COUNTY ASSESSOR'S MAPS FOR FISCAL YEAR 2005-2006.

W.O. 05-0360

EXHIBIT B

COUNTY AND CITY FACILITIES

Community Facilities District No. F05 -1 (Homeland/Romoland) of the Riverside County Flood Control and Water Conservation District

<u>Line A</u>:

City Facilities:

- Murrieta Road: Line A crossing of Murrieta Road is an 11'H x 14'W 4-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 128'.

- Encanto Drive: Line A crossing of Encanto Drive is a 10.75'H x 12'W 4-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 118'.

Facilities within the jurisdiction of both the City and the County

- Ethanac Road: Line A crossing of Ethanac Road is an 11'H x 14'W 4-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for the road width of 184'.

- Trumble Road: Line A crossing of Trumble Road is a 7.5'H x 12'W 4-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 60'.

- Barnett Road: Line A crossing of Barnett Road is a 10'H x 14'W 4-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 100'.

County Facilities:

- Sherman Road: Line A crossing of Sherman Road is a 7.5'H x 12'W 4-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 118'.

- Dawson Road: Line A crossing of Dawson Road is a 7.5'H x 14'W 3-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 60'.

- Antelope Road: Line A crossing of Antelope Road is an 8'H x 14'W 3-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 100'.

- San Jacinto Road: Line A crossing of San Jacinto Road is a 7.5'H x 14'W 3-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 60'.

Line 1:

County Facilities:

[None]

Line A-2:

County Facilities:

- Rouse Road: Line A-2 crossing of Rouse Road is a 6'H x 10'W 2-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 118'.

- Palomar Road: Line A-2 crossing of Palomar Road is a 6'H x 8'W single-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 60'.

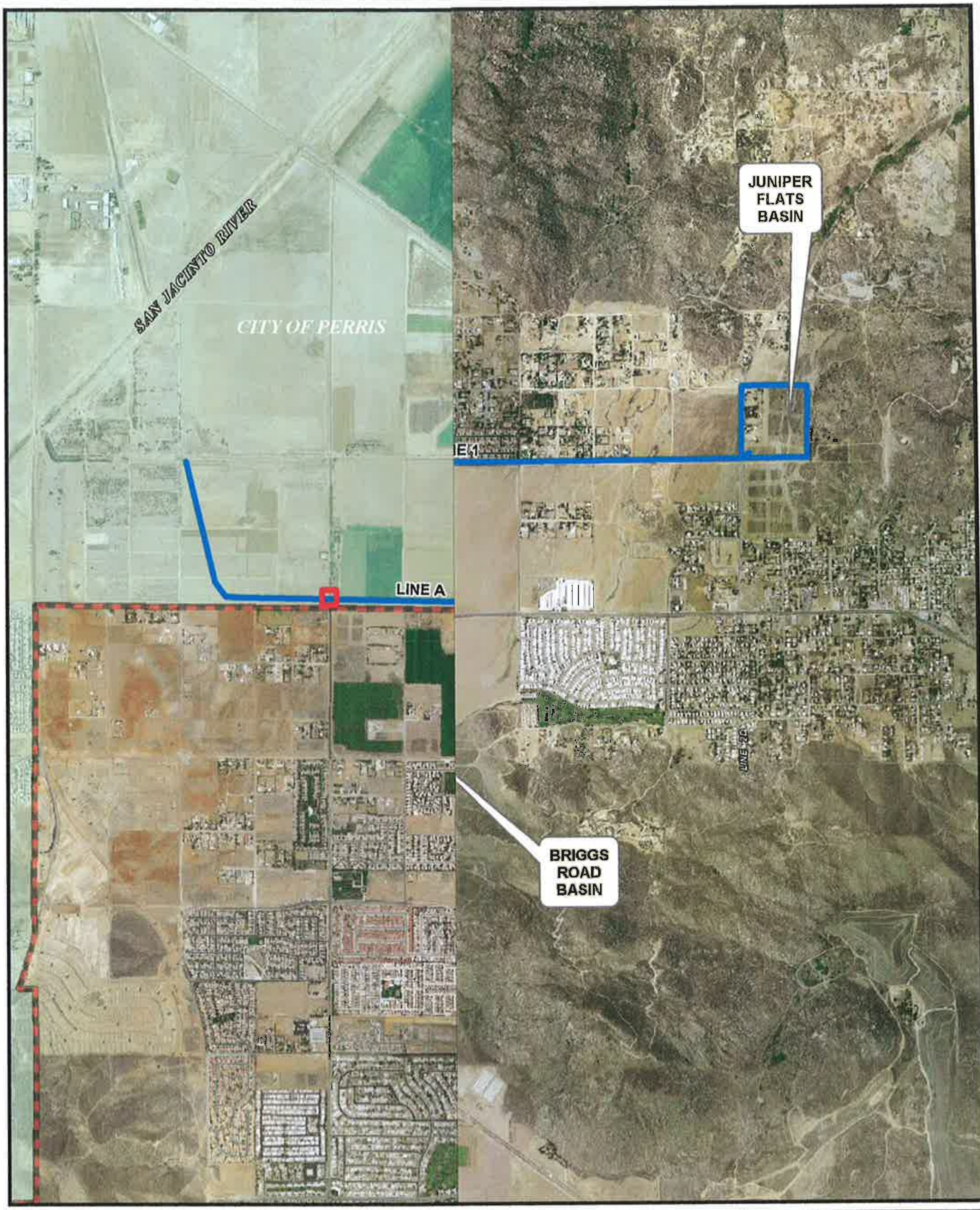
- "V" Street: Line A-2 crossing of "V" Street is a 6'H x 10'W 2-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 56'.

- "J" Street: Line A-2 crossing of "J" Street is a 7'H x 10'W 1-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 56'.

Line A-3:

County Facilities:

- Malaga Road: Line A-3 crossing of Malaga Road is a 5'H x 10'W single-cell reinforced concrete box culvert. The road crossing is to accommodate a right-of-way for a road width of 100'.



Source: AirPhoto USA
February 2004

N
W E
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Phase 1 Street Crossing Exhibit

Romoland / Homeland MDP/ADP

ALBERT A. WEBB ASSOCIATES
ENGINEERING CONSULTANTS

G:\2003\03-0141\Gis\drainageEIR_fig_I-2-D.mxd; Map revised A

EXHIBIT C

PAYMENT BOND

(Public Work - Civil Code Section 3247 *et seq.*)

The makers of this Bond are ____________________ as Principal and Original Contractor and ____________________________, a corporation, authorized to issue Surety Bonds in California, as Surety, and this Bond is issued in conjunction with that certain public works contract dated as of ________, 2007, between Principal, ___________________________, as owner, for ______________________________ dollars ($ __________) the total amount payable. THE AMOUNT OF THIS BOND IS 100% OF SAID SUM. Said contract is for public work of those certain _________________________________as defined and described in said agreement entitled: "Joint Community Facilities Agreement by and among Riverside County Flood Control and Water Conservation District, County of Riverside, City of Perris, and Homeland/Romoland ADP Inc, a Delaware corporation" dated as of _________, 2007.

The beneficiaries of this Bond are as is stated in 3248 of the Civil Code and the requirements and conditions of this Bond are as is set forth in Sections 3248, 3249, 3250 and 3252 of said Code. Without notice, Surety consents to extension of time for performance, change in requirements, amount of compensation, or prepayment under said Contract.

Signed and Sealed this _________________Day of _____________200___

____

(Firm Name - Principal)

____ Affix Seal

(Business Address) if
Corporation

By: ____
(Signature - Attach Notary's Acknowledgment)

____

(Title)

____

(Corporation Name - Surety)

____Affix

(Business Address) Corporate
Seal

By: ____
(Signature - Attached Notary's Acknowledgment)

ATTORNEY-IN-FACT
(Title-Attach Power of Attorney)

PERFORMANCE BOND

The makers of this Bond, ________________________________as Principal, and ____________________________________ as Surety, are held and firmly bound unto ________________________, hereinafter called the Owner and to the County of Riverside, the City of Perris, the Riverside Flood Control and Water Conservation District, and Community Facilities District No. 05-1 (Homeland/Romoland) of the Riverside County Flood Control and Water Conservation District as additional obligees, in the sum of ______________________________Dollars ($__________) for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

The condition of this obligation is such, that whereas the Principal entered into a certain contract, hereto attached, with the Owner, dated as of __________, 2007 for those certain ________________________________as defined and described in said agreement entitled: "Joint Community Facilities Agreement by and among Riverside County Flood Control and Water Conservation District, County of Riverside, City of Perris, and Homeland/Romoland ADP Inc, a Delaware corporation" dated as of ________, 2007.

Now therefore, if the Principal shall well and truly perform and fulfill all the undertakings covenants, terms, conditions and agreements of said Contract during the original term of said Contract and any extension thereof that may be granted by the Owner, with or without notice to the Surety, and during the file of any guarantee required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may thereafter be made, then this obligation to be void, otherwise to remain in full force and virtue. Without notice, Surety consents to extension of time for performance, change in requirements, change in compensation or prepayment under said Contract.

Signed and Sealed this _______________ Day of _____________, 200___

____
(Firm Name - Principal)

____ Affix Seal
(Business Address)if Corporation

By: ____
(Signature - Attach Notary's Acknowledgment)

____
(Title)

____
(Corporation Name - Surety)

____Affix
(Business Address) Corporate
Seal
By: ____
(Signature - Attach Notary's Acknowledgment)

ATTORNEY-IN-FACT
(Title-Attach Power of Attorney)

EXHIBIT D

FORM OF PAYMENT REQUEST

Community Facilities District No. 05-1 (Homeland/Romoland) of Riverside County Flood Control and Water Conservation District

____________________, hereby requests payment of the Purchase Price for the Facility described in Attachment A attached hereto. Capitalized undefined terms shall have the meanings ascribed thereto in the Joint Communities Facilities Agreement, dated as of _____________, 2007 (the "Joint Community Facilities Agreement"), by and among Riverside County Flood Control and Water Conservation District, a public agency organized and existing pursuant to Chapter 48 of the Appendix to the California Water Code (the "Flood Control District"), County of Riverside, a public subdivision of the State of California (the "County"), City of Perris, an incorporated municipality (the "City") and Homeland/Romoland ADP Inc, a Delaware corporation (the "Developer"). In connection with this Payment Request, the undersigned hereby represents and warrants to the Contract Administrator as follows:

1. The undersigned has been authorized by the Developer and is qualified to execute this request for payment on behalf of the Developer and is knowledgeable as to the matters set forth herein.

2. The Developer has submitted or submits herewith to the Flood Control Engineer and the County/City Engineer as-built drawings or similar Plans and Specifications for the Facility for which payment is requested, and such drawings or plans and specifications, as applicable, are true, correct and complete.

3. The Facility has been constructed in accordance with the Plans and Specifications therefor, and in accordance with all applicable standards and the requirements of the Joint Community Facilities Agreement, and the as-built drawings or similar Plans and Specifications referenced in paragraph 2 above.

4. There has not been filed with or served upon the Developer notice of any lien, right to lien or attachment upon, or claim affecting the right to receive the payment requested herein which has not been released or will not be released simultaneously with the payment of such obligation, other than material men's or mechanics' liens accruing by operation of law. Copies of lien releases for all work for which payment is requested hereunder are attached hereto.

5. The representations and warranties of the Developer set forth in Section 5.1 of the Joint Community Facilities Agreement are true and correct on and as of the date hereof with the same force and effect as if made on and as of the date hereof.

I hereby declare under penalty of perjury that the above representations and warranties are true and correct.

Date: ______________ Developer

By: ________________________________
Authorized Representative

ATTACHMENT A
PAYMENT REQUEST - ACTUAL COSTS

Developer is to complete Columns 1 through 7

CFD/Improvement Area/Tract Number: ______________________

Facility Description: ______________________

1 Bid Item No.	2 Bid Item Description	3 Unit of Measure	4 Unit Price	5 Original Contract Quantity	6 Quantity Invoiced	7 Amount Invoiced	8 Quantity Calculated By Flood District	9 Amount Calculated By Flood District	10 Difference	11 Actual Cost
1			0.00	0	0	0.00	0	0.00	0.00	
2			0.00	0	0	0.00	0	0.00	0.00	
3			0.00	0	0	0.00	0	0.00	0.00	
4			0.00	0	0	0.00	0	0.00	0.00	
5			0.00	0	0	0.00	0	0.00	0.00	
6			0.00	0	0	0.00	0	0.00	0.00	
7			0.00	0	0	0.00	0	0.00	0.00	
8			0.00	0	0	0.00	0	0.00	0.00	
9			0.00	0	0	0.00	0	0.00	0.00	
10			0.00	0	0	0.00	0	0.00	0.00	
11			0.00	0	0	0.00	0	0.00	0.00	
12			0.00	0	0	0.00	0	0.00	0.00	
13			0.00	0	0	0.00	0	0.00	0.00	
14			0.00	0	0	0.00	0	0.00	0.00	
15			0.00	0	0	0.00	0	0.00	0.00	
16			0.00	0	0	0.00	0	0.00	0.00	
17			0.00	0	0	0.00	0	0.00	0.00	
18			0.00	0	0	0.00	0	0.00	0.00	
19			0.00	0	0	0.00	0	0.00	0.00	
20			0.00	0	0	0.00	0	0.00	0.00	
				Total:		0.00		0.00	0.00	
				Amount Requested:		______		______	______	

APPROVAL BY THE FLOOD ENGINEER

The Flood Engineer confirms that the Facility described in Attachment A-1 has been constructed in accordance with the Plans and Specifications therefor. The Actual Cost of each Facility as described in Attachment A-1 has been reviewed, verified and approved by the Flood Engineer. The Purchase Price for said Facility is established at $____________. Payment of the Purchase Price for the Facility is hereby approved.

Date: __________________________

FLOOD ENGINEER

By: ______________________________

ATTACHMENT A-1
PAYMENT REQUEST - ACTUAL COSTS

Contract Administrator to complete Columns 8 through 11

CFD/Improvement Area/Tract Number: ______________________

Facility Description: ______________________

1 Bid Item No.	2 Bid Item Description	3 Unit of Measure	4 Unit Price	5 Original Contract Quantity	6 Quantity Invoiced	7 Amount Invoiced	8 Quantity Calculated By Flood District	9 Amount Calculated By Flood District	10 Difference	11 Actual Cost
1			0.00	0	0	0.00	0	0.00	0.00	
2			0.00	0	0	0.00	0	0.00	0.00	
3			0.00	0	0	0.00	0	0.00	0.00	
4			0.00	0	0	0.00	0	0.00	0.00	
5			0.00	0	0	0.00	0	0.00	0.00	
6			0.00	0	0	0.00	0	0.00	0.00	
7			0.00	0	0	0.00	0	0.00	0.00	
8			0.00	0	0	0.00	0	0.00	0.00	
9			0.00	0	0	0.00	0	0.00	0.00	
10			0.00	0	0	0.00	0	0.00	0.00	
11			0.00	0	0	0.00	0	0.00	0.00	
12			0.00	0	0	0.00	0	0.00	0.00	
13			0.00	0	0	0.00	0	0.00	0.00	
14			0.00	0	0	0.00	0	0.00	0.00	
15			0.00	0	0	0.00	0	0.00	0.00	
16			0.00	0	0	0.00	0	0.00	0.00	
17			0.00	0	0	0.00	0	0.00	0.00	
18			0.00	0	0	0.00	0	0.00	0.00	
19			0.00	0	0	0.00	0	0.00	0.00	
20			0.00	0	0	0.00	0	0.00	0.00	
				Total:		0.00		0.00	0.00	
				Amount Requested:		______		______	______	

City of Ontario

Final Report

Urban Water Management Plan

December 2005

MWH

CITY OF ONTARIO

Urban Water Management Plan

FINAL REPORT

December 2005

MWH

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List of Abbreviations

To conserve space and improve readability, abbreviations have been used in this report. Each abbreviation has been spelled out in the text the first time it is used. Subsequent usage of the term is usually identified by its abbreviation. The abbreviations used are as follows:

List of Abbreviations

Abbreviation	Description
acre-ft/yr	acre-feet per year
AFY	acre-feet per year
Act	Urban Water Management Planning Act (Water Code Section 10610-10656)
ADD	Average Day Demand
BMP's	Best Management Practices
CBWM	Chino Basin Watermaster
CCI	Construction Cost Index
CDA	Chino Basin Desalter Authority
CDA-I	Chino Desalter No. 1 (located in the City of Chino)
CDA-II	Chino Desalter No. 2 (located in JCSD)
CDA-III	Chino Desalter No. 3 (no location)
City	City of Ontario
CII	Commercial-Industrial-Institutional
CIP	Capital Improvement Program
CUWCC	California Urban Water Conservation Council
CVWD	Cucamonga Valley Water District
DMM	Demand Management Measures
du	dwelling unit
DWR	California State Department of Water Resources
DYY	Dry Year Yield
ENR	Engineering News Record
ERP	Emergency Response Plan
ft/s	feet per second
FWC	Fontana Water Company
FY	Fiscal Year
GP	General Plan
gpd	gallons per day
gpd/cap	gallons per day per capita
FY	Fiscal Year
HDR	High Density Residential
HECW	High Efficiency Clothes Washers
HGL	Hydraulic Grade Line
IEUA	Inland Empire Utilities Agency
INF	Infrastructure
IRP	Integrated Resources Plan
JCSD	Jurupa Community Services District
LDR	Low Density Residential
MDD	Maximum Day Demand
MDR	Medium Density Residential

List of Abbreviations (Continued)

MFR	Multi Family Residential
MOU	Memorandum of Understanding regarding water conservation in California
MWD	Metropolitan Water District of Southern California
MVWD	Monte Vista Water District
NMC	New Model Colony
NC	Neighborhood Commercial
OBMP	Optimum Basin Management Plan
OMC	Old Model Colony
OSY	Operating Safe Yield
RO	Reverse Osmosis
SAWC	San Antonio Water Company
SAWRC	Santa Ana River Water Company
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SFR	Single Family Residential
SR	State Route
SWP	State Water Project
TDS	Total Dissolved Solids
TVMWD	Three Valleys Municipal Water District
ULF	Ultra Low Flow (toilets)
UWMP	Urban Water Management Plan
WEWAC	Water Education Water Awareness Committee
WDF	Water demand factor
WFA	Water Facilities Authority
WMP	Water Master Plan

Section 1
Introduction

1.1 PROJECT AUTHORIZATION

This Urban Water Management Plan (UWMP) has been prepared in accordance with the agreement for water master planning consulting services between the City of Ontario (City) and MWH Americas, Inc. (MWH) dated July 20, 2004. This report refers to the scope of services of Task 5 of this contract only. The work related to the remaining tasks are presented in separate reports.

1.2 REPORT OVERVIEW

This UWMP is divided into seven sections. This section provides an brief description of the Urban Water Management Planning Act, the relation of this UWMP with the regional UWMP prepared by the Inland Empire Utilities Agency (IEUA) and other water agencies. This section also included a description of the City's service area, land use, climate, and topography.

Section 2 describes the City's historical and projected population through year 2030, which is the planning horizon of this report. The historical and projected potable and recycled water demands associated with the population are also discussed in this section. **Section 3** describes the water conservation efforts of the City to date and through year 2030, including a more detailed water conservation plan for the period 2006-2010. **Section 4** provides an overview of the City's water supplies, the historical usage of various supply sources and the projected water supply mix through year 2030 as presented in the *2005 Water and Recycled Water Master Plan Update* (MWH, 2005a). **Section 5** discusses the water supply reliability by comparing the projected water demands presented in Section 2 with the available supplies presented in Section 4. Normal Year, Single Dry Year, and Multiple Dry Year scenarios are evaluated through year 2030. The Water Shortage Contingency Plan is discussed in **Section 6**, and the UWMP Implementation Plan is provided in **Section 7**. A list of references used for the preparation of this UWMP is provided in **Appendix A**.

The majority tables presented in this report correspond with the sample table formats included in the *Guidebook to assist water suppliers in the preparation of a 2005 UWMP* prepared by the California Department of Water Resources (DWR, 2005). To facilitate DWR's review of this report, a lookup table is included in the Table of Contents which lists all the sample tables presented in DWR's Guidebook that are included in this report with the corresponding table numbering in this UWMP.

1.3 URBAN WATER MANAGEMENT PLANNING ACT

This is the UWMP for the City for the period of 2006 through 2010. This report has been prepared in compliance with California Water Code, Division 6, Part 2.6. The Urban Water Management Planning Act (Act; Water Code Section 10610 et. Seq.) became effective on

January 1, 1984. Multiple amendments have been added to the Act, the most recent occurring in 2004.

The Act requires that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually (AFY) prepare and adopt an UWMP. The Act requires urban water suppliers to prepare an UWMP that describes and evaluates sources of supply, reasonable and practical efficient water uses, recycling and water demand management activities. The amendments require additional actions addressing urban water management plan preparation and considerations of such issues as metering, drought contingency planning, and water recycling. The Act requires that each water supplier prepare or update its UWMP every five years before December 31, in years ending in five and zero. A copy of the Act is included in **Appendix B**.

The requirements for the preparation of an UWMP set forth in the California Water Code Sections 10610 through 10656 are intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water. The need for the planning and management of urban water supplies are based on the following declaration of the State of California Legislature (Water Code 10610):

- The waters of the state are a limited and renewable resource subject to ever-increasing demands.
- The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.
- A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate.
- As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years.
- Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.
- Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.
- Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.
- Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.
- The quality of source supplies can have a significant impact on water management strategies and supply reliability.

According to the Act, this UWMP will be submitted to the DWR within 30 days of adoption by the City Council of the City of Ontario.

1.4 ONTARIO'S 2005 UWMP

The IEUA prepared an UWMP in year 2000 in compliance with the Act, which was adopted by the City on November 20, 2001 (Ontario, 2001). This Ontario UWMP updates the Ontario information as presented in the IEUA's 2000 UWMP. It provides a greater level of detail on Ontario specific water demands, water supplies, and water conservation activities and it incorporates a number of significant changes in the region's water planning and management activities that have taken place in the last five years. These changes include, but are not limited to, the Dry Year Yield (DYY) program of Metropolitan Water District of Southern California (MWD), the Chino Basin Recharge Master Plan, IEUA's Recycled Water Implementation Plan, and the City's Water and Recycled Water Master Plan (WMP) Update.

1.5 INTER-AGENCY COORDINATION

Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable (Water Code 10620.d.2). The City is a member agency of the IEUA, Water Facilities Authority (WFA), Chino Basin Desalter Authority (CDA), and the Chino Basin Watermaster (CBWM). The City coordinated the preparation of this UWMP with these four regional agencies. In addition, the City has seven neighboring water retail agencies, City of Chino, City of Upland, Fontana Water Company (FWC), Jurupa Community Services District (JCSD), Monte Vista Water District (MVWD), Cucamonga Valley Water District (CVWD) and San Antonio Water Company (SAWC). The actions the City has taken to coordinate the preparation of this UWMP with these agencies is summarized in **Table 1-1**. A brief description of these agencies is summarized in **Table 1-2.**

Table 1-1
Coordination with Appropriate Agencies

Water Agency Category	Participated in developing the plan	Was contacted for assistance?	Was sent a copy of the draft plan?(1)	Commented on the draft?	Attended public meetings?	Was sent a notice of intention to adopt?	Not Involved or no Information
Wholesale Water Suppliers	WFA	Yes	Yes	No	No	No	No
	MWD	Yes	Yes	No	No	No	No
	CDA	Yes	Yes	No	No	No	No
	IEUA	Yes	Yes	Yes	No	No	No
Water Mgmt Agencies	CBWM	Yes	Yes	No	No	No	No
Neighboring Water Agencies	City of Chino	No	Yes	No	No	No	No
	City of Upland	No	Yes	No	No	No	No
	MVWD	No	Yes	No	No	No	No
	FWC	No	Yes	No	No	No	No
	JCSD	No	Yes	No	No	No	No
	SAWC	No	Yes	No	No	No	No
	CVWD	No	Yes	No	No	No	No

This table corresponds to DWR Table 1 and 32. (1) Includes electronic copies available through the City's website.

Table 1-2
Description of Coordination Agencies

Agency	Description
IEUA	The Inland Empire Utilities Agency collects and treats wastewater and distributes recycled water to its member agencies and groundwater recharge basins in a 242 square mile service area. Its member agencies are the cities of Chino, Chino Hills, Ontario, Upland, Fontana, Cucamonga Valley Water District, Fontana Water Company, Monte Vista Water District, and San Antonio Water Company. IEUA is a member agency of MWD and a member of the Chino Basin Watermaster Board of Directors.
WFA	The Water Facilities Authority is a joint powers authority responsible for the operation and maintenance of the Aqua de Lejos Water Treatment Plant that treats imported State Water Project water from MWD through IEUA. Member of WFA are the cities of Chino, Chino Hills, Ontario, Upland, Monte Vista Water District, and Cucamonga Valley Water District.
CDA	The Chino Basin Desalter Authority is a joint powers authority responsible for the operation and maintenance of the CDA-I and the design, construction, and operation of the Chino I Desalter Expansion and the CDA-II.
CBWM	The Chino Basin Watermaster is responsible for the administrating adjudicated water rights and managing groundwater resources within the watershed of the Chino Basin.
City of Chino	The City of Chino serves water to approximately 66,000 residents in the city and some unincorporated areas in San Bernardino County and encompasses approximately 25 square miles.
City of Upland	The City of Upland serves water to approximately 70,000 residents in the city and encompasses approximately 15 square miles.
MVWD	Monte Vista Water District is an independent special district that serves a population of about 42,000 in the City of Montclair, portions of the City of Chino and some unincorporated areas in San Bernardino County. MWVD encompasses approximately 30 square miles.
FWC	Fontana Water Company is a retail investor-owned utility company that provides water to about 130,000 residents in the City of Fontana and some portions of the cities of Rancho Cucamonga and Rialto. FWC encompasses approximately 51 square miles.
JCSD	The Jurupa Community Services District provides water to approximately 60,000 residents and encompasses approximately 48 square miles (JSCD, 2005).
SAWD	The San Antonio Water Company serves water to approximately 1,200 residents in San Antonio Heights which is an unincorporated areas in San Bernardino County (SAWC, 2005).
CVWD	The Cucamonga Valley Water District provides water to approximately 140,000 residents and encompasses approximately 49 square miles (MWH, 2005a).

In addition to the agencies listed in **Table 1-1**, the City is indirectly related to other water retail agencies through its membership with IEUA and the CBWM. These agencies are not included in the inter-agency coordination, as this coordination is part of the preparation of IEUA's UWMP Update. These agencies are listed in **Table 1-3.**

Table 1-3
Agencies Indirectly Related to the City through IEUA

Other Regional Water Agencies	Other Retail Water Agencies
Metropolitan Water District of Southern California	City of Chino Hills
Santa Ana Watershed Project Authority	City of Fontana
	City of Montclair
	City of Norco
	City of Pomona
	Fontana Union Water Company
	Los Serranos Country Club
	Maygold Mutual Water Company
	Monte Vista Irrigation Company
	Santa Ana River Water Company
	San Bernardino County (Prado Shooting Park)
	Southern California Water Company
	West End Consolidated Water Company
	West Valley Water District

1.6 ONTARIO'S SERVICE AREA

The City is located in the western portion of San Bernardino County, California, and is surrounded by the City of Montclair to the west, the City of Upland and the City of Rancho Cucamonga to the north, the City of Chino to the southwest, the City of Fontana to the northeast, and some unincorporated areas of Riverside County to the southeast. The location of the City is shown on **Figure 1-1**. Also shown on this figure is that the City is traversed by four major freeways, Interstate 10, Interstate 15, and State Route (SR) 60, and the City is also the home of the Ontario International Airport.

The study area of this UWMP is the water service area of the City. With over 32,000 water meters, the City currently serves a population of approximately 169,000 people. As shown on **Figure 1-1**, the study area coincides with the City boundaries, with the exception of two small areas in the north and the northeast corner that are served by CVWD.

The City is divided into two distinct areas, the Old Model Colony (OMC) in the north and the New Model Colony (NMC) in the south, with Riverside Drive delineating the majority of the boundary between the two areas. The OMC is the existing City and consists mainly of residential, industrial, and commercial developments. The OMC comprises about 23,000 acres or 36 square miles. The NMC is an 8,200-acre agricultural area that was annexed in 1999. With the addition of the NMC, the City's service area is expanded from 36 square miles to about 49 square miles, which equates to a 26 percent increase. The NMC is currently dominated with extensive agricultural activity. Rapid development of the eastern part of the NMC is about to start. Completion of the first homes is anticipated in late 2006 and occupancies in early 2007. The development of the NMC will significantly increase the City's population in the coming decades. The historical and projected population of the City are discussed in **Section 2**.

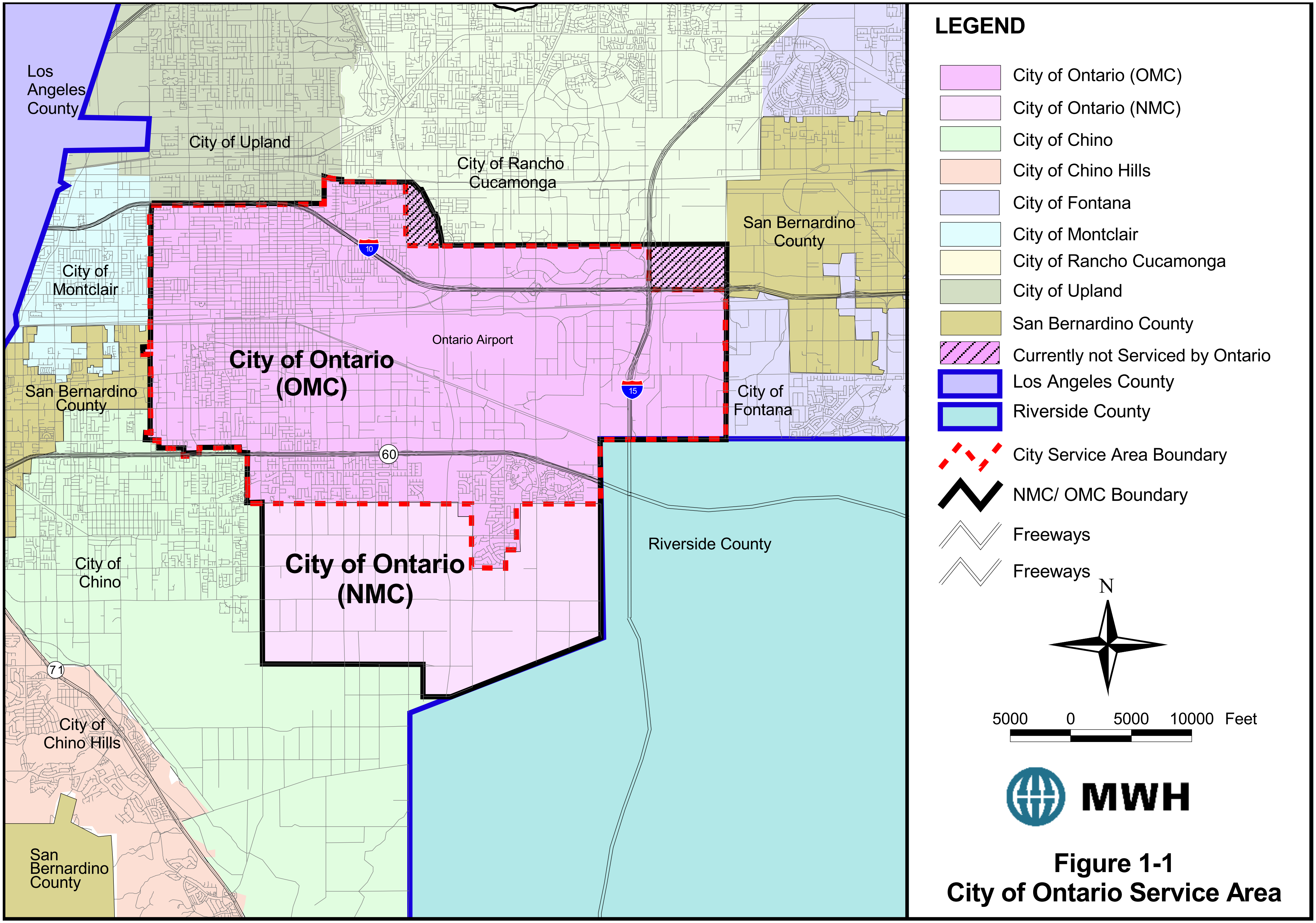


Figure 1-1
City of Ontario Service Area

1.6.1 Land Use

The primary land use categories in the OMC are Single Family Residential (SFR) and industrial. Additionally, the OMC has Multi Family Residential (MFR), commercial, infrastructure, parks, schools, and institutional land uses. The City is also home of the Ontario International Airport and its airport-related businesses. The NMC is primarily characterized by agricultural land use, mostly of dairy and poultry farms along with cultivated crops, fallow fields, and plant nurseries. The NMC is planned to be converted to predominantly residential area with some schools, parks, and commercial land uses over the next 25 years.

1.6.2 Climate

The City is located within the desert climate zone of Southern California. The region receives an average annual rainfall of about 15 inches. Monthly average temperatures range from a low of 66 degrees in December and January to a summer high average of 92 degrees. Records show daily summer temperatures as high as 114 degrees. The monthly average rainfall, temperature, and evapotranspiration rate in the City's service area are listed in **Table 1-4**.

Table 1-4
Climate Summary

Month	Standard Average Eto(1) (in)	Average Rainfall (2) (in)	Average Max Temperature(2) (F)	Average Min Temperature(2) (F)
January	2.17	3.65	66.8	44.0
February	2.80	2.85	69.4	45.0
March	4.03	2.80	70.1	46.3
April	5.10	1.13	74.5	48.4
May	5.89	0.26	79.9	52.6
June	6.60	0.04	86.7	56.6
July	7.44	0.01	95.0	62.2
August	6.82	0.11	94.4	62.9
September	5.70	0.34	91.3	61.3
October	4.03	0.34	83.0	55.4
November	2.70	1.72	73.6	48.5
December	1.86	2.07	68.3	44.4
Annual	**55.10**	**15.32**	**79.4**	**52.3**

This table corresponds to DWR Table 3.
(1) California Irrigation Management Information System Dept. of Water Resources Office of Water Use Efficiency (CIMIS, 2005)
(2) Western Regional Climate Center, Fontana Kaiser, CA (WRCC, 2005)

1.6.3 Topography

The City is located on relatively flat terrain with a general rise in elevation as one moves from the southern boundary to the northeastern corner of the City. Elevations range from a low of approximately 550 feet above mean sea level to a high of approximately 1,200 feet. The City overlays a portion of the Chino Groundwater Basin, which is located in the northern part of the Santa Ana Watershed. The principal drainage direction is north to south from the San Bernardino Mountains and foothills to Prado Lake and the Prado Flood Control Basin located south of the City of Chino. The primary creeks and washes within the City that convey storm water are the West Cucamonga Creek, Cucamonga Creek, and Deer Lower Creek. Once the water reaches Prado Lake, it is discharged through the outlet of Prado Dam into the Santa Ana River which ultimately discharges into the Pacific Ocean.

Section 2
Population and Water Use

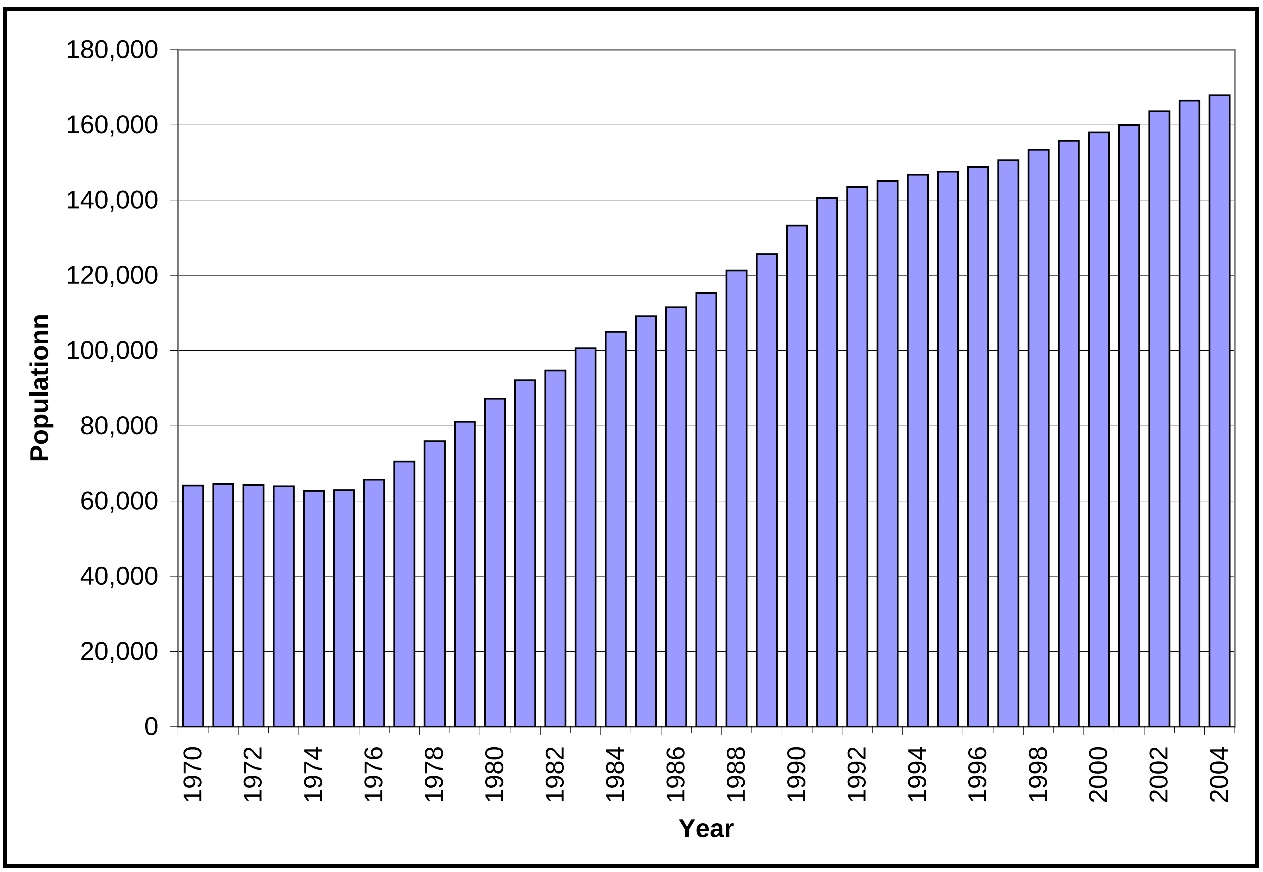
This section describes the historical and projected population for the City of Ontario (City) followed by a discussion of the historical and projected water use. The potable water and recycled water demands are discussed as well as the estimated water losses and water conservation. The information presented here is based on the 2005 Water and Recycled Water Master Plan (MWH,2005).

2.1 POPULATION

2.1.1 Historical Population

The historical population from the year 1970 to 2004 for the City is shown on **Figure 2-1**. The City had a fairly steady population throughout the early 1970s, and began to steadily increase after 1975. This population growth will continue with the development of the New Model Colony (NMC) in the coming decades.

Figure 2-1
Historical Population of the City



The existing (year 2004) population of the City is estimated at approximately 167,900 people. The overwhelming majority of the City's population (98.5 percent) resides in the OMC. It is estimated that the existing (2004) population of the NMC is not more than about 2,500 people (1.5 percent).

2.1.2 Future Population

Once the City is fully developed and has reached build out conditions, the population is expected to rise to nearly 305,500 residents (SCAG, 2004). This corresponds to a population increase of about 81 percent or 3 percent per year.

This population projection was verified in the draft 2005 Water and Recycled Water Master Plan (2005 WMP) Update (MWH, 2005a) using land use information from the City's General Plan, Specific Plans, and aerial photography. The population projections presented in the 2005 WMP show a population increase from 169,125 people to 297,670 people. Hence, the population projection of SCAG is about 7,839 people higher. This difference of 3 percent could be due to different land use, phasing, or population density assumptions.

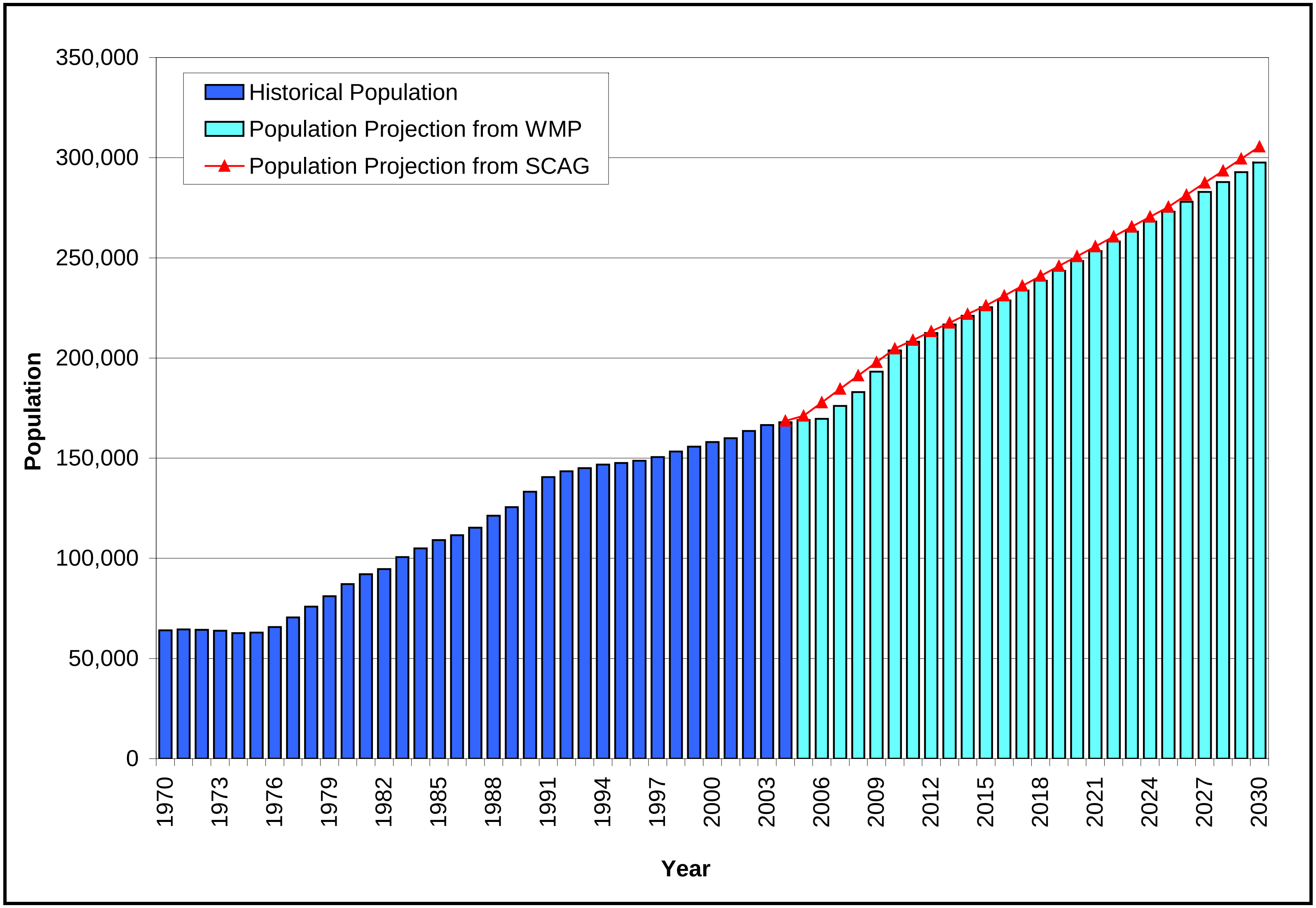
The population projections used in this UWMP are based on SCAG data, which is consistent with the population projections presented in IEUA's 2005 UWMP Update. The projections are presented in 5-year increments in **Table 2-1**, while the historical and projected population is shown on **Figure 2-2**. This figure also shows the projected by SCAG for the period 2004 through 2030.

Table 2-1
Estimated and Projected Population

Population Projection Source	2005	2010	2015	2020	2025	2030
WMP Projections (1)	169,125	203,811	225,412	248,424	273,047	297,670
SCAG Projections (2,3)	171,154	204,645	226,182	250,811	275,440	305,509
Difference	(2,029)	(834)	(770)	(2,387)	(2,393)	(7,839)

This table corresponds to DWR Table 2.
(1) 2005 Water and Recycled Water Master Plan Update (MWH, 2005a).
(2) Southern California Association of Governments 2004 population projections (SCAG,2004).
(3) 2005 Urban Water Management Plan (IEUA, 2005d).

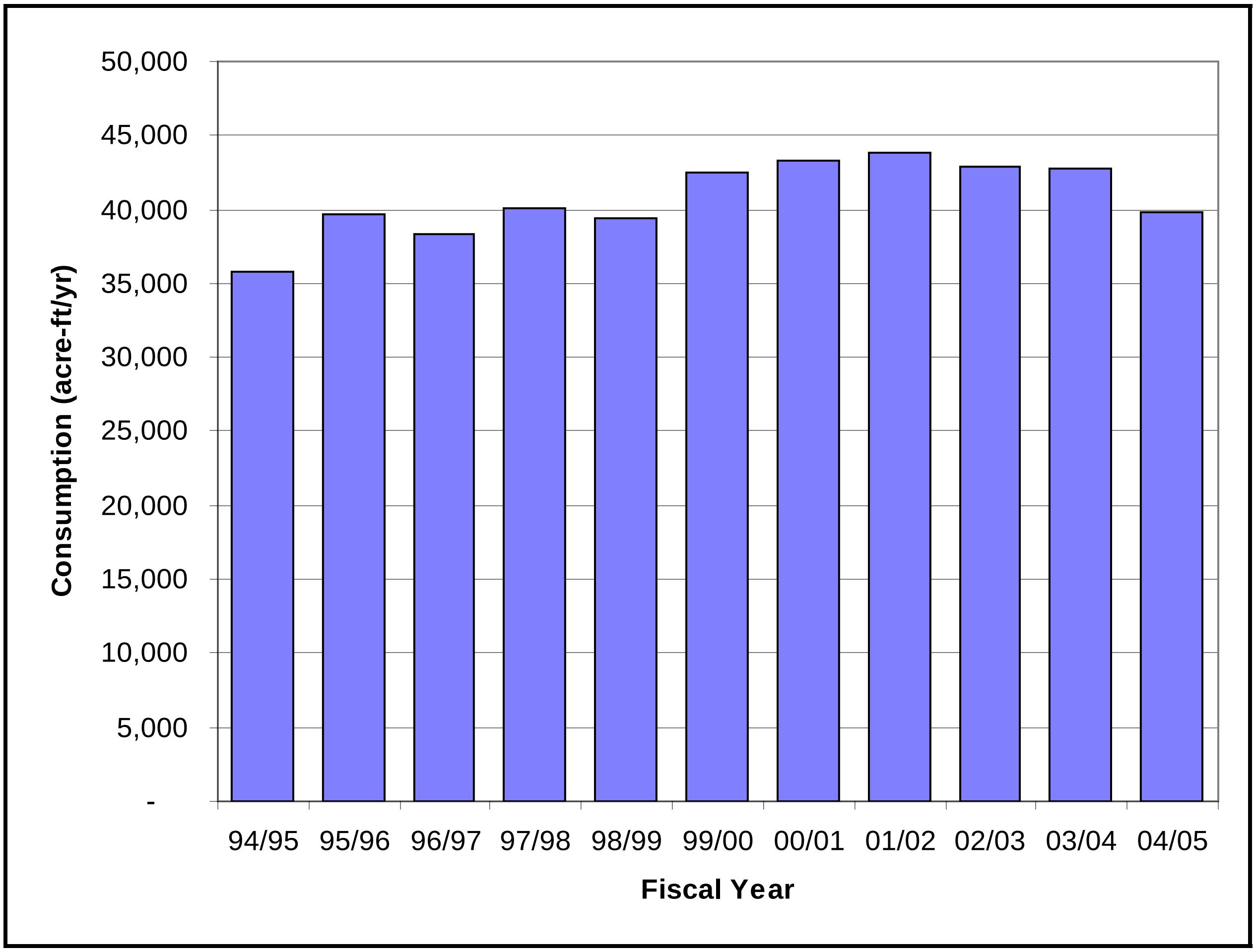
Figure 2-2
Historical and Projected Population Trend



2.2 HISTORICAL WATER USE

The historical water use of the City is shown on **Figure 2-3**. As shown in this figure, the City's water demand has increased from approximately 37,500 acre-feet per year (AFY) in fiscal year (FY)1994/1995 to approximately 39,800 AFY in FY 2004/2005.

Figure 2-3
Historical Water Consumption



Source: Historical Water Consumption Records (Ontario, 2005)

Based on the historical population records and the metered consumption, the water usage trend per capita is calculated for the years 2000 through 2004. It should be noted that this usage does not express the water consumption per person in gallons per day per capita (gpd/cap) as the total water usage also includes non-residential demands such as industrial, commercial, schools, parks, fire fighting, etc. The per capita water usage of residential accounts only is listed separately in **Table 2-2**.

As shown in **Table 2-2**, the total per capita water use ranges from 224 to 243 gpd/cap. This is similar to the average per capita water usage of the entire Inland Empire Region, which ranges from 241 gpcd to 279 gpcd (IEUA, 2005).

Table 2-2
Per Capita Water Use – City of Ontario

Calendar Year	2000	2001	2002	2003	2004
Population	158,007	160,000	163,600	166,500	167,900
Total Water Usage (AFY)[(1)]	43,028	43,109	44,194	41,772	42,087
Residential Water Usage (AFY) [(1)]	24,644	24,393	25,050	23,830	23,715
Capita Water Use (gpd/cap)	243	241	241	224	224
Residential Capita Water Use (gpd/cap)	139	136	137	128	126

(1) Source: Public Water System Statistics (Ontario, 2000), (Ontario, 2001a), (Ontario, 2002a), (Ontario, 2003), (Ontario, 2004)

Typically, areas that are located in dry and hot climate zones are expected to have higher water use rates than areas that are located in wet and cooler climate zones. The City is also characterized by industrial land use, which results in a higher water usage per capita. For comparison purposes, the per capita water use in MWD's service areas are presented in **Table 2-3**.

Table 2-3
Per Capita Water Use – MWD Service Area

County	1980[(1)] (gpcd)	1985[(1)] (gpcd)	1990[(1)] (gpcd)	1995[(1)] (gpcd)	2000[(1)] (gpcd)	2005[(2)] (gpcd)
Los Angeles County	191	197	188	164	175	171
Orange County	224	229	233	197	205	192
Riverside County	275	262	304	226	258	258
San Bernardino County	325	318	281	221	n/a	255
San Diego County	186	213	209	164	185	179
Ventura County	206	211	228	179	198	205
Weighted Average of MWD	**203**	**212**	**210**	**176**	**n/a**	**187**

(1) Source: Table I-4 of the MWD UWMP (MWD, 2005)
(2) Source: Table 2-5 of the IEUA UWMP (IEUA, 2005)

2.3 FUTURE WATER USE

2.3.1 Projected Potable Water Demand

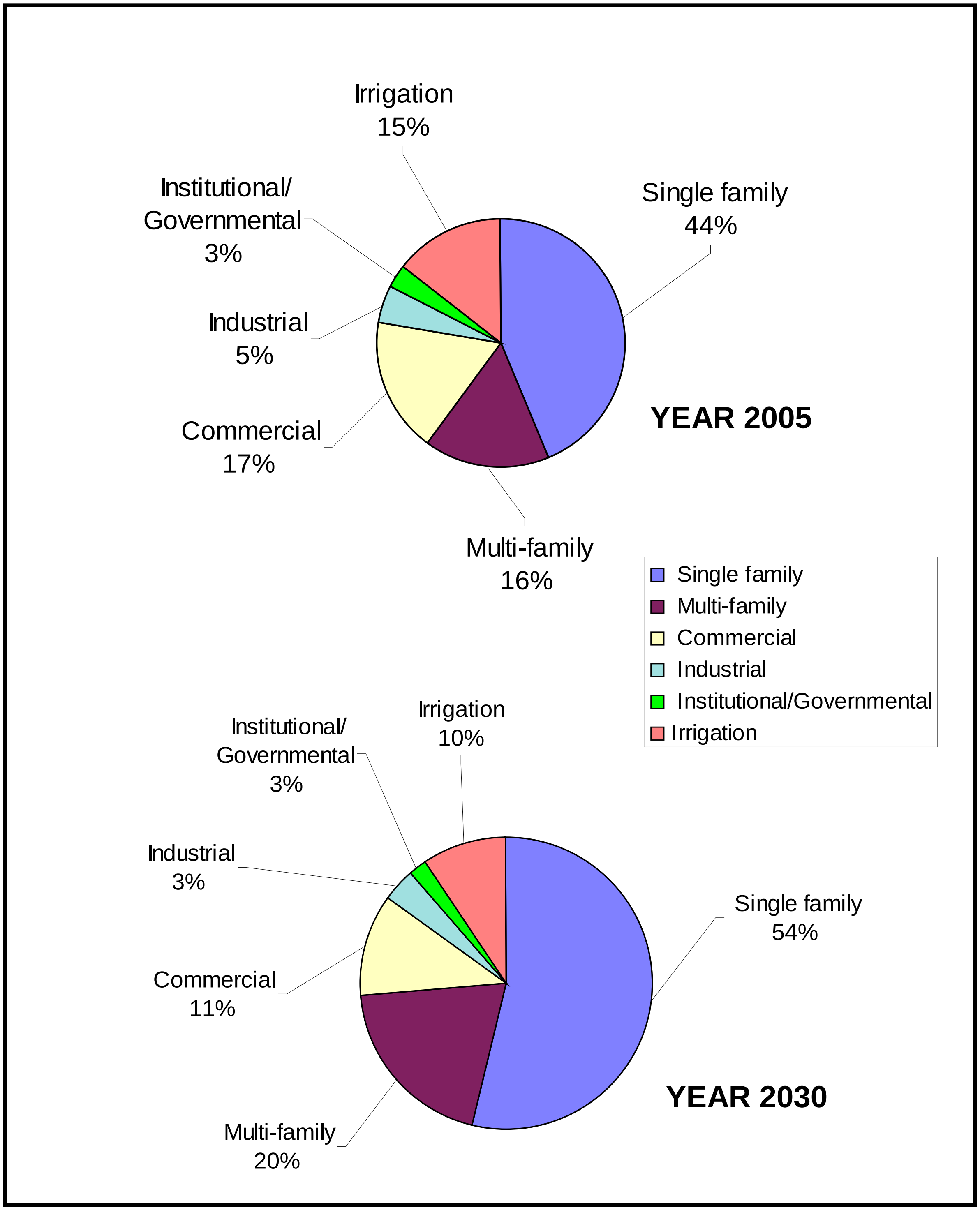
As presented in section 2.1, the population of the City is projected to increase from 167,900 (year 2004) to about 305,500 residents in year 2030. This population increase, which will primarily occur in the NMC, will result in a substantial increase in water deliveries. The projected water demands for the period 2005 through 2030 in five year increments in listed in **Table 2-4** and shown on
Figure 2-4.

Table 2-4
Past, Current, and Projected Water Deliveries

Year		Water Use	Single Family	Multi-Family	Commercial	Industrial	Institutional Governmental	Irrigation	Other[4]	Total[5]
2000[1]	metered	# of accounts[1]	25,600	1,988	2,089	342	258	1,011	340	31,628
		Deliveries (AFY) [1]	17,785	6,859	5,010	3,873	619	5,979	2,902	43,028
2005	metered	# of accounts[2]	26,050	2,099	2,840	349	341	1,033		32,712
		Deliveries (AFY) [3]	17,222	6,454	6,836	2,040	1,132	5,743		39,428
2010	metered	# of accounts[2]	34,903	2,812	2,951	363	354	1,073		42,457
		Deliveries (AFY) [3]	23,074	8,648	7,104	2,119	1,177	5,968		48,091
2015	metered	# of accounts[2]	38,557	3,107	3,080	379	370	1,120		46,612
		Deliveries (AFY) [3]	25,490	9,553	7,414	2,212	1,228	6,229		52,127
2020	metered	# of accounts[2]	45,176	3,640	3,174	390	381	1,154		53,915
		Deliveries (AFY) [3]	29,866	11,193	7,639	2,279	1,265	6,418		58,661
2025	metered	# of accounts[2]	51,687	4,165	3,285	404	394	1,195		61,129
		Deliveries (AFY) [3]	34,170	12,807	7,907	2,359	1,310	6,643		65,195
2030	metered	# of accounts[2]	58,198	4,689	3,396	417	408	1,235		68,344
		Deliveries (AFY) [3]	38,475	14,420	8,174	2,439	1,354	6,868		71,730

This table corresponds to DWR Table 12.
Note: All accounts are metered.
(1) From the Public Water System Statistic Reports submitted to the DWR by the City of Ontario.
(2) Calculated by dividing the projected water deliveries by the average water delivery per account in year 2005 (projected 2005 demand/number of accounts as of August 2004).
(3) Projected water demands obtained from hydraulic model prepared for the Water and Recycled Water master Plan. SFR and MFR demands are distributed based on the ratio SFR/MFR in year 2004. Commercial, Industrial, Institutional and Irrigation demands are distributed based on the ratio COM/IND/INS/IRR in year 2004.
(4) Per Water Statistics submitted to the DWR: specified as Re. Code 7/9
(5) Total consumption; excludes 8% water loss. Demand = Consumption + Water loss.

Figure 2-4
Water Use Distribution by Land Use Category



The projected demand data for year 2005 and the actual number of account as of August 2004 is used to calculate the average water delivery per account for each billing classification as listed in **Table 2-4**. These averages were used to estimate the number of future accounts for the years 2005 through 2030.

As shown in **Table 2-4**, the total water deliveries are projected to increase from about 43,000 AFY to approximately 72,000 AFY in 2030. This equates to a water demand increase of 67 percent. This increase in demand is lower than the population increase of 81 percent considering a lower per capita use for the added population as the NMC does not include water usage associated with industrial land use and minimal commercial water demands. The number of accounts is estimated to increase from about 32,000 in year 2000 to 68,000 in year 2030.

It should be noted that the listed demands and account numbers per billing classification are based on the potable water demand projections presented in the WMP Update (MWH, 2005a), which are based on 2003 billing data and land use types. Because the billing classifications do not exactly match the land use type categories, the projected demands had to be re-distributed amongst the billing classifications as described in footnote 3 of **Table 2-4**. Due to the lower demand of the 2003 billing data compared to 2000 and the re-distribution process, certain billing classifications show an initial decrease in demand.

2.3.2 Projected Recycled Water Demand

The existing recycled water demand within the City is about 2,129 AFY, which includes 500 AFY of recycled water that is currently used for groundwater recharge at the Ely Basins by IEUA. It should be noted that Ely Basin is not an Ontario customer, but a customer of IEUA. All existing recycled water customers that are located in the City are currently served by IEUA, rather than by the City. The comparison of the projected and actual recycled water demand projected for 2005 in the 2000 UWMP (IEUA, 2000) is presented in **Table 2-5**. This table shows that recycled water usage in Ontario has not expanded as rapidly as projected in 2000.

Table 2-5
Comparison of 2000 Recycled Water Projection and Actual Usage

Projection for 2005(1) (AFY)	Actual Use 2005(2) (AFY)
6,000	1,829

This table corresponds to DWR Table 37.
(1) Table 5-6 from IEUA 2000 UWMP (IEUA, 2000)
(2) Water and Recycled Water Master Plan (MWH,2005)

The City has taken measures to encourage the use of recycled water including 1) reduced recycled water rates that provide recycled water at lower cost than potable water to customers, 2) developer's agreements for new OMC and NMC developments that mandate the installation of recycled water mains to all common irrigation areas, parks, and schools, or 3) the development and approval of a mandatory ordinance.

The existing and projected recycled water demand in the City is summarized in **Table 2-6** in AFY. As shown in this table, the recycled water demand in the City is projected to increase from 1,829 AFY to 14,492 AFY, which equates to an increase of almost 700 percent. It should be noted that these projections are contingent upon the development of the NMC.

Table 2-6
Recycled Water Demand Projection

Year	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Old Model Colony	1,229	2,198	2,903	5,471	5,512	5,554
New Model Colony	600	5,728	5,913	6,290	6,923	8,938
Total	**1,829**	**7,926**	**8,816**	**11,761**	**12,435**	**14,492**

This table corresponds to DWR Table 14.

The potential recycled water demands by user type and category are summarized in **Table 2-7**, while the projected recycled water demands are summarized in **Table 2-8**. The only difference between the potential and projected demand is the projected demand of the future landscape users in the OMC. A feasibility study was conducted for this user category as part of the latest WMP Update (MWH, 2005a). This study eliminated some of the potential recycled water users based on the cost, resulting in a lower projected than potential demand for this category. The recycled water demand projection for the NMC is based on assumptions that reflect extensive use of recycled water. Hence, the potential and projected recycled water demands for the NMC listed in **Table 2-7** and **Table 2-8** are the same. A detailed breakdown of the various categories listed in these tables are discussed below.

Table 2-7
***Potential* Recycled Water Demand by User Type**

User type	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Landscape in the OMC (existing users)	1,229	1,229	1,229	1,229	1,229	1,229
Agriculture use in NMC (temporary)	600	3,295	3,019	1,381	0	0
Landscape in the OMC (future users)	0	356	1,719	3,080	4,442	5,803
Industrial in the OMC (future user)	0	1,005	1,005	1,005	1,005	1,005
Landscape in NMC	0	2,433	2,894	4,909	6,923	8,938
Wildlife Habitat	n/a	n/a	n/a	n/a	n/a	n/a
Wetlands	n/a	n/a	n/a	n/a	n/a	n/a
Groundwater Recharge	0	0	0	0	0	0
Total	**1,829**	**8,318**	**9,866**	**11,604**	**13,599**	**16,975**

This table corresponds to DWR Table 35.

Note: IEUA wholesales disinfected tertiary recycled water to the City

Table 2-8
***Projected* Recycled Water Demand by User Type**

User Type	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Landscape in the OMC (existing users)	1,229	1,229	1,229	1,229	1,229	1,229
Agriculture use in NMC (temporary)	600	3,295	3,019	1,381	0	0
Landscape in the OMC (future users)	0	0	669	3,237	3,278	3,320
Industrial in the OMC (future user)	0	969	1,005	1,005	1,005	1,005
Landscape in NMC	0	2,433	2,894	4,909	6,923	8,938
Wildlife Habitat	n/a	n/a	n/a	n/a	n/a	n/a
Wetlands	n/a	n/a	n/a	n/a	n/a	n/a
Groundwater Recharge	n/a	n/a	n/a	n/a	n/a	n/a
Total	**1,829**	**7,926**	**8,816**	**11,761**	**12,435**	**14,492**

This table corresponds to DWR Table 36.

Major Existing Recycled Water Customers

Some of the existing recycled water customers located in the City are currently served directly by IEUA. The existing recycled water customers are listed in **Table 2-8**.

Table 2-9
Existing Recycled Water Customers

User Type	Existing Demand (AFY)	Ultimate Demand (AFY)
Whispering Lakes Golf Course	1,036	1,036
Murai Farms	600	0
Westwind Park	80	80
Two Caltrans connections	100	100
Median on Archibald Avenue	13	13
Total	**1,829**	**1,229**

This table corresponds to DWR Table 36.

These customers are currently served by IEUA directly, rather than through the City. With the expansion of the regional recycled water system, it is assumed that all recycled water demands within the City will be served by the City directly in the future. The recycled demand of these existing users that will be served by the City under ultimate conditions is about 1,229 AFY (1,829 AFY minus 600 AFY for Murai Farms as discussed below).

Temporary Agricultural Users

In the near-term, the City could serve recycled water to (non-dairy) agricultural customers with irrigation in the NMC by accelerating the construction of some of the recycled water pipelines that are planned for the NMC under build out conditions. One example is Murai Farms, which is currently served with recycled water directly by IEUA with a demand of about 600 AFY. In addition to Murai Farms, the total area identified with agricultural users that can be temporarily served with recycled water is 802 acres. The estimated recycled water demand of this area is 2,695 AFY, resulting in a total recycled water demand for temporary agricultural users of 3,295 AFY or 2.9 mgd. Due to the development of the NMC, this demand is reduced to zero by year 2025, but is replaced by a combination of potable and recycled water demand.

Future Customers in the OMC

The projected recycled water demands in the OMC are based on the conversion of existing potable water users and the use of recycled water on newly developed parcels (infill) where possible. The potential recycled water demand is estimated to be about 6,627 AFY including one large industrial user with a potential demand of 1,005 AFY. As part of the WMP Update (MWH, 2005a), a feasibility study was conducted to select those user groups that are most feasible based on the relative unit cost ($/acre-ft). The projected recycled water demand in the OMC based on this feasibility study is 4,230 AFY or 3.8 mgd.

Future Customers in the NMC

The projected recycled water demand for the entire NMC at build out conditions is about 8,938 AFY or 8.0 mgd under average day demand (ADD) conditions. As shown in this table, the recycled water demand of temporary agricultural users is assumed to be zero in year 2025, when the NMC is anticipated to get close to being build out.

Future Customers in the entire City

The projected recycled water demands are summarized in **Table 2-6**. As shown in this table, the recycled water demand in the City is projected to increase from 1,816 AFY to 14,384 AFY, which equates to almost 700 percent increase. The NMC contributes approximately 500 percent to this increase.

2.3.3 Sales to Other Agencies

The City also serves water to Sunkist as part of the Chino Basin overlying (non-agricultural) assessment adjustment. In exchange for water delivery, the City obtains the groundwater pumping rights in the amount equal to the amount of water served. The historical and projected water deliveries to Sunkist are shown in **Table 2-10**.

Table 2-10
Sales to Other Agencies

Water Distributed	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Sunkist(1)	1,449	1,470	1,470	1,470	1,470	1,470

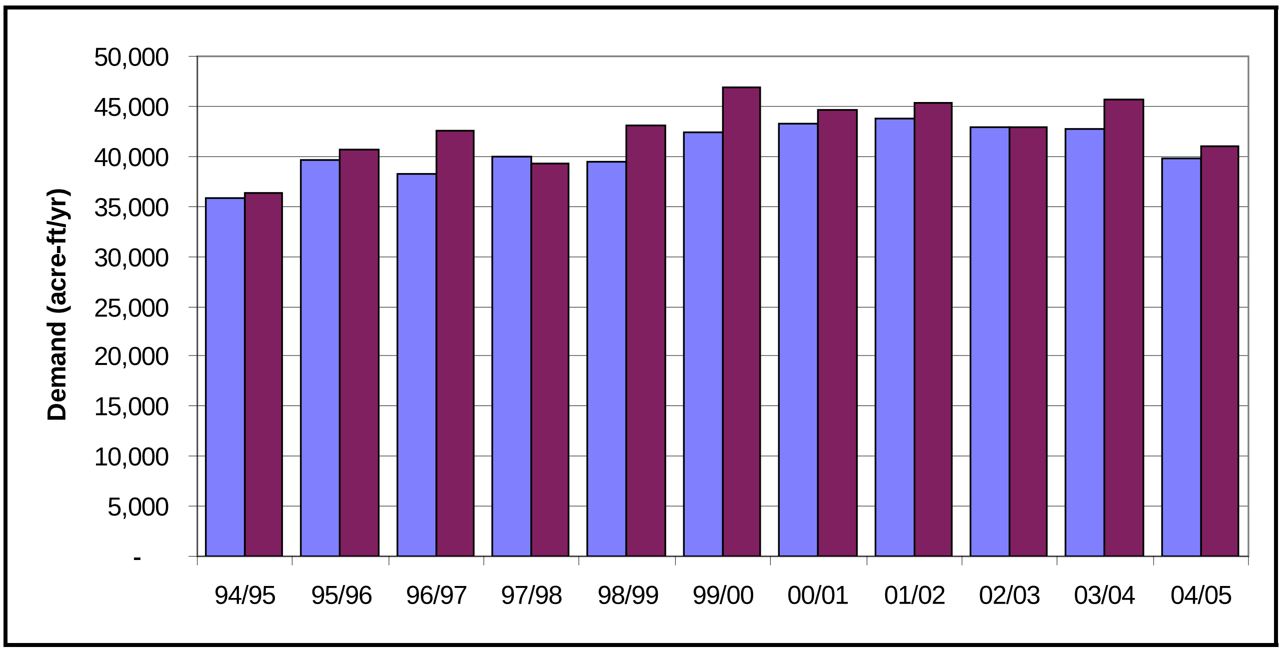
This table corresponds to DWR Table 13.
(1) It should be noted that Sunkist is not a water agency, but a customer located within the City boundaries.

The projected water delivery for years 2005 through 2030 is assumed to be constant and is based on the average water delivery of the last six years (1998 through 2003). No other adjustments to water rights assessment or special deliveries are identified.

2.3.4 Water Losses

The difference between the volume of water delivered to the distribution system (water production) and the metered sales (water consumption) is often referred to as "unaccounted-for water" or water loss. The historical water production and consumption is presented on **Figure 2-5**.

Figure 2-5
Historical Water Consumption and Production



As shown on this figure, the water loss varies from year to year. The average water loss in the period 1994 through 2004 was 4 percent. As some years have shown water loss as high as 10 percent, the water loss used for system planning purposes in the WMP Update is 8 percent. To be consistent with the WMP Update, the projected water loss as shown in **Table 2-11** is calculated as 8 percent of the projected water demand listed in **Table 2-4**. The value listed for year 2000 is the actual recorded water loss.

Table 2-11
Historical and Projected Water Loss

Water Loss	2000 (AFY)	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Production (AFY)	46,100	42,583	51,938	56,297	63,354	70,411	77,468
Consumption (AFY)	43,028	39,428	48,091	52,127	58,661	65,195	71,730
Water Loss (AFY)	3,072	3,155	3,847	4,170	4,693	5,215	5,738
Water Loss (%)	7%	8%	8%	8%	8%	8%	8%

This table corresponds to DWR Table 14.
The water loss of year 2000 is based on historical records (7%), while the projected water loss for years 2005 through 2030 is estimated using 8% of the projected water consumption as defined in the 2005 WMP Update (MWH, 2005a).

2.3.5 Total Water Use

The total historical and projected water use through year 2030 is presented in **Table 2-12**. The total water use is the summation of the potable water used by user categories (Table 2-4), projected recycled water demands, sales to other agencies (Table 2-10), and water loss (Table 2-11). It should be noted that the City does not have any additional water uses such as saline barriers protection, groundwater recharge, conjunctive use, or demands associated with raw water projects.

Table 2-12
Total Water Use – Without Water Conservation

Water Use	2000 (AFY)	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Consumption(1)	43,028	39,428	48,091	52,127	58,661	65,195	71,730
Recycled Water	0	1,829	7,926	8,816	11,761	12,435	14,492
Sunkist	1,449	1,470	1,470	1,470	1,470	1,470	1,470
Water Loss	3,072	3,154	3,847	4,170	4,693	5,216	5,738
Saline barriers	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Groundwater Recharge	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Conjunctive Use	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Raw Water	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	**47,549**	**45,881**	**61,334**	**66,583**	**76,585**	**84,316**	**93,430**

This table corresponds to DWR Table 14.
(1) Consumption plus 8% water loss is equal to the production numbers listed in **Table 2-11**.

The total water use projected through year 2030 that incorporates water conservation is summarized in **Table 2-13**. As shown, the total water use is estimated to be 7,747 AFY lower than presented in **Table 2-12**, which equates to a demand reduction of 8percent. Details regarding water conservation are discussed in **Section 3**.

Table 2-13
Total Water Use – With Water Conservation

Water Use	2000 (AFY)	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Total Water Use	47,549	45,881	61,334	66,583	76,585	84,316	93,430
Water Conservation	0	-840	-2,635	-3,994	-4,900	-6,149	-7,747
Water Use with Conservation	**47,549**	**45,041**	**58,699**	**62,589**	**71,685**	**78,167**	**85,683**

This table corresponds to DWR Table 15.

Section 3
Water Conservation

3.1 INTRODUCTION

Water conservation is an important component of water resource management, not only for the City of Ontario (City) but also for the entire Inland Empire Region and Southern California. For a variety of reasons, the Inland Empire Region remains one of the top growth areas in the country, with the City being a major contributor to the projected growth. This growth in population and industry puts pressure on the local retail agencies to meet the anticipated water demand over the next 25 years and beyond. Implementation of conservation programs helps reduce the expected increase in water demand.

The City's water conservation policies are primarily driven by two factors, the water conservation goals defined in IEUA's *Review Draft Urban Water Management Plan* (IEUA, 2005d) and the California Urban Water Conservation Council (CUWCC) *Memorandum of Understanding regarding urban water conservation in California* (MOU) of September 1991 and last amended in March 2004 (CUWCC, 2004). As a signatory to the MOU, the City has pledged to implement a prescribed set of urban water conservation Best Management Practices (BMPs). In the California Water Code Section 10631, the BMPs are referred to as Demand Management Measures (DMMs). BMPs and DMMs are functionally equivalent. In this report the term BMP is used. The 14 BMPs are listed in **Table 3-1**.

Table 3-1
Best Management Practices

BMP No.	Best Management Practices
1	Water Survey Programs for Single-Family and Multi-Family Residential Customers
2	Residential Plumbing Retrofit
3	System Water Audits, Leak Detection and Repair
4	Metering with Commodity Rates for all New Connections and Retrofit of Existing
5	Large Landscape Conservation Programs and Incentives
6	High-Efficiency Washing Machine Rebate Programs
7	Public Information Programs
8	School Education Programs
9	Conservation Programs for Commercial, Industrial and Institutional (CII) Accounts
10	Wholesale agency programs
11	Conservation Pricing
12	Water Conservation Coordinator
13	Water Waste Prohibition
14	Residential Ultra-Low-Flush Toilet Replacement Program

As a signatory to the MOU, the City is a member of the CUWCC and is required to provide BMP Activity Reports every two years. These reports provide specific details of the agency's efforts to implement each BMP. The Act requires that agencies describe the implementation status and cost-effectiveness of each BMPs in their UWMP unless the agency is signatory to the MOU and provides the annual BMP Activity Reports. California Water Code Section 10613 (i) allows an agency to provide the BMP Activity Reports in-lieu of describing each of the BMPs. The City has submitted the Activity Reports for 2003 and 2004 to the CUWCC since the City signed the MOU in 2002. These reports are included in **Appendix C**.

3.2 WATER CONSERVATION STRATEGY OF IEUA

Over the past five years, IEUA and their member agencies have developed a strong partnership and an aggressive approach to BMPs that reduce water at the source. Water conservation is an important component of water resource management. Conservation has multiple benefits such as a reduction on the dependence of imported water supplies. Water conservation helps solve the water quality issues in the California Bay Delta and improves water supply reliability. Water conservation is also beneficial for the region's water rate payers, as water conservation is one of the least expensive new sources of water. IEUA projects regional savings of more than $200 million over the next 20 years by utilizing water conservation measures to reduce imported water purchases (IEUA, 2005e).

IEUA and the local retail agencies have been implementing water conservation programs for the region since 1991. Through year 2000, the source of the majority of water savings has been the distribution of ultra low flush (ULF) toilets. Beginning in 2001, the conservation programs have become much more diversified with the introduction of high efficiency clothes washer (HECW) rebates, commercial and industrial rebates, landscape water efficiency programs, public education, school programs, hiring of water conservation coordinators and water waste prohibition ordinances.

3.2.1 2000-2005 Water Conservation

The IEUA regional water conservation goal for year 2005 as defined in the 2000 UWMP (IEUA, 2000) was 11,600 acre-feet per year (AFY). The actual amount of water conservation achieved is estimated as 5,100 AFY. Over the past five years, IEUA has introduced a variety of new and innovative incentive programs to help achieve this goal. The water conservation programs that IEUA has implemented in the 5-year period from 2000 to 2005 to encourage participation by its retail agencies are:

- Large Landscape: As part of BMP No. 5, IEUA has participated in a number of initiatives to reduce the amount of water used for irrigation. These programs include regional and local classes for businesses on landscaping efficiencies, the "California Friendly Model Program", and the weather sensitive irrigation controller program.
- Residential HECW Rebates: As part of BMP No. 6, about 4,800 HECW have been installed, contributing to about 220 AFY of water savings.
- School Education: As part of BMP No. 8, IEUA and local agencies expanded water conservation education programs by conducting three presentations: (1) a magic show entitled "Think Earth; It's Magic" that reached 22,000 elementary school students, (2) a stage show entitled "The Water Pirates of Neverland" that was seen by 21,000 students, and (3) the thematic school garden demonstration projects entitled "A Garden in Every School".

- Commercial, Industrial, and Institutional (CII) rebate program. As part of BMP No. 9, rebates were provided for ULF toilets, waterless urinals, HECW, cooling tower conductivity controllers, x-ray film processor re-circulation units, pressurized water brooms, pre-rinse spray nozzles, and weather sensitive irrigation controllers.
- Agency Support: As part of BMP No. 10, IEUA provided annual grants of $2,000 per agency for BMP related programs or projects. The City of Ontario prefers to participate in programs sponsored by IEUA, which provide greater benefits for the City than small-scale water conservation programs.
- Residential ULF Active Programs: As part of BMP No. 14, about 35,000 ULF toilets have been installed since 1991, contributing to about 1,800 AFY of water savings.
- Residential ULF Passive Programs: As part of BMP No. 14, about 153,000 ULF toilets have been installed since 1993, contributing to about 6,000 AFY of water savings.

The combined active and passive water conservation achieved from these programs for the region between 1993 and 2000 is about 5,110 AFY. Additional water savings from 2001 through 2004 are expected to bring the total water saved to over 8,600 AFY, which is IEUA's water conservation goal for year 2005 as listed in the 2005 UWMP (IEUA, 2005d). It should be noted that the water conservation goal for year 2005 was set at 11,600 AFY in the 2000 IEUA UWMP. To achieve new water conservation savings each year, IEUA and the retail agencies will have to invest more into existing conservation programs.

3.2.2 2005-2010 Water Conservation

The water conservation goals established in IEUA's Review Draft UWMP (IEUA, 2005d) are summarized in **Table 3-2**. Although all agencies participate in water conservation programs, each agency has a different service area size, population, land use, and water use mix. The water conservation goals for the period 2010 though 2030 are set 10 percent of the projected water demands, while the water conservation goal for 2005 is about 3.6 percent of the combined projected water demand of all member agencies.

Table 3-2
IEUA's Water Conservation Goals (Active and Passive)

Water Purveyor	2005(1) (AFY)	2010(2) (AFY)	2015(2) (AFY)	2020(2) (AFY)	2025(2) (AFY)
City of Chino	745	2,459	2,750	2,983	3,183
City of Chino Hills	690	2,019	2,080	2,142	2,206
City of Ontario	***1,825***	***5,695***	***6,315***	***6,925***	***7,596***
City of Upland	699	2,164	2,194	2,194	2,194
Cucamonga Valley Water District	2,047	7,283	8,133	8,733	9,514
Fontana Water Company	2,024	7,000	7,180	7,240	7,320
Monte Vista Water District	447	1,310	1,373	1,437	1,500
San Antonio Water Company	123	351	331	339	348
Total	**8,600**	**28,281**	**30,356**	**31,993**	**33,861**
Total (rounded)(3)	8,600	28,500	30,000	32,000	34,000

(1) Calculated by multiplying the projected demands from Table2-8 of the 2005 UWMP (IEUA, 2005d) with 3.6%
(2) Calculated by multiplying the projected demands from Table2-8 of the 2005 UWMP (IEUA, 2005d) with 10%
(3) Water conservation goal as listed in Table2-8 of the 2005 UWMP (IEUA, 2005d)

It should be noted that the water conservation goals presented in **Table 3-2** include both active and passive water conservation, resulting in higher water conservation goals than presented in IEUA's Draft UWMP (IEUA, 2005), which include active water conservation measures only.

Passive water conservation refers can be defined as the water conservation resulting from changes in the (plumbing) code and will happen automatically due to changes in the available appliances. Passive conservation is also referred to as "Code Based water conservation". Active water conservation can be defined as water conservation resulting from special activities and (financial) incentives that encourage reduction in water usage.

The active and passive water conservation goals for the City are listed in **Table 3-3**.

Table 3-3
IEUA's Water Conservation Goals (Active and Passive)

Water Conservation Goal	2005(1) (AFY)	2010(2) (AFY)	2015(2) (AFY)	2020(2) (AFY)	2025(2) (AFY)	2030(3) (AFY)
Active Water Conservation(1)	840	1,800	2,630	2,980	3,640	3,712
Passive Water Conservation(2)	985	3,895	3,685	3,945	3,956	4,035
Total	**1,825**	**5,695**	**6,315**	**6,925**	**7,596**	**7,747**

(1) Water conservation goal as listed in Table2-10 of the 2005 UWMP (IEUA, 2005)
(2) Water conservation goal as listed in Table2-8 of the 2005 UWMP (IEUA, 2005d)
(3) Total calculated as 10 percent of the projected demands; 2025-2030 increase distributed evenly between active and passive water conservation.

To achieve the water conservation goals listed in **Table 3-2**, IEUA has included an annual BMP implementation schedule in its UWMP for the years 2005 through 2010. The estimated cost of implementing these BMPs is $1,536,500. These programs are estimated to generate 1,020 acre-ft of new water savings per year for the period 2005-2010. This corresponds to a unit cost of approximately $300 per acre-ft (1,020 AFY x $1,536,500/5 years) (IEUA, 2005).

3.2.3 2010 and Beyond

Water conservation is a constantly evolving process due to changes and improvements in technologies, saturation of water saving devices, and consumer trends. By the year 2010, many programs are expected to be fully implemented, and some of the incentive programs may not be needed anymore due to market transformations.

For the period 2010 and beyond, IEUA and the retail agencies will modify the water conservation program and focus on those areas where the greatest water conservation potential will exist. Programs that may be part of the water conservation strategy in this period are:

- Replacement of water inefficient toilets, clothes washers, dishwashers, showerheads, and irrigation systems in existing homes
- Aggressive water conservation measures in new homes, similar to a large scale implementation of the pilot program "California Friendly Model Home"
- Incentives such as "Turf Buyback program" where homeowners receive a rebate (e.g. $1.00 per square foot) of turf removed.

- Expansion of the CII rebate program "Save Water, Save A Buck"
- Implementation of an extensive recycled water system throughout IEUA's service area.
- Legislative approaches such as the "Retrofit upon Resale" ordinance that requires plumbing upgrades prior to selling a property.
- Adjustment of rate structures that reward conservation minded customers with lower rates.
- Continuation of education programs for teachers and students.

3.3 WATER CONSERVATION STRATEGY OF ONTARIO

The City signed the MOU on December 11, 2002 (Ontario, 2002). The MOU sets goals for implementing each of the BMPs. Since 2003, the City has submitted the annual BMP Activity Report to the CUWCC. The BMP reports for 2003 and 2004 are included in **Appendix C**, and the status of the City's water conservation efforts are summarized in **Table 3-4**.

Table 3-4
BMP Implementation Status - City of Ontario

Best Management Practices		Status Details(1)
1	Water Survey Programs for Single-Family and Multi-Family Residential Customers	Surveys began in 2005. Several hundreds of surveys completed.
2	Residential Plumbing Retrofit	City distributed over 1,000 low-flow showerheads along with other conservation items to customers that completed surveys
3	System Water Audits, Leak Detection and Repair	Pre-Screening Completed
4	Metering with Commodity Rates for all New Connections and Retrofit of Existing	All accounts are metered
5	Large Landscape Conservation Programs and Incentives	Ontario, in conjunction with IEUA, conducted 3 audits in 2005
6	High-Efficiency Washing Machine Rebate Programs (HECW)	51 rebates awarded in 2004. Funded by IEUA (through MWD)
7	Public Information Programs	32 activities reported to date in BMP reports
8	School Education Programs	70 presentations to 1595 students to date in the BMP reports
9	Conservation Programs for CII Accounts	18 CII Surveys, 211 rebates, 6 AFY of Performance Savings, and 20.5 AFY of Conservation Program Savings. This BMP is also covered by IEUA's "*Save Water Save a Buck*" program
10	Wholesale agency programs	N/A (Ontario is a retail agency)
11	Conservation Pricing	Increasing block pricing structure
12	Water Conservation Coordinator	Position staffed in 2001
13	Water Waste Prohibition	A general water waste prohibition is incorporated into the Emergency Water Conservation section of the City Ordinances (OMC, Section 6, Chapter 8A.)
14	Residential ULFT Replacement Program	1,756 rebates reported in BMP reports

(1) Reflect cumulative totals to date (September 2005)

Examples of the existing water conservation programs implemented by the City (Ontario, 2005a) are:

- ULF Toilet Exchange Program: The City promotes water conservation through distribution of ULF toilets that have a flushing volume of 1.6 gallons, compared to 3.5 gallons/flush of older models. Single family home customers that reside in homes built prior to 1992 are eligible to participate in this program. . The City hosts at least two large-scale toilet distribution events each year.
- ULF Toilet Rebate Program: Customers that are not able to participate in the exchange program may purchase toilets from a local retailer and apply for a $50.00 rebate per toilet.
- HECW Rebates: Customers may purchase a HECW and apply for a rebate up to $100.00.
- Water Education Water Awareness Committee (WEWAC): The City is an active member of WEWAC, a committee that is comprised of local agencies. WEWAC co-sponsors several education programs for teachers and students regarding conservation and the environment. WEWAC also provides public education grants.
- Home and Garden Show: The annual home and garden show held at the Ontario Convention Center provides water resource information and conservation materials through WEWAC.
- Low Flow Shower Heads: Customers can obtain new low flow showerheads free of charge in exchange for their less water efficient showerheads from the City's Utilities Department. The City also provides faucet aerators and low-flow hose nozzles.
- Cooling Tower Rebate: Commercial customers can receive a $500.00 rebate by installing a Cooling Tower Conductivity Controller, which can save up to 800,000 gallons annually.

Based on the 2004 Activity Reports submitted to CUWCC, the active water conservation amount achieved by the end of the fiscal year (FY) 2005 is estimated to be around 177 AFY. It should be noted that this does not include passive or "code based" water conservation. Hence, the total amount of water conservation is higher. The estimate breakdown is presented in **Table 3-5.** Details of calculations to estimate the water conservation savings are included in **Appendix D**. The estimated (active) water conservation (177 AFY) is significantly less than the IEUA's water conservation goal for 2005 as defined in the 2000 UWMP (3,000 AFY). It should be noted that the goal for 2005 was lowered from 3,000 AFY to 840 AFY in the 2005 UWMP (IEUA, 2005). Based on the estimate of 177 AFY it is evident that the City needs to ramp up the implementation of the BMPs. The strategy to increase water conservation and meet the goal set for year 2010 is discussed in Section 3.3.1.

It should be noted that the water conservation estimates only include active water conservation measures, and do not account for passive water conservation such as the direct purchase of ULF toilets, showerheads, or high-efficiency washers by residents in the City that do not apply for a rebate. The estimates also excludes the water conservation achieved by behavioral changes as a result of education programs and increased awareness of the limited water resources in California.

Table 3-5
Water Conservation Estimate by the End of FY 2004/2005 (Active Programs)

Best Management Practices (BMP's)	Total Number of BMP's	Estimated Savings(1) (AFY)
(1) Water Survey Programs for Single-Family and Multi-Family Residential Customers	0	0.0
(2) Residential Plumbing Retrofit - single family dwelling units	1,500	14.4
(2) Residential Plumbing Retrofit - multi family dwelling units	500	4.8
(3) System Water Audits	on-going	0.0
(4) Metering with Commodity Rates	on-going	0.0
(5) Large Landscape Programs	on-going	0.0
(6) HECW machine Rebate Programs (washers)	689	31.4
Pool Cover Rebates(2)	87	4.5
(7) Public Information Programs	32	0.0
(8) School Education Programs	1,595	0.0
(9) Conservation Programs for CII accounts	211	-
CII ULF Toilet rebates	187	11.2
unknown CII Rebates	3	0.0
CII Surveys	18	0.0
HECW rebates	69	8.3
Cooling Tower Conductivity Controllers (CTCC)	9	20.2
Waterbrooms(3)	17	2.6
Performance Target savings	0	6.0
Conservation Program Targets	0	19.5
(10) Wholesale pricing	N/A	N/A
(11) Conservation Pricing	complete	0.0
(12) Conservation Coordinator	complete	0.0
(13) Water Waste Prohibition	complete	0.0
(14) Residential ULFT rebates	1,756	54.4
Total Estimated Savings	**n/a**	**177.0**

Note: Details of calculations to estimate the water conservation savings are included in **Appendix D.**
(1) Includes active water conservation estimates only, does not include passive (or Code Based) water conservation.
(2) This program has been discontinued by IEUA.
(3) This program has been discontinued by the City.

In addition, the water conservation estimates are highly dependent upon the assumptions made to calculate the actual water conservation achieved by certain BMPs. The assumptions used for the water conservation estimates presented in this section are listed below.

- Showerhead Savings (BMP 2): The MOU states that pre-retrofit showerheads correspond with an estimated water use of 7.2 gpd/cap, while low flow showerheads have an average water usage of 2.9 gpd/cap. Therefore, the water savings are about 4.3 gpd/cap. With an average density of 4 people per household and 2 showerheads per homes, this equates to 8.6 gpd/showerhead or 0.010 AFY per showerhead.

- Large Landscape Meters (BMP 5): The MOU states that landscaping retrofits result in 15 percent water savings. With 1,000 large landscaping meters (2004 BMP report) and a total irrigation demand of 6,402 AFY, the average landscaping water usage in the City is 6.4 AFY. Hence, 15 percent savings equates to about 0.96 AFY per meter.
- Residential HECW Rebate Program (BMP 6): The potential water savings of a residential HECW machine is estimated to be up to 14,720 gallons per year or 0.046 AFY (IEUA, 2005a). These savings can be achieved when a 40 gallon per load washer is replaced with a 20 gallon per load washer and the clothes washer is used 400 times a year. Pool Cover rebates , grouped with residential HECW for this report, have a savings of 0.052 AFY (IEUA, 2005b).
- CII Rebates (BMP 9): The MWD CII Annual Report (MWD, 2004) lists the water savings of various CII water devices. The devices that are part of the City's rebate program under this BMP and the associated water savings are: 0.06 AFY for ULFT, 0.12 AFY for commercial HECW, 2.24 AFY for CTCC, and 0.15 AFY for water brooms. It should be noted that these unit savings in the CII sector are higher for residential BMP's due to more intensive use.
- ULF Toilets (BMP 14): The water conservation estimate of residential ULFT's is based on the savings reported in the IEUA Regional ULF Toilet Rebate Program Status Report (IEUA, 2005c). This report states that 308 active toilet replacements resulted in an average saving of 9.7 AFY, or 0.03 AFY/toilet.

The water conservation as a result of other BMP's are not included in **Table 3-5** as water savings for many BMPs are difficult to quantify. In addition, measurable water savings from ULFT distribution occurring prior to 2003 is not included in the table. Therefore, it is expected that the actual water savings are higher than 177 AFY.

3.3.2 2006-2010

As listed in **Table 3-2**, the water conservation goal for the City in year 2010 is 1,800 AFY (IEUA, 2005). This goal reflects active water conservation measures only, and does not include passive water conservation as a result of plumbing retrofits etc. To achieve this goal and to be in compliance with the goals defined in the MOU, a water conservation implementation plan has been developed as part of this UWMP. This plan defines the number of BMP's that need to be implemented each year to achieve the 2010 water conservation goal. **Table 3-6** presents the number of BMPs that needs to be realized on an annual basis from FY 2005-2006 through FY 2009-2010 to achieve the water conservation goals. **Appendix D** contains BMP activity reports for 2003 and 2004 and additional details regarding existing and project water conservation projections.

Table 3-6
Ontario's Active Water Conservation Implementation Plan

Best Management Practice	Hist.	Future BMP Activities (MOU and Add'l)					Estimated Savings (AFY)						Unit
	Pre FY 04-05	FY 05-06	FY 06-07	FY 07-08	FY 08-09	FY 09-10	Pre FY 04-05	FY 05-06	FY 06-07	FY 07-08	FY 08-09	FY 09-10	
(1) Water Survey Programs	0	0	0	0	0	0	0	0	0	0	0	0	
SFR Surveys	0	408	489.5	571	647.5	724	0	0	0	0	0	0	Surveys
MFR Surveys	0	31	37	43	49	55	0	0	0	0	0	0	Surveys
(2) Residential Plumbing Retrofit	0	-	-	-	-	-	0	0	0	0	0	0	-
SFR Rebates	1,500	2,386	2,386	2,386	2,386	2,386	14	37	60	83	106	129	Showerheads
MFR Rebates	500	1,108	1,108	1,108	1,108	1,108	5	15	26	37	47	58	Showerheads
(3) System Water Audits	0	0	0	0	0	0	0	0	0	0	0	0	Audits
(4) Metering with Commodity Rates	0	0	0	0	0	0	0	0	0	0	0	0	Unmetered Accounts
(5) Large Landscape Programs	0	225	225	450	50	50	0	216	432	864	912	960	Accounts
(6) HECW Rebates	689	200	200	200	200	200	31	41	50	59	68	77	Rebates
Pool Cover Rebates(2)	87	0	0	0	0	0	5	5	5	5	5	5	Rebates
(7) Public Information Programs	32	0	0	0	0	0	0	0	0	0	0	0	Events
(8) School Education Programs	1,595	0	0	0	0	0	0	0	0	0	0	0	Students
(9) CII Conservation Programs	-	-	-	-	-	-	-	-	-	-	-	-	
Commercial surveys	11	28	47	67	92	117	0	0	0	0	0	0	Surveys
Industrial surveys	3	4	7	10	14	17	0	0	0	0	0	0	Surveys
Institutional surveys	4	3	6	8	11	14	0	0	0	0	0	0	Surveys
Number of CII ULFT rebates	187	450	500	550	600	650	11	38	68	101	137	176	Rebates
Unknown rebates	3	0	0	0	0	0	0	0	0	0	0	0	Rebates
HECW	69	10	10	10	15	20	8	9	11	12	14	16	Rebates
CCTC	9	5	5	5	5	5	20	31	43	54	65	76	Rebates
Waterbrooms(2)	17	0	0	0	0	0	3	3	3	3	3	3	Rebates
Performance Target savings	6	0	0	0	0	0	6	6	6	6	6	6	AFY
Conservation Program Targets	20	0	0	0	0	0	20	20	20	20	20	20	AFY
(11) Conservation Pricing	0	0	0	0	0	0	0	0	0	0	0	0	-
(12) Conservation Coordinator	0	0	0	0	0	0	0	0	0	0	0	0	Coordinator
(13) Water Waste Prohibition	0	0	0	0	0	0	0	0	0	0	0	0	-
(14) Res. ULFT Replacements	1,756	500	1,000	1,500	2,000	2,500	54	70	101	147	209	287	Rebates
Total(1)	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**177**	**491**	**823**	**1,390**	**1,592**	**1,813**	

(1) Totals may not add up due to rounding.
(2) Program is discontinued (no increase).

As shown in **Appendix D**, the BMPs are divided into three categories; 1) Pre- FY 04-05, 2) MOU Requirements, and 3) Additional BMP Activities. The measures currently in place are referred to as "Pre-FY 04-05", and are estimated to conserve about 177 AFY (see **Table 3-5**). The BMPs listed in the MOU requirements would result in an additional 936 AFY, increasing the water conservation amount to 1,113 AFY. Hence, additional BMP activities have been identified to meet the goal of 1,800 AFY. These additional activities are:

- Increasing the number of distributed showerheads give-aways (BMP 2) by 1,000 for SFR customers and 1,000 for MFR customers for the next five years.
- Implementing water conservation measures at 50 large landscaping customers in FY 2008-2009 and FY 2009-2010.
- Providing rebates for 200 residential HECW's per year (BMP 6) for each year in 2006 through 2010.
- Distributing ULF toilets in the CII sector (BMP 9), starting with 450 units in FY 2006-2007 and increase by 50 toilets per year to 650 toilets in 2010.
- Providing rebates for 10 commercial HECW for the next 3 FY's, then increase by 5 each FY until FY 2009-2010 for a total of 20 HECW per year.
- Distributing 5 CTCC per year.
- ULF toilets in the residential sector (BMP 14), starting with 1,000 units in FY 2006-07 and increase by 500 toilets per year to 2,500 toilets in FY 2009 -2010.

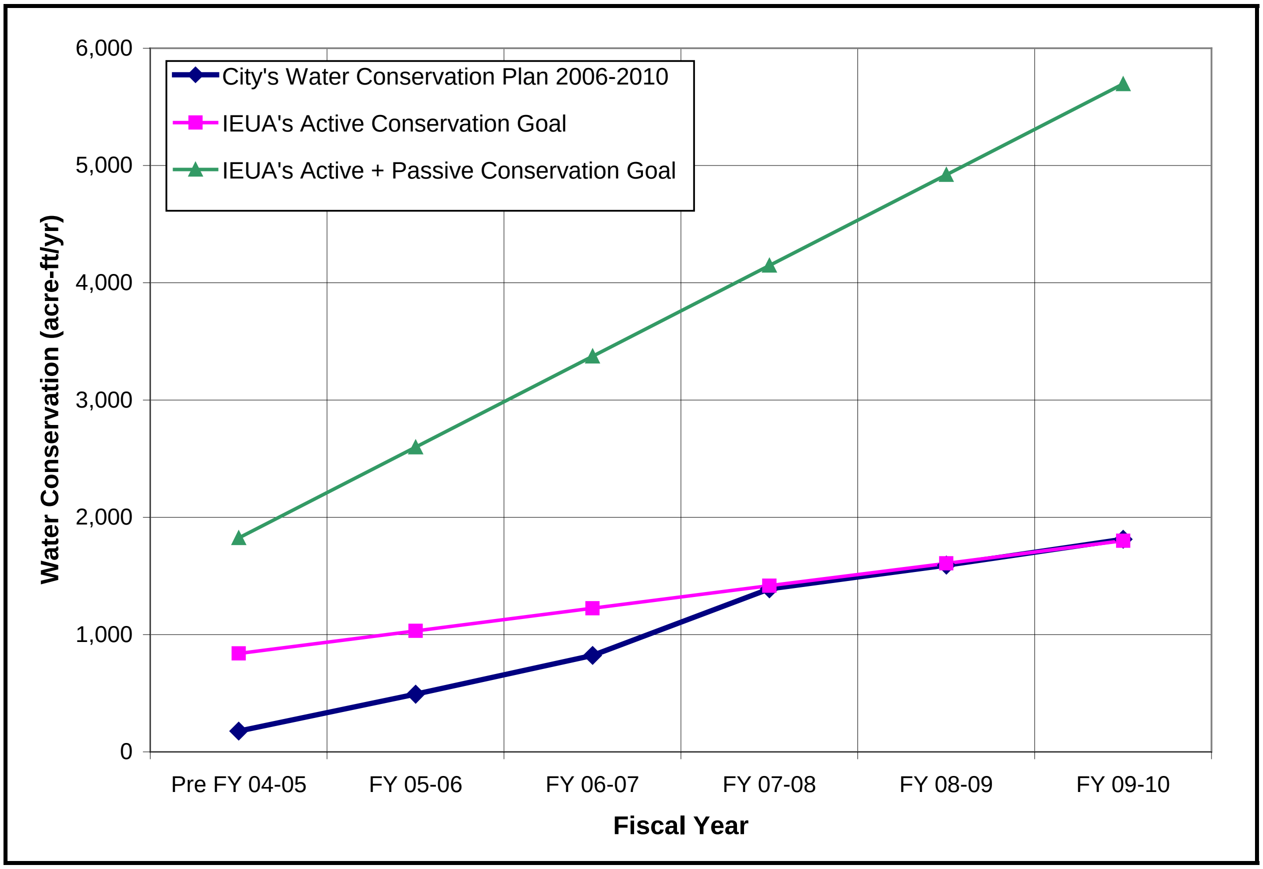
These activities and the MOU requirements will bring the water conservation in line with the IEUA goal. The comparison of the active water conservation goals and estimated water conservation is listed in **Table 3-7** and is graphically shown on **Figure 3-1**. This figure also presents the combined active and passive water conservation goal as presented in the Review Draft UMWP (IEUA, 2005d). As shown in the figure, passive water conservation is expected to contribute significantly to the total water conservation, ranging from about 55-70 percent of the total water conservation.

Table 3-7
Comparison of Water Conservation Estimates and Goals for 2006-2010

Water Conservation Plan	Pre FY 04-05 (AFY)	FY 05-06 (AFY)	FY 06-07 (AFY)	FY 07-08 (AFY)	FY 08-09 (AFY)	FY 09-10 (AFY)
City's Water Conservation Plan(1)	177	491	823	1,390	1,592	1,813
IEUA's Active Water Conservation Goal(2)	840	1,032	1,224	1,416	1,608	1,800
Difference (AFY)	-663	-541	-401	-26	-16	13
Difference (%)	-79%	-52%	-33%	-2%	-1%	1%
City's Water Conservation Plan(1)	177	491	823	1,390	1,592	1,813
IEUA's Active and Passive Water Conservation Goal(3)	1,825	2,599	3,373	4,147	4,921	5,695
Difference (AFY)	-1,648	-2,108	-2,550	-2,757	-3,329	-3,882
Difference (%)	-90%	-81%	-76%	-66%	-68%	-68%

(1) The estimated savings of the City's water conservation plan reflect active conservation measures only.
(2) Active water conservation goals per IEUA's Draft UWMP Table 2-10 (IEUA, 2005).
(3) Active and passive water conservation goals per IEUA's Review Draft UWMP Table 2-8 (IEUA, 2005d) and **Table 3-2**.

Figure 3-1
Comparison of Water Conservation Estimates and Goals for 2006-2010



As shown in **Figure 3-1**, the proposed implementation plan will result in a rapid increase of water conservation in the period FY 06/07 to FY 07/08, primarily as a result of the large landscaping metering program. In the following years, the MOU requirements and additional BMP activities will increase the water conservation at the same rate as the linear increase in water conservation goals set by IEUA.

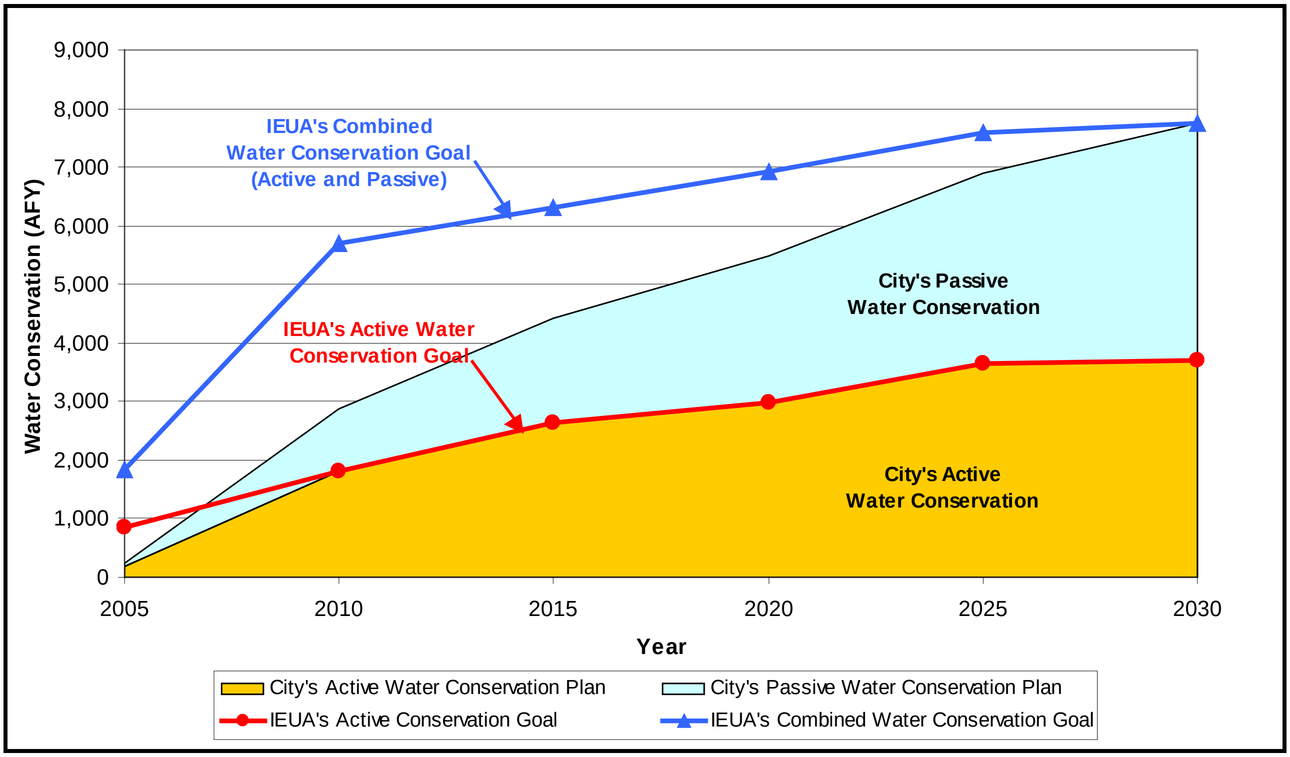
3.3.3 2010 and Beyond

In addition to the active water conservation measures defined in **Table 3-6**, passive water conservation will take place as new homes in the NMC will be constructed according to current plumbing codes and toilet and fixtures will be replaced in homes in the OMC. It is the City's goal to reach IEUA's combined (passive and active) water conservation goal in year 2030 when the NMC is anticipated to reach build out conditions. The estimated water conservation increase compared to the goals of IEUA defined in the Draft and Review Draft Urban Water Management Plan Reports is presented in **Figure 3-2**. This estimate is based the following assumptions:

- 100 percent of the homes in the NMC will be in compliance with the current plumbing code by installation of water conserving toilets, showerheads and fixtures;

- 25 percent of the homes in the OMC will be in compliance with the current plumbing code in year 2030 through passive replacement of toilets, showerheads and fixtures;
- Implementation of passive water conservation measures would save approximately 15 gallons of water per person per day.

Figure 3-2
Comparison of Water Conservation Estimates and Goals for 2005-2030



Water conservation measures that need to be taken beyond year 2010 should be defined in detail in the 2010 UWMP Update. The actual water conservation achieved by year 2009 should be estimated and compared with the goals set by IEUA. Additional water conservation measures should be considered in the future because market saturation of certain BMPs, such as ULF toilets, is anticipated to occur in the future. A number of water conservation alternatives are discussed under the water conservation strategy of IEUA for the period 2010 and beyond.

Section 4
Water Supplies

4.1 INTRODUCTION

About one third of the water used in Southern California comes from local sources such as groundwater and treated runoff water, while two thirds of the water supplies are imported into the region from the Colorado River (via the Colorado River Aqueduct), the Sacramento-San Joaquin River Delta (via the State Water Project (SWP) aqueduct and the Owens Valley and Mono Basin (via the Los Angeles Aqueducts).

Increased environmental regulations and competition for water from outside the region have resulted in projected decreases in reliability of imported water supplies. At the same time, the Colorado River basin is experiencing a drought that is unprecedented in recorded history, while water demands continue to rise within the region because of population and economic growth.

To address the regional water supply challenges, Metropolitan Water District of Southern California (MWD) completed a landmark evaluation of the future water supplies in Southern California in 1996. This evaluation is known as the Integrated Resources Plan (IRP). The purposed of this plan was to provide a realistic means of achieving a reliable and affordable water supply to meet Southern California's water needs until year 2020. This plan developed a Preferred Resource Mix which consisted of a diverse mix of resources to meet a goal of 100 percent reliability for full-service demands through 2020 through the attainment of regional targets set for conservation, local supplies, SWP supplies, Colorado River supplies, groundwater banking, and water transfers.

The IRP was updated in May 2004 to incorporate achievements to date, identify changed conditions, and to extend the planning horizon to year 2025. The results of the IRP Update show that the most significant change was the increased participation of local agencies in developing local water supplies and promoting water conservation. The contribution of the City of Ontario (City) to develop new local water supplies are discussed in this section. The existing and projected water supplies presented herein are based on the water supply plan presented in the Water Master Plan (WMP) Update (MWH, 2005).

4.2 HISTORICAL WATER SUPPLY

Currently, the City obtains potable water from the following four principal sources:

- Chino Basin groundwater wells owned and operated by the City
- Chino Basin Groundwater from San Antonio Water Company (SAWC)
- Imported water from the Water Facilities Authority (WFA)
- Imported recycled water from the Inland Empire Utilities Agency (IEUA)

The historical water supply mix for the period 1990-2003 is listed in acre-feet per year (AFY) in **Table 4-1** and is graphically presented in **Figure 4-1**.

Table 4-1
Historical Water Supply Mix

Year	WFA (AFY)	SAWC[1] (AFY)	Wells (AFY)	IEUA[2] (AFY)	Total (AFY)
1990	16,637	574	20,639	0	37,850
1991	8,607	1,632	24,900	0	35,140
1992	8,825	1,084	24,935	0	34,844
1993	14,645	1,040	19,474	0	35,159
1994	7,695	476	28,555	0	36,725
1995	6,810	0	30,994	0	37,804
1996	8,759	0	32,006	0	40,765
1997	7,590	0	35,526	0	43,115
1998	4,582	0	35,489	0	40,071
1999	8,116	0	37,029	0	45,144
2000	9,258	0	36,842	0	46,100
2001	8,907	0	35,105	0	44,011
2002	9,325	0	35,444	0	44,769
2003	13,207	0	30,240	630	43,447
2004	15,143	0	27,824	1,058	42,967
Average	**9,874**	**320**	**30,333**	**113**	**40,527**

(1) Per the agreement between City and SAWC, the City pumps SAWC's entitlement from its own wells to avoiding the water quality problems associated with SAWC's well.
(2) Historical recycled water sales to customers within the City of Ontario.

As shown in **Table 4-1** and **Figure 4-1**, the City has not imported Chino Basin groundwater from SAWC since 1994 due to high nitrate in their well water. In the past, the City took at a maximum 1,632 AFY of water and an average of 961 AFY of water over the years 1990 to 1994. Since 2001, the City has pumped water from its own wells on behalf of SAWC to obtain its entitlement. As discussed in Section 2.3.3, the City obtains water rights from SAWC in exchange for water deliveries through the City's distribution system.

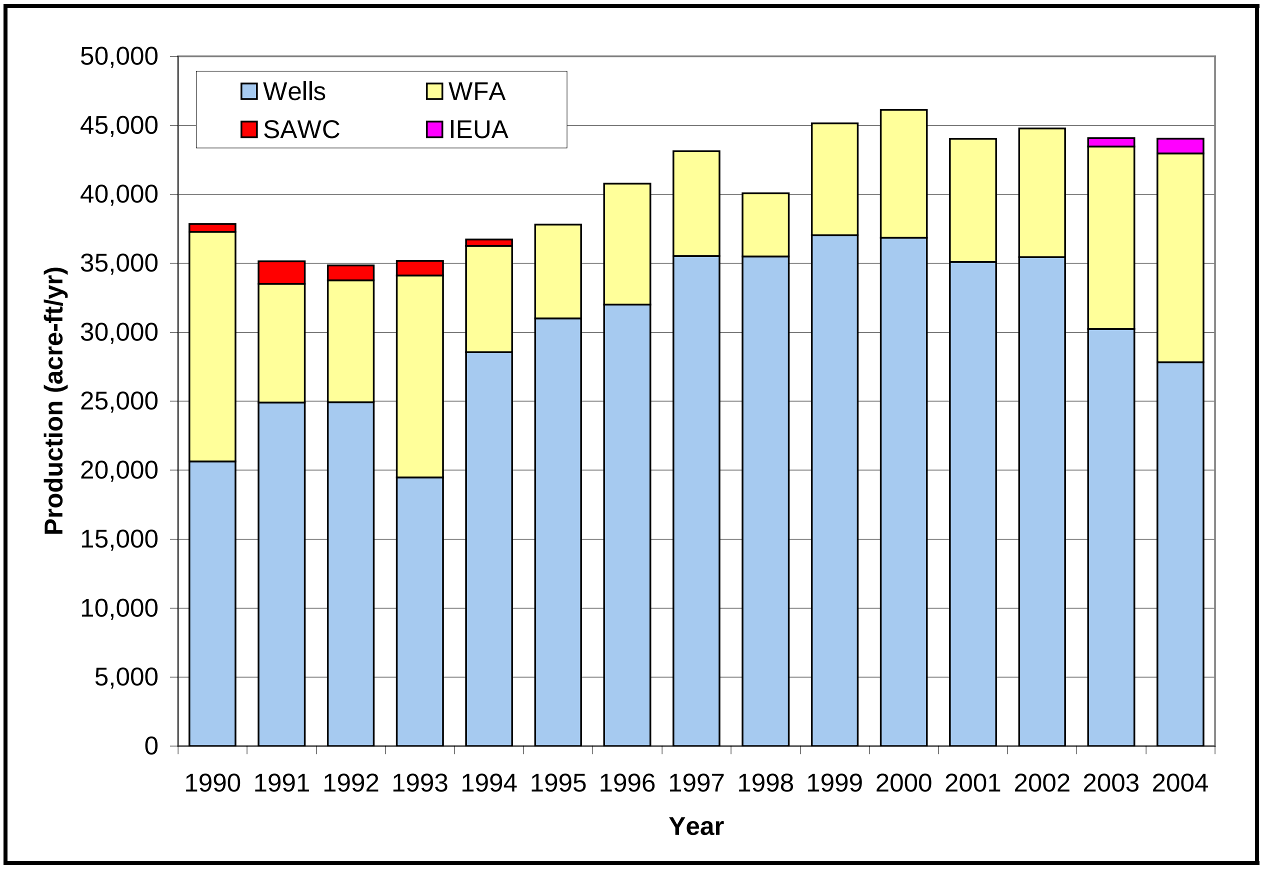
Recycled water recharge of the Chino Basin is not shown as a separate supply source, as this supply is represented in the historical amount of groundwater pumped with City wells. However, the amount groundwater recharged with recycled water is important as it reduces the amount of groundwater overpumping, which is subject to a replenishment fee. The amount of overpumping is calculated as the difference of the total amount of groundwater pumped minus the groundwater rights minus the City's share (24.34 percent) of the total groundwater recharged with recycled water by IEUA.

4.3 EXISTING AND FUTURE WATER SUPPLY SOURCES

In addition to the existing water supplies from the City's groundwater wells, the SAWC groundwater wells, imported water from WFA, recycled water recharge and recycled water from IEUA, the City will have additional potable water supply source in the near future. In January 2006, the City will receive treated Chino Basin groundwater from the Chino Basin Desalter Authority (CDA).

The existing and future supply sources shown in **Figure 4-1** are discussed below.

Figure 4-1
Historical Water Supply Mix



4.3.1 Chino Basin Groundwater from City Wells

The Chino Basin covers an area of about 235 square miles. The basin contains about 5 million acre-ft of water in storage and has an unused storage capacity of about 1 million acre-ft. The Chino Basin is the largest groundwater basin in the Upper Santa Ana River watershed. The basin is bounded on the north by the Red Hill fault and Cucamonga fault zone, on the northwest by the San Jose fault, on the southwest by the Chino Hills, on the northeast by the Rialto-Colton fault, on the east by the Jurupa and Pedley Hills and on the south by the Santa Ana River. The basin is an alluvial valley that was formed when eroded sediments from the surrounding San Gabriel Mountains, the Chino Hills, the Puente Hills and the San Bernardino Mountains filled a geological depression

The groundwater quality in Chino Basin is of better quality in the north than in the south, as that is the direction of water flow through the basin. With recharge in the northern portion, salinity measured as total dissolved solids (TDS) and nitrate concentrations increase in the southern portion of Chino Basin. Generally, the TDS exceeds 500 mg/L and nitrate exceeds 50 mg/L south of Riverside Drive. TDS and nitrate generally originate from non-point sources such as land application of wastes and fertilizer from previous and current agricultural activities. In addition, several point sources of contamination exist in the basin that affects groundwater quality in localized areas.

Water Rights

Groundwater rights are defined by the 1978 judgment in the case *Chino Basin MWD v. City of Chino, et al.* The judgment is administered by a watermaster and is subject to the on-going court jurisdiction. The original watermaster, the Chino Basin Municipal Water District (now known as IEUA), was replaced in 1998 by a nine-member board made up of representatives of the basin pumpers, designated the Chino Basin Watermaster (CBWM). The judgment defined the safe yield of the basin to be 140,000 AFY.

The water rights of the Chino Basin are allotted to three pools: the Overlying (Agricultural) Pool, the Overlying (Non-agricultural) Pool, and the Appropriative Pool. The Overlying (Agricultural) Pool consists of private property owners with land being used for agricultural activities and the State of California detention centers. The Overlying (Non-Agricultural) Pool consists of businesses and industries, and the Appropriative Pool consists of cities and water agencies that supply water to their customers. Water rights are divided for the City between the three pools as follows:

Overlying (Agricultural) Pool:	82,800 AFY
Overlying (Non-Agricultural) Pool:	7,366 AFY
Appropriative Pool:	49,834 AFY
Total Water Rights:	140,000 AFY

The City has water rights based on 20.742 percent of the Initial Operating Safe Yield (OSY), permanent conversion of agricultural land, temporary transfers of unpumped water from the Overlying (Agricultural) Pool, and the safe yield reallocation of the Agricultural Pool. The cities groundwater rights are summarized in **Table 4-2**.

For Fiscal Year (FY) 2003-2004, the City had a total right to pump 28,539 AFY. This amount consists of 11,374 AFY of the Initial OSY, 11,110 AFY of Appropriative Pool transactions and new yield, 5,827 acre-ft from Agricultural Pool transfers and a one-time storage adjustment of 229 AFY. The Appropriative Pool transactions included 8,600 acre-ft of water rights that were leased from the City of Chino and Jurupa Community Services District (JCSD).

The historical and projected amount of groundwater pumped by City wells are listed in **Table 4-3** and **Table 4-4**, respectively. Historical records show that groundwater has contributed to approximately 70-80 percent of the City's water supply mix. Although the City is planning to drill more groundwater wells to serve new customers, the projected amount of groundwater decreases to about 41-48 percent of the City's water supply, which means that the City will become more reliant on imported water from WFA. These tables also show that the actual amount of groundwater pumped and projected to be pumped exceeds the City's water rights as listed in **Table 4-2**. The City needs to pay IEUA a replenishment fee of $213/acre-ft pumped in excess of its water rights to cover IEUA's cost to replenishment the groundwater basin with recycled water. As mentioned in paragraph 4.2, the amount of overpumping that is subject to the replenishment fee is reduced by the City's share of the amount of groundwater recharged with recycled water, which is calculated as 24.34 percent of the total amount of groundwater recharged with recycled water by IEUA. The projected recycled water recharge and the City's share are presented in **Table 4-5**.

Table 4-2
Groundwater Pumping Rights

Chino Basin	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Initial Safe Yield	11,374	11,374	11,374	10,337	10,337	10,337
New Yield	2,489	2,489	2,489	2,489	2,489	2,489
NMC Ag and Land Use Conversions	0	3,625	5,712	8,813	11,917	15,021
OMC Ag Conversions	97	207	317	426	536	646
Prior Land Use Conversions	895	895	895	895	895	895
Annual Early Transfers	6,803	6,803	6,803	6,803	6,803	6,803
Adjustment to Total Available(1)	(708)	(910)	(1,111)	(1,313)	(1,514)	(1,716)
Total Share of Initial OSY	**20,950**	**24,483**	**26,478**	**28,451**	**31,463**	**34,475**
SAWC Shares	765	765	765	765	765	765
Sunkist (service agreement)	1,470	1,470	1,470	1,470	1,470	1,470
Total Groundwater Rights	**23,185**	**26,718**	**28,713**	**30,686**	**33,698**	**36,710**

This table corresponds to DWR Table 5.

(1) Adjustment is based on the City's share of the projected early transfers and land use conversions. The adjustments of 708 AFY (year 2005) and the 1,716 AFY (year 2030) are obtained from the Chino Basin Water Master (Post land use conversions – 2025). As the NMC is projected to reach build out conditions in year 2030 (2005 Water Master Plan Update), the year 2025 numbers are used for 2030. Intermediate years are calculated with linear interpolation.

Table 4-3
Historical Amount of Groundwater Pumped

Chino Basin	2000	2001	2002	2003	2004
City Wells in Chino Basin (AFY)	36,842	35,105	35,444	30,240	27,824
Percent of Total Water Supply to City	80%	80%	79%	70%	65%

This table corresponds to DWR Table 6.

Table 4-4
Projected Amount of Groundwater Pumped

Chino Basin	2010	2015	2020	2025	2030
City Wells in Chino Basin (AFY)	25,248	27,453	33,554	39,312	44,721
Percent of Total Water Supply to City	41%	41%	44%	47%	48%

This table corresponds to DWR Table 7.

Table 4-5
City's Share of Groundwater Recharge

Recycled Water Recharge	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY
Total Recharge by IEUA(1)	22,000	25,000	28,000	35,000	35,000
City's Share of Total Recharge(2)	5,355	6,085	6,815	8,519	8,519

(1) Source: IEUA's Review Draft UWMP (IEUA, 2005d)
(2) Calculated as 24.34% of total groundwater recharge by IEUA.

4.3.2 Chino Basin Groundwater from SAWC

The City is a shareholder of the SAWC. Currently, the City owns 295 shares, which currently entitles the City to approximately 765 AFY. This value was recently reduced from 2.9 to about 2.59 AFY per share. Historically, the water from SAWC is delivered through a Chino Basin well that is owned and operated by SAWC. However, this well is currently closed due to nitrates over 100 mg/L, which is above the State Primary Maximum Contaminant Level of 45 mg/L.

In October 2001, the City and SAWC executed a license agreement whereby the City pumps its SAWC entitlement from its own Wells 31, 37 and 38. This agreement allows the City to access its SAWC entitlement while avoiding the water quality problems associated with SAWC's well.

In the past, the City took at a maximum 1,630 AFY of water and an average of 961 AFY of water over the years 1990 to 1994. Since 2001, the City has pumped water from its own wells on behalf of SAWC to obtain its entitlement.

4.3.3 Imported Water from WFA

The WFA operates the Aqua de Lejos Water Treatment Plant located in the City of Upland. The plant obtains raw imported SWP water from MWD through the Rialto Reach of the Foothill Feeder. At the time of its construction in 1988, the plant had an initial capacity of 68 million gallons per day (mgd). The plant is a conventional water treatment plant featuring coagulation, flocculation, sedimentation, filtration and chloramine disinfection. The plant has been re-rated several times and has a current capacity of 81 mgd. The City owns 31.4 percent of the plant capacity or 25 mgd. The City of Ontario purchases imported water from the WFA. There are two connections designated Ontario #1 (15 mgd capacity), and Ontario #2 (10 mgd capacity) serving the City's water system.

Based on historical records for 1990 through 2003, the average annual WFA supply has been 8,947 AFY, while the maximum annual purchase was 16,637 AFY in 1990. The peak monthly flow averaged 20.2 mgd. For the period 1999-2002, the City obtained about 20 percent of its annual supply from the WFA. In 2003, this amount was increased to about 30 percent.

The quality of water from the WFA has low TDS and nitrate levels at 280 and 4 mg/L, respectively. Data from MWD (1979-2005) indicates the TDS of water from the East Branch of the SWP has ranged from 84 to 455 mg/L with an average of 266 mg/L (MWD, 2005).

4.3.4 Recycled Water from IEUA

Recycled water is provided by the IEUA, which treats its collected wastewater at four regional wastewater reclamation plants; Carbon Canyon Wastewater Reclamation Facility (CCWRF), Regional Plant No. 1 (RP-1), RP-4, and RP-5. The City of Ontario can currently obtain recycled water from RP-1 and RP-4 through the existing recycled water distribution system of IEUA. As described in the IEUA's *Recycled Water Implementation Plan* (MWH, 2005b), IEUA has planned to expand the existing recycled water distribution system significantly to serve its entire service area. With the expansion, more regional recycled water pipelines will be constructed within the City that allow substantial increase of recycled water use in the future. It is anticipated that the current recycled water supply of 1,829 AFY will increase to 14,492 AFY by year 2030.

4.3.5 Chino Basin Groundwater from CDA

The City of Ontario is a member of the CDA, a joint powers agency created on September 25, 2001, between JCSD, Santa Ana River Water Company (SAWRC), IEUA and the cities of Chino, Chino Hills, Norco, and Ontario. The CDA currently operates and maintains a treatment facility, Chino Desalter I (CDA-I), and is currently in the construction phase of the Chino Desalter I Expansion and Chino Desalter II (CDA-II).

CDA-I

CDA-I treats brackish groundwater high in nitrates and TDS from the southern portion of Chino Basin and treats the water using a reverse osmosis (RO) system for domestic purposes. The CDA-I has a treated water quality goal of 350 mg/L for TDS and 25 mg/L for nitrate with a target of 20 mg/l (Chino, 2002). This quality reflects the blended product water from the plant. The existing capacity of CDA-I is 9.2 mgd, while the expansion of the CDA-I from 9.2 mgd (10,3200 AFY) to 14.2 mgd (15,900 AFY) is scheduled to be completed by January 2006. The City will take 1,500 AFY into the 1,010 Zone from a connection near the intersection of Archibald and Schaeffer Avenues after the plant is expanded.

CDA-II

In addition to the expansion of CDA-I, a second facility, CDA-II, is under construction and is expected to be completed in January 2006. The CDA-II was initiated by the CDA to provide 10,400 acre-ft/ yr of water deliveries to JCSD, the cities of Ontario, Norco and the SARWC. The City will receive 3,500 AFY of water from the CDA-II facility. This plant will deliver water to the City at two connections, one near the intersection of Philadelphia Street and Milliken Avenue and one near the intersection of Galena Street and Milliken Avenue.

CDA-III

As part of the Optimum Basin Management Plan (OBMP) investigations, the CBWM has conducted groundwater modeling studies to determine how best to establish hydraulic control of groundwater, salts and nitrates in the southern Chino Basin. Hydraulic control is necessary to ensure that groundwater, heavily contaminated with nitrate, TDS and other constituents of concern, does not discharge to the Santa Ana River and impact water users in Orange County. Hydraulic control is also needed for maintaining the safe yield of the Chino Basin. As the agricultural preserve area develops, it will be important that production be continued to prevent increased losses of water to the Santa Ana River. Groundwater production by the Agricultural Pool is currently about 40,000 AFY and is projected to decline to about 10,000 AFY. Production by the CDA desalters will be about 24,600 AFY. CBWM studies indicate that an additional 20,000 AFY of extraction will be needed to achieve hydraulic control of the basin.

CDA-III (or further expansion of CDA-I or CDA-II) is a possible facility that could be located in the southern portion of the Chino Basin, to collect and reduce the loss of water to Orange County. At this time, no capacities or locations have been identified for such a facility.

4.3.6 Dry Year Yield Program

The Dry Year Yield (DYY) Storage Program is a cooperative conjunctive use program involving MWD, IEUA, CBWM, Three Valleys Municipal Water District (TVMWD) and the Chino Basin groundwater producers. The DYY Program allows MWD to store up to 100,000 acre-ft of water in the Chino Basin when surplus water is available during wet years and produce 33,000 AFY in dry, drought or emergency periods. The DYY Program is partially funded by a State grant from Proposition 13 Bond funds. A combination of grant and MWD funding will be provided to local agencies to build water production and treatment facilities in support of the DYY. The funds received by each participating local water agency are consistent with each agency's commitment to use delivered MWD water during normal years and use groundwater from the MWD's storage account during dry years.

On April 15, 2003, the City authorized execution of an agreement with IEUA to participate in the DYY program. To participate in the DYY program, an agency agrees to reduce its use of imported water compared to the prior year by a fixed amount, known as the agency's "shift obligation". Thus, water that the City would normally import from WFA in a dry year would be offset by groundwater. The City's shift obligation is 8,076 AFY, and its share of the funding is $5,674,168. During years when MWD calls for extraction, the City's WFA production would be reduced by 8,076 AFY compared to the previous year and it would extract this amount of water from the designated DYY wells.

The funds will be used to build three new groundwater wells (designated and a wellhead treatment facility to remove nitrates from one existing well and one future well. Each well has an estimated yield of 2,500 gpm (about 3,000 AFY when operated 75 percent of the year). Upon call by MWD for stored water delivery, the City will operate these facilities, combined with the existing infrastructure to meet its shift obligation. MWD would pay for the cost of operations and the City would pay MWD (through IEUA) the full service water rate. The City can use the DYY facilities to meet its normal water demands during other periods but is responsible for the O&M costs when they use the facilities. Because of this program, the City is less reliant on imported water supply in dry years and improves its groundwater capacity during wet weather cycles.

4.4 SUMMARY OF WATER SUPPLIES

The existing and projected water supplies under normal year and dry year conditions are summarized in **Table 4-6** and **Table 4-7**, respectively. Under the Dry Year Scenario, the amount of imported water from WFA is reduced by the shift obligation amount of 8,076 AFY. This amount is pumped from the DYY wells.

The projected imported water supplies from WFA are based on the assumption that 30 percent of the water demands are met with water from WFA up to a total supply of 20,000 AFY, which is 8,000 AFY less than the City's allotment in the treatment plant capacity. The maximum capacity is not reached by year 2030. This shift obligation amount is subtracted under the Dry Year Scenario.

Table 4-6
Current and Planned Water Supplies – Normal Year Scenario

Water Supply Sources	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Wholesale Water Provider						
WFA Connection I & II (1)	19,750	19,800	19,850	19,900	19,950	20,000
Groundwater Produced						
Operating Safe Yield(2)	20,950	24,483	26,478	28,451	31,460	34,475
SAWC (3)	765	765	765	765	765	765
Recycled Water Recharge(4)	243	1,890	4,203	6,815	8,519	8,519
Leases and Transfers (5)	874	0	0	2,423	4,716	8,709
DYY(6)	0	0	0	0	0	0
Sunkist(7)	1,470	1,470	1,470	1,470	1,470	1,470
Local Surface Water Supplies	n/a	n/a	n/a	n/a	n/a	n/a
Recycled Water(9)	1,829	7,926	8,816	11,761	12,435	14,492
Desalinated Water	0	5,000	5,000	5,000	5,000	5,000
Total without Water Conservation	**45,881**	**61,334**	**66,583**	**76,585**	**84,316**	**93,430**
Water Conservation	-840	-2,635	-3,994	-4,900	-6,149	-7,747
Total with Water Conservation	**45,041**	**58,699**	**62,589**	**71,685**	**78,167**	**85,683**

This table corresponds to DWR Table 4
(1) The max capacity that WFA can deliver is 25 mgd (28,000 AFY). WFA is set at 30% of demand except for years where this would results in a supply surplus.
(2) Obtained from Table 4-2.
(3) SAWC well is closed due to high nitrates. The water rights are transferred to the City which pumps the water from its own wells (Wells 31, 37, and 38). Assessment package from the years 2003 - 2004 for the years 2004 - 2005 budget.(CBWM, 2004).
(4) The first amount of overpumping (if applicable) is assigned to recycled water recharge up to the amount listed in Table 4-5.
(5) The remaining amount of overpumping (if applicable) is assigned to leases and transfers that are subject to a replenishment fee.
(6) Shift Obligation per the "Local Agency Agreement" between IEUA and the City of Ontario (IEUA,2003).
(7) Supply from Sunkist is set equal to the projected demand, thus it does not impact the available water supply for growth.
(8) Combined Water Conservation (active + passive) is counted as a supply source. Values obtained from Table 3-3.
(9) Obtained from Table 2-6 (supply is equal to demand).

Table 4-7
Current and Planned Water Supplies – Dry Year Scenario

Water Supply Sources	2005 (AFY)	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Wholesale Water Provider						
WFA Connection I & II (1)	19,750	11,724	11,774	11,824	11,874	11,924
Groundwater Produced						
Operating Safe Yield(2)	20,950	24,483	26,478	28,451	31,460	34,475
SAWC (3)	765	765	765	765	765	765
Recycled Water Recharge(4)	243	5,355	6,085	6,815	8,519	8,519
Leases and Transfers (5)	874	742	2,678	7,554	10,420	14,984
DYY(6)	0	8,076	8,076	8,076	8,076	8,076
Sunkist(7)	1,470	1,470	1,470	1,470	1,470	1,470
Local Surface Water Supplies	n/a	n/a	n/a	n/a	n/a	n/a
Recycled Water(9)	1,829	7,926	8,816	11,761	12,435	14,492
Desalinated Water	0	5,000	5,000	5,000	5,000	5,000
Total without Water Conservation	**45,881**	**65,541**	**71,143**	**81,716**	**90,019**	**99,704**
Water Conservation(8)	-840	-2,635	-3,994	-4,900	-6,149	-7,747
Total with Water Conservation	**45,041**	**62,906**	**67,149**	**76,816**	**83,870**	**91,957**

This table corresponds to DWR Table 4
(1) The max capacity that WFA can deliver is 25 mgd (28,000 AFY). WFA is set at 30% of demand except for years where this would results in a supply surplus.
(2) Obtained from Table 4-2.
(3) SAWC well is closed due to high nitrates. The water rights are transferred to the City which pumps the water from its own wells (Wells 31, 37, and 38). Assessment package from the years 2003 - 2004 for the years 2004 - 2005 budget.(CBWM, 2004).
(4) The first amount of overpumping (if applicable) is assigned to recycled water recharge up to the amount listed in Table 4-5.
(5) The remaining amount of overpumping (if applicable) is assigned to leases and transfers that are subject to a replenishment fee.
(6) Shift Obligation per the "Local Agency Agreement" between IEUA and the City of Ontario (IEUA,2003).
(7) Supply from Sunkist is set equal to the projected demand, thus it does not impact the available water supply for growth.
(8) Combined Water Conservation (active + passive) is counted as a supply source. Values obtained from Table 3-3.
(9) Obtained from Table 2-6 (supply is equal to demand).

The OSY is calculated as the sum of:

- The City's share of the Initial OSY (20.742 percent of 54,834 or 11,373 AFY till 2017 and 10,337 AFY from 2018 and beyond due to a reduction of 5,000 AFY in OSY)
- The City's share of new yield (2,489 AFY from 2004 and beyond).
- The Ag Pool Reallocation varies over time due to increasing land use conversions and the variable conversion rates (1.3 AFY/acre prior to the Peace Agreement and 2.0 AFY/acre post Peace Agreement). The total re-allocation amount of 15,668 AFY that was estimated for year 2025 by the Chino Basin watermaster is used for year 2030, when the NMC is projected to reach build out conditions.
- The City's share of the early transfers (20.742 percent of 32,800 or 6,804 AFY)
- The City's share of overpumping (28.15 percent of 6,097 or 1,716 AFY). The percentage is based on the portion of the City's potential for reallocation (annual early transfers plus land use conversions) which is 23,366 AFY of 83,006 AFY total.

The amount of water obtained from SAWC is based on a water rights transfer as the SAWC well has high nitrates. The City will obtain water through pumping its own wells.
The amount of overpumping is calculated by subtracting all available potable water supplies (groundwater wells, WFA, SAWC, CDA-I, CDA-II, and water conservation) from the projected

average potable water demand. The first amount of overpumping is assigned to "Recycled Water Recharge" up to the amounts listed in **Table 4-5**. This amount is zero if the City has a supply surplus. For years where the City needs to overpump more than the City's share of recycled water recharge, the City would need to lease or transfer additional groundwater supplies.

The DYY amount is zero under normal conditions, and equal to the shift obligation under Dry Year Scenario.

The demand of Sunkist is assumed to remain constant.

The amount of recycled water supplies are based on the recycled water demand projections presented in **Section 3**. Although the actual available recycled water supplies from IEUA may be higher than the projected demands, the recycled water supply is set equal to the recycled water demand, to avoid counting recycled water supplies towards meeting potable water demands. Therefore, the remaining supplies listed in **Table 4-6** and **Table 4-7** should be sufficient to meet the projected potable water demands listed in **Table 2-8**.

Desalinated groundwater from CDA-I and CDA-II will become available in 2007 and is a constant supply delivery.

The Water Conservation amounts are based on the projections presented in IEUA's Review Draft UWMP (IEUA, 2005d). Details on how to achieve these water savings are presented in **Section 3**.

The comparison of supplies and demands and the supply reliability under various weather conditions are discussed in **Section 5**.

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Section 5
Supply Reliability

5.1 WATER SERVICE RELIABILITY

Water Code section 10635 (a) defines that every urban water supplier shall include an assessment of the reliability of its water service to its customers during normal, dry year, and multiple dry years in its Urban Water Management Plan (UWMP). This water supply and demand assessment shall compare the total water supply sources available to the water suppliers with the total projected water use over the next 20 years, in 5-year increments, for normal water year, a single dry water year, and multiple dry years.

This section provides the comparison of the available water supplies under various demand conditions through year 2030. The following assumptions are made to calculate the numbers presented in **Tables 5-2** through **5-29**. The projected demands per year from 2005 through 2030 under the evaluated demand scenarios are summarized in **Appendix E**.

- The projected water demand in a "Normal Water Year" are based on the average annual water demand projections presented in **Table 7-1** of the 2005 Water and Recycled Water Master Plan (MWH, 2005).
- The projected water demand in a "Single Dry Year" and "Multiple Dry Year" are based on the high annual water demand projections presented in **Table 7-1** of the 2005 Water and Recycled Water Master Plan (MWH, 2005) and adjusted for water conservation.
- The projected recycled water demands as presented in **Table 2-4** are added to all of the 2005 Water and Recycled Water Master Plan (MWH, 2005) demands under normal year, single dry year, and multiple dry years.
- The water conservation amount as presented in **Table 3-2** of this UWMP is deducted from the projected water demands. This is referred to as the "base water conservation amount"
- Multiple dry year periods consist of three consecutive years, rather than 4 years, as the City's only requires to meets its shift obligation for three years as defined in the Dry Year Yield (DYY) Program.
- For each multiple dry year period, the first and last year of each 5-year period (ending in 0 and 5) are considered normal years, while the second through fourth year are selected as the dry years. This rule does not apply to the period 2005-2010, as the DYY Program does not become effective until 2008. Years 2009 and 2010 are selected as the multiple dry years in this period. This approach is consistent with the IEUA UWMP (IEUA, 2005).
- In the second and third year of a multiple dry year period, additional water conservation equal to 10 percent of the projected high annual demand is deducted from the projected water demand minus the Active Conservation. Additional water conservation is not applied to the first year of a 3-year multiple dry year period as it is unknown in the first year if a drought sustains. It is assumed that when a drought sustains, public notifications will be used effectively to reduce water consumption.
- All years are considered normal years for the normal year evaluations.

- Every year of each 5-year period is considered as a dry years for the single dry year evaluations, because each year is evaluated separately. Additional water conservation as used for multiple dry years is not applied.
- In dry years and multiple dry years, the amount of imported water from WFA is reduced by the City's DYY shift obligation of 8,076 acre-ft/yr. This reduction in supply is compensated by increased groundwater production of 8,076 acre-ft/yr. This amount is added to the Chino Basin groundwater leases and replenishment, which is groundwater pumped in excess of the City's water rights.

With these assumptions, the contribution of each supply source to the total supply mix under the various demand conditions is determined. This contribution expressed in percentage of normal year conditions is also referred to as supply reliability. The supply reliability of groundwater leases and replenishment varies over time, as the amount of groundwater used will increase in the future to meet the increasing demands. The supply reliability of the City's supply sources are summarized in **Table 5-1**. The upper end of each range represents the first dry year in the period 2005-2030 when the shift obligation is relatively high, while the lower end of each range represents the last dry year in the period 2005-2030 when the shift obligation becomes a smaller percentage due to an increase in groundwater production.

Table 5-1
Supply Reliability per Source

Supply Source	Average / Normal Water Year	Single Dry Water Year	Multiple Dry Water Years (1)			
			Year 1	Year 2	Year 3	Year 4 (2)
Groundwater Rights	100%	100%	100%	100%	100%	100%
Recycled Water	100%	100%	100%	105%	110%	100%
CDA I & II	100%	100%	100%	100%	100%	100%
Imported Water	100%	62%	60%	59%	59%	100%

This table corresponds to DWR Table 8.
Source: (IEUA,2005) pg. 169
(1) Chino Basin Dry-Year Yield (DYY) Program facilities provide for 100,000 AF of storage and 33,000 AFY of additional groundwater production for use in-lieu of Imported Water during dry years. The DYY Program is in effect during dry years between 2008 and 2025. Percentages reflect decrease in imported water and associated increase in groundwater production. From Report on Metropolitan's Water Supplies " A Blueprint for Water Reliability" (MWD, 2003), Metropolitan has documented the capability to reliably meet 100 percent of projected supplemental water demands through 2030. Per the Fiscal Year 2004/2005 Chino Basin Watermaster Assessment Package, agencies have approximately 150,000 AF in storage.
(2) Metropolitan's Report on Metropolitan's Water Supplies, A Blueprint for Water Reliability, March 25, 2003, provides information for three consecutive dry years

5.2 PROJECTED DEMAND AND SUPPLIES – NORMAL WATER YEAR

The City's water supplies, which are separated into the following five categories, are summarized in **Table 5-2**:

- Groundwater – The City's water rights consistent with the operating safe yield (OSY) of the Chino Basin and City's water rights through the San Antonio Water Company (SAWC) shares. As discussed in detail in **Section 4**, the City's water rights will increase in time due to land use conversions and other factors from 25,660 acre-ft/yr in 2005 to 33,063 acre-ft/yr in 2030.

- CDA – The City's 5,000 acre-ft/yr allotment of Chino Desalter I and II starting in 2006.
- Chino Basin Leases and Replenishment – The amount of groundwater pumped in excess of the City's water rights that are subject to replenishment fees. This amount increases over time to accommodate the growth in water demand.
- Imported Water – The projected amount of water purchased from WFA and increases to 20,000 acre-ft/yr in year 2030 under normal year conditions. This amount is adjusted with the shift obligation of 8,076 acre-ft/yr for single and multiple dry years.
- Recycled Water – The recycled water supply is set equal to the projected recycled water demand and increases from gradually to 14,492 acre-ft/yr in 2030.

Table 5-2
Projected Normal Water Supply

Supply Sources	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Groundwater Rights (1)	26,718	28,713	30,686	33,695	36,710
CDA-I and II	0	209	4,338	7,086	9,481
Additional Groundwater Pumping(2)	5,000	5,000	5,000	5,000	5,000
Imported Water(3)	19,055	19,850	19,900	19,950	20,000
Recycled Water	7,926	8,816	11,761	12,435	14,492
Base Conservation	2,635	3,994	4,900	6,149	7,747
Total Supply	**61,334**	**66,583**	**76,585**	**84,316**	**93,430**

This table corresponds to DWR Table 40.
(1) Groundwater rights includes the Total share of Initial OSY, the SAWC shares, and the water rights from Sunkist.
(2) Additional groundwater pumping includes recycled water recharge, leases and transfers.
(3) The City of Ontario owns a total capacity of 25 MGD (28,000 AF) in the WFA Plant.

The projected normal demand consist of the combination of potable and recycled water demands and is adjusted for the base water conservation as discussed in **Section 3**. The projected normal year demands are summarized in **Table 5-3**.

Table 5-3
Projected Normal Year Water Demand

Demand	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Potable Water	53,408	57,767	64,824	71,881	78,938
Recycled Water	7,926	8,816	11,761	12,435	14,492
Total Demand	**61,334**	**66,583**	**76,585**	**84,316**	**93,430**
% of year 2005	136%	148%	170%	187%	207%
Active Conservation	(2,635)	(3,994)	(4,900)	(6,149)	(7,747)
Total Demand with Conservation	**58,699**	**62,589**	**71,685**	**78,167**	**85,683**

This table corresponds to DWR Table 41

The comparison between the available water supplies and projected demands for normal year conditions is presented in **Table 5-4**. As shown in this table, the available supplies are equal to the projected demand.

Table 5-4
Normal Year Supply and Demand Comparison

Supply and Demand	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Supply totals	61,334	66,583	76,585	84,316	93,430
Demand totals	61,334	66,583	76,585	84,316	93,430
Difference	**0**	**0**	**0**	**0**	**0**
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

This table corresponds to DWR Table 42

The supply strategy shown in **Table 5-4** is based on maximizing groundwater and CDA supplies as these are the cheapest sources of supply. The amount of imported water is such that the City maintains sufficient supplies when it needs to meet its shift obligation in dry years. The recycled water supplies are set equal to the recycled water demand. Hence, the only variable in the water supply mix is the amount of Chino Basins groundwater leases and replenishment. This amount is adjusted such that the total water supply equals the projected demands. Therefore, there is no supply surplus shown in **Table 5-4**. However, the City has the ability to pump more water if needed as the City's groundwater pumping capacity is greater than needed to meet the annual demands, as additional wells are used to meet the maximum day demand. The groundwater supply surplus based on continues groundwater pumping of all wells is shown in **Table 5-5**.

Table 5-5
Groundwater Pumping Surplus in Normal Year Conditions

Groundwater Supply	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Groundwater Rights	26,718	28,713	30,686	33,695	36,710
Additional Groundwater Pumping(1)	0	209	4,338	7,086	9,481
Total Projected GW Supply	**26,718**	**28,923**	**35,024**	**40,782**	**46,191**
Available GW Pumping Capacity	78,877	78,877	78,877	83,715	93,391
GW Pumping Surplus	**52,159**	**49,954**	**43,853**	**42,933**	**47,200**

(1) Additional groundwater pumping includes recycled water recharge, leases and transfers.

5.3 PROJECTED DEMAND AND SUPPLIES – SINGLE DRY YEAR

The City has the same water supply sources available in a single dry year as in a normal dry year, however the available amount of some of the sources are adjusted. As discussed in **Section 4**, the City will participate in a cooperative conjunctive use program with Metropolitan Water District of Southern California (MWD) and other agencies. This program will become effective in year 2008. Under this program, the City will receive less imported water from MWD through WFA in years designated as a dry year based on the regional water supply situation. To compensate the reduced imported water supply, also referred to as the City's shift obligation, the City will pump additional groundwater with wells that are drilled and financed through the DYY Program. The City's shift obligation is 8,076 acre-ft/yr. The water supply mix under dry year conditions is presented in **Table 5-5**. As shown in this table, the imported supplies are reduced by 8,076 acre-ft/yr, while the chino basin replenishment supplies are increased by this amount.

Table 5-6
Projected Single Dry Year Water Supply

Supply Sources	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Groundwater Rights(1)	26,718	28,713	30,686	33,695	36,710
Additional GW Pumping(2)	5,000	5,000	5,000	5,000	5,000
CDA-I and II	11,538	12,845	17,546	20,866	23,832
Imported Water	11,724	11,774	11,824	11,874	11,924
Recycled Water	9,449	10,511	14,022	14,825	17,278
Base Conservation	2,635	3,994	4,900	6,149	7,747
Total Supply	**67,064**	**72,837**	**83,977**	**92,409**	**102,490**
Groundwater Rights	100%	100%	100%	100%	100%
Additional Groundwater(2)	100%	100%	100%	100%	100%
CDA	n/a	6135%	404%	294%	251%
Imported Water	62%	59%	59%	60%	60%
Recycled Water	119%	119%	119%	119%	119%
% of projected normal	**105%**	**104%**	**103%**	**102%**	**102%**

This table corresponds to DWR Table 43
(1) Groundwater rights includes the Total share of Initial OSY, the SAWC shares, and the water rights from Sunkist.
(2) Additional groundwater includes groundwater pumping for the DYY shift obligation, recycled water recharge, and Chino Basin Leases and Replenishment.

Based on historical production data for the period 1990-2003, the dry year demands are about 8.1 higher than the annual average demands. The dry year demands are also referred to as the High Year Demand in the 2005 Water Master Plan (MWH, 2005). The demands used for the single dry year are based on the high year demands. The demand of Sunkist is assumed to remain unchanged at 1,470 acre-ft/yr. The difference between the dry year demands shown in **Table 5-7**and the annual average demands listed in **Table 5-3** are not exactly 8.1 percent, because the potable demands include both the City's and Sunkist's demands.

The recycled water demands are increased with 19 percent under dry year conditions to compensate the decrease in rainfall. With an average ET of 55.1 inches and average rainfall of 15.3 inches, irrigation should be about 39.8 inches per year. Assuming that rainfall in a dry year is about 50 percent of normal rainfall, irrigation increases to about 47.5 inches, which is 19 percent higher than 39.8 inches.

The projected demands under single dry year conditions are shown in **Table 5-7**.

Table 5-7
Projected Single Dry Year Water Demand

Demand	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Potable High Demand 1	57,615	62,327	69,955	77,584	85,212
Recycled Water	9,449	10,511	14,022	14,825	17,278
Total Demand without Conservation	**67,064**	**72,837**	**83,977**	**92,409**	**102,490**
Base Conservation	(2,635)	(3,994)	(4,900)	(6,149)	(7,747)
Total Demand with Conservation	**64,429**	**68,843**	**79,077**	**86,260**	**94,743**
% of projected normal	108%	106%	105%	104%	103%

This table corresponds to DWR Table 44

The comparison between the available water supplies and projected demands for single dry year conditions is presented in **Table 5-8**. As shown in this table, the available supplies are equal to the projected demand, which means that the City has sufficient supply to meet the demands under single dry year conditions. Similarly to the supply strategy under normal year conditions, the City has the ability to pump more water if needed by using additional wells. The groundwater supply surplus under single dry year conditions based on continues groundwater pumping of all wells is shown in **Table 5-9.**

Table 5-8
Single Dry Year Supply and Demand Comparison

	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Supply totals	67,064	72,837	83,977	92,409	102,490
Demand totals	67,064	72,837	83,977	92,409	102,490
Difference	**0**	**0**	**0**	**0**	**0**
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

This table corresponds to DWR Table 45

Table 5-9
Groundwater Pumping Surplus in Single Dry Year Conditions

Groundwater Supply	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Groundwater Rights	26,718	28,713	30,686	33,695	36,710
Additional Groundwater Pumping(1)	11,538	12,845	17,546	20,866	23,832
Total Projected GW Supply	**38,256**	**41,559**	**48,231**	**54,561**	**60,541**
Available GW Pumping Capacity	78,877	78,877	78,877	83,715	93,391
GW Pumping Surplus	**40,621**	**37,318**	**30,646**	**29,154**	**32,849**

(1) Additional groundwater pumping includes recycled water recharge, leases and transfers.

5.4 PROJECTED DEMAND AND SUPPLIES – MULTIPLE DRY YEAR

The water demands and supplies are also analyzed for the next 25 years in the event of a multiple dry year period. Multiple dry year periods consist of 3 consecutive years, rather than 4 years, as the City is only required to meets its shift obligation for 3 years as defined in the DYY Program.

The results are presented in per year for 5-year periods, compared to the 5-year intervals shown for the normal and single dry year conditions to demonstrate the effect of multiple dry years on water demands, conservation, and supplies. For each multiple dry year period, the first and last year of each 5-year period (ending in 0 and 5) are considered normal years, while the second through fourth year are selected a the dry years. An exception is the period 2005-2010, where years 2009 and 2010 are selected as the 2-year multiple dry year period, because full implementation of the DYY Program does not become effective until 2008. The water demand in the first year of a multiple dry year period is the same as a single dry year, while the demand in the second and third year are lowered with additional water conservation, corresponding to multiple dry year demand in **Appendix E**.

The City has the same water supply sources and supply amounts available in a multiple dry year as in a single dry year. The water supply mix under multiple dry year conditions for the period 2006-2010 is presented in **Table 5-10.** As shown in this table, the imported supplies in 2009 and 2010 are reduced by 8,076 acre-ft/yr, while the chino basin replenishment supplies are increased by this amount for these years.

Table 5-10
Projected Supply for a Multiple Dry Year Period ending in 2010

Supply Sources	2006 (AFY)	2007 (AFY)	2008 (AFY)	2009 (AFY)	2010 (AFY)
Climate Condition	**Normal**	**Normal**	**Dry**	**Dry**	**Dry**
Groundwater[1]	23,892	24,598	25,305	26,012	26,718
CDA-I and II	5,000	5,000	5,000	5,000	5,000
Additional Groundwater Pumping[2]	0	0	8,743	4,626	5,776
Imported Water	14,167	15,389	11,704	11,714	11,724
Recycled Water	3,042	4,268	6,551	8,013	9,449
Active Conservation	1,199	1,558	1,917	2,276	2,635
Additional Conservation	0	0	0	5,514	5,761
Total Supply	**47,299**	**50,813**	**59,220**	**63,154**	**67,064**
Groundwater	100%	100%	100%	100%	100%
CDA-I and II	100%	100%	100%	100%	100%
Additional Groundwater Pumping	100%	100%	100%	100%	100%
Imported Water	80%	81%	70%	66%	62%
Recycled Water	100%	100%	119%	119%	119%
% of projected normal	**103%**	**103%**	**116%**	**117%**	**117%**

This table corresponds to DWR Table 46
(1) Groundwater rights includes the Total share of Initial OSY, the SAWC shares, and the water rights from Sunkist.
(2) Additional groundwater includes groundwater pumping for the DYY shift obligation, recycled water recharge, and Chino Basin Leases and Replenishment.

Similarly to the single dry year conditions, the potable water demands for multiple dry years are increased with 8.1 percent (with the exception of Sunkist) to represent high annual demands, while recycled water demands are increased by 19 percent compared to normal year conditions. In addition to the "base water conservation" used for normal and single dry year conditions, additional water conservation equal to 10 percent of the projected high annual demand is deducted from the projected water demand in the second and third year of each multiple dry year period. The 10 percent additional water conservation is not applied to the first year of a 3-year multiple dry year period because it is unknown in the first year if a drought sustains. It is assumed that when a drought sustains, public notifications will be used effectively to reduce water consumption.

The projected demands under the period 2006-2010 with multiple dry years in 2009 and 2010 are shown in **Table 5-11**.

Table 5-11
Projected Demand for a Multiple Dry Year Period ending in 2010

Demand	**2006 (AFY)**	**2007 (AFY)**	**2008 (AFY)**	**2009 (AFY)**	**2010 (AFY)**
Climate Condition	**Normal**	**Normal**	**Dry**	**Dry**	**Dry**
Potable High Demand	0	0	52,669	55,142	57,615
Potable Normal Demand	44,257	46,545	0	0	0
Recycled Water	3,042	4,268	6,551	8,013	9,449
Total Demand without Conservation	**47,299**	**50,813**	**59,220**	**63,154**	**67,064**
Base Conservation	(1,199)	(1,558)	(1,917)	(2,276)	(2,635)
Additional Conservation	0	0	0	(5,514)	(5,761)
Total Demand with Conservation	**46,100**	**49,255**	**57,303**	**55,364**	**58,668**
% of projected normal	**100%**	**100%**	**109%**	**100%**	**100%**

This table corresponds to DWR Table 47

The comparison between the available water supplies and projected demands for multiple dry years in the period 2006-2010 is presented in **Table 5-12**.

Table 5-12
Supply and Demand Comparison for a Multiple Dry Year Period ending in 2010

Supply and Demand	**2006 (AFY)**	**2007 (AFY)**	**2008 (AFY)**	**2009 (AFY)**	**2010 (AFY)**
Climate Condition	**Normal**	**Normal**	**Dry**	**Dry**	**Dry**
Supply totals	47,299	50,813	59,220	63,154	67,064
Demand totals	47,299	50,813	59,220	63,154	67,064
Difference	2,276	1,972	0	0	0
Difference as % of Supply	4.7%	3.8%	0.0%	0.0%	0.0%
Difference as % of Demand	4.9%	4.0%	0.0%	0.0%	0.0%

This table corresponds to DWR Table 48

As shown in this table, the available supplies are equal to the projected demand, which means that the City has sufficient supply to meet the demands under single dry year conditions. Similarly to the supply strategy under normal and single dry year conditions, the City has the ability to pump more water if needed by using additional wells. The groundwater supply surplus under multiple dry year conditions based on continues groundwater pumping of all wells is shown in **Table 5-13**.

Table 5-13
Groundwater Pumping Surplus in Multiple Dry Year Conditions ending in 2010

Groundwater Supply	2006 (AFY)	2007 (AFY)	2008 (AFY)	2009 (AFY)	2010 (AFY)
Climate Condition	**Normal**	**Normal**	**Dry**	**Dry**	**Dry**
Groundwater Rights	23,892	24,598	25,305	26,012	26,718
Additional Groundwater Pumping(1)	0	0	8,743	4,626	5,776
Total Projected GW Supply	**23,892**	**24,598**	**34,048**	**30,638**	**32,494**
Available GW Pumping Capacity	49,204	78,877	78,877	78,877	83,715
GW Pumping Surplus	**25,313**	**54,279**	**44,829**	**48,239**	**51,221**

(1) Additional groundwater pumping includes recycled water recharge, leases and transfers.

The projected supply, demands, and the comparison of supply and demand, and the groundwater pumping surplus for the period 2011-2015 are presented in **Table 5-14**, **Table 5-15, Table 5-16**, and **Table 5-17,** respectively. Years 2011 and 2015 represent normal year conditions, while years 2012 through 2014 represent the multiple dry year period. As shown in **Table 5-16**, the City has sufficient water supplies to meet the projected demands and has excess groundwater pumping capacity as shown in **Table 5-17.**

Table 5-14
Projected Supply for a Multiple Dry Year Period ending in 2015

Supply Sources	2011 (AFY)	2012 (AFY)	2013 (AFY)	2014 (AFY)	2015 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Groundwater(1)	27,117	27,516	27,915	28,314	28,713
CDA-I and II	5,000	5,000	5,000	5,000	5,000
Additional Groundwater Pumping(2)	0	12,061	6,451	6,445	209
Imported Water	19,256	11,744	11,581	11,764	19,850
Recycled Water	8,378	10,501	11,015	11,528	8,816
Active Conservation	2,907	3,179	3,450	3,722	3,994
Additional Conservation	0	0	6,044	6,138	0
Total Supply	**62,657**	**70,001**	**71,457**	**72,912**	**66,583**
Groundwater	100%	100%	100%	100%	100%
CDA-I and II	100%	100%	100%	100%	100%
Additional Groundwater Pumping	100%	100%	100%	34983%	100%
Imported Water	100%	60%	59%	59%	100%
Recycled Water	100%	119%	119%	119%	100%
% of projected normal	**105%**	**118%**	**118%**	**119%**	**106%**

This table corresponds to DWR Table 49.; (1) Groundwater rights includes the Total share of Initial OSY, the SAWC shares, and the water rights from Sunkist. (2) Additional groundwater includes groundwater pumping for the DYY shift obligation, recycled water recharge, and Chino Basin Leases and Replenishment.

Table 5-15
Projected Demand for a Multiple Dry Year Period ending in 2015

Demand	2011 (AFY)	2012 (AFY)	2013 (AFY)	2014 (AFY)	2015 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Potable High Demand	0	59,500	60,442	61,384	0
Potable Normal Demand	54,280	0	0	0	57,767
Recycled Water	8,378	10,501	11,015	11,528	8,816
Total Demand without Conservation	**62,657**	**70,001**	**71,457**	**72,912**	**66,583**
Base Conservation	(2,907)	(3,179)	(3,450)	(3,722)	(3,994)
Additional Conservation	0	0	(6,044)	(6,138)	0
Total Demand with Conservation	**59,750**	**66,822**	**61,962**	**63,052**	**62,589**
% of projected normal	**100.0%**	**109.9%**	**100.2%**	**100.3%**	**100.0%**

This table corresponds to DWR Table 50.

Table 5-16
Supply and Demand Comparison for a Multiple Dry Year Period ending in 2015

Supply and Demand	2011 (AFY)	2012 (AFY)	2013 (AFY)	2014 (AFY)	2015 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Supply totals	62,657	70,001	71,457	72,912	66,583
Demand totals	62,657	70,001	71,457	72,912	66,583
Difference	**0**	**0**	**0**	**0**	**0**
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

This table corresponds to DWR Table 51.

Table 5-17
Groundwater Pumping Surplus in Multiple Dry Year Conditions ending in 2015

Groundwater Supply	2011 (AFY)	2012 (AFY)	2013 (AFY)	2014 (AFY)	2015 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Groundwater Rights	27,117	27,516	27,915	28,314	28,713
Additional Groundwater Pumping(1)	0	12,061	6,451	6,445	209
Total Projected GW Supply	**27,117**	**39,577**	**34,366**	**34,760**	**28,923**
Available GW Pumping Capacity	49,204	78,877	78,877	78,877	83,715
GW Pumping Surplus	**22,087**	**39,300**	**44,511**	**44,117**	**54,792**

(1) Additional groundwater pumping includes recycled water recharge, leases and transfers.

The projected supply, demands, and the comparison of supply and demand, and the groundwater pumping surplus for the period 2016-2020 are presented in **Table 5-18**, **Table 5-19, Table 5-20**, and **Table 5-21**, respectively. Years 2016 and 2020 represent normal year conditions, while years 2017 through 2019 represent the multiple dry year period. As shown in **Table 5-20,** the City has sufficient water supplies to meet the projected demands and has excess groundwater pumping capacity as shown in **Table 5-21**.

Table 5-18
Projected Supply for a Multiple Dry Year Period ending in 2020

Supply Sources	2016 (AFY)	2017 (AFY)	2018 (AFY)	2019 (AFY)	2020 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Groundwater(1)	29,108	29,502	29,897	30,291	30,686
CDA-I and II	5,000	5,000	5,000	5,000	5,000
Additional Groundwater Pumping(2)	1,035	14,725	8,975	9,763	4,338
Imported Water	19,860	11,794	11,804	11,814	19,900
Recycled Water	10,259	12,420	12,609	12,798	11,761
Active Conservation	4,175	4,356	4,538	4,719	4,900
Additional Conservation	0	0	6,690	6,843	0
Total Supply	**69,437**	**77,798**	**79,513**	**81,227**	**76,585**
Groundwater	100%	100%	100%	100%	100%
CDA-I and II	100%	100%	100%	100%	100%
Additional Groundwater Pumping	100%	791%	334%	278%	100%
Imported Water	100%	59%	59%	59%	100%
Recycled Water	100%	119%	119%	119%	100%
% of projected normal	**106%**	**119%**	**119%**	**120%**	**107%**

This table corresponds to DWR Table 52

(1) Groundwater rights includes the Total share of Initial OSY, the SAWC shares, and the water rights from Sunkist.

(2) Additional groundwater includes groundwater pumping for the DYY shift obligation, recycled water recharge, and Chino Basin Leases and Replenishment.

Table 5-19
Projected Demand for a Multiple Dry Year Period ending in 2020

Demand	2016 (AFY)	2017 (AFY)	2018 (AFY)	2019 (AFY)	2020 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Potable High Demand	0	65,378	66,904	68,430	0
Potable Normal Demand	59,178	0	0	0	64,824
Recycled Water	10,259	12,420	12,609	12,798	11,761
Total Demand without Conservation	**69,437**	**77,798**	**79,513**	**81,227**	**76,585**
Base Conservation	(4,175)	(4,356)	(4,538)	(4,719)	(4,900)
Additional Conservation	0	0	(6,690)	(6,843)	0
Total Demand with Conservation	**65,262**	**73,441**	**68,285**	**69,666**	**71,685**
% of projected normal	**100.0%**	**110.2%**	**100.4%**	**100.3%**	**100.0%**

This table corresponds to DWR Table 53

Table 5-20
Supply and Demand Comparison for a Multiple Dry Year Period ending in 2020

Supply and Demand	2016 (AFY)	2017 (AFY)	2018 (AFY)	2019 (AFY)	2020 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Supply totals	69,437	77,798	79,513	81,227	76,585
Demand totals	69,437	77,798	79,513	81,227	76,585
Difference	0	0	0	0	0
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

This table corresponds to DWR Table 54

Table 5-21
Groundwater Pumping Surplus in Multiple Dry Year Conditions ending in 2020

Groundwater Supply	2016 (AFY)	2017 (AFY)	2018 (AFY)	2019 (AFY)	2020 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Groundwater Rights	29,108	29,502	29,897	30,291	30,686
Additional Groundwater Pumping(1)	1,035	14,725	8,975	9,763	4,338
Total Projected GW Supply	**30,143**	**44,228**	**38,872**	**40,054**	**35,024**
Available GW Pumping Capacity	49,204	78,877	78,877	78,877	83,715
GW Pumping Surplus	**19,061**	**34,649**	**40,005**	**38,823**	**48,691**

(1) Additional groundwater pumping includes recycled water recharge, leases and transfers.

The projected supply, demands, and the comparison of supply and demand, and the groundwater pumping surplus for the period 2021-2025 are presented in **Table 5-22, Table 5-23, Table 5-24** and **Table 5-25**, respectively. Years 2021 and 2025 represent normal year conditions, while years 2022 through 2024 represent the multiple dry year period. As shown in **Table 5-24,** the City has sufficient water supplies to meet the projected demands and has excess groundwater pumping capacity as shown in **Table 5-25.**

Table 5-22
Projected Supply for a Multiple Dry Year Period ending in 2025

Supply Sources	2021 (AFY)	2022 (AFY)	2023 (AFY)	2024 (AFY)	2025 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Groundwater(1)	31,288	31,890	32,492	33,093	33,695
CDA-I and II	5,000	5,000	5,000	5,000	5,000
Additional Groundwater Pumping(2)	4,888	18,874	12,084	12,596	7,086
Imported Water	19,910	11,844	11,854	11,864	19,950
Recycled Water	11,103	13,487	13,736	13,986	12,435
Active Conservation	5,150	5,400	5,649	5,899	6,149
Additional Conservation	0	0	7,453	7,606	0
Total Supply	**77,338**	**86,493**	**88,269**	**90,045**	**84,316**

Table 5-22 (continued)
Projected Supply for a Multiple Dry Year Period ending in 2025

Supply Sources	2021 (AFY)	2022 (AFY)	2023 (AFY)	2024 (AFY)	2025 (AFY)
Groundwater	100%	100%	100%	100%	100%
CDA-I and II	100%	100%	100%	100%	100%
Additional Groundwater Pumping	100%	347%	202%	193%	100%
Imported Water	100%	59%	59%	59%	100%
Recycled Water	100%	119%	119%	119%	100%
% of projected normal	**107%**	**120%**	**120%**	**120%**	**108%**

This table corresponds to DWR Table 55.

(1) Groundwater rights includes the Total share of Initial OSY, the SAWC shares, and the water rights from Sunkist.

(2) Additional groundwater includes groundwater pumping for the DYY shift obligation, recycled water recharge, and Chino Basin Leases and Replenishment.

Table 5-23
Projected Demand for a Multiple Dry Year Period ending in 2025

Demand	2021 (AFY)	2022 (AFY)	2023 (AFY)	2024 (AFY)	2025 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Potable High Demand	0	73,007	74,533	76,058	0
Potable Normal Demand	66,235	0	0	0	71,881
Recycled Water	11,103	13,487	13,736	13,986	12,435
Total Demand without Conservation	**77,338**	**86,493**	**88,269**	**90,045**	**84,316**
Base Conservation	(5,150)	(5,400)	(5,649)	(5,899)	(6,149)
Additional Conservation	0	0	(7,453)	(7,606)	0
Total Demand with Conservation	**72,188**	**81,094**	**75,166**	**76,540**	**78,167**
% of projected normal	**100.0%**	**110.2%**	**100.3%**	**100.3%**	**100.0%**

This table corresponds to DWR Table 56

Table 5-24
Supply and Demand Comparison for a Multiple Dry Year Period ending in 2025

Supply and Demand	2021 (AFY)	2022 (AFY)	2023 (AFY)	2024 (AFY)	2025 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Supply totals	77,338	86,493	88,269	90,045	84,316
Demand totals	77,338	86,493	88,269	90,045	84,316
Difference	0	0	0	0	0
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

This table corresponds to DWR Table 57

Table 5-25
Groundwater Pumping Surplus in Multiple Dry Year Conditions ending in 2025

Groundwater Supply	2021 (AFY)	2022 (AFY)	2023 (AFY)	2024 (AFY)	2025 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Groundwater Rights	31,288	31,890	32,492	33,093	33,695
Additional Groundwater Pumping(1)	4,888	18,874	12,084	12,596	7,086
Total Projected GW Supply	***36,175***	***50,763***	***44,576***	***45,689***	***40,782***
Available GW Pumping Capacity	49,204	78,877	78,877	78,877	83,715
GW Pumping Surplus	**13,029**	**28,114**	**34,301**	**33,188**	**42,933**

(1) Additional groundwater pumping includes recycled water recharge, leases and transfers.

The projected supply, demands, and the comparison of supply and demand, and the groundwater pumping surplus for the period 2026-2030 are presented in **Table 5-26**, **Table 5-27**, **Table 5-28**, and **Table 5-29**, respectively. Years 2026 and 2030 represent normal year conditions, while years 2027 through 2029 represent the multiple dry year period. As shown in **Table 5-28** the City has sufficient water supplies to meet the projected demands and has excess groundwater pumping capacity as shown in **Table 5-29**.

Table 5-26
Projected Supply for a Multiple Dry Year Period ending in 2030

Supply Sources	2026 (AFY)	2027 (AFY)	2028 (AFY)	2029 (AFY)	2030 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Groundwater(1)	34,298	34,901	35,504	36,107	36,710
CDA-I and II	5,000	5,000	5,000	5,000	5,000
Additional Groundwater Pumping(2)	7,565	22,052	14,429	14,870	9,481
Imported Water	19,960	11,894	11,904	11,914	20,000
Recycled Water	12,430	15,401	15,984	16,566	14,492
Active Conservation	6,469	6,788	7,108	7,427	7,747
Additional Conservation	**0**	**0**	**8,216**	**8,369**	**0**
Total Supply	85,722	96,037	98,145	100,253	93,430
Groundwater	100%	100%	100%	100%	100%
CDA-I and II	100%	100%	100%	100%	100%
Additional Groundwater Pumping	100%	274%	169%	165%	100%
Imported Water	100%	60%	60%	60%	100%
Recycled Water	100%	119%	119%	119%	100%
% of projected normal	108%	121%	121%	121%	109%

(1) Groundwater rights includes the Total share of Initial OSY, the SAWC shares, and the water rights from Sunkist.
(1) Additional groundwater includes groundwater pumping for the DYY shift obligation, recycled water recharge, and Chino Basin Leases and Replenishment.

Table 5-27
Projected Demand for a Multiple Dry Year Period ending in 2030

Demand	2026 (AFY)	2027 (AFY)	2028 (AFY)	2029 (AFY)	2030 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Potable High Demand	0	80,635	82,161	83,687	0
Potable Normal Demand	73,292	0	0	0	78,938
Recycled Water	12,430	15,401	15,984	16,566	14,492
Total Demand without Conservation	**85,722**	**96,037**	**98,145**	**100,253**	**93,430**
Base Conservation	(6,469)	(6,788)	(7,108)	(7,427)	(7,747)
Additional Conservation	0	0	(8,216)	(8,369)	0
Total Demand with Conservation	**79,253**	**89,248**	**82,821**	**84,457**	**85,683**
% of projected normal	**100.0%**	**110.4%**	**100.5%**	**100.6%**	**100.0%**

Table 5-28
Supply and Demand Comparison for a Multiple Dry Year Period ending in 2030

Supply and Demand	2026 (AFY)	2027 (AFY)	2028 (AFY)	2029 (AFY)	2030 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Supply totals	85,722	96,037	98,145	100,253	93,430
Demand totals	85,722	96,037	98,145	100,253	93,430
Difference	0	0	0	0	0
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

Table 5-29
Groundwater Pumping Surplus in Multiple Dry Year Conditions ending in 2030

Groundwater Supply	2026 (AFY)	2027 (AFY)	2028 (AFY)	2029 (AFY)	2030 (AFY)
Climate Condition	**Normal**	**Dry**	**Dry**	**Dry**	**Normal**
Groundwater Rights	34,298	34,901	35,504	36,107	36,710
Additional Groundwater Pumping(1)	7,565	22,052	14,429	14,870	9,481
Total Projected GW Supply	**41,863**	**56,953**	**49,933**	**50,977**	**46,191**
Available GW Pumping Capacity	49,204	78,877	78,877	78,877	83,715
GW Pumping Surplus	**7,341**	**21,924**	**28,944**	**27,900**	**37,524**

(1) Additional groundwater pumping includes recycled water recharge, leases and transfers.

5.5 INTER-AGENCY CONNECTIONS

The City's water system is connected with neighboring cities and water utilities through five inter-agency connections. Only one of the five inter-agency connections can provide water supply to the City of Ontario, while four locations can provide water from Ontario to the adjacent water agencies. In 2006, the City will obtain water from CDA though three additional connections which will provide water to the City at a continuous rate. The 2005 Water Master Plan (MWH, 2005) includes recommendations for five additional inter-agency connections that would be used in emergencies only. These connections will increase the City's supply reliability and are summarized in **Table 5-30**.

Table 5-30
Existing and Proposed Inter-Agency Connections

ID	General Location	From		To	
		Agency	Zone	Agency	Zone
Existing Connections					
WFA	Benson Ave. & 18th St.	WFA	1618'	Ontario	1348' and
CVWD-1	Sixth St. & Corona Ave.	Ontario	1348'	CVWD	1190' or
CVWD-2	Sixth St. & Vineyard Ave.	Ontario	1348'	CVWD	1190'
CVWD-3	Milliken Ave. & 6th St.	CVWD	1310'	Ontario	1212'
Chino-1	Benson Avenue/State St.	Ontario (3)	1212'	Chino	980'
Upland-1	Campus Ave./Richland St.	Ontario	1348'	Upland	unknown
Future Connections					
CDA-1	Archibald & Schaefer Ave.	CDA-1	Unknown	Ontario	1212'
JCSD-1/ CDA2-1	Milliken Ave. and Philadelphia St.	JCSD/CDA-2	1110'	Ontario	1212'
JCSD-2/ CDA2-2	Milliken Ave. & Galena St.	JCSD/CDA-2	1110'	Ontario	925'
JCSD-3	Along Bellgrave Ave.	Ontario	925'	JSCD	870'
Chino-2	Euclid Ave & Chino Ave.	Chino	980'	Ontario	925'
MVWC-1	Benson Ave & San Bernardino Ave.	Ontario	1212'	MVWD	1207'
		MVWD	1355'	Ontario	1348'
Upland-2	Reservoir 1348' (1-3)	Upland	Unknown	Ontario	1348'
FWC-1	Etiwanda Ave. & Airport Dr.	Fontana	1280'	Ontario	1212'

Section 6
Water Shortage Contingency Plan

The City of Ontario (City) has prepared and adopted a number of plans that address water shortages including the Emergency Response Plan (Boyle, 2003) and the Emergency Water Conservation Chapter of the Municipal Code (Ontario, 1999). This section provides a summary of these plans and presents actions to be undertaken to respond to water shortages in compliance with the Urban Water Management Plan (UWMP) Act (CC 10610). The Act requires every urban water supplier to file a plan, because of the worsening 1986-1992 drought. The Act is included in **Appendix B** and summarized below.

6.1 URBAN WATER MANAGEMENT PLAN ACT

In summary, Section 10632 of the UWMP Act requires than each urban water supplier provides an urban water shortage contingency analysis that includes each of the following elements, where applicable:

- A definition of stages of water supply conditions and the associated actions to be undertaken during each stage, including up to a 50 percent reduction in water supply. 10632 (a).
- Estimates the minimum water supply available at the end of 1, 2 and 3 years. 10632 (b)
- Actions to be undertaken to prepare for, and implement during, a catastrophic interruption of water supplies. 10632 (c)
- Mandatory prohibitions against specific water use during water shortages. 10632 (d)
- Consumption reductions to achieve up to a 50 percent reduction in water supply. 10632 (e)
- Penalties or charges for excessive use. 10632 (f)
- An analysis of the impacts on revenues and expenditures of each of the actions and conditions described in subdivisions (a) to (f)., 10632 (g)
- A draft water shortage contingency resolution or ordinance. 10632 (h)
- A mechanism for determining actual reductions in water use. 10632 (i)

6.2 MINIMUM SUPPLY AND DEMANDS DURING WATER SHORTAGES

Section 10632 (b) defines the minimum water supply as the supply available during each of the next three water years based on the driest three-year historic sequence for the City's water supply. The lowest 3-year supply occurred in the period 1991 through 1993, which partially overlaps with the 1986-1992 drought. However, the supply in this period is not driven by supply availability but by water demands. The City could have pumped more groundwater or imported more water from WFA in these years if needed. Therefore, the minimum supply in this UWMP is not based on historical data but on the assumption that the City's imported water supply would be cut back by 50 percent. The three-year minimum water supplies are compared with the normal year demands for the period 2005 through 2008 in **Table 6-1**

Table 6-1
Three-Year Minimum Water Supply

Year	Minimum Supply (acre-ft/yr)	Normal Year Demand (acre-ft/yr)	Supply Deficit(1) (acre-ft/yr)	Additional GW Pumping Capacity (acre-ft/yr)	Supply Surplus(2) (acre-ft/yr)
Year 1 (2005)	29,629	43,572	13,943	27,366	13,423
Year 2 (2006)	34,564	44,797	10,233	57,103	46,870
Year 3 (2007)	37,764	48,119	10,356	55,130	44,775

This table corresponds to DWR Table 24.
(1) Without groundwater pumping limited to the City's water rights.
(2) With additional groundwater pumping beyond City's water rights (limited by available firm groundwater pumping capacity.

The minimum supplies and demands listed in **Table 6-1** are based on the following assumptions:

- Imported water is reduced to 50 percent (4,749 acre-ft/yr) of the historical purchases in the period 1990-2003 (9,494 acre-ft/yr).
- Groundwater supply is limited to the City's water rights and transfer water rights from San Antonio Water Company (SAWC) and Sunkist.
- Leases and replenishment of groundwater are not included.
- Water from the Chino Basin Desalter Authority (CDA) is included for 2006 and 2007.
- Recycled water supplies are assumed to be equal to the projected recycled water demands.
- The base amount of water conservation per the goals set forth in Inland Empire Utilities Agency (IEUA) 2005 UWMP are included. Additional water conservation, as used for multiple dry year scenarios discussed in **Section 5**, are not included.

As shown in **Table 6-1**, the City needs to purchase additional groundwater beyond its water rights to meet its demands. As the Chino Basin judgement does not limit the City's groundwater supplies to its water rights, the City can pump additional groundwater in exchange for a groundwater replenishment fee to the Chino Basin Watermaster. The only limitation to the supply is the available groundwater pumping capacity, which is demonstrated to be sufficient in **Table 6-1** and under all scenarios presented in **Section 5**.

6.3 WATER SHORTAGE STAGES

On March 19th of 1999, the City adopted Ordinance No. 2500, adding Chapter 8A "*Emergency Water Conservation*" to Title 6 of the Ontario Municipal Code (Ontario, 1999). This ordinance established a phased approach to water conservation enforcement that consists of three mandatory water shortage phases, Phase 1 through Phase 3 that increase in severity of water shortage. These water supply shortage stages and the associated conditions are summarized in **Table 6-2**.

As shown in **Table 6-2**, a voluntary stage, Phase 0, has been added. The benefit of a voluntary stage is that the City can maintain its normal operations and it gives customers a chance to voluntarily conserve water compliance to comply to mandatory regulations is enforced. Based on the customers response to Phase 0, City Council can determine that it is necessary to implement Phase 1 to protect the public welfare and safety. Prior to the implementation of each mandatory phase, the City Council shall hold a public hearing for the purpose of determining whether a shortage exists and which measures should be implemented. The public shall be informed of the public hearing at least 10 days prior before the hearing, and City Council shall notify the public of its determination by public proclamations.

Table 6-2
Water Supply Shortage Stages and Conditions

Stage No.	Water Supply Conditions	Shortage (percent)
0	Voluntary	0-10 %
1	Mandatory	0-10 %
2	Mandatory	11-20%
3	Mandatory	20-50%

This table corresponds to DWR Table 23.

6.3.1 Water Use Restrictions

The water use restrictions for each Phase are listed in **Table 6-3**. The voluntary water use restrictions selected of Phase 0 are the same as the mandatory water use restrictions of Phase 1.

Table 6-3
Mandatory Prohibitions and Stage

Examples of Prohibitions	Phase			
	0	1	2	3
Hose washing of outdoor paved surfaces, except for sanitary purposes	X	X	X	X
Washing of vehicles or mobile equipment, except at a commercial car wash or with reclaimed water.	X	X	X	X
Filling of decorative fountains, ponds or lakes.	X	X	X	X
Supply of water at a commercial venue unless requested by customer.	X	X	X	X
Not repairing leaks promptly.	X	X	X	X
Allowing water to leave a customer's property by drainage onto adjacent property due to excessive irrigation.	X	X	X	X
Lawn watering or irrigation during daylight.			X	X
Use of hand-held hose without automatic shut-off nozzle			X	X
Use of potable water for commercial street cleaning			X	X
Residential car washing			X	X
No residential outdoor watering at any time except by bucket.				X

In addition to the water use restrictions listed in **Table 6-3**, the Emergency Water Conservation Chapter (Ontario, 1999) defines that no water customer of the City shall make, cause, use or permit the use of water from the City for any purpose in an amount in excess of 85 percent for Phase 2 and 80 percent for Phase 3 of the amount used on the customer's premises during the corresponding billing period during the prior calendar year.

Failure to comply with the mandatory phases 1-3 can lead to the fines as listed in **Table 6-4**.

Table 6-4
Penalties and Charges

Violation description	Violation number (1)	Penalty
Conservation Actions	First violation	The City issues a written notice of a first violation to the water customer.
	Second violations	The City imposes a surcharge in an amount of fifty dollars ($50.00) added to the water customer's water bill.
	Third violation	The City imposes a surcharge in an amount of one hundred dollars ($100.00) added to the water customer's water bill.
	Fourth violation	The City imposes a surcharge in an amount of one hundred fifty dollars ($150.00) added to the customer's water bill. And Install a flow restrictive device and charge the customer for the installation and disassembly.
Conservation Quantity		Pay a surcharge in an amount equal to one hundred percent (100%) of the portions of the water bill that exceeds the respective percentages set in those two subsections.

(1) Violations within one water shortage emergency

In addition to the water use restrictions listed in **Table 6-3**, the City could also add additional consumption reduction methods. Examples are presented in **Table 6-5**.

6.4 CATASTROPHE

Section 10632 (c) of the UWMP requires the definition of actions to be undertaken to prepare for, and implement during, a catastrophic interruption of water supplies. Catastrophic events include non-drought events such as earthquakes. With three of Southern California’s imported water supplies (State Water Project, Colorado River Aqueduct, and the Los Angeles Aqueduct) all crossing the San Andreas Fault, it is likely that one or more of these supplies will be disrupted in the event of a major earthquake. It is estimated that restoring service to any of these facilities following a catastrophic outage could take up to six months, which could reduce annual imported water deliveries by roughly 50 percent.

Planning for catastrophes has been addressed in multiple documents that can be differentiated based on the level of detail specifically related to the City. These levels are:

- Southern California Region – MWD’s Water Surplus and Drought Management Plan
- Inland Empire Region – IEUA’s Emergency Response Plan
- City of Ontario – Ontario’s Emergency Response Plan

Table 6-5
Other Consumption Reduction Methods

Consumption Reduction Method	Phase When Method Takes Effect	Projected Reduction (percent)
Coordinate with other agencies to issue press notification to the media	0	Unknown
Notify customers of need for additional conservation	0	
Ask large irrigation customers to reduce water usage	0	
Ask customers to reduce irrigation	0	
Reduce or suspend deliveries to neighboring water agencies	1	Unknown
Establish reduction targets for commercial landscape accounts	1	
Enforce water conservation and use restrictions	1	
Consider reassigning personnel to enforce water use regulations	2	Unknown
Require Agricultural Water Program customers to reduce usage up to 30 %	2	
Mandating water budgets for large landscape accounts	2	
Consider mandating water budgets for all customers	2	
Suspend all water use from temporary meters.	2	
Restrict filling of swimming pools, ponds or lakes	3	Unknown
Suspend all water use from temporary meters.	3	

MWD has developed a Water Surplus and Drought Management Plan (WSDM) to address water surplus and shortage scenarios and achieve the reliability goals of the Integrated Resources Plan (IRP). Substantial investments are made in emergency storage projects and water conservation measures to adapt to water supply catastrophes. And the unplanned 7-day shutdown of the Rialto Feeder in June 2004 demonstrated that customers respond well to the request to reduce water use. For example, the customers of Cucamonga Valley Water District (CVWD) reduced their overall water use by 60 percent during the week of repairs. Based on the ongoing projects, detailed analysis, and successful customers response during previous imported water supply interruptions, MWD expects to be 100 percent reliable for all non-discounted non-interruptible demands throughout the next ten years (MWD, 2005).

The IEUA updated its 1996 Emergency Response Plan in 2000. According to this plan, IEUA expects to meet emergency demands within the region through extraordinary water conservation and groundwater pumping measures. Multiple sources of power exist within the region, making any electrical shortages a temporary disruption (IEUA, 2005).

The City's Department of Public Works has prepared an Emergency Response Plan (Boyle, 2003) that defines disaster events and the actions to be taken by City staff to respond to these. The water supply related disasters are:

- Threat or actual intentional contamination of the water system
- Threat of contamination at a major event
- Notification from Health Department Officials of potential water contamination
- Intrusion through the Supervisory Control and Data Acquisition system
- Significant structural damage resulting from an intentional act

A model response to any of these events is described in the City's ERP including, but not limited to, details of the organization and responsibilities, contact phone numbers, training requirements, and public notification samples. It should be noted that many of these disasters are water quality related. Hence, the ERP list the water quality constituents that are monitored.

In addition to the City's ERP, the impact of a number of catastrophic events on the City's ability to meet its water demands has been evaluated in the Water and Recycled Water Master Plan (MWH, 2005). The water supply balance per pressure zone under various emergency scenarios through year 2030 are presented and the necessary system improvements are included in the proposed Capital Improvement Program.

Actions that are included in the City's ERP are listed in **Table 6-6**. Overall it can be concluded that the City has prepared the appropriate documentation and planning documents to be prepared for a catastrophe. It is recommended that the City defines the different water shortage stages in terms of total supply available to provide a quantitative measure for declaring a certain water shortage stage and implement the associated water use restrictions.

Table 6-6
Preparation Actions for a Catastrophe

Actions	Included in ERP[1]
Quantify the definition of each phase of water shortage.	no
Stretch existing water storage.	yes
Obtain additional water supplies.	yes
Develop alternative water supplies.	yes
Determine where the funding will come from.	no
Contact and coordinate with other agencies.	yes
Create and Emergency Response Team /Coordinator.	yes
Create a catastrophe preparedness plan.	yes
Put employees/contractors on-call.	yes
Develop methods to communicate with the public.	yes
Develop methods to prepare for water quality interruptions.	yes
Reassess the Emergency Response Plan each year.	yes

(1) ERP = Emergency Response Plan (Boyle, 2003)

6.5 REVENUES AND EXPENDITURES

The impact of each of the phases of water reduction on the City's revenue and cost are estimated and presented in **Table 6-7**.

Table 6-7
Estimated Revenue Impacts at Various Demand Reduction Levels

Description	Baseline Year 2005	Phase 1 (10 percent reduction)	Phase 2 (20 percent reduction)	Phase 3 (50 percent reduction)
Projected Demand (acre-ft/yr)	42,583	38,325	34,066	21,291
Revenue from Sales	**$22,258,897**	**$20,033,007**	**$17,807,117**	**$11,129,448**
Groundwater	$3,462,605	$3,462,605	$3,462,605	$3,199,910
Groundwater L&R	$845,346	$2,771,783	$3,004,680	$0
Imported Water	$9,104,750	$4,552,375	$2,276,188	$1,138,094
Water Supply Cost	**$13,412,701**	**$10,786,763**	**$8,743,473**	**$4,338,004**
Revenue minus Supply Cost	$8,846,196	$9,246,244	$9,063,645	$6,791,445
Difference Compared to Baseline	**$0**	**$400,048**	**$217,449**	**-$2,054,751**
Difference with Baseline Revenue		2%	1%	-9%

The following assumptions have been made for these estimates listed in **Table 6-7**:

- The revenue estimates are based on the average potable water volume community charge of the baseline charge (0-15 hundred cubic feet) of $1.14/HCF and the second tier charge (> 15 HCF) of $1.26/HCF. The average volume community charge is $1.20/HCF.
- The first reduction in supply is based on a 50 percent cutback of WFA water
- The reduction of supply is compensated with additional groundwater pumping above the City's water rights
- For the 50 percent supply scenario, groundwater pumping is reduced such that the demands are met with 50 percent imported water supplies and groundwater pumping within the City's water rights.
- The unit cost of WFA water is $461/acre-ft.
- The unit cost of groundwater leases and replenishment is $343/acre-ft.
- The unit cost of groundwater within the City's water rights is $170/acre-ft.
- No reduction in operations and maintenance cost, as payroll for operational staff during a temporary catastrophe is expected to remain the same.
- The duration of the shortage is based on the average over one year.

As shown in **Table 6-7**, the reduction in water revenue is slightly less than the reduction in water supply cost for Phase 1 and 2 due to an increased use of lower cost water supply sources (groundwater). This results in a positive financial impact of approximately $200,000-$400,000, if the shortage would sustain for a full year. In Phase 3, the only source of supply is groundwater, which is the City's lowest cost source. However, due to the drastic demand reduction, the revenue is reduced more than the water supply cost, resulting in the need for additional funds of about $2 million.

Although it can be concluded that the net impact on revenue and expenditures is relatively small (two to nine percent of the normal demand year revenues) several measures could be taken to generate additional funds to absorb the negative financial impact of a severe water shortage. Examples of such measures are listed in **Table 6-8**.

Table 6-8
Proposed Measures to Overcome Revenue and Expenditure Impacts

Proposed Measure	Summary of Impacts
Rate Adjustment	• Increased savings to General Fund • In normal years, the City would receive more money that required for normal operations (increased profit). • Water customers resistance
Development of Reserves	• Increased savings to General Fund • Decreased availability for O&M or Capital Fund
Decrease Capital Expenditure	• Increased savings to General Fund • Delay of system rehabilitation • Decrease in quality of future system facilities
Decrease of O&M Expenditure	• Increased savings to General Fund • Less staff available to respond to emergencies • Reduced maintenance frequency of system facilities

This table corresponds with DWR Tables 29 and 30

6.6 WATER USE MONITORING MECHANISMS

The water use monitoring mechanisms that the City has implemented to date are summarized in **Table 6-9**.

Table 6-9
Water Use Monitoring Mechanisms

Mechanisms to Determine Water Use Reductions	Benefits
Water Meter Readings	Monthly records can help detect leaking service laterals
Remote Metering Program	Increased efficiency in meter readings and detection of leaking service laterals
Residential Meter Replacement Program (every 15 years)	Accurate readings and revenue collection
Large Meter Replacement Program (every 5-10 years)	Accurate readings and revenue collection
Inter-Agency Connection readings	Accurate readings and revenue collection
Water Quality Reports	Detect standing water
Valve Exercising Program	Avoid leaking valves
Daily Production Recording (Groundwater wells, WFA, CDA, and inter-agency connections)	Determine monthly or annual system losses on a when compared with billing records.

This table corresponds with DWR Tables 31

Section 7
Implementation Plan

The process for adopting this 2005 Urban Water Management Plan (UWMP) and submitting it to the California Department of Water Resources (DWR) is outlined in the California Water Code Sections 10640 through 10645. The City of Ontario (City) is required to review any amendments to the conservation and water recycling plans that were adopted as part of the Inland Empire Utilities Agency (IEUA) 2000 UWMP (IEUA, 2000).

7.1 ADOPTION PROCESS

This UWMP is prepared in accordance with the State of California Water Code Section 10610 through 10657 and has followed DWR's *Guideline to Assist Water Suppliers in the Preparation of a 2005 Urban Water Management Plan* (DWR, 2005). The Draft UWMP was submitted for review by the City's in October 2005. Comments were incorporated in a Final Draft UWMP.

According to Water Code 10620 (d), each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable. The city is a member agency of the IEUA, Water Facilities Authority (WFA), Chino Desalter Authority (CDA), and the Chino Basin Watermaster (CBWM). The City coordinated the preparation of this Plan with these four regional agencies. In addition, the City has seven neighboring water retail agencies, City of Chino, City of Upland, Fontana Water Company (FWC), Jurupa Community Services District (JCSD), Monte Vista Water District (MVWD), Cucamonga Valley Water District (CVWD) and San Antonio Water Company (SAWC). The actions the City has taken to coordinate the preparation of this UWMP with these agencies is summarized in **Table 1-1**. The Final Draft UWMP was submitted to the City's neighboring water agencies, and wholesale agencies listed in this table were contacted per telephone or by e-mail during the preparation of the Draft UWMP. The UWMP reports prepared by the wholesale agencies were used, where available.

A public hearing process was announced to all water agencies and the general public through newspaper advertisement and City's homepage (Ontario, 2005b). The public hearing on December 20 was preceded by a 14-day review period. The review of the Review Draft UMWP by neighboring water agencies coincides with the public hearing period. No comments were received.

The 2005 UWMP was formally adopted on December 20, 2005 and submitted to the DWR on December 29, 2005, accordance with State Law. The adoption resolution is included in **Appendix F**.

7.2 IMPLEMENTATION PLAN

As presented in section 2.1, the population of the City is projected to increase from 168,950 (year 2004) to about 305,500 residents in year 2030. This population increase, which will primarily occur in the newly annexed area south of the City, the New Model Colony (NMC), will result in a substantial increase in water demand. The projected water demands for the period 2005 through 2030 in five year increments are listed in **Table 7-1** and is graphically presented in **Figure 7-1**. The total water use is the summation of the projected potable water demands, projected recycled water demands, sales to other agencies, water loss, and water conservation.

It should be noted that these projected water demands are based on an aggressive approach for both water conversation and recycled water use. The implementation of these plans is required to minimize the increase of potable water demands and the associated need for and dependence of imported water supplies

Table 7-1
Projected Water Use through 2030

Water Use	2010 (AFY)	2015 (AFY)	2020 (AFY)	2025 (AFY)	2030 (AFY)
Consumption	48,091	52,127	58,661	65,195	71,730
Recycled Water	7,926	8,816	11,761	12,435	14,492
Sunkist	1,470	1,470	1,470	1,470	1,470
Water Loss	3,847	4,170	4,693	5,216	5,738
Total w/o Conservation	**61,334**	**66,583**	**76,585**	**84,316**	**93,430**
Water Conservation	-2,635	-3,994	-4,900	-6,149	-7,747
Total with Conservation	**58,699**	**62,589**	**71,685**	**78,167**	**85,683**

This table corresponds to DWR Table 14.

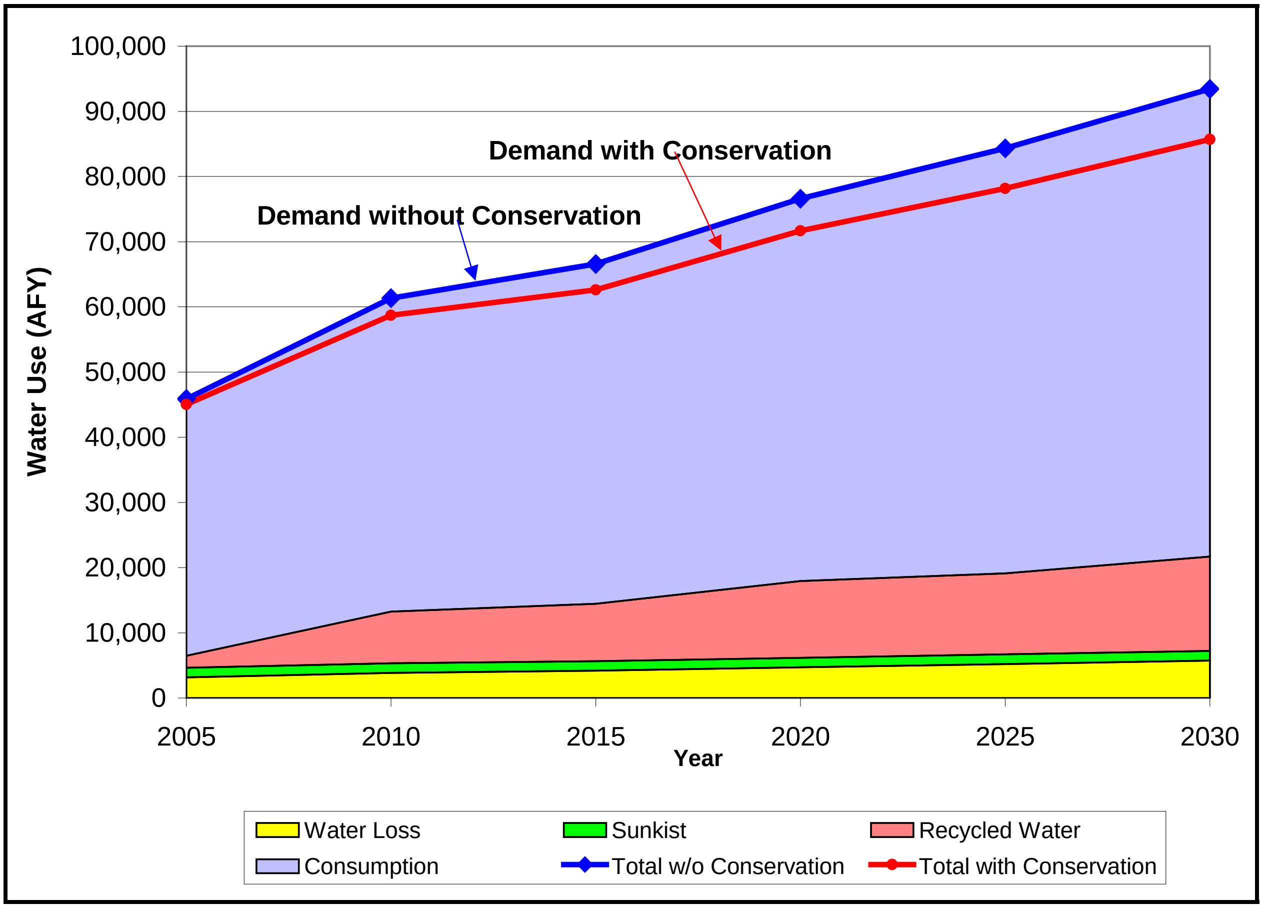
7.2.1 Water Conservation Plan

The primary focus of the City's water conservation efforts in the implementation of the Best Management Practices (BMPs) as discussed in detail in **Section 3**. As a signatory to the *Memorandum of Understanding regarding water conservation in California* (MOU), the City is a member of the California Urban Water Conservation Council (CUWCC). The City has provided the CUWCC with bi-annual reports to update its progress on the implementation of BMPs since fiscal year (FY) 2002/2003. These reports are included in **Appendix C**.

Based on the 2004 Activity Reports submitted to CUWCC, the water conservation amount achieved through active programs by the end of the fiscal year (FY) 2005 is estimated to be around 177 acre-feet per year (AFY). This is significantly less than the 2005 water conservation goals of 3,000 and 840 AFY set for the City in the 2000 UWMP (IEUA, 2000) and 2005 UWMP (IEUA, 2005), respectively.

To get the City back on track to meet the active water conservation goal of 1,800 AFY by 2010, a detailed BMP implementation schedule for the period 2005-2010 is prepared as part of this UWMP.

Figure 7-1
Projected Water Use through 2030



This schedule (see **Table 3-5**) will increase the City's active water conservation from an estimated 177 AFY to 1,800 AFY in year 2010 as shown on **Figure 3-1**. The main increase in water conservation will be achieved by implementation large landscaping metering programs (BMP 5). Other BMPs include plumbing retrofits of residential homes (BMP 2), rebates for residential High Efficiency Clothes Washers (HECW) and swimming pool covers (BMP 6), and Ultra Low Flush (ULF) toilets (BMP 9 and 14).

In addition to active water conservation programs, passive water conservation will happen automatically due to changes in the plumbing code and the available appliances. Passive conservation is also referred to as "Code Based water conservation". By year 2010, passive water conservation is estimated to account for nearly 3,900 AFY, which is about 68 percent of the combined water conservation goal for year 2010 (1,800 + 3,900 = 5,700 AFY).

7.2.2 Recycled Water Plan

The City has recently prepared a *Water and Recycled Water Master Plan* (WMP) (MWH, 2005) that identifies the City's potential to serve recycled water to existing and future customers. This WMP includes an aggressive approach to increase the use of recycled water in the City.

The recycled water system expansion of recycled water system in the Old Model Colony (OMC) includes 32 miles of new recycled water pipelines will connect to existing and proposed regional recycled water pipeline of IEUA. The recycled water demand served through these extensions is estimated to be about 4,325 AFY, which will increase the existing recycled water demand in the NMC of 1,229 AFY to about 5,554 AFY (350 percent increase).

In addition, the water system of the New Model Colony (NMC) is based on intensive use of recycled water with an estimated recycled water demand of 8,938 AFY, which is about 20 percent of the total NMC demand. The backbone recycled water system for the NMC is 52 miles, which does not include the mains for the small service streets.

The City also plans to temporarily serve about 3,300 AFY of recycled water to the existing agricultural customers in the NMC until development occurs by accelerating certain future planned recycled water pipelines.

7.2.3 Water Supply Strategy

The existing and proposed water supply sources of the City are:

- Chino Basin groundwater wells owned and operated by the City
- Chino Basin Groundwater from San Antonio Water Company (SAWC)
- Imported water from the Water Facilities Authority (WFA)
- Recycled water form the IEUA
- Treated Chino Basin groundwater from the Chino Basin Desalter Authority (CDA).
- Chino Basin groundwater wells that are part of the Dry Year Yield (DYY) Program

These sources are described in detail in **Section 4**. All sources are used under normal year, single dry year, and multiple dry year conditions. However, the amount of imported and leased groundwater water used from each source varies depending on the demand conditions. Leased groundwater is water pumped from the Chino Basin beyond the City's water rights (including transfers), which is subject to a replenishment fee. Supplies that are the same under all scenarios are:

- Groundwater pumping is maximized for all scenarios up to the City's water rights, as this is the cheapest source of supply. This groundwater amount will be increased over time as the groundwater rights gradually increase from 19,603 AFY in 2005 to 30,828 AFY in 2030 due to land use conversion.
- Starting in 2006, the City will obtain a constant delivery of 5,000 AFY from CDA under all demand scenarios.
- The recycled water supply is set equal to the projected demands, as IEUA has sufficient recycled water available to meet the projected demands (MWH, 2005a).

Under normal year conditions, about 30 percent of the water demands are met with imported water from WFA with a total supply of 20,000 AFY, which is 8,000 AFY less than the City's allotment in the treatment plant capacity. Under the single dry year and multiple dry year scenarios, the amount of imported water from WFA is reduced by the shift obligation amount of

8,076 AFY to be in compliance with the DYY agreement. This amount is pumped from the DYY wells. The amount of leased groundwater is adjusted to meet the demands. The water supply mix and reliability is evaluated for all three scenarios for the period 2005-2030 in **Section 5**. It can be concluded that the City has sufficient water supply to meet it's demand through year 2030, provided that the City can pump the projected amounts from the Chino Basin. As the Chino Basin Judgment does not limit the pumping and the City obtain pumping capacity beyond its water rights in exchange for a replenishment fee.

The comparison between the available water supplies and projected demands for multiple dry years in the period 2006-2010 is presented in **Table 5-10**. As shown in this table, the available supplies are equal to the projected demand, which means that the City has sufficient supply to meet the demands under normal, single dry year and multiple dry conditions. The City's groundwater supply is only limited by its pumping capacity, rather than by its water rights, as the Chino Basin judgement not limit pumping in excess to the assigned water rights because IEUA can recharge the basin through spreading basins in exchange for a replenishment fee. As shown in **Section 5**, the City has sufficient groundwater pumping capacity to provide a reliable water supply for the City through year 2030.

7.2.4 Water Shortage Contingency Plan

On March 19th of 1999, the City adopted Ordinance No. 2500, adding Chapter 8A "*Emergency Water Conservation*" to Title 6 of the Ontario Municipal Code (Ontario, 1999). This ordinance established a phased approach to water conservation enforcement that consists of three mandatory water shortage phases, Phase 1 through Phase 3 that increase in severity of water shortage. This UWMP introduced a "Phase 0", which consists of the same water use prohibitions, with the exception that these are voluntary under Phase 0 and mandatory under Phase 1. The water use restrictions for each Phase are listed in **Table 6-3**, while the associated penalties and charges are listed in **Table 6-4**.

Section 6 also includes a discussion on the actions to be undertaken to prepare for, and implement during, a catastrophic interruption of water supplies. Catastrophic events include non-drought events such as earthquakes. Planning for catastrophes has been addressed in multiple documents that can be differentiated based on the level of detail specifically related to the City. These levels are:

- Southern California Region – MWD's Water Surplus and Drought Management Plan
- Inland Empire Region – IEUA's Emergency Response Plan (ERP)
- City of Ontario – Ontario's ERP

Actions that are included in the City's ERP are listed in **Table 6-6**. Overall it can be concluded that the City has prepared the appropriate documentation and planning documents to be prepared for a catastrophe. It is recommended that the City defines the different water shortage stages in terms of total supply available to provide a quantitative measure for declaring a certain water shortage stage and implement the associated water use restrictions.

7.3 CONCLUSION

This UWMP is based upon an aggressive water conservation approach to meet the 2010 water conservation goals and include significant extensions of a recycled water in the next five years to increase the use of recycled water to reduce the use of limited potable water supplies where possible. The City has sufficient water supplies to meet its projected demands under normal, dry year, and multiple dry year scenarios with a combination of imported water and Chino Basin groundwater. This UWMP should be updated before December 2010 to be in compliance with the UMWP Act.

Appendix A
References

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Appendix B
Urban Water Management Plan Act

Established: AB 797, Klehs, 1983
Amended: AB 2661, Klehs, 1990
AB 11X, Filante, 1991
AB 1869, Speier, 1991
AB 892, Frazee, 1993
SB 1017, McCorquodale, 1994
AB 2853, Cortese, 1994
AB 1845, Cortese, 1995
SB 1011, Polanco, 1995
AB 2552, Bates, 2000
SB 553, Kelley, 2000
SB 610, Costa, 2001
AB 901, Daucher, 2001
SB 672, Machado, 2001
SB 1348, Brulte, 2002
SB 1384, Costa, 2002
SB 1518, Torlakson, 2002
AB 105, Wiggins, 2004
SB 318, Alpert, 2004

CALIFORNIA WATER CODE DIVISION 6
PART 2.6. URBAN WATER MANAGEMENT PLANNING

CHAPTER 1. GENERAL DECLARATION AND POLICY

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. (a) The Legislature finds and declares all of the following:

(1) The waters of the state are a limited and renewable resource subject to ever-increasing demands.

(2) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.

(3) A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate.

(4) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in

its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years.

(5) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.

(6) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.

(7) Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.

(8) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.

(9) The quality of source supplies can have a significant impact on water management strategies and supply reliability.

(b) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:

(a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.

(b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.

(c) Urban water suppliers shall be required to develop water management plans to actively pursue the efficient use of available supplies.

CHAPTER 2. DEFINITIONS

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. "Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10616.5. "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

CHAPTER 3. URBAN WATER MANAGEMENT PLANS
Article 1. General Provisions

10620.

(a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d)

(1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

10621.

(a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero.

(b) Every urban water supplier required to prepare a plan pursuant to this part shall notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

(c) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

Article 2. Contents of Plans

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree.

For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(1) An average water year.
(2) A single dry water year.
(3) Multiple dry water years.

For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(e)

(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:

(A) Single-family residential.
(B) Multifamily.
(C) Commercial.
(D) Industrial.
(E) Institutional and governmental.
(F) Landscape.
(G) Sales to other agencies.
(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.
(I) Agricultural.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers.

(B) Residential plumbing retrofit.

(C) System water audits, leak detection, and repair.

(D) Metering with commodity rates for all new connections and retrofit of existing connections.

(E) Large landscape conservation programs and incentives.

(F) High-efficiency washing machine rebate programs.

(G) Public information programs.

(H) School education programs.

(I) Conservation programs for commercial, industrial, and institutional accounts.

(J) Wholesale agency programs.

(K) Conservation pricing.

(L) Water conservation coordinator.

(M) Water waste prohibition.

(N) Residential ultra-low-flush toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

(4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.

(h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

(j) Urban water suppliers that are members of the California Urban Water Conservation Council and submit annual reports to that council in accordance with the ‘‘Memorandum of Understanding Regarding Urban Water Conservation in California,’’ dated September 1991, may submit the annual reports identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirements of subdivisions (f) and (g).

(k) Urban water suppliers that rely upon a wholesale agency for a source of water, shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier’s plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c), including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

10631.5. The department shall take into consideration whether the urban water supplier is implementing or scheduled for implementation, the water demand management activities that the urban water supplier identified in its urban water management plan, pursuant to Section 10631, in evaluating applications for grants and loans made available pursuant to Section 79163. The urban water supplier may submit to the department copies of its annual reports and other relevant documents to assist the department in determining whether the urban water supplier is implementing or scheduling the implementation of water demand management activities.

10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:

(a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage.

(b) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

(c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

(d) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

(e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

(f) Penalties or charges for excessive use, where applicable.

(g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

(h) A draft water shortage contingency resolution or ordinance.

(i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area, and shall include all of the following:

(a) A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

(b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

(c) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

(f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

(g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

Article 2.5 Water Service Reliability

10635.

(a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

(c) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.

(d) Nothing in this article is intended to change existing law concerning an urban water supplier's obligation to provide water service to its existing customers or to any potential future customers.

Articl 3. Adoption and Implementation of Plans

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630).

The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water demand management methods and techniques.

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644.

(a) An urban water supplier shall file with the department and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be filed with the department and any city or county within which the supplier provides water supplies within 30 days after adoption.

(b) The department shall prepare and submit to the Legislature, on or before December 31, in the years ending in six and one, a report summarizing the status of the plans adopted pursuant to this part. The report prepared by the department shall identify the outstanding elements of the individual plans. The department shall provide a copy of the report to each urban water supplier that has filed its plan with the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans submitted pursuant to this part.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

CHAPTER 4. MISCELLANEOUS PROVISIONS

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part.

(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of actions taken pursuant to Section 10632. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing Section 10632, or any project for expanded or additional water supplies.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board and the Public Utilities Commission, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board or the Public Utilities Commission requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

10654. An urban water supplier may recover in its rates the costs incurred in preparing its plan and implementing the reasonable water conservation measures included in the plan. Any best water management practice that is included in the plan that is identified in the "Memorandum of Understanding Regarding Urban Water Conservation in California" is deemed to be reasonable for the purposes of this section.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. An urban water supplier that does not prepare, adopt, and submit its urban water management plan to the department in accordance with this part, is ineligible to receive funding pursuant to Division 24 (commencing with Section 78500) or Division 26 (commencing with Section 79000), or receive drought assistance from the state until the urban water management plan is submitted pursuant to this article.

10657.

(a) The department shall take into consideration whether the urban water supplier has submitted an updated urban water management plan that is consistent with Section 10631, as amended by the act that adds this section, in determining whether the urban water supplier is eligible for funds made available pursuant to any program administered by the department.

(b) This section shall remain in effect only until January 1, 2006, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2006, deletes or extends that date.

Appendix C
BMP Activity Report

This Appendix includes the following information:

- Water Supply and Reuse Summary 2004
- Water Account and Use Summary 2004
- BMP Activity Reports 2004
- Water Supply and Reuse Summary 2003
- Water Account and Use Summary 2003
- BMP Activity Reports 2003
- CUWCC Coverage Reports as of October 2005

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Water Supply & Reuse

Reporting Unit: **City of Ontario**

Year: **2003**

Water Supply Source Information

Supply Source Name	Quantity (AF) Supplied	Supply Type
Well No.3	896.19	Groundwater
Well No.9	133.14	Groundwater
Well No. 11	1777.46	Groundwater
Well No. 15	1837.91	Groundwater
Well No. 16	982.81	Groundwater
Well No.17	2077.4	Groundwater
Well No.20	693.45	Groundwater
Well No.24	2758.84	Groundwater
Well No.25	2087.05	Groundwater
Well No.26	335.86	Groundwater
Well No.27	903.2	Groundwater
Well No.29	3152.54	Groundwater
Well No.30	536.8	Groundwater
Well No.31	2847.3	Groundwater
Well No.34	2761.72	Groundwater
Well No.35	1838.98	Groundwater
Well No.36	1127.72	Groundwater
Well No.37	3835.16	Groundwater
Well No.38	1407.06	Groundwater
Well No.39	2639.69	Groundwater
State Proj/MWD	8255.08	Imported

Total AF: 42885.36

Reported as of 10/12/05

Accounts & Water Use

Reporting Unit Name:	Submitted to CUWCC	Year:
City of Ontario	**11/22/2004**	**2003**

A. Service Area Population Information:

1. Total service area population 165678

B. Number of Accounts and Water Deliveries (AF)

Type	Metered		Unmetered	
	No. of Accounts	Water Deliveries (AF)	No. of Accounts	Water Deliveries (AF)
1. Single-Family	25830	17038	0	0
2. Multi-Family	1977	6484	0	0
3. Commercial	2615	10423	0	0
4. Industrial	344	2473	0	0
5. Institutional	293	1171	0	0
6. Dedicated Irrigation	958	5052	0	0
7. Recycled Water	2	87	0	0
8. Other	0	0	0	0
9. Unaccounted	NA	5	NA	0
Total	32019	42733	0	0
	Metered		**Unmetered**	

Reported as of 10/12/05

BMP 01: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

1. Based on your signed MOU date, 12/11/2002, your Agency STRATEGY DUE DATE is:	12/10/2004
2. Has your agency developed and implemented a targeting/ marketing strategy for SINGLE-FAMILY residential water use surveys?	no
a. If YES, when was it implemented?	
3. Has your agency developed and implemented a targeting/ marketing strategy for MULTI-FAMILY residential water use surveys?	no
a. If YES, when was it implemented?	

B. Water Survey Data

Survey Counts:	**Single Family Accounts**	**Multi-Family Units**
1. Number of surveys offered:	0	0
2. Number of surveys completed:	0	0
Indoor Survey:		
3. Check for leaks, including toilets, faucets and meter checks	no	no
4. Check showerhead flow rates, aerator flow rates, and offer to replace or recommend replacement, if necessary	no	no
5. Check toilet flow rates and offer to install or recommend installation of displacement device or direct customer to ULFT replacement program, as neccesary; replace leaking toilet flapper, as necessary	no	no
Outdoor Survey:		
6. Check irrigation system and timers	no	no
7. Review or develop customer irrigation schedule	no	no
8. Measure landscaped area (Recommended but not required for surveys)	no	no
9. Measure total irrigable area (Recommended but not required for surveys)	no	no
10. Which measurement method is typically used (Recommended but not required for surveys)		None
11. Were customers provided with	no	no

information packets that included evaluation results and water savings recommendations?		
12. Have the number of surveys offered and completed, survey results, and survey costs been tracked?	no	no
a. If yes, in what form are surveys tracked?		
b. Describe how your agency tracks this information.		

C. Water Survey Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? yes

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

Leaks are checked at the meter during customer service work, in response to a customer complain, during meter exchanges and when the meter is read. The coverage % would be 100% coverage several times throughout the year. Additionally, during various in-home customer service visits, leaks are noticed to customers. Customers are also offered swimming pool rebates to reduce evaporation.

E. Comments

Reported as of 10/12/05

BMP 02: Residential Plumbing Retrofit

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

1. Is there an enforceable ordinance in effect in your service area requiring replacement of high-flow showerheads and other water use fixtures with their low-flow counterparts?	no
a. If YES, list local jurisdictions in your service area and code or ordinance in each:	
2. Has your agency satisfied the 75% saturation requirement for single-family housing units?	no
3. Estimated percent of single-family households with low-flow showerheads:	1.4%
4. Has your agency satisfied the 75% saturation requirement for multi-family housing units?	no
5. Estimated percent of multi-family households with low-flow showerheads:	5.8%
6. If YES to 2 OR 4 above, please describe how saturation was determined, including the dates and results of any survey research.	

B. Low-Flow Device Distribution Information

1. Has your agency developed a targeting/ marketing strategy for distributing low-flow devices?	yes
a. If YES, when did your agency begin implementing this strategy?	1/1/2002
b. Describe your targeting/ marketing strategy.	

Low flow showerheads are distributed at water quality/water conservation fair booths, during in-home water quality site visits and by customer service staff conducting routine fieldwork.

Low-Flow Devices Distributed/ Installed	SF Accounts	MF Units
2. Number of low-flow showerheads distributed:	375	125
3. Number of toilet-displacement devices distributed:	0	0
4. Number of toilet flappers distributed:	0	0
5. Number of faucet aerators distributed:	0	0

6. Does your agency track the distribution and cost of low-flow devices?	no
a. If YES, in what format are low-flow devices tracked?	

b. If yes, describe your tracking and distribution system :

C. Low-Flow Device Distribution Expenditures

	This Year	Next Year
1. Budgeted Expenditures	2000	2000
2. Actual Expenditures	2290	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

500 Low flow hoze nozzles were also distributed this year with the showerhead giveaways.

Reported as of 10/12/05

BMP 03: System Water Audits, Leak Detection and Repair

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

1. Has your agency completed a pre-screening system audit for this reporting year?	yes
2. If YES, enter the values (AF/Year) used to calculate verifiable use as a percent of total production:	
a. Determine metered sales (AF)	42733
b. Determine other system verifiable uses (AF)	86.5
c. Determine total supply into the system (AF)	42885.36
d. Using the numbers above, if (Metered Sales + Other Verifiable Uses) / Total Supply is < 0.9 then a full-scale system audit is required.	1.00
3. Does your agency keep necessary data on file to verify the values used to calculate verifiable uses as a percent of total production?	yes
4. Did your agency complete a full-scale audit during this report year?	no
5. Does your agency maintain in-house records of audit results or the completed AWWA audit worksheets for the completed audit?	yes
6. Does your agency operate a system leak detection program?	yes

a. If yes, describe the leak detection program:

Leaks are reported by Ontario Utilities employees and other Public Works employees working in the field who may observe leaks while reading meters, working on services lines or conducting misc. work within the City. Leaks are also reported directly by the customer. In addition, field crews investigate below ground leaks.

B. Survey Data

1. Total number of miles of distribution system line.	498
2. Number of miles of distribution system line surveyed.	0

C. System Audit / Leak Detection Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	20000	20000
2. Actual Expenditures	13000	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Reported as of 10/12/05

BMP 04: Metering with Commodity Rates for all New Connections and Retrofit of Existing

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

1. Does your agency require meters for all new connections and bill by volume-of-use?	yes
2. Does your agency have a program for retrofitting existing unmetered connections and bill by volume-of-use?	no
a. If YES, when was the plan to retrofit and bill by volume-of-use existing unmetered connections completed?	
b. Describe the program:	

Not needed, all services are metered.

3. Number of previously unmetered accounts fitted with meters during report year.	0

B. Feasibility Study

1. Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	no
a. If YES, when was the feasibility study conducted? (mm/dd/yy)	
b. Describe the feasibility study:	
2. Number of CII accounts with mixed-use meters.	0
3. Number of CII accounts with mixed-use meters retrofitted with dedicated irrigation meters during reporting period.	0

C. Meter Retrofit Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

The number of CII accounts with mix-used meters is unknown at this time. The zero number reported above may not be an accurate reflection of the zero number reported above.

Reported as of 10/12/05

BMP 05: Large Landscape Conservation Programs and Incentives

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Water Use Budgets

1. Number of Dedicated Irrigation Meter Accounts:	890
2. Number of Dedicated Irrigation Meter Accounts with Water Budgets:	0
3. Budgeted Use for Irrigation Meter Accounts with Water Budgets (AF):	0
4. Actual Use for Irrigation Meter Accounts with Water Budgets (AF):	0
5. Does your agency provide water use notices to accounts with budgets each billing cycle?	no

B. Landscape Surveys

1. Has your agency developed a marketing / targeting strategy for landscape surveys?	no
a. If YES, when did your agency begin implementing this strategy?	
b. Description of marketing / targeting strategy:	
2. Number of Surveys Offered.	0
3. Number of Surveys Completed.	0
4. Indicate which of the following Landscape Elements are part of your survey:	
a. Irrigation System Check	no
b. Distribution Uniformity Analysis	no
c. Review / Develop Irrigation Schedules	no
d. Measure Landscape Area	no
e. Measure Total Irrigable Area	no
f. Provide Customer Report / Information	no
5. Do you track survey offers and results?	no
6. Does your agency provide follow-up surveys for previously completed surveys?	no
a. If YES, describe below:	

C. Other BMP 5 Actions

1. An agency can provide mixed-use accounts with ETo-based landscape budgets in lieu of a large landscape survey program. Does your agency provide mixed-use accounts with landscape budgets?	no
2. Number of CII mixed-use accounts with landscape budgets.	0

3. Do you offer landscape irrigation training?	yes
4. Does your agency offer financial incentives to improve landscape water use efficiency?	no

Type of Financial Incentive:	Budget (Dollars/ Year)	Number Awarded to Customers	Total Amount Awarded
a. Rebates	0	0	0
b. Loans	0	0	0
c. Grants	0	0	0

5. Do you provide landscape water use efficiency information to new customers and customers changing services?	No
a. If YES, describe below:	
6. Do you have irrigated landscaping at your facilities?	yes
a. If yes, is it water-efficient?	no
b. If yes, does it have dedicated irrigation metering?	yes
7. Do you provide customer notices at the start of the irrigation season?	no
8. Do you provide customer notices at the end of the irrigation season?	no

D. Landscape Conservation Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

E. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

F. Comments

Reported as of 10/12/05

BMP 06: High-Efficiency Washing Machine Rebate Programs

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

1. Do any energy service providers or waste water utilities in your service area offer rebates for high-efficiency washers? yes

   a. If YES, describe the offerings and incentives as well as who the energy/waste water utility provider is.

   Rebates are available through Inland Empire Utilities Agency in coordination with the Metropolitan Water District. The rebate is $100. The City does not offer a rebate in addition to the IEUA/MWD rebate.

2. Does your agency offer rebates for high-efficiency washers? no

3. What is the level of the rebate? 0

4. Number of rebates awarded. 0

B. Rebate Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? no

   a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Budgeted and actual expenditures may be reflected through IEUA regional program expenditures for this program. This City pays into this program and monies and programs and administered regionally.

Reported as of 10/12/05

BMP 07: Public Information Programs

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

1. Does your agency maintain an active public information program to promote and educate customers about water conservation? yes

a. If YES, describe the program and how it's organized.

Conservation information is distributed in a variety of ways. Conservation information is found prominantly in our water quality reports and our quarterly newsletter. Conservation topics are discussed with residents and businesses on an individual and group level. Various literature is targeted and distributed to various age levels.

2. Indicate which and how many of the following activities are included in your public information program.

Public Information Program Activity	Yes/No	Number of Events
a. Paid Advertising	yes	3
b. Public Service Announcement	no	
c. Bill Inserts / Newsletters / Brochures	yes	2
d. Bill showing water usage in comparison to previous year's usage	no	
e. Demonstration Gardens	yes	2
f. Special Events, Media Events	yes	2
g. Speaker's Bureau	yes	2
h. Program to coordinate with other government agencies, industry and public interest groups and media	yes	

B. Conservation Information Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	5000	5000
2. Actual Expenditures	4925	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

A budgeted amount of $1500 shown is paid to a regional conservation group called the Water Education and Water Awareness Committee whose purpose is to conduct public education on water conservation. Additionally, budgeted expenditures reflect Ontario staff time to implement these programs.

Reported as of 10/12/05

BMP 08: School Education Programs

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

1.Has your agency implemented a school information program to promote water conservation? yes

2. Please provide information on your school programs (by grade level):

Grade	Are grade-appropriate materials distributed?	No. of class presentations	No. of students reached	No. of teachers' workshops
Grades K-3rd	yes	0	0	0
Grades 4th-6th	yes	31	799	0
Grades 7th-8th	yes	0	0	0
High School	yes	0	0	0

3. Did your Agency's materials meet state education framework requirements? yes

4. When did your Agency begin implementing this program? 01/01/2003

B. School Education Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Budgeted and actual expenditures will be reflected on the wholesale agency report.

Reported as of 10/12/05

BMP 09: Conservation Programs for CII Accounts

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

1. Has your agency identified and ranked COMMERCIAL customers according to use?	no
2. Has your agency identified and ranked INDUSTRIAL customers according to use?	yes
3. Has your agency identified and ranked INSTITUTIONAL customers according to use?	yes

Option A: CII Water Use Survey and Customer Incentives Program

4. Is your agency operating a CII water use survey and customer incentives program for the purpose of complying with BMP 9 under this option?	yes

CII Surveys	Commercial Accounts	Industrial Accounts	Institutional Accounts
a. Number of New Surveys Offered	0	0	0
b. Number of New Surveys Completed	0	0	0
c. Number of Site Follow-ups of Previous Surveys (within 1 yr)	0	0	0
d. Number of Phone Follow-ups of Previous Surveys (within 1 yr)	0	0	0

CII Survey Components	Commercial Accounts	Industrial Accounts	Institutional Accounts
e. Site Visit	no	no	no
f. Evaluation of all water-using apparatus and processes	no	no	no
g. Customer report identifying recommended efficiency measures, paybacks and agency incentives	no	no	no

Agency CII Customer Incentives	Budget ($/Year)	No. Awarded to Customers	Total $ Amount Awarded
h. Rebates	0	14	2100

i. Loans	0	0	0
j. Grants	0	0	0
k. Others	0	0	0

Option B: CII Conservation Program Targets

5. Does your agency track CII program interventions and water savings for the purpose of complying with BMP 9 under this option?	yes
6. Does your agency document and maintain records on how savings were realized and the method of calculation for estimated savings?	yes
7. Estimated annual savings (AF/yr) from site-verified actions taken by agency since 1991.	.65
8. Estimated annual savings (AF/yr) from non-site-verified actions taken by agency since 1991.	5.82

B. Conservation Program Expenditures for CII Accounts

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	2515.5	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Budgeted expenditures should be reflected on the wholesale agency report.

Reported as of 10/12/05

BMP 09a: CII ULFT Water Savings

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

1. Did your agency implement a CII ULFT replacement program in the reporting year? If No, please explain why on Line B. 10. — Yes

A. Targeting and Marketing

1. What basis does your agency use to target customers for participation in this program? Check all that apply.

CII Sector or subsector
CII ULFT Study subsector targeting

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

We found CII sectors and sub sectors most effective because we were able to version our marketing efforts appropriately.

2. How does your agency advertise this program? Check all that apply.

Direct letter
Web page
Bill insert
Newsletter
Newspapers
Trade publications
Other print media
Trade shows and events
Telemarketing

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

For the purposes of this program, Trade Allies have proven to be the most effective overall marketing tool, as well as the most effective per dollar expended. Trade Allies include plumbers, distributors, retail home improvement stores and product manufacturers.

B. Implementation

1. Does your agency keep and maintain customer participant information? (Read the Help information for a complete list of all the information for this BMP.) — Yes

2. Would your agency be willing to share this information if the CUWCC did a study to evaluate the program on behalf of your agency? — Yes

3. What is the total number of customer accounts participating in the program during the last year ? — 0

CII Subsector	Number of Toilets Replaced			
4.	Standard Gravity Tank	Air Assisted	Valve Floor Mount	Valve Wall Mount
a. Offices	0	0	0	0
b. Retail / Wholesale	0	0	0	0
c. Hotels	0	0	0	0
d. Health	0	0	0	0
e. Industrial	0	0	0	0
f. Schools: K to 12	0	0	0	0
g. Eating	0	0	0	0
h. Government	0	0	0	0
i. Churches	0	0	0	0
j. Other	0	0	0	0

5. Program design.	Rebate or voucher
6. Does your agency use outside services to implement this program?	Yes
a. If yes, check all that apply.	Consultant
7. Participant tracking and follow-up.	Telephone Site Visit

8. Based on your program experience, please rank on a scale of 1 to 5, with 1 being the least frequent cause and 5 being the most frequent cause, the following reasons why customers refused to participate in the program.

a. Disruption to business	1
b. Inadequate payback	3
c. Inadequate ULFT performance	2
d. Lack of funding	5
e. American's with Disabilities Act	0
f. Permitting	0
g. Other. Please describe in B. 9.	

9. Please describe general program acceptance/resistance by customers, obstacles to implementation, and other isues affecting program implementation or effectiveness.

Customers are generally more willing to participate in the program if the cost of the retrofit is in balance with the amount of the rebate, and the projected water savings is significant. Resistance occurs if the out-of-pocket expense for the retrofit is too costly and the rebate amount is too low.

10. Please provide a general assessment of the program for this reporting year. Did your program achieve its objectives? Were your targeting and marketing approaches effective? Were program costs in line with expectations and budgeting?

Either Metropolitan or its Agencies to provide this response.

C. Conservation Program Expenditures for CII ULFT

1. CII ULFT Program: Annual Budget & Expenditure Data

	Budgeted	Actual Expenditure
a. Labor	0	0
b. Materials	0	0
c. Marketing & Advertising	0	0
d. Administration & Overhead	0	0
e. Outside Services	0	0
f. Total	0	0

2. CII ULFT Program: Annual Cost Sharing

a. Wholesale agency contribution	0
b. State agency contribution	0
c. Federal agency contribution	0
d. Other contribution	0
e. Total	0

D. Comments

The # of toilets is an estimate.

Reported as of 10/12/05

BMP 11: Conservation Pricing

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

Rate Structure Data Volumetric Rates for Water Service by Customer Class

1. Residential

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Increasing Block
c. Total Revenue from Volumetric Rates	$14221989
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$14221989

2. Commercial

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Increasing Block
c. Total Revenue from Volumetric Rates	$8580852
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$8580852

3. Industrial

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Increasing Block
c. Total Revenue from Volumetric Rates	$1381299
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$1381299

4. Institutional / Government

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Increasing Block
c. Total Revenue from Volumetric Rates	$709610
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$709610

5. Irrigation

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$0
d. Total Revenue from Non-	

Volumetric Charges, Fees and other Revenue Sources	$0

6. Other

a. Water Rate Structure	Decreasing Block
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$0
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$0

B. Conservation Pricing Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	70000	0
2. Actual Expenditures	60000	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Revenue for irrigation and recycled water is lumped into other revenue accounts and is not tracked separately. In addition, readiness-to-serve charges are also lumped into total revenue and cannot be broken out at this time. Conservation pricing expenditures covered a full-scale rate study.

Reported as of 10/12/05

BMP 12: Conservation Coordinator

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

1. Does your Agency have a conservation coordinator?	yes
2. Is this a full-time position?	no
3. If no, is the coordinator supplied by another agency with which you cooperate in a regional conservation program ?	yes
4. Partner agency's name:	Inland Empire Utilities Agency
5. If your agency supplies the conservation coordinator:	
a. What percent is this conservation coordinator's position?	30%
b. Coordinator's Name	Rosemarie Chora
c. Coordinator's Title	Water Quality Specialist
d. Coordinator's Experience and Number of Years	Water quality and supply/4 years
e. Date Coordinator's position was created (mm/dd/yyyy)	01/01/2000
6. Number of conservation staff, including Conservation Coordinator.	3

B. Conservation Staff Program Expenditures

	This Year	**Next Year**
1. Budgeted Expenditures	32000	35000
2. Actual Expenditures	31235	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? yes

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

Conservation activities are managed by the Environmental Programs Manager with primary responsibility to implement by the Water Quality Specialist. These positions are additionally supported by many other in-house and wholesaler staff members in order to implement the BMPs. The City is also an active participant in 2 regional conservation groups which pool resources to implement conservation programs. these groups are WEWAC and the IEUA Conservation Committee.

D. Comments

Reported as of 10/12/05

BMP 13: Water Waste Prohibition

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Requirements for Documenting BMP Implementation

1. Is a water waste prohibition ordinance in effect in your service area?	no
a. If YES, describe the ordinance:	
2. Is a copy of the most current ordinance(s) on file with CUWCC?	no

a. List local jurisdictions in your service area in the first text box and water waste ordinance citations in each jurisdiction in the second text box:

City of Ontario	none at this time

B. Implementation

1. Indicate which of the water uses listed below are prohibited by your agency or service area.

a. Gutter flooding	no
b. Single-pass cooling systems for new connections	no
c. Non-recirculating systems in all new conveyor or car wash systems	no
d. Non-recirculating systems in all new commercial laundry systems	no
e. Non-recirculating systems in all new decorative fountains	no
f. Other, please name	no

2. Describe measures that prohibit water uses listed above:

none at this time

Water Softeners:

3. Indicate which of the following measures your agency has supported in developing state law:

a. Allow the sale of more efficient, demand-initiated regenerating DIR models.	no
b. Develop minimum appliance efficiency standards that:	
i.) Increase the regeneration efficiency standard to at least 3,350 grains of hardness removed per pound of common salt used.	no
ii.) Implement an identified maximum number of gallons discharged per gallon of soft water produced.	no
c. Allow local agencies, including municipalities and special districts, to set more stringent standards and/or to ban on-site regeneration of water softeners if it is demonstrated and found by the	yes

agency governing board that there is an adverse effect on the reclaimed water or groundwater supply.

4. Does your agency include water softener checks in home water audit programs?	no
5. Does your agency include information about DIR and exchange-type water softeners in educational efforts to encourage replacement of less efficient timer models?	no

C. Water Waste Prohibition Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Water treatment devices (softeners) are limited to one cubic foot in size. Comm/Ind. users needing unit larger than this are prohibited from installation and must use and exchange service. Ontario is an active partner in the Inland Empire Utilities Agency salinity study which is looking at salinity from residential. If acceptable, this report will be used to move forward prohibition of "time controlled" regenerable softeners.

Reported as of 10/12/05

BMP 14: Residential ULFT Replacement Programs

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2003**

A. Implementation

	Single-Family Accounts	Multi-Family Units
1. Does your Agency have program(s) for replacing high-water-using toilets with ultra-low flush toilets?	yes	yes

Number of Toilets Replaced by Agency Program During Report Year

Replacement Method	SF Accounts	MF Units
2. Rebate	0	0
3. Direct Install	0	0
4. CBO Distribution	852	284
5. Other	0	0
Total	**852**	**284**

6. Describe your agency's ULFT program for single-family residences.

ULFT Exchange events are hosted twice per year at the City's public works yard. Advertising is done through local newspapers and within the water bills. Toilets are given to Ontario water customers. Customers are required to install and return old toilet within 2 weeks on a predetermined exchange date. Random inspections are done to ensure installation at the address provided by the customer.

7. Describe your agency's ULFT program for multi-family residences.

None existing presently that specifically target multi-family residences. It is believed that a number of residences will obtain toilets through the regional events.

8. Is a toilet retrofit on resale ordinance in effect for your service area? no

9. List local jurisdictions in your service area in the left box and ordinance citations in each jurisdiction in the right box:

City of Ontario	None at this time.

B. Residential ULFT Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	20000	20000

2. Actual Expenditures	17920

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Actual costs associated with the toilets should be reflected in reporting from the wholesale agency. Costs reported above reflect staff time to distribute and accept returned toilets. Toilet numbers reported above include toilets distributed at regional events and also through rebate programs.

Reported as of 10/12/05

Water Supply & Reuse

Reporting Unit: **City of Ontario**

Year: **2004**

Water Supply Source Information

Supply Source Name	Quantity (AF) Supplied	Supply Type
Well No.3	734.69	Groundwater
Well No.4	13.31	Groundwater
Well No.9	31.05	Groundwater
Well No.11	2116.59	Groundwater
Well No.15	0	Groundwater
Well No.16	714.66	Groundwater
Well No.17	1839.15	Groundwater
Well No.24	1047.31	Groundwater
Well No.25	1289.23	Groundwater
Well No.26	158.22	Groundwater
Well No.27	1073.83	Groundwater
Well No.29	3320.32	Groundwater
Well No.30	0	Groundwater
Well No.31	4009.64	Groundwater
Well No.34	2216.4	Groundwater
Well No.35	1263.48	Groundwater
Well No.36	1846.46	Groundwater
Well No.37	2516.79	Groundwater
Well No.38	1390.12	Groundwater
Well No.39	3293.8	Groundwater
State Proj/MWD	15938.05	Imported
Well No. 40	0	Groundwater
Well No. 41	0	Groundwater
Well No. 20	338.89	Groundwater

Total AF: 45151.99

Reported as of 10/12/05

Accounts & Water Use

Reporting Unit Name:	Submitted to CUWCC	Year:
City of Ontario	**12/10/2004**	**2004**

A. Service Area Population Information:

1. Total service area population 167000

B. Number of Accounts and Water Deliveries (AF)

Type	Metered		Unmetered	
	No. of Accounts	Water Deliveries (AF)	No. of Accounts	Water Deliveries (AF)
1. Single-Family	25648	17875	0	0
2. Multi-Family	2042	6621	0	0
3. Commercial	2758	8262	0	0
4. Industrial	345	2234	0	0
5. Institutional	333	1353	0	0
6. Dedicated Irrigation	1000	6402	0	0
7. Recycled Water	2	69	0	0
8. Other	0	0	0	0
9. Unaccounted	NA	5	NA	0
Total	32128	42821	0	0
	Metered		**Unmetered**	

Reported as of 10/12/05

BMP 01: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

1. Based on your signed MOU date, 12/11/2002, your Agency STRATEGY DUE DATE is:	12/10/2004
2. Has your agency developed and implemented a targeting/ marketing strategy for SINGLE-FAMILY residential water use surveys?	no
a. If YES, when was it implemented?	
3. Has your agency developed and implemented a targeting/ marketing strategy for MULTI-FAMILY residential water use surveys?	no
a. If YES, when was it implemented?	

B. Water Survey Data

Survey Counts:	**Single Family Accounts**	**Multi-Family Units**
1. Number of surveys offered:	0	0
2. Number of surveys completed:	0	0
Indoor Survey:		
3. Check for leaks, including toilets, faucets and meter checks	no	no
4. Check showerhead flow rates, aerator flow rates, and offer to replace or recommend replacement, if necessary	no	no
5. Check toilet flow rates and offer to install or recommend installation of displacement device or direct customer to ULFT replacement program, as neccesary; replace leaking toilet flapper, as necessary	no	no
Outdoor Survey:		
6. Check irrigation system and timers	no	no
7. Review or develop customer irrigation schedule	no	no
8. Measure landscaped area (Recommended but not required for surveys)	no	no
9. Measure total irrigable area (Recommended but not required for surveys)	no	no
10. Which measurement method is typically used (Recommended but not required for surveys)		None
11. Were customers provided with	no	no

information packets that included evaluation results and water savings recommendations?		
12. Have the number of surveys offered and completed, survey results, and survey costs been tracked?	no	no
a. If yes, in what form are surveys tracked?		None
b. Describe how your agency tracks this information.		

C. Water Survey Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Reported as of 10/12/05

BMP 02: Residential Plumbing Retrofit

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

1. Is there an enforceable ordinance in effect in your service area requiring replacement of high-flow showerheads and other water use fixtures with their low-flow counterparts?	no
a. If YES, list local jurisdictions in your service area and code or ordinance in each:	
2. Has your agency satisfied the 75% saturation requirement for single-family housing units?	no
3. Estimated percent of single-family households with low-flow showerheads:	2.7%
4. Has your agency satisfied the 75% saturation requirement for multi-family housing units?	no
5. Estimated percent of multi-family households with low-flow showerheads:	11.6%
6. If YES to 2 OR 4 above, please describe how saturation was determined, including the dates and results of any survey research.	

B. Low-Flow Device Distribution Information

1. Has your agency developed a targeting/ marketing strategy for distributing low-flow devices?	yes
a. If YES, when did your agency begin implementing this strategy?	1/1/2002
b. Describe your targeting/ marketing strategy.	

Low flow showerheads are distributed at water quality/water conservation fair booths, during in-home water quality site visits and by customer service staff conducting routine fieldwork.

Low-Flow Devices Distributed/ Installed	SF Accounts	MF Units
2. Number of low-flow showerheads distributed:	375	125
3. Number of toilet-displacement devices distributed:	0	0
4. Number of toilet flappers distributed:	0	0
5. Number of faucet aerators distributed:	375	125

6. Does your agency track the distribution and cost of low-flow devices?	no
a. If YES, in what format are low-flow devices tracked?	

b. If yes, describe your tracking and distribution system :

C. Low-Flow Device Distribution Expenditures

	This Year	Next Year
1. Budgeted Expenditures	2000	4000
2. Actual Expenditures	2395	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

We will begin to track where these devices are being distributed in an effort to comply better with this BMP.

Reported as of 10/12/05

BMP 03: System Water Audits, Leak Detection and Repair

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

1. Has your agency completed a pre-screening system audit for this reporting year?	yes
2. If YES, enter the values (AF/Year) used to calculate verifiable use as a percent of total production:	
a. Determine metered sales (AF)	42821
b. Determine other system verifiable uses (AF)	25
c. Determine total supply into the system (AF)	45151.99
d. Using the numbers above, if (Metered Sales + Other Verifiable Uses) / Total Supply is < 0.9 then a full-scale system audit is required.	0.95
3. Does your agency keep necessary data on file to verify the values used to calculate verifiable uses as a percent of total production?	yes
4. Did your agency complete a full-scale audit during this report year?	no
5. Does your agency maintain in-house records of audit results or the completed AWWA audit worksheets for the completed audit?	yes
6. Does your agency operate a system leak detection program?	yes

a. If yes, describe the leak detection program:

Leaks are reported by Ontario Utilities employees and other Public Works employees working in the field who may observe leaks while reading meters, working on service lines or conducting misc. work within the City. Leaks are also reported directly by the customer. In addition, field crews investigate below ground leaks. Based on the leak percentage this year, we will slowly begin an active leak program.

B. Survey Data

1. Total number of miles of distribution system line.	531
2. Number of miles of distribution system line surveyed.	0

C. System Audit / Leak Detection Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	20000	20000
2. Actual Expenditures	13000	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Reported as of 10/12/05

BMP 04: Metering with Commodity Rates for all New Connections and Retrofit of Existing

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

1. Does your agency require meters for all new connections and bill by volume-of-use?	yes
2. Does your agency have a program for retrofitting existing unmetered connections and bill by volume-of-use?	no
a. If YES, when was the plan to retrofit and bill by volume-of-use existing unmetered connections completed?	
b. Describe the program: Not needed, all services are metered.	
3. Number of previously unmetered accounts fitted with meters during report year.	0

B. Feasibility Study

1. Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	no
a. If YES, when was the feasibility study conducted? (mm/dd/yy)	
b. Describe the feasibility study:	
2. Number of CII accounts with mixed-use meters.	0
3. Number of CII accounts with mixed-use meters retrofitted with dedicated irrigation meters during reporting period.	0

C. Meter Retrofit Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No
a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."	

E. Comments

The number of CII accounts with mix-used meters is unknown at this time. The zero number reported above may not be an accurate reflection of the zero number reported above.

Reported as of 10/12/05

BMP 05: Large Landscape Conservation Programs and Incentives

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Water Use Budgets

1. Number of Dedicated Irrigation Meter Accounts:	890
2. Number of Dedicated Irrigation Meter Accounts with Water Budgets:	0
3. Budgeted Use for Irrigation Meter Accounts with Water Budgets (AF):	0
4. Actual Use for Irrigation Meter Accounts with Water Budgets (AF):	0
5. Does your agency provide water use notices to accounts with budgets each billing cycle?	no

B. Landscape Surveys

1. Has your agency developed a marketing / targeting strategy for landscape surveys?	no
a. If YES, when did your agency begin implementing this strategy?	
b. Description of marketing / targeting strategy:	
2. Number of Surveys Offered.	0
3. Number of Surveys Completed.	0
4. Indicate which of the following Landscape Elements are part of your survey:	
a. Irrigation System Check	no
b. Distribution Uniformity Analysis	no
c. Review / Develop Irrigation Schedules	no
d. Measure Landscape Area	no
e. Measure Total Irrigable Area	no
f. Provide Customer Report / Information	no
5. Do you track survey offers and results?	no
6. Does your agency provide follow-up surveys for previously completed surveys?	no
a. If YES, describe below:	

C. Other BMP 5 Actions

1. An agency can provide mixed-use accounts with ETo-based landscape budgets in lieu of a large landscape survey program. Does your agency provide mixed-use accounts with landscape budgets?	no
2. Number of CII mixed-use accounts with landscape budgets.	0

3. Do you offer landscape irrigation training?	yes
4. Does your agency offer financial incentives to improve landscape water use efficiency?	no

Type of Financial Incentive:	Budget (Dollars/ Year)	Number Awarded to Customers	Total Amount Awarded
a. Rebates	0	0	0
b. Loans	0	0	0
c. Grants	0	0	0

5. Do you provide landscape water use efficiency information to new customers and customers changing services?	No
a. If YES, describe below:	
6. Do you have irrigated landscaping at your facilities?	yes
a. If yes, is it water-efficient?	no
b. If yes, does it have dedicated irrigation metering?	yes
7. Do you provide customer notices at the start of the irrigation season?	no
8. Do you provide customer notices at the end of the irrigation season?	no

D. Landscape Conservation Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

E. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

F. Comments

We began a pilot program in FY 04/05 which fulfills this BMP. If the pilot proves to be successful, a large full-scale program will be implemented. Though no budget is reflected, this program is funded through monies contributed by the City of Ontario to the Inland Empire Utilites Agency (our wholesaler) as a surcharge on imported water purchases. Monies are distributed among regional agencies.

Reported as of 10/12/05

BMP 06: High-Efficiency Washing Machine Rebate Programs

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

1. Do any energy service providers or waste water utilities in your service area offer rebates for high-efficiency washers? yes

    a. If YES, describe the offerings and incentives as well as who the energy/waste water utility provider is.

    Rebates are available through Inland Empire Utilities Agency in coordination with the Metropolitan Water District. The rebate is $100. The City does not offer a rebate in addition to the IEUA/MWD rebate.

2. Does your agency offer rebates for high-efficiency washers? no
3. What is the level of the rebate? 0
4. Number of rebates awarded. 51

B. Rebate Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? no

    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Budgeted and actual expenditures may be reflected through IEUA regional program expenditures for this program. This City pays into this program and monies and programs and administered regionally. $282,500 is budgeted regionally for this program

Reported as of 10/12/05

BMP 07: Public Information Programs

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

1. Does your agency maintain an active public information program to promote and educate customers about water conservation? yes

   a. If YES, describe the program and how it's organized.

   Conservation information is distrbuted in a variety of ways. Conservation information is found prominantly in our water quality reports and quarterly newsletter. Conservation topics are discussed with residents on an individual and group level. Various literature is targeted to various age levels.

2. Indicate which and how many of the following activities are included in your public information program.

Public Information Program Activity	Yes/No	Number of Events
a. Paid Advertising	yes	3
b. Public Service Announcement	yes	2
c. Bill Inserts / Newsletters / Brochures	yes	2
d. Bill showing water usage in comparison to previous year's usage	no	
e. Demonstration Gardens	yes	2
f. Special Events, Media Events	yes	2
g. Speaker's Bureau	yes	10
h. Program to coordinate with other government agencies, industry and public interest groups and media	yes	

B. Conservation Information Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	5000	5000
2. Actual Expenditures	5023	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

   a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

A budgeted amount of $1500 shown is paid to a regional conservation group called the Water Education and Water Awareness Committee whose purpose is to conduct public education on water conservation. Additionally, budgeted expenditures reflect Ontario staff time to implement the WEWAC awareness programs.

Reported as of 10/12/05

BMP 08: School Education Programs

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

1.Has your agency implemented a school information program to promote water conservation? yes

2. Please provide information on your school programs (by grade level):

Grade	Are grade-appropriate materials distributed?	No. of class presentations	No. of students reached	No. of teachers' workshops
Grades K-3rd	yes	0	0	0
Grades 4th-6th	yes	39	796	0
Grades 7th-8th	yes	0	0	0
High School	yes	0	0	0

3. Did your Agency's materials meet state education framework requirements? yes

4. When did your Agency begin implementing this program? 01/01/2003

B. School Education Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Budgeted expenditures will be reflected on the wholesale agency report

Reported as of 10/12/05

BMP 09: Conservation Programs for CII Accounts

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

1. Has your agency identified and ranked COMMERCIAL customers according to use?	no
2. Has your agency identified and ranked INDUSTRIAL customers according to use?	yes
3. Has your agency identified and ranked INSTITUTIONAL customers according to use?	yes

Option A: CII Water Use Survey and Customer Incentives Program

4. Is your agency operating a CII water use survey and customer incentives program for the purpose of complying with BMP 9 under this option?	yes

CII Surveys	Commercial Accounts	Industrial Accounts	Institutional Accounts
a. Number of New Surveys Offered	0	0	0
b. Number of New Surveys Completed	0	0	0
c. Number of Site Follow-ups of Previous Surveys (within 1 yr)	0	0	0
d. Number of Phone Follow-ups of Previous Surveys (within 1 yr)	0	0	0

CII Survey Components	Commercial Accounts	Industrial Accounts	Institutional Accounts
e. Site Visit	no	no	no
f. Evaluation of all water-using apparatus and processes	no	no	no
g. Customer report identifying recommended efficiency measures, paybacks and agency incentives	no	no	no

Agency CII Customer Incentives	Budget ($/Year)	No. Awarded to Customers	Total $ Amount Awarded
h. Rebates	0	197	22220

i. Loans	0	0	0
j. Grants	0	0	0
k. Others	0	0	0

Option B: CII Conservation Program Targets

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5. Does your agency track CII program interventions and water savings for the purpose of complying with BMP 9 under this option?	yes
6. Does your agency document and maintain records on how savings were realized and the method of calculation for estimated savings?	yes
7. Estimated annual savings (AF/yr) from site-verified actions taken by agency since 1991.	1.3
8. Estimated annual savings (AF/yr) from non-site-verified actions taken by agency since 1991.	11.7

B. Conservation Program Expenditures for CII Accounts

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	27262.5	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

Budgeted expenditures should be reflected on the wholesale agency report.

Reported as of 10/12/05

BMP 09a: CII ULFT Water Savings

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

1. Did your agency implement a CII ULFT replacement program in the reporting year? If No, please explain why on Line B. 10. — Yes

A. Targeting and Marketing

1. What basis does your agency use to target customers for participation in this program? Check all that apply.

CII Sector or subsector
CII ULFT Study subsector targeting

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

We found CII sectors and sub sectors most effective because we were able to version our marketing efforts appropriately.

2. How does your agency advertise this program? Check all that apply.

Direct letter
Web page
Newsletter
Bill insert
Newspapers
Trade publications
Other print media
Trade shows and events
Telemarketing

a. Describe which method you found to be the most effective overall, and which was the most effective per dollar expended.

For the purposes of this program, Trade Allies have proven to be the most effective overall marketing tool, as well as the most effective per dollar expended. Trade Allies include plumbers, distributors, retail home improvement stores and product manufacturers.

B. Implementation

1. Does your agency keep and maintain customer participant information? (Read the Help information for a complete list of all the information for this BMP.) — Yes

2. Would your agency be willing to share this information if the CUWCC did a study to evaluate the program on behalf of your agency? — Yes

3. What is the total number of customer accounts participating in the program during the last year ? — 2

CII Subsector	Number of Toilets Replaced			
4.	Standard Gravity Tank	Air Assisted	Valve Floor Mount	Valve Wall Mount
a. Offices	0	0	0	0
b. Retail / Wholesale	0	0	0	0
c. Hotels	137	0	0	0
d. Health	0	0	0	0
e. Industrial	0	0	0	0
f. Schools: K to 12	0	0	0	0
g. Eating	0	0	0	0
h. Govern-ment	0	0	0	0
i. Churches	0	0	0	0
j. Other	0	0	0	0

5. Program design.	Rebate or voucher
6. Does your agency use outside services to implement this program?	Yes
a. If yes, check all that apply.	Consultant
7. Participant tracking and follow-up.	Telephone Site Visit

8. Based on your program experience, please rank on a scale of 1 to 5, with 1 being the least frequent cause and 5 being the most frequent cause, the following reasons why customers refused to participate in the program.

a. Disruption to business	1
b. Inadequate payback	3
c. Inadequate ULFT performance	2
d. Lack of funding	5
e. American's with Disabilities Act	0
f. Permitting	0
g. Other. Please describe in B. 9.	

9. Please describe general program acceptance/resistance by customers, obstacles to implementation, and other isues affecting program implementation or effectiveness.

Customers are generally more willing to participate in the program if the cost of the retrofit is in balance with the amount of the rebate, and the projected water savings is significant. Resistance occurs if the out-of-pocket expense for the retrofit is too costly and the rebate amount is too low.

10. Please provide a general assessment of the program for this reporting year. Did your program achieve its objectives? Were your targeting and marketing approaches effective? Were program costs in line with expectations and budgeting?

Either Metropolitan or its Agencies to provide this response.

C. Conservation Program Expenditures for CII ULFT

1. CII ULFT Program: Annual Budget & Expenditure Data

	Budgeted	Actual Expenditure
a. Labor	0	0
b. Materials	0	0
c. Marketing & Advertising	0	0
d. Administration & Overhead	0	0
e. Outside Services	0	0
f. Total	0	0

2. CII ULFT Program: Annual Cost Sharing

a. Wholesale agency contribution	8220
b. State agency contribution	0
c. Federal agency contribution	0
d. Other contribution	0
e. Total	8220

D. Comments

.

Reported as of 10/12/05

BMP 11: Conservation Pricing

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

Rate Structure Data Volumetric Rates for Water Service by Customer Class

1. Residential

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Increasing Block
c. Total Revenue from Volumetric Rates	$14266962
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$14266962

2. Commercial

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Increasing Block
c. Total Revenue from Volumetric Rates	$9652163
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$9652163

3. Industrial

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Increasing Block
c. Total Revenue from Volumetric Rates	$1454459
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$1454459

4. Institutional / Government

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Increasing Block
c. Total Revenue from Volumetric Rates	$750286
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$750286

5. Irrigation

a. Water Rate Structure	Increasing Block
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$0
d. Total Revenue from Non-	

Volumetric Charges, Fees and other Revenue Sources	$0
6. Other	
a. Water Rate Structure	Decreasing Block
b. Sewer Rate Structure	Service Not Provided
c. Total Revenue from Volumetric Rates	$0
d. Total Revenue from Non-Volumetric Charges, Fees and other Revenue Sources	$0

B. Conservation Pricing Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP? No

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

See note from previous year for revenue explanations. #6-other reflects recycled water.

Reported as of 10/12/05

BMP 12: Conservation Coordinator

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

1. Does your Agency have a conservation coordinator?	yes
2. Is this a full-time position?	no
3. If no, is the coordinator supplied by another agency with which you cooperate in a regional conservation program ?	yes
4. Partner agency's name:	Inland Empire Utilities Agency

5. If your agency supplies the conservation coordinator:

a. What percent is this conservation coordinator's position?	30%
b. Coordinator's Name	Rosemarie Chora
c. Coordinator's Title	Water Quality Specialist
d. Coordinator's Experience and Number of Years	Water quality and supply/5 years
e. Date Coordinator's position was created (mm/dd/yyyy)	01/01/2000

6. Number of conservation staff, including Conservation Coordinator.	3

B. Conservation Staff Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	35000	35000
2. Actual Expenditures	32059	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	yes

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

Conservation activities are managed by the Environmental Programs Manager with primary responsibility to implement by the Water Quality Specialist. These positions are additionally supported by many other in-house and wholesaler staff members in order to implement the BMPs. The City is also an active participant in 2 regional conservation groups which pool resources to implement conservation programs. these groups are WEWAC and the IEUA Conservation Committee.

D. Comments

Reported as of 10/12/05

BMP 13: Water Waste Prohibition

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Requirements for Documenting BMP Implementation

1. Is a water waste prohibition ordinance in effect in your service area? — no

   a. If YES, describe the ordinance:

2. Is a copy of the most current ordinance(s) on file with CUWCC? — no

   a. List local jurisdictions in your service area in the first text box and water waste ordinance citations in each jurisdiction in the second text box:

   City of Ontario — none at this time

B. Implementation

1. Indicate which of the water uses listed below are prohibited by your agency or service area.

a. Gutter flooding	no
b. Single-pass cooling systems for new connections	no
c. Non-recirculating systems in all new conveyor or car wash systems	no
d. Non-recirculating systems in all new commercial laundry systems	no
e. Non-recirculating systems in all new decorative fountains	no
f. Other, please name	no

2. Describe measures that prohibit water uses listed above:

   none at this time

Water Softeners:

3. Indicate which of the following measures your agency has supported in developing state law:

a. Allow the sale of more efficient, demand-initiated regenerating DIR models.	no
b. Develop minimum appliance efficiency standards that:	
i.) Increase the regeneration efficiency standard to at least 3,350 grains of hardness removed per pound of common salt used.	no
ii.) Implement an identified maximum number of gallons discharged per gallon of soft water produced.	no
c. Allow local agencies, including municipalities and special districts, to set more stringent standards and/or to ban on-site regeneration of water softeners if it is demonstrated and found by the	yes

agency governing board that there is an adverse effect on the reclaimed water or groundwater supply.

4. Does your agency include water softener checks in home water audit programs?	no
5. Does your agency include information about DIR and exchange-type water softeners in educational efforts to encourage replacement of less efficient timer models?	no

C. Water Waste Prohibition Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	0	5000
2. Actual Expenditures	0	

D. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as effective as" variant of this BMP?	no

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

E. Comments

Water treatment devices (softeners) are limited to one cubic foot in size for commercial and industrial use. Comm/ind. users that need larger units are prohibited by ordinance from installation and must use an off-site exchange and regeneration service. Ontario is continuing to be an active partner in the Inland Empire Utilities Agency salinity study which is looking at salinity generation from residential sources. If acceptable, this report will be used to move forward with prohibiting "time controlled" regenerable softeners.

Reported as of 10/12/05

BMP 14: Residential ULFT Replacement Programs

Reporting Unit:	BMP Form Status:	Year:
City of Ontario	**100% Complete**	**2004**

A. Implementation

	Single-Family Accounts	Multi-Family Units
1. Does your Agency have program(s) for replacing high-water-using toilets with ultra-low flush toilets?	yes	yes

Number of Toilets Replaced by Agency Program During Report Year

Replacement Method	SF Accounts	MF Units
2. Rebate	103	34
3. Direct Install	0	0
4. CBO Distribution	362	121
5. Other	0	0
Total	**465**	**155**

6. Describe your agency's ULFT program for single-family residences.

The City continued to host ULFT Exchange events twice per year at the Public Works Yard. Ontario customers were also able to obtain toilets at an Inland Empire Utilities Agency regional toilet exchange event. See note for 02/03 for program implementation.

7. Describe your agency's ULFT program for multi-family residences.

None existing presently.

8. Is a toilet retrofit on resale ordinance in effect for your service area? no

9. List local jurisdictions in your service area in the left box and ordinance citations in each jurisdiction in the right box:

City of Ontario	None at this time.

B. Residential ULFT Program Expenditures

	This Year	Next Year
1. Budgeted Expenditures	20000	20000
2. Actual Expenditures	18300	

C. "At Least As Effective As"

1. Is your AGENCY implementing an "at least as no

effective as" variant of this BMP?

a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."

D. Comments

See note for 02/03

Reported as of 10/12/05

Appendix D
Water Conservation Details

This Appendix includes the following information:

- Estimated Water Conservation Savings 2004/2005
- Water Conservation Strategy 2006 - 2010

Estimated Water Conservation Savings by end of FY 2004/2005 (Existing BMPs)

Best Management Practices	Number of BMPs					BMP Savings	
	Pre 2002 - 2003	FY 02 - 03	2004	Total by the end of 2004	Unit	acre-ft/year per unit	Total (acre-ft/year)
(1) Water Survey Programs for Single-Family and Multi-Family Residential Customers	0	0	0	0	residential surveys		
(2) Residential Plumbing Retrofit - Single Family Residential	0	750	750	1,500	showerheads	0.01	14
(2) Residential Plumbing Retrofit - Multi Family Residential		250	250	500	showerheads	0.01	5
(3) System Water Audits, Leak Detection and Repair	yes	yes	yes	0	audit[(1)]		
(4) Metering with Commodity Rates for all New Connections and Retrofit of Existing	none	none	none	0	unmetered accounts		
(5) Large Landscape Conservation Programs and Incentives	none	none	none	0	landscape meters surveyed	0.96	
(6) High-Efficiency Washing Clothes Machine (HECW) Rebate Programs	189	226	274	689	washing machine rebates	0.05	31
Pool Covers	29	28	30	87	pool cover rebates	0.05	5
(7) Public Information Programs	0	11	21	32	events		
(8) School Education Programs	0	799	796	1,595	students		
(9) Conservation Programs for CII accounts	0	14	197	211	CII rebates		
CII ULF Toilets	50	0	137	187	toilet rebates	0.06	11
unaccounted CII Rebates	0	2	1	3	Other rebates	unknown	
CII Surveys	0	0	18	18	surveys		
High Efficiency Clothes Washers (HECW)	18		51	69	Washer rebates	0.12	8
Cooling Tower Conductivity Controllers (CTCC)	6	2	1	9	Cooling Tower Rebates	2.24	20
Waterbrooms	0	10	7	17	Waterbroom rebates	0.15	3
Performance Target savings	0	2	4	6	acre-ft/year	unknown	6
Conservation Program Targets	0	6.5	13	20	acre-ft/year	unknown	20
(10) Wholesale pricing	N/A	N/A	N/A	0	wholesale pricing		
(11) Conservation Pricing	yes	yes	yes	0	increasing price block		
(12) Conservation Coordinator	1	0	0	1	coordinator		
(13) Water Waste Prohibition	0	0	0	0	water waste ordinance		
(14) Residential ULFT Replacement Program	0	1136	620	1,756	residential ULFT rebates[(2)]	0.03	54
Total Estimated Savings	**n/a**	**n/a**	**n/a**	**6,700**	**n/a**	**n/a**	**177**

Note: Savings of BMPs with grey cells are assumed to be zero, as the impact of these can not be quantified.

(1) Audit determined that waterloss is less than 10 percent no further actions required.

(2) For 2003 year 852 SFR rebates and 284 MFR rebates and for 2004 year 465 SFR rebates and155 MFR rebates.

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Water Conservation Strategy 2006-2010

Best Management Practice	Historical	BMP Requirements per MOU					Additional BMP Activities					Units		Estimated Savings (acre-ft/year)					
	Pre FY 04-05	FY 05-06	FY 06-07	FY 07-08	FY 08-09	FY 09-10	FY 05-06	FY 06-07	FY 07-08	FY 08-09	FY 09-10	Unit	Savings (AFY/unit)	Pre FY 04-05	FY 05-06	FY 06-07	FY 07-08	FY 08-09	FY 09-10
(1) Water Survey Programs																			
SFR Customrs		408	490	571	648	724						Surveys	0						
MFR Customers		31	37	43	49	55						Surveys	0						
(2) Residential Plumbing Retrofit - single family		-	-	-	-	-						-	0						
SFR Customrs	1,500	1,386	1,386	1,386	1,386	1,386	1,000	1,000	1,000	1,000	1,000	showerheads	0.01	14	37	60	83	106	129
MFR Customers	500	108	108	108	108	108	1,000	1,000	1,000	1,000	1,000	showerheads	0.01	5	15	26	37	47	58
(3) System Water Audits, Leak Detection and Repair												audits(1)	0						
(4) Metering with Commodity Rates for all New Connections and Retrofit of Existing Customers												unmetered accounts	0						
(5) Large Landscape Conservation Programs and Incentives		225	225	450						50	50	landscape meters surveyed	0.96		216	432	864	912	960
(6) High-Efficiency Washing Machine Rebate Programs	689						200	200	200	200	200	HECW rebates	0.046	31	41	50	59	68	77
Pool Cover Rebates	87											pool cover rebates	0.052	5	5	5	5	5	5
(7) Public Information Programs	32											events	0						
(8) School Education Programs	1,595											students	0						
(9) Conservation Programs for CII accounts	-	-	-	-	-	-	-	-	-	-	-	CII conservation	0						
Commercial surveys per account	11	28	47	67	92	117						Surveys	0						
Industrial surveys per account	3	4	7	10	14	17						Surveys	0						
Institutional surveys per account	4	3	6	8	11	14						Surveys	0						
Number of CII ULFT rebates	187						450	500	550	600	650	CII ULFT rebates	0.06	11	38	68	101	137	176
unknown rebates	3											unknown CII rebates	0						
High Efficiency Clothes Washers (HECW)	69						10	10	10	15	20	CII HECW rebate	0.12	8	9	11	12	14	16
Cooling Tower Conductivity Controllers (CTCC)	9						5	5	5	5	5	CTCC rebate	2.24	20	31	43	54	65	76
Waterbrooms	17											Waterbroom rebates	0.15	3	3	3	3	3	3
Performance Target savings	6											acre-ft/year		6	6	6	6	6	6
Conservation Program Targets	20											acre-ft/year		20	20	20	20	20	20
(11) Conservation Pricing												increasing price block	0						
(12) Conservation Coordinator												coordinator	0						
(13) Water Waste Prohibition												water waste ordinance	0						
(14) Residential ULFT Replacement Program	1,756						500	1,000	1,500	2,000	2,500	ULFT rebates	0.03	54	70	101	147	209	287
Residential ULFT rebates	137											residential ULFT rebates (2)	0						
CBO Distribution	483											CBO distribution	0						
Total	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**Total**		**177**	**491**	**823**	**1,390**	**1,592**	**1,813**

Note: Savings of BMPs with grey cells are assumed to be zero, as the impact of these can not be quantified.

(1) Audit determined that waterloss is less than 10 percent no further actions required.

(2) For 2003 year 852 SFR rebates and 284 MFR rebates and for 2004 year 465 SFR rebates and155 MFR rebates.

Appendix E
Water Demand Projections by Year

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Water Demand Projections by Year

Demand Summary	2005	2006	2007	2008	2009	2010
1) Average Annual Demand	42,582	42,786	45,074	47,362	49,649	51,938
2) High Annual Demand	46,031	46,252	48,725	51,198	53,671	56,145
3) Sunkist Demand	1,470	1,470	1,470	1,470	1,470	1,470
4) Potable Normal Demand (1+3)	44,052	44,256	46,544	48,832	51,119	53,408
5) Potable High Demand (2+3)	47,501	47,722	50,195	52,668	55,141	57,615
6) Normal Year Recycled Water Demand	1,829	3,042	4,268	5,495	6,721	7,926
7) Dry Year Recycled Water Demand	2,181	3,627	5,089	6,551	8,013	9,449
8) Base Conservation*	-840	-1,199	-1,558	-1,917	-2,276	-2,635
9) Additional Conservation**	-4,750	-4,772	-5,019	-5,267	-5,514	-5,761
Normal Year Demand (1+3+6+8)	45,041	46,099	49,254	52,409	55,564	58,699
Single Dry Year Demand (2+3+7+8)	48,842	50,150	53,726	57,302	60,877	64,429
Multiple Dry Year Demand (2+3+7+8+9)	44,091	45,378	48,706	52,035	55,363	58,668

* Base Conservation includes passive and active conservation

** Additiona Conservation is 10 % * (2 + 3)

Demand Summary	2011	2012	2013	2014	2015
1) Average Annual Demand	52,810	53,681	54,553	55,425	56,297
2) High Annual Demand	57,087	58,030	58,972	59,914	60,857
3) Sunkist Demand	1,470	1,470	1,470	1,470	1,470
4) Potable Normal Demand (1+3)	54,280	55,151	56,023	56,895	57,767
5) Potable High Demand (2+3)	58,557	59,500	60,442	61,384	62,327
6) Normal Year Recycled Water	8,378	8,808	9,239	9,669	8,816
7) Dry Year Recycled Water	9,988	10,501	11,015	11,528	10,511
8) Base Conservation*	-2,907	-3,179	-3,450	-3,722	-3,994
9) Additional Conservation**	-5,856	-5,950	-6,044	-6,138	-6,233
Normal Year Demand (1+3+6+8)	59,750	60,781	61,812	62,842	62,589
Single Dry Year Demand (2+3+7+8)	65,638	66,822	68,006	69,190	68,843
Multiple Dry Year Demand (2+3+7+8+9)	59,783	60,872	61,962	63,052	62,611

* Base Conservation includes passive and active conservation

** Additiona Conservation is 10 % * (2 + 3)

Demand Summary	2016	2017	2018	2019	2020
1) Average Annual Demand	57,708	59,120	60,531	61,942	63,354
2) High Annual Demand	62,383	63,908	65,434	66,960	68,485
3) Sunkist Demand	1,470	1,470	1,470	1,470	1,470
4) Potable Normal Demand (1+3)	59,178	60,590	62,001	63,412	64,824
5) Potable High Demand (2+3)	63,853	65,378	66,904	68,430	69,955
6) Normal Year Recycled Water	10,259	10,417	10,576	10,734	11,761
7) Dry Year Recycled Water	12,230	12,420	12,609	12,798	14,022
8) Base Conservation*	-4,175	-4,356	-4,538	-4,719	-4,900
9) Additional Conservation**	-6,385	-6,538	-6,690	-6,843	-6,996
Normal Year Demand (1+3+6+8)	65,262	66,650	68,039	69,428	71,685
Single Dry Year Demand (2+3+7+8)	71,908	73,441	74,975	76,509	79,077
Multiple Dry Year Demand (2+3+7+8+9)	65,523	66,904	68,285	69,666	72,081

* Base Conservation includes passive and active conservation

** Additiona Conservation is 10 % * (2 + 3)

Demand Summary	2021	2022	2023	2024	2025
1) Average Annual Demand	64,765	66,177	67,588	68,999	70,411
2) High Annual Demand	70,011	71,537	73,063	74,588	76,114
3) Sunkist Demand	1,470	1,470	1,470	1,470	1,470
4) Potable Normal Demand (1+3)	66,235	67,647	69,058	70,469	71,881
5) Potable High Demand (2+3)	71,481	73,007	74,533	76,058	77,584
6) Normal Year Recycled Water	11,103	11,312	11,522	11,731	12,435
7) Dry Year Recycled Water	13,237	13,487	13,736	13,986	14,825
8) Base Conservation*	-5,150	-5,400	-5,649	-5,899	-6,149
9) Additional Conservation**	-7,148	-7,301	-7,453	-7,606	-7,758
Normal Year Demand (1+3+6+8)	72,188	73,559	74,930	76,301	78,167
Single Dry Year Demand (2+3+7+8)	79,568	81,094	82,620	84,145	86,260
Multiple Dry Year Demand (2+3+7+8+9)	72,420	73,793	75,166	76,540	78,502

* Base Conservation includes passive and active conservation

** Additiona Conservation is 10 % * (2 + 3)

Demand Summary	2026	2027	2028	2029	2030
1) Average Annual Demand	71,822	73,233	74,645	76,056	77,468
2) High Annual Demand	77,640	79,165	80,691	82,217	83,742
3) Sunkist Demand	1,470	1,470	1,470	1,470	1,470
4) Potable Normal Demand (1+3)	73,292	74,703	76,115	77,526	78,938
5) Potable High Demand (2+3)	79,110	80,635	82,161	83,687	85,212
6) Normal Year Recycled Water	12,430	12,918	13,407	13,895	14,492
7) Dry Year Recycled Water	14,819	15,401	15,984	16,566	17,278
8) Base Conservation*	-6,469	-6,788	-7,108	-7,427	-7,747
9) Additional Conservation**	-7,911	-8,064	-8,216	-8,369	-8,521
Normal Year Demand (1+3+6+8)	79,253	80,833	82,414	83,994	85,683
Single Dry Year Demand (2+3+7+8)	87,460	89,248	91,037	92,826	94,743
Multiple Dry Year Demand (2+3+7+8+9)	79,549	81,185	82,821	84,457	86,222

* Base Conservation includes passive and active conservation

** Additiona Conservation is 10 % * (2 + 3)

Appendix F
Adoption Resolution

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RESOLUTION NO. 2005-126

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ONTARIO, CALIFORNIA ADOPTING THE 2005 URBAN WATER MANAGEMENT PLAN

WHEREAS, the California Legislature enacted Assembly Bill 797 (Water Code Section 10610 et seq., known as the Urban Water Management Planning Act) during the 1983-1984 Regular Session, and as amended subsequently, which mandates that every supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare an Urban Water Management Plan; and

WHEREAS, the City of Ontario is a water supplier of more than 3,000 acre-feet annually; and

WHEREAS, the Plan is periodically reviewed at least once every five years; and

WHEREAS, the City of Ontario contracted with expert consultants, MWH Americas, to assist staff in completing the draft 2005 Urban Water Management Plan; and

WHEREAS, a public hearing was held by the City of Ontario City Council on December 20, 2005 to respond to public comments regarding on the draft Urban Water Management Plan .

NOW, THEREFORE, IT IS HEREBY RESOLVED as follows:

SECTION 1. The 2005 Urban Water Management Plan for the City of Ontario is hereby adopted.

SECTION 2. The Public Works/Community Services Director is hereby authorized to file three copies of the Plan with the State Department of Water Resources.

SECTION 3. The City Manager is hereby authorized and directed to implement the Water Programs as detailed in the adopted 2005 Urban Water Management Plan, including recommendations to the City Council regarding necessary procedures, rules, and regulations in an effort to carry out effective and equitable water programs.

SECTION 4. This Resolution shall take effect upon adoption.

I HEREBY CERTIFY, that the foregoing resolution was duly and regularly passed and adopted by the City Council of the City of Ontario, California, at a regular meeting thereof held on the 20th day of December, 2005.

Mary Wirtes
City Clerk of the City of Ontario

CITY OF CORONA

URBAN WATER MANAGEMENT PLAN

2005 UPDATE

Prepared for

CITY OF CORONA

Department of Water and Power

400 S. Vicentia Avenue

Corona, CA 92882

Prepared by

AKM CONSULTING ENGINEERS

553 Wald

Irvine, CA 92618

November 2005

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EXECUTIVE SUMMARY

The City of Corona Department of Water and Power considers the Urban Water Management Plan (UWMP) as a long-range planning tool to ensure the water service reliability for our customers into the future. The UWMP is also a guide for management of water resources with neighboring water agencies. The UWMP will serve as written verification of water supply for existing customers and future development, assist the City in defining effective water management strategies, document efficient use of available water supplies, and allow the City to maximize its resources.

Urban water suppliers are required by the Urban Water Management Planning Act (Water Code Sections 10610-10656), to update their UWMP and submit it to the California Department of Water Resources (DWR) every five years, in years ending in 0 and 5. An UWMP Update is required in order for a water supplier to be eligible for DWR administered State grants and loans, and drought assistance. The City of Corona prepared its first UWMP in 1997, with an update in 2000.

This 2005 plan update summarizes the City of Corona Department of Water and Power's evaluation of:

- Water supplies and demands
- Reliability of supplies during drought and emergency conditions
- Current demand management measures and implementation of Best Management Practices (BMPs)
- Water recycling
- Alternative water supply sources.

Water Supply and Demand

The City of Corona's water system obtains potable water from two (2) sources. The primary source is groundwater pumped from the Temescal Basin and the Bedford and Coldwater Sub-Basins. The secondary source is imported water from MWD Colorado River and State Project Water on the Mills Pipeline from MWD's Henry J. Mills filtration plant, which is delivered to the City through three turnouts. The City's current available total water supply is 79,056 acre feet per year (AF/Y).

For the past five years, the City's total water demand has averaged 42,462 AF/Y with 43.12 percent (18,311 AF/Y) being supplied from local groundwater wells, 40.02 percent (16,992 AF/Y) from Colorado River, and 16.86 percent (7,159 AF/Y) from the Mills Pipeline Connection. In 2004, the City produced over 50% of its demand from local groundwater. Total water demand is currently 45,000 AF/Y. The City's Water Master Plan estimates ultimate build-out demand at 49,408 AF/Y in the year 2020.

Reliability of Supplies During Drought and Emergency Conditions

Corona's diversification of water supplies has resulted in ample capacity to meet its customer's demands. This became evident in the past seven years by the development of the Temescal Basin Desalter and seven new wells in the Temescal Basin. As a result, Corona will be in a position to manage its water supplies to match specific basin responses to both wet and dry years. Operating costs will be minimized by utilizing lower cost supplies such as local ground water. The City is currently developing a Ground Water Management Plan to use as a guide for management of its ground water resources.

Corona recognized that while the cost of demand management and supply augmentation are high, it needed to develop additional supply capacity to offset supply interruption from maintenance, equipment failures, natural disasters, drought, etc. Correspondingly, Corona has gone to great lengths to improve the capacity of the local supply over the past decade with updating the water master plan, implementing capital improvement and replacement projects, updating the water utility rates and continued planning. These efforts have enabled the city to be adequately prepared to accommodate water demand in the years to come.

Current Conservation Program and Implementation of Best Management Practices

The City of Corona is a signatory to the Memorandum of Understanding regarding the Urban Water Conservation in California (MOU) and is therefore a member of the California Urban Water Conservation Council (CUWCC). The City became a signatory to the MOU on March 3, 1996 and must submit bi-annual reports to the CUWCC outlining progress towards implementing the 14 Best Management Practices (BMPs) in the MOU. BMPs are conservation practices that have been identified by the CUWWC: conferences, BMP workshops, free publications, research regarding water management practices, leadership on water legislation and networking with other agencies and special interest groups.

A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement, including, but not limited to, all of the following:

1. Water survey programs for single-family residential and multi-family residential customers.
2. Residential plumbing retrofit.
3. System water audits, leak protection and repair.
4. Metering with commodity rates for all new connections and retrofit of existing connections.
5. Large landscape conservation programs and incentives.
6. High efficiency washing machine rebate programs.
7. Public information programs.
8. School education programs.
9. Conservation programs for commercial, industrial, and institutional accounts.
10. Wholesale agency programs.
11. Conservation pricing.
12. Water conservation coordinator.
13. Water waste prohibition
14. Residential ultra-low-flush toilet replacement program.

The City has in good faith, tried to address and comply with all of the BMP targets listed in the CUWCC MOU where applicable. The UWMP discusses the water conservation programs and BMPs currently implemented and planned by the City. BMP Number 10 applies only to wholesale agencies and is not reported in this plan.

Water Recycling

The City currently has the capacity to supply 1,350 AF/Y of disinfected tertiary Title 22 water as recycled water to offset potable water demand where appropriate. The recycled water quality is excellent. The City adopted its Recycling Water Master Plan in 2001 and is still current. During the preparation of the recycled water master plan, a marketing survey was conducted which identified potential future users to include, schools, landscape management districts, parks, golf courses etc. Use of recycled water was well received in the community. The survey also concluded that there are agricultural, commercial landscapes, and industrial customers that would like to convert a portion of their water use to recycled water when it becomes available.

Alternative Water Supply Sources

Even with Corona's current supply reliability the City has taken steps to further strengthen the integrity of their water supply. Two water supply projects are to be completed in the future to achieve this objective. The Rincon and El Sobrante Ground water treatment projects have be planned out adding almost 11,000 AF/Y to the current system.

The Rincon project is to be completed in the fiscal year of 2008-2009. The proposed location is in the vicinity of Rincon St. and Alcoa. The project will yield 4.7 MGD or 5,265 AF/Y to the current system. The specific components of the project are 3 new wells, a raw water pipeline, and a treatment process which will be selective resins or best available technology (BAT), a 6,500 sq. ft. building to house the process, a product pipeline, property acquisition, and a brine disposal pipeline.

The El Sobrante project is to be completed in the fiscal year of 2014-2015. The proposed location is in the vicinity of Sixth St. and El Sobrante. The project will yield 4.7 MGD or 5,265 AF/Y to the current system. The specific components of the project are 3 new wells, a raw water pipeline, and a treatment process which will be selective resins or best available technology (BAT), a 6,500 sq. ft. building to house the process, a product pipeline, property acquisition, and a brine disposal pipeline.

Recommendations

As previously mentioned, the City of Corona Department of Water and Power considers the UWMP as a long-range planning tool to ensure the water service reliability for our customers, and as a guide for management of its water resources. This update recommends:

- Implementation of a Ground Water Management Plan
- Implementation of alternative water supply projects as identified in the City's water master plan
- Continue to increase supply reliability through groundwater recharge at the City's percolation ponds
- Continue to offset appropriate potable water demands with recycled water, and
- Continue to support the water demand management measures established by the California Urban Water Conservation Council.

Section 1

PUBLIC PARTICIPATION

Law

> 10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published ... After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

The City of Corona has actively encouraged community participation in its urban water management planning efforts since the first plan was developed in 1985. Public meetings were held on the 1996 and 2000 plans.

For this update to the Urban Water Management Plan, several public notices were published and a public workshop held. These included (1) a public notice placed in the Press-Enterprise on October 28 & 30, 2005, noticing the public that work would begin on the plan, (2) A Public Workshop was conducted on November 1, 2005, to review the draft plan, and (3) A Public Hearing was held on November 16, 2005, to accept any final public comments before the Corona City Council resolved to adopt the plan.

Legal public notices for each meeting were published in the local newspapers, and posted at City facilities. A copy of the “Notice of Public Workshop” is included at the end of this section. A reasonable attempt was made to invite and encourage the public to participate in the development of the plan; however, no public comments were received. A copy of the workshop presentation is included at the end of this section.

The City of Corona has well established conservation programs in-place and interacts frequently with the public of all demographic sectors through the implementation of water-use efficiency programs. Some of these programs include an ultra-low-flush toilet program, free public landscape classes, water education programs, landscape evaluations, and commercial, institutional, and industrial programs.

Plan Adoption

The City of Corona prepared this update of its Urban Water Management Plan during the summer and fall of 2005. The updated plan was adopted by City Council in November 2005, and submitted to the California Department of Water Resources within 30 days of Council approval. Attached to the cover letter addressed to the Department of Water Resources and as Appendix B, are copies of the signed Resolution of Plan Adoption. This plan includes all information necessary to meet the requirements of the California Water Code Division 6, Part 2.6 (Urban Water Management Planning).

Agency Coordination

Law

> 10620 (d) (2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

Coordination within the City

The City of Corona Department of Water and Power staff coordinated the development of the original plan with the city planning, public works, and all other related departments. The Department of Water and Power, through the Water and Sewer Master Plans adopted in 1997 and most recently the 2005 updates to the Water and Sewer Master Plans, has been able to forecast water and sewer reliability through the year 2030. These plans illustrate and forecast water demands and sewer capacities and makes recommendations on capital improvements and capital replacements. This plan was a city-wide coordinated document.

Interagency Coordination

The City of Corona is within the service area of Western Municipal Water District, who in-turn is a member agency of the Metropolitan Water District of Southern California. Metropolitan Water District is the regional water purveyor for Southern California and sells water to Western Municipal Water District. The City of Corona purchases, 50 percent of its water supply from Western Municipal Water District. The City therefore coordinated the development of this plan with the following agencies:

- Western Municipal Water District (acts as a wholesaler)
- Elsinore Valley Municipal Water District
- Santa Ana Watershed Project Authority
- The City of Norco
- The City of Riverside
- Lee Lakes Water District
- SAWPA
- Riverside County Flood Control

Table 1 summarizes the efforts the City of Corona has taken to include various agencies and citizens in its planning process. Copies of the transmittal letters sent to the various agencies are included at the end of this section.

Table 1 Coordination With Appropriate Agencies							
Entities	**Participated in UWMP Development**	**Commented on the Draft**	**Attended Public Meetings**	**Contacted for Assistance**	**Received Copy of the Draft**	**Sent Notice of Intention to Adopt**	**Not Involved / No Information**
Wholesaler		x		x	x		
Retailers		x	x		x		
Wastewater Agencies	x				x		
Special Interest Groups			x				
Citizen Groups			x				
General Public			x			x	
Public Library					x	x	
Other							

Section 2

HISTORY, CLIMATE, DEMOGRAPHICS

Law

> 10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:
>
> 10631. (a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

History of the City of Corona

The City of Corona is located in the northwestern portion of Riverside County. The City's regional location is depicted on Figure 3-1 from the City's Water Master Plan. A copy of Figure 3-1 is included at the end of this section. The City encompasses approximately 39 square miles of residential, commercial, and industrial land.

Neighboring cities include Riverside to the northeast and Norco to the north. The eastern portion of the City is generally bounded by unincorporated Riverside County territory. Home Gardens and El Cerrito are two communities located within this County land. The southern and western portions of the City are bounded by the Cleveland National Forest and unincorporated County territory. Prado Flood Control Basin is located adjacent the City's northwest corner. The unincorporated community of Coronita is located within Corona's boundaries in the western portion of the City. This community along with El Cerrito, although unincorporated, is included in Corona's existing service area.

The area is divided by several Southern California highways, providing access into the City from all directions. The Riverside Freeway (SR-91) runs east and west and the Corona Freeway (I–15) runs north and south through the City. Major local roads include Lincoln Avenue, Main Street, and Fullerton Avenue in the north-south direction; and Ontario Avenue, Sixth Street and Railroad Street in the east-west direction.

In the early 1700s, prior to the arrival of the Spanish, the Corona area was occupied by the Luiseño and Gabrieleño Indians. The arrival of the Spanish brought the Franciscan missionaries and agricultural development to the area. These early Spanish missionaries converted the Indians to Christianity and taught them agricultural husbandry.

In the early 1800's, the agricultural base developed in the mission era expanded as portions of the Corona area became part of the Mexican land grants (Rancho La Sierra Yorba, Rancho Jurupa, Rancho El Rincon, and Rancho El Sobrante de San Jacinto). These regions were dominated by cattle ranching and agriculture. In 1846, by the Treaty of Guadalupe Hidalgo, the Corona area, as part of California, was ceded by Mexico to the United States. In 1849, the California gold rush brought prospectors, settlers and new development. This influx of people to Corona was aided greatly by the Butterfield Stagecoach, which traversed the Corona area through the Temescal Canyon. The land boom of the 1880's resulted in the formation of the township of South Riverside. In 1896, the township was incorporated and its name changed to Corona. The initial City municipal area included 19.14 square miles with approximately 1,400 people. The center of the City was a circular dirt road, 7/8 of a mile in diameter, known today as Grand Boulevard. This inspired the City~s secondary name, the "Circle City."

In the early 1800's, the planting of citrus groves and the mining of clay, gypsum, porphyry, and other mineral deposits necessitated the development of a regional water system. Water was initially obtained by surface diversions of stream flows and shallow windmill wells. Distribution was by animal-drawn water tanks, open ditches and furrows, and non-pressure irrigation pipe. In 1887, the Temescal Water Company (TWC) was formed to develop the local water supply sources and to distribute the waters in the Corona area for domestic, mining and agricultural uses. For this early water system, TWC constructed major concrete gravity pipelines in Temescal Canyon to convey surface waters and well waters to the City area. The surface waters were from the Coldwater Canyon, Mayhew Canyon and as far south as Lake Elsinore. The well water was from deep wells constructed in Coldwater Canyon and Temescal Canyon. Later, deep wells in the City area were also developed.

In 1920, the Corona City Water Company (CCWC), a TWC subsidiary, was formed to distribute potable water within the City. Deep wells were developed in the Coldwater and Temescal Basins. Pressure pipelines were constructed with supply from wells and an open reservoir on Chase Drive east of Main Street. One of the major gravity pipelines in Temescal Canyon was also converted to this CCWC system. This gravity pipeline provided additional supply from the Coldwater Canyon. TWG continued to serve non-potable water to agricultural, mining, and industrial customers from the remaining portion of its water system not converted to the potable CCWC system.

From 1900 to 1950, the Corona area became a major citrus producer and mining center. Up until 1950, nearly 50 percent of the marketed lemons from California and Arizona were processed by one of the City's largest employers, the Exchange Lemon Products Company. Thus, the City of Corona acquired the distinction as the ~Lemon Capital of the World." The Corona area, with its natural mineral resources, also developed mining enterprises and ancillary industries.

In 1954, the Corona area was included in the formation of Western Municipal Water District (WMWD), which was subsequently annexed to the Metropolitan Water District of Southern California (MWD). Therefore, the Corona area became eligible for supplemental imported water initially from the Colorado River, and later the northern California State Water Project (SWP).

In 1964, the City purchased the assets of CCWC with a portion of the proceeds from a $4.25 million revenue bond issue, thereby creating the City of Corona Water Department as a self-sustaining, non-profit municipal utility. In 1966, the City constructed the Lester Water Treatment Plant with an initial capacity of 5 mgd and began receiving imported Colorado River water. Within five years the facility was upgraded to10 mgd. In 1977, the City issued a $6 million general obligation bond to finance the construction of storage reservoirs, well water blending facilities, and transmission pipelines. The most notable of these facilities was the Glen Ivy transmission pipeline in Temescal Canyon that replaced an old CCWC gravity pipeline constructed by TWC in 1894.

In the 1980's, the City's water system expanded phenomenally with the development of the Sierra del Oro project, the acquisition of the Green River System from WMWD, the development of Assessment District 79-2, and Corona Ranch in the northeasterly portion of the City of Corona. Development slowed in the early to mid- 1990's and then exploded again in 1995 through the present. The last growth spurt occurred in the industrial areas, fill in growth in the northeast and northwest portions of the City, South Corona, and Temescal Canyon lands that annexed into the City (Eagle Glen).

The City of Corona Department of Water and Power, which changed its name from the Corona Utilities Department in 2002, provides service within the City and its sphere of influence (SOI) (Coronita, El Cerrito and portions of Temescal Canyon). Some areas within Corona sphere are served by other agencies. In the East Sphere, the City of Riverside and the Home Gardens County Water District provide water to the Home Garden area; the Western Municipal Water District (WMWD) serves the Eagle Valley area; and in the South Sphere, portions of the Temescal Canyon area are served by the Lee Lake Water District.

The City presently provides municipal water service to nearly 146,700 (This includes the City's sphere of influence) people through 40,000 domestic service connections to an area approximately 39 square miles in size. This area includes approximately 32 square miles within the City's municipal area, and 7 square miles within the City's Sphere Of Influence (SOI) in Riverside County. The City of Corona's water service area population, number of housing units and persons per household as of year 2003 is presented in Table 4, which is adopted from The City of Corona's 2005 Water Master Plan.

Climate

The climate in the area is typical of Southern California with generally mild temperatures, virtually no days below freezing, and approximately 330 days of sunshine per year. The average annual rainfall in the City is approximately 12.6 inches (www.worldclimate.com). 87.62% of the rainfall occurs through the months of November and April. Table 2 provides a summary of climate data for Corona. Figure 2-1 depicts the average historic rainfall for Riverside County for a period 1927 through 2005.

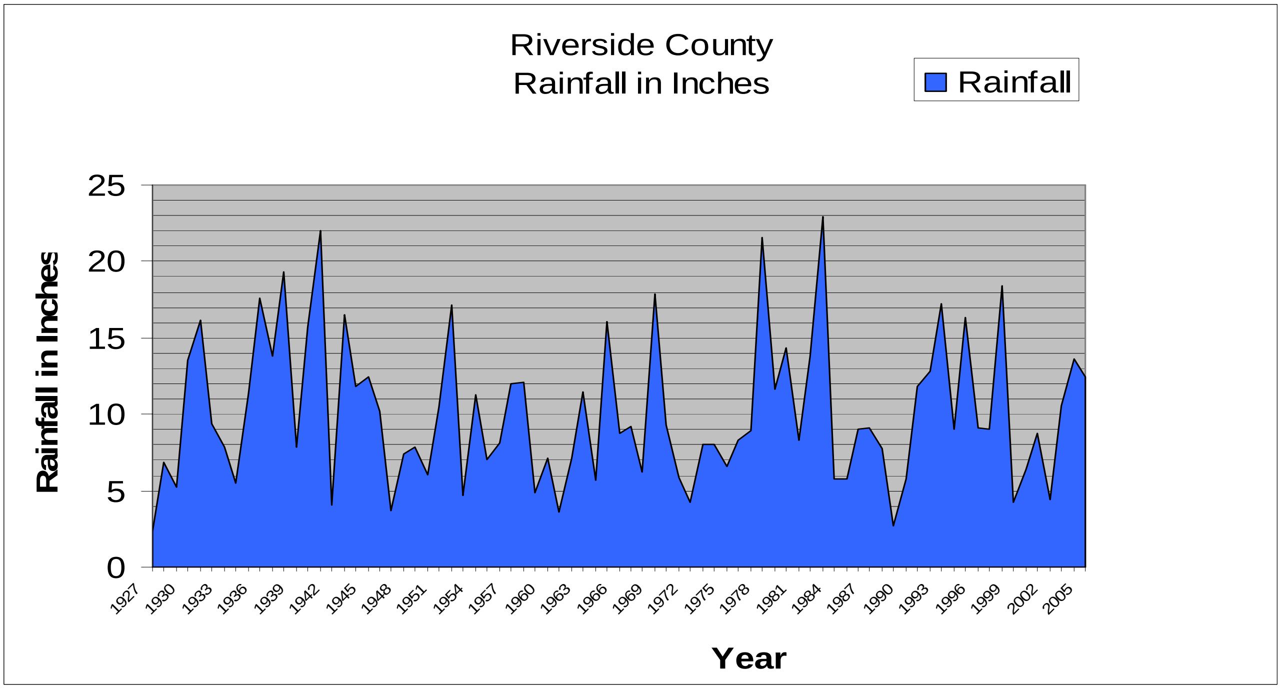
Table 2 Climate

	Jan	Feb	Mar	Apr	May	Jun
Standard Monthly Average Eto	2.94	2.91	4.16	5.27	5.94	6.56
Average Rain Fall (inches)	2.61	2.27	1.91	1.02	0.30	0.12
Average Temperature (Fahrenheit)	53.15	55.3	56.65	60.45	64.85	69.7

Table 2 Climate (Continued)

	July	Aug	Sep	Oct	Nov	Dec	Annual
Standard Monthly Average Eto	7.22	6.92	5.35	4.05	2.94	2.56	56.37
Average Rain Fall (inches)	0.12	0.20	0.39	0.40	1.47	1.76	12.6
Average Temperature (Fahrenheit)	75.1	75.45	72.85	66.45	58.85	53.75	63.55

Figure 2-1



Other Demographic Factors

[1]For generations, Southern California has grown outward along its transportation corridors. During each decade, the current outer ring of development has eventually become saturated. This has driven up its cost of living and level of congestion, pushing people and firms still farther out. At different times, this "spill over" process has made the San Fernando Valley and Orange County metaphors for Southern California's energy and growth.

Today, that mantle is falling on the Inland Empire with the City of Corona one of the prime beneficiaries. Thus, the city's demographic profile now shows a fast growing, relatively diverse place, where relatively young, well educated families are raising children, and succeeding economically.

From 1990-2005, Corona has added 68,331 people (90 %) to reach a population of 144,274 (not including the City's sphere of influence), a figure that tops all other comparable Inland Empire communities by 14,000 residents.

Corona's families benefit from better income and education. Corona's average household income exceeds $75,000 and 25% of all Corona Households have earnings in excess of $100,000. The 1990 Census showed that over half of Corona's residents have attended some college (52.6%), with 18.0% receiving bachelors or graduate degrees.

[1] City of Corona, Economic Development Department

Like most Southern California places, Corona is an ethnically diverse community. Its White population was estimated at 50% in 2004. Those who culturally consider themselves Hispanic represented 35.7%. Asian residents were approximately 8.1% of the population and the Black community constituted about 6.2%. The comparable estimates for Riverside County were: White (60%), Hispanics (30%), Asian (5%) and Black (5%).

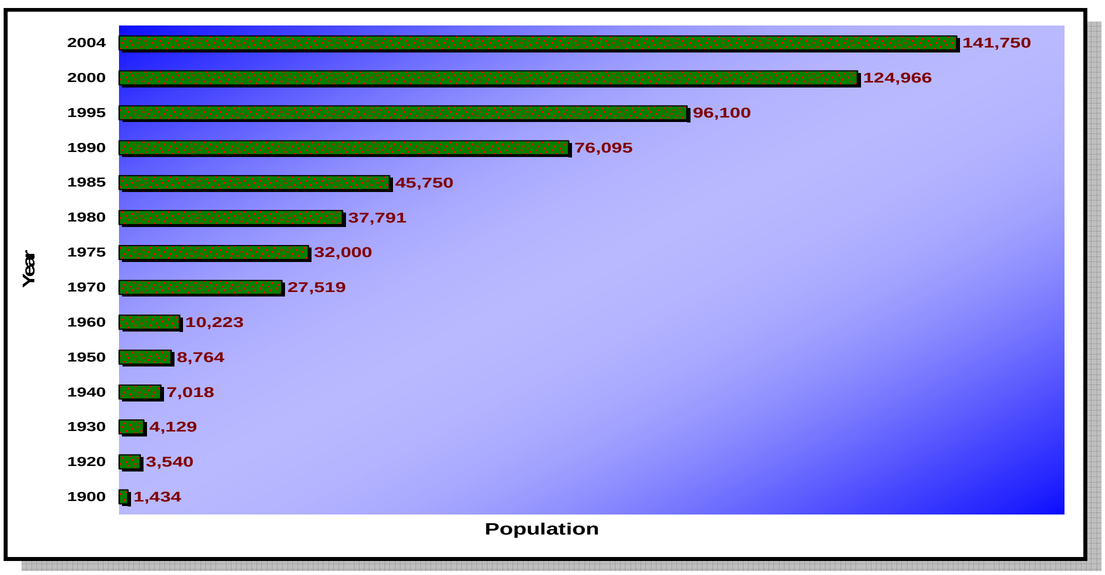
Recent changes in residential markets argue strongly that Corona's cycle of prosperity is shifting into a higher gear. The city's close proximity to Orange County and the extremely high price of residential real estate there are causing developers to undertake an increasing number of high-end projects in Corona. These developments are succeeding and can be expected to add families with higher incomes and educational levels into the city's demographic base.

Current and Projected Population

The City's population increased steadily from its inception in` 1896 until about 1960. This was followed by a sharp increase between 1960 and 1970, from a population of 10,223 to 27,519. From 1985 until the present, the population has more than tripled, increasing from 45,750 to 144,274. Figure 2-2 graphically depicts the population trends for the City of Corona dating back to the Cities inception.

Figure 2-2

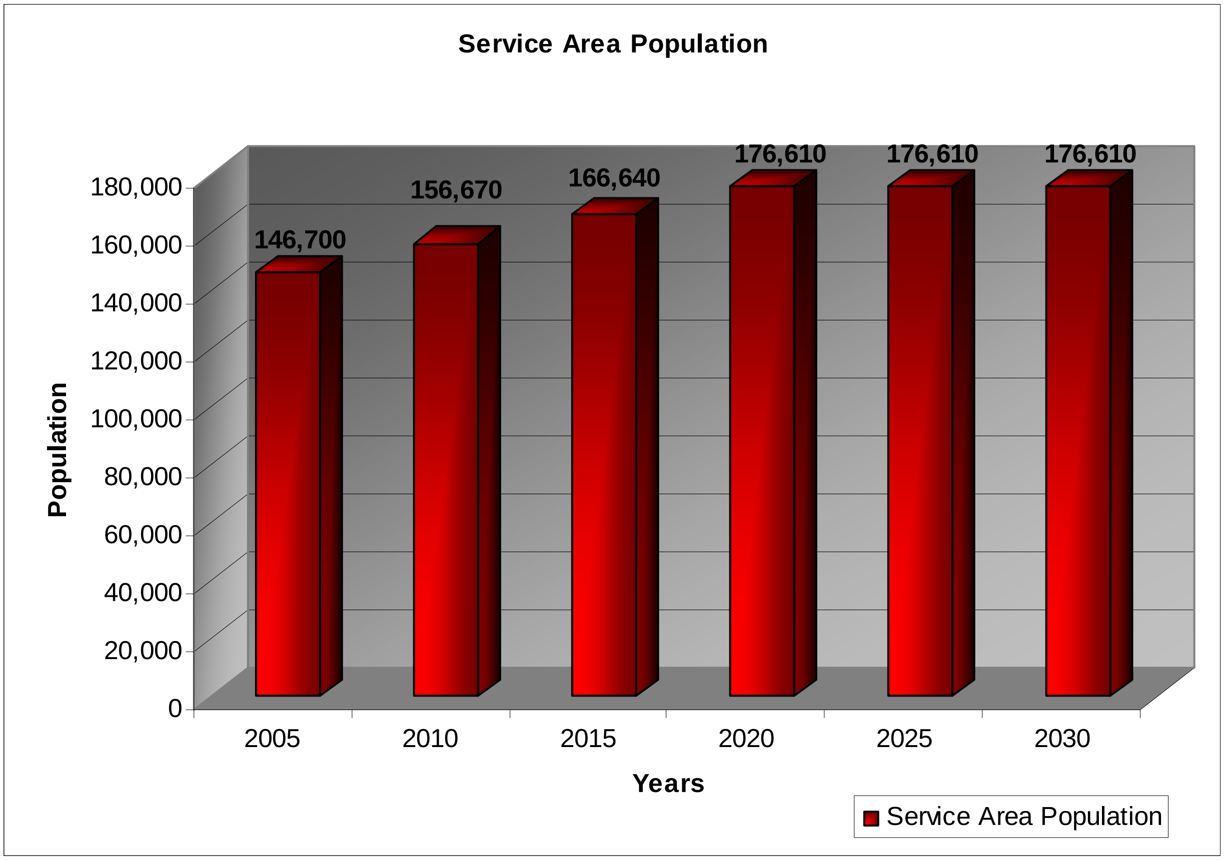
City of Corona Population History



In January 2004, the California State Department of Finance estimated the total number of occupied housing units in Corona at 42,210. The estimated average number of persons per dwelling unit is 3.343 and the residential vacancy rate is 3.65 percent.

Table 3 Population - Current and Projected						
	2005	2010	2015	2020	2025	2030
Service Area Population	146,700	156,670	166,640	176,610	176,610	176,610

Figure 2-3



The City's projected population within its service area, including its sphere of influence (SOI), is presented in Table 3 and graphically represented in Figure 2-3. The projected population within the water service area of the City of Corona is estimated to increase 20 percent until General Plan build-out in year 2020. Therefore, large increases in water demand for the City of Corona are anticipated in the future which are quantified and explained Section 3.

Table 4
City of Corona Water Service Area Population, Number of Housing Units, Persons Per Household, and City Area

Year	City Limits	County	Total Service Area-Population	No. Units	Population per Household[1]	Service Area
1900	1,434	_	_	_	_	19.14
1920	4,129	_	_	_	_	19.14
1940	8,756	_	_	_	_	19.14
1960	13,336	_	_	_	_	15.60
1970	27,519	2,800	30,319	_	_	23.20
1975	30,400	4,200	35,600	_	_	23.97
1980	37,400	7,010	44,410	14,638	3.15	23.91
1985	44,141	8,180	52,321	16,788	3.19	25.33
1990	76,095	9,400	85,495	29,365	3.13	28.01
1995	98,102	9,600	107,702	34,700	3.34	32.83
2000	122,989	9,700	132,689	42,352	3.38	35.00
2003	137,000[2]	9,700[2]	146,700[2]	46,147[2]	3.40[2]	39.00[2]

1. Adjusted for vacancy rate of occupied units.
2. Calculated values for 2003

Past Drought, Water Demand, and Conservation Information

The local region experienced a prolonged drought from 1987 through 1992. The City met its customers' needs through careful conjunctive management of groundwater and local reservoir supplies, and by investing in water conservation and water recycling. Community involvement made it possible to have voluntary rationing during 1987-89.

The citizens of Corona have a high commitment to quality of life and environmental issues and are active participants in resource and planning discussions held by City staff and the City Council. Water conservation is one of several high priority policies actively implemented in the City, and programs such as residential water audits, ultra-low flush toilet replacements, and landscape water audits are well accepted.

The character of residential developments changed in the early 1980s; community landscaping along with major roadways and common areas became prevalent as planners sought to create a community atmosphere with more open space. In 1986, with active community input and support, Corona adopted a General Plan Amendment for the then agricultural South Corona area that identified land use development standards and infrastructure needs. This change in the General Plan opened the door for the portion of the City called South Corona, the last large undeveloped area in Corona.

Section 3

Water Sources

SOURCES OF SUPPLY

The City of Corona's water system obtains potable water from two (2) sources. The primary source is groundwater pumped from the Temescal, Basin and the Bedford and Coldwater sub basins. The secondary source is imported water from MWD Colorado River and State Project Water on the Mills Pipeline from MWD's Henry J. Mills filtration plant, which is delivered to the City through three turnouts. The current and projected future supply is illustrated in Table 7 broken down by each supply source. For the past five years, the total supply has averaged 42,462 acre feet per year (AF/YR) with 43.12 percent (18,311 AF/YR) from the groundwater wells, 40.02 percent (16,992 AF/YR) from Colorado River, and 16.86 percent (7,159 AF/YR) from Mills Pipeline Connection. Table 5 and 7 illustrates City of Corona's Historic water production. The City's Master Plan Figure 4-2 depicts the existing water system's hydrolic profile and sources of supply. A copy of Figure 4-2 is included at the end of this section.

The City's municipal area and its Sphere of Influence overlie the Bedford, Coldwater, Temescal, Santa Ana Narrows, Lee Lake, Arlington and Chino groundwater basins. The City of Corona currently maintains and operates 21 groundwater production wells for its municipal potable water supply: 18 wells in the Temescal Basin, one, (currently inactive) well in the Bedford Sub Basin, and three wells in the Coldwater Sub Basin.

The groundwater basin and two sub basins from which the City extracts groundwater are not adjudicated. However, under a stipulated judgment entitled *Orange County Water District vs. City of Chino, et al.(1968),* the City, with other purveyors upstream of Prado Dam, have the right to use all surface and groundwater supplies originating above Prado Dam without interference from water purveyors downstream of Prado Dam, provided that the average adjusted base flow at Prado Dam is at least 42,000 acre-ft/yr. WMWD is one member of a watermaster panel that administers provisions of this judgment. To ensure provisions of the judgment, the City is required to provide a base flow of 1,625 acre-ft/yr (adjusted for water quality) from the City's WWTP.

Bedford Sub Basin

The Bedford Basin is located south of the Temescal Basin in Temescal Canyon between the Santa Ana Mountains and the El Sobrante Hills. The basin covers an area of approximately 10 square miles with an alluvial depth ranging from 30 to 200 feet. Groundwater within the basin tends to flow northwest into the Temescal Basin. The City has only one well (Well No. 4) in the Bedford Basin. Other major extractors from the basin have been Elsinore Valley Municipal Water District (EVMWD) and Foothill Properties. EVMWD extracted 616 acre-ft from four wells in 1993, and Foothill Properties extracted 887 acre-ft from three wells in 1993. Total extraction from the Bedford Basin has averaged approximately 2,255 acre-ft/yr since 1982 but has been inactive since the year 2000. The City of Corona has plans to redrill this source in 2006 for future use. Table 8 details the projected future amounts to be pumped.

Coldwater Sub Basin

The City acquired the rights to the surface flows of Coldwater Canyon in 1964 when it purchased the assets of the Corona City Water Company (CCWC). To meet CDHS requirements, the surface flow is spread in percolation ponds and extracted by the City's three Glen Ivy area wells in the Coldwater Basin.

The Coldwater Basin is located southwest of the Bedford Basin and the Temescal Wash. The Basin encompasses an area of approximately 2.6 square miles and lies within the structural graben between the Santa Ana Mountains to the west and the El Sobrante Hills to the east. The Coldwater Basin is bound by the North Glen Ivy Fault to the northeast. The North Glen Ivy Fault behaves as an effective barrier to groundwater flow and prevents migration of groundwater from the Coldwater Basin into the Temescal Wash. Groundwater levels throughout the basin typically respond rapidly to precipitation and recharge because of the high permeability and limited groundwater storage within this Basin. Table 6 details the capacities, depth and location of the wells.

The City of Corona and EVMWD are the two major extractors of groundwater from the Coldwater Basin. The City currently operates three wells in the Coldwater Basin. In the past five years the city produced 3,999 AF/Y, 2,532 AF/Y, 2,579 AF/Y, 2,553 AF/Y and 2,780 AF/Y respectively. Historic groundwater production from each of these wells is summarized in Table 4 and table 7. Future production from the Coldwater basin is projected to remain static through the year 2030 which is detailed in Table 8.

Temescal Basin

The Temescal groundwater basin encompasses an area of approximately 26 square miles bound by the Santa Ana River, La Sierra Hills, El Sobrante Hills and the Santa Ana Mountains.

Typical depths for the City's wells in the Temescal Basin range from 180 to 480 feet. Groundwater quality of these wells typically does not meet the EPA and DHS MCL's for nitrate (45 mg/L). The shallow basin groundwater typically has high levels of nitrate (4.0 to 110 mg/L) which require treatment and/or blending to meet regulatory requirements. Table 6 details the capacities, depth and location of the wells.

Currently, 18 City of Corona wells with a combined capacity of approximately 23,405 gpm, extract groundwater from the Temescal Basin. In the past five years Corona has drilled and equipped Seven (7) new wells, 22, 23, 24, 25 and 26, 27, and 28 to supply water to the Temescal Basin Desalter. EVMWD, Corona has also produced from the Temescal Basin with combined extraction ranging from 3,275 to 5,259 AF/Y. Total Basin production for the past five years was 9,125 AF/Y, 10,568 AF/Y, 17,217 AF/Y, 17,463 AF/Y, 19,235 AF/Y respectively (Table 7). The City of corona plans to pump 29,765 AF/Y by year 2015 and will continue to pump that amount indefinitely (Table 8).

Santa Ana Narrows Basin

The Santa Ana Narrows Basin, bisected by the perennial Santa Ana River, lies south of the Chino Basin and west of the Temescal Basin. Wells drilled in the alluvium of the river are shallow, typically less than 100 feet. In the summer months, the river flow is primarily effluent discharge from the wastewater treatment plants located upstream. The water is characteristically high in nitrates and TDS. The City has one well (Well No. 18) in the Basin used solely for landscape irrigation. It has been shut down due to high operation and maintenance expense.

In the past five years the City of Corona has strived to increase the production of local water relative to imported water. Table 8a details the percentage of total water supply that has been pumped over the last five years. In 2000 the local production of water from the all of the basins was 33.11%. Last year in 2004 groundwater accounted for 49.97% of total water supply, which is a 67.75% increase in local production. Looking forward, Corona plans to increase this figure to 59.22% in 2010 and ultimately pumping 65.87% of their water supply by year 2020 (Table 8b).

Figures 3-1 and 3-2 graphically depict the historic and future trends for groundwater and imported water respectively.

Table 5

Water Production and Purchases AF/Y

Source of Supply	Well #	1990	1995	2000	2001	2002	2003	2004
Coldwater Basin	1	1,062	1,685	-	0	0	0	0
	2	0	1,191	-	0	0	0	0
	3	1,024	1,391	506	4	0	256	380
	20	0	0	0	0	0	0	0
	21	-	-	3,493	2,528	2,579	2,297	2,400
	Subtotal	*2,086*	*4,267*	*3,999*	*2,532*	*2,579*	*2,553*	*2,780*
Temescal Basin	4	253	173	0	0	0	0	0
	6	535	588	436	314	27	0	0
	7	531	654	876	757	12	1,084	0
	7A	0	0	0	0	15	0	1,202
	8 & 8A	1,164	1,737	1,654	1,324	1,517	1,701	2,081
	9	650	467	554	602	14	1,779	2,480
	11	316	408	354	390	123	351	501
	12(A)	134	0	0	0	614	588	575
	13	886	0	0	0	0	170	231
	14	75	310	534	332	674	602	645
	15	761	1,150	1,633	849	870	769	1,480
	17(A)	1,059	1,349	959	68	954	1,413	454
	19	-	-	2,123	2,703	2,184	1,260	1,497
	22	0	0	0	1,248	4,465	3,404	2,885
	23				51		0	
	24	0	0	0	321	679	256	200
	25	0	0	0	897	3,686	1,982	2,386
	26	0	0	0	712	1,383	2,104	996
	27	0	0	0	0	0	0	253
	28	0	0	0	0	0	0	1,369
	Subtotal	*6,111*	*6,663*	*9,123*	*10,568*	*17,217*	*17,463*	*19,235*
MWD Colorado River	WR – 19	11,574	6,373	13,920	13,315	12,384	14,111	11,452
	WR – 29	451	463	0	0	0	0	0
	WR – 33	5,471	4,661	6,258	5,515	3,924	3,227	3,039
MWD State Water Project	WR – 24	-	3,797	6,334	6,771	7,593	6,685	7,549
MWD Combined	*Subtotal*	*17,496*	*15,294*	*26,512*	*25,601*	*23,901*	*24,023*	*22,040*
Total		**25,693**	**26,224**	**39,634**	**38,701**	**43,697**	**44,039**	**44,055**

Table 6
Maximum Water Production Capacity of Groundwater Wells

Well Identification				General Data						
Atlas Sheet	Facility Name	State Well No.	Service Address	Status	Well Head Elevation (ft)	Depth (ft)	Pump Depth (ft)	Well Basin	Year Drilled	Maximum Capacity (GPM)
S38	Well No. 3	T05S/R06W-03K01	9865 Glen Ivy Rd	Active	1138	543	370	Cold Water	1935	1060
Q26	Well No. 4	T04S/R06W-16C01	20310 Temescal Canyon Rd	Abandon	791	99	77	Bedford	1963	n/a
L18	Well No. 6	T03S/R06W-31D02	917 Circle City Dr	Abandon	681	217	167	Temescal	1950	n/a
L18	Well No. 7A	T03S/R06W-30N03S	907 Circle City Dr	Active	680	210	200	Temescal	2002	1000
L17	Well No. 8A	T03S/R07W-25J02S	219 S. Joy St	Active	647	210	200	Temescal	2002	1650
K17	Well No. 9A	T03S/R07W-25M03S	505 S. Vicentia	Active	691	250	240	Temescal	2002	1500
H16	Well No. 11	T03S/R07W-27G01	1865 W. Pomona Rd	Active	650	234	180	Temescal	1953	700
H16	Well No. 12A	T03S/R07W-27F02	519 Maple St	Active	661	250	180	Temescal	2002	1100
M19	Well No. 13	T03S/R06W-31K01	1018 Cottonwood Ct	Active	735	279	160	Temescal	1952	1000
I18	Well No. 14	T03S/R07W-35C01	1200 W. Tenth St	Active	728	515	210	Temescal	1936	1000
J16	Well No. 15	T03S/R07W-26G01	102 N. Lincoln Ave	Active	640	220	120	Temescal	1946 *(Rehab in 1998)*	1100
H16	Well No. 16	T03S/R07W-27A01	1865 Pomona Rd	Inactive	650	850	777	Temescal	1982	n/a
M17	Well No. 17A	T03S/R06W-25J03S	1052 Quarry St	Active	648	204	150	Temescal	2002	1400
B15	Well No. 18	T03S/R07W-30F01	34 Crestridge Lane	Inactive	435	77	65	Santa Ana Narr.	1984	n/a
K16	Well No. 19	T03S/R07W-25L01	219 W. Grand Blvd	Active	630	265	200	Temescal	1990	2100
T39	Well No. 20	T05S/R06W-11D01S	25225 Maitri Rd	Active	1150	660	460	Cold Water	1998	2500
S38	Well No. 21	T05S/R06W-03J05S	24650 Glen Ivy Rd	Active	1128	660	460	Cold Water	1998	2250
J17	Well No. 22	T03S/R07W-26J03S	405 Sierra Vista St	Active	660	410	370	Temescal	1998	3500
K17	Well No. 23	T03S/R07W-25L02S	315 Merrill St	Active	645	560	425	Temescal	1998	800
K16	Well No. 24	T03S/R07W-25K02S	204 Washburn Cir	Active	640	470	425	Temescal	1998	455
K16	Well No. 25	T03S/R07W-25E02S	310 Vicentia	Active	648	210	180	Temescal	1999	3500
K15	Well No. 26	T03S/R07W-25C03S	710 McGrath Cir	Active	578	452	410	Temescal	1999	1000
H21	Well No. 27	T04S/R07W-01A01S	2621 Mangular	Active	954	545	480	Temescal	1980	500
K16	Well No. 28	T03S/R07W-26K S	202 Buena Vista Ave	Active	610	190	170	Temescal	2003	2000

Table 7 Current and Planned Water Supplies -AF/Y						
Water Supply Sources	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Western Municipal Watet District						
Metropolitan Water District (Colorado River)	32,598	32,598	32,598	32,598	32,598	32,598
Metropolitan Water District (State Water Project)	7,281	7,281	7,281	7,281	7,281	7,281
Metropolitan Water District (Total)	39,879	39,879	39,879	39,879	39,879	39,879
Groundwater						
Coldwater Basin	2,780	2,780	2,780	2,780	2,780	2,780
Temescal Basin	39,208	44,473	49,737	49,737	49,737	49,737
Bedford Basin	0	0	0	0	0	0
Groundwater Total	41,988	47,253	52,517	52,517	52,517	52,517
Recycled Water						
Wastewater Treatment	1,120	7,842	12,322	12,322	12,322	12,322
Desalination						
Totals	82,987	94,974	104,718	104,718	104,718	104,718

Table 8a Amount of Groundwater Pumped (AF/Y)					
Basin	**2000**	**2001**	**2002**	**2003**	**2004**
Coldwater Basin	3,999	2,532	2,579	2,553	2,780
Temescal Basin	9,125	10,568	17,217	17,463	19,235
Bedford Basin	0	0	0	0	0
% of Total Water Supply	33.11%	33.85%	45.30%	45.45%	49.97%

Table 8b Amount of Groundwater Projected to Be Pumped (AF/Y)					
Basin	**2010**	**2015**	**2020**	**2025**	**2030**
Coldwater Basin	2,780	2,780	2,780	2,780	2,780
Temescal Basin	24,500	29,765	29,765	29,765	29,765
Bedford Basin	0	0	0	0	0
% of Total Water Supply	59.22%	68.18%	65.87%	65.87%	65.87%

Figure 3-1

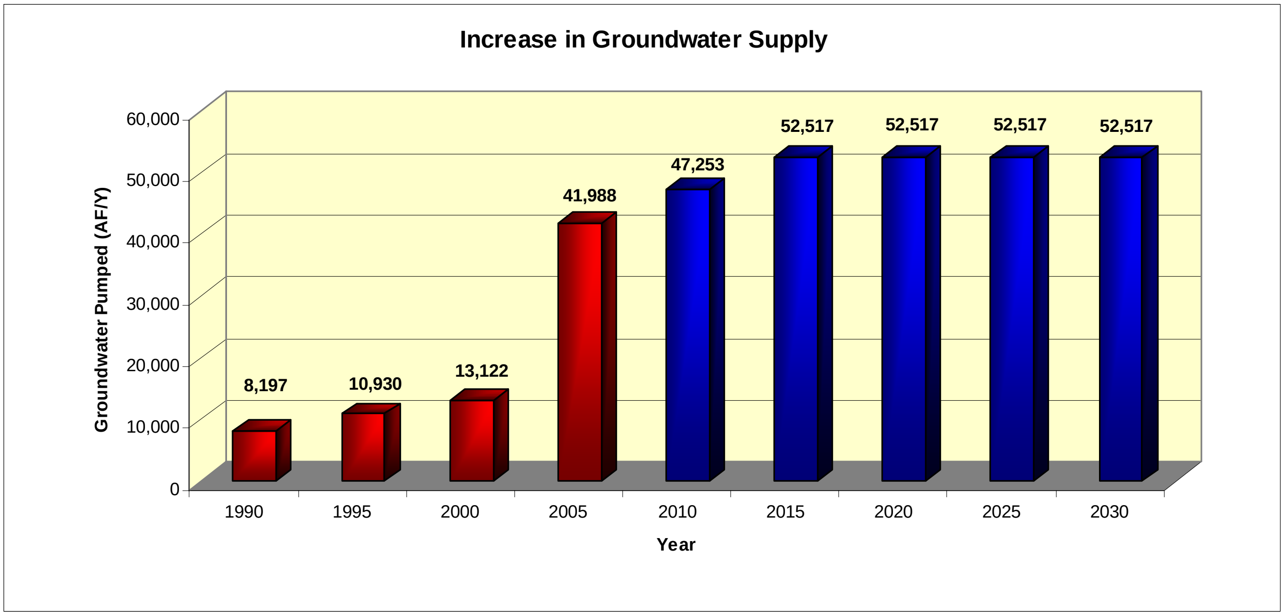
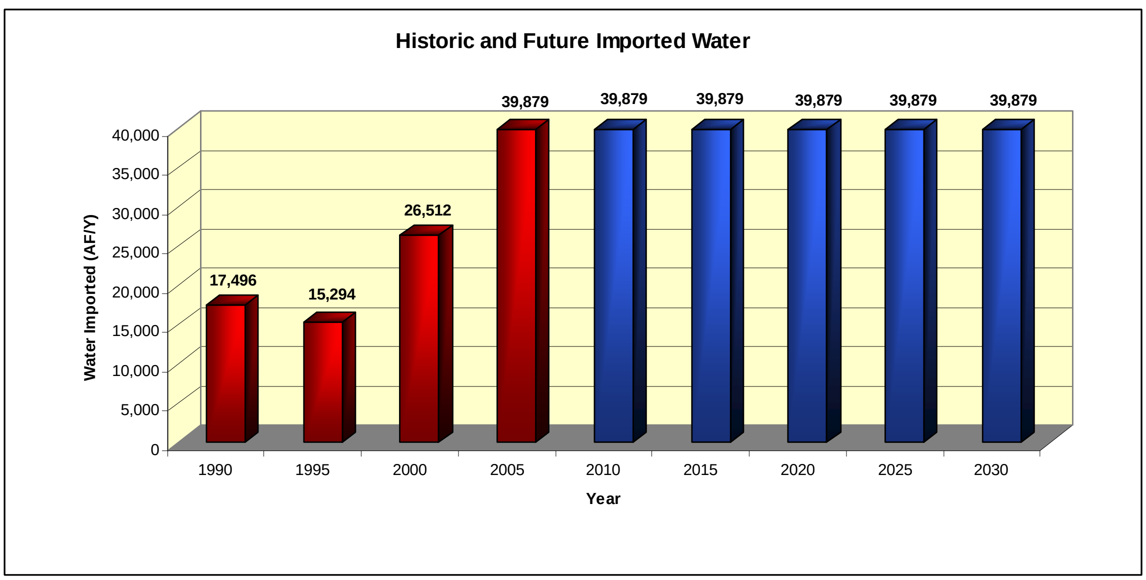


Figure 3-2



Section 4

Reliability

Law

Water Code section 10631: (c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortages, to the extent practicable, and provide data for each of the following:

(1) An average dry water year.
(2) A single dry water year
(3) Multiple dry water years.

Normal Year is a year in the historical sequence that most closely represents median runoff levels and patterns.

Single Dry-Year is generally considered to be the lowest annual runoff for a watershed since the water-year beginning in 1903.

Multiple-dry-water years is generally considered to be the lowest average runoff for a consecutive multiple year period (usually three years or more) for a water shed since 1903.

Supply and Demand Comparison

Table 9 compares current and projected water supply and demand. It indicates that in average precipitation years, the City of Corona has sufficient water to meet its customer's needs through the year 2030. This was achieved through a commitment to conservation programs and additional development to utilize local groundwater.

Table 9
Projected and Current Supply and Demand Projections (AF/Y)

	2005	2010	2015	2020	2025	2030
Supply Totals	82,987	94,974	104,718	104,718	104,718	104,718
Demand Totals	44,055	46,470	47,939	49,408	49,408	49,408
Differential	38,932	48,504	56,779	55,310	55,310	55,310

Corona's diversification of water supplies has resulted in ample capacity to meet its customer's demands. This became evident in the past seven years by the development of the Temescal Basin Desalter, and (5) five new wells and (8) rehabilitated wells in the Temescal Basin. As a result, Corona will be in a position to manage its water supplies to match specific basin responses to both wet and dry years. Operating costs will be minimized by utilizing lower cost supplies such as local ground water.

Inconsistent Water Sources

The Coldwater Basin may be considered inconsistent. The Coldwater basin is quite small and easily filled in years of average and above average rainfall. When the basin fills, its high quality water overtops natural barriers causing water to flow out into the Temescal Basin where it combines with lower quality groundwater. Corona's new wells allow increased production to capture the basin's high quality water before it is lost to the Temescal Basin. The size of the basin is such that Corona does have to moderate and reduce pumping to ensure safe production during drought years. It is not anticipated that Corona will have to completely cease production for the purpose of drought years in the future.

Four Year Minimum Water Supply

The diversity of Corona's water supply placed the city in an excellent position for the last four years and continues to do so into the future. Table 10 details the past four years of water supply. It is made evident here that even in the driest year of 2002, supply was only 97.37% of normal (2003). It was the addition of new wells in the Temescal Basin and Desalter that enabled Corona to maintain the integrity of their water supply even through very dry drought years of less than 5 inches of rain. Looking ahead to the future, the City of Corona has ample supply to meet all projected demands by more than a factor of 2, through year 2030. (Table 9)

Table 10
Supply Reliability (AF/Y)

		Multiple Dry Water Year			
Normal Water Year 2003	**Single Dry Water Year 2002**	**Year 1 2001**	**Year 2 2002**	**Year 3 2003**	**Year 4 2004**
72,143	70,249	68,355	70,249	72,143	81,867
% of Normal	97.37%	94.75%	97.37%	100.00%	113.48%

Reliability

Corona recognized that while the cost of demand management and supply augmentation are high, it needed to develop additional supply capacity to offset supply interruption from maintenance, equipment failures, natural disasters, drought, etc. Corona's local water is lower in cost compared to MWD Colorado River water and State Project Water, $100 to $200 per acre foot compared to $435 per acre foot. As a result, Corona has gone to great lengths to improve the capacity of the local supply over the past decade with updating the water master plan, implementing capital improvement and replacement projects, updating the water utility rates and continued planning. These efforts have enabled the city to be adequately prepared to accommodate a 100% raise in water demand in the years to come, (see Table 9 differential row).

Corona can provide adequate water supply during times of inconsistent supply from certain sources and is protected against factors resulting in inconsistency of supply. Table 11 shows many factors that affect a water agency's supply. The only factor effecting Corona is climatic factors. The City does not anticipate any of the other factors listed below having impact on their supply in the future.

Table 11
Factors Resulting in Inconsistency of Supply

Name of Supply	Legal	Environmental	Water Quality	Climate
Groundwater Wells				x
WMWD				x

Future Water System

Figure 7-2 from the City's Water Master Plan depicts the City's future water system's hydraulic profile and supply sources. A copy of Figure 7-2 is included at the end of this section.

Section 5

Transfer and Exchange Opportunities

Law

10631. A plan shall be adopted in accordance to this chapter and shall do all of the following.

10631 (d) Describe the opportunities for exchanges or transfers of water on a short – term or long- term basis.

The Water Code definition of short and long-term is that short-term is for a period of one year or less and long-term is for a period of one year or more.

Water Transfers

The City of Corona has three inter ties with other agencies: City of Riverside, City of Norco, and Lee Lake Water District. The inter tie with Riverside is for emergency use of up to 2 mgd from Riverside to Corona by gravity flow. Riverside's system hydraulic grade line is higher than Corona's and pumping will be required if Riverside need emergency flows from Corona. The inter tie with Norco is to wheel up to 4,000 gallons per minute (5.76 mgd) to Norco from Western Municipal Water District (WMWD). Norco's system does not have capacity to deliver any significant volume of water to Corona. The inter tie with Lake Lee Water District is used for normal delivery of water to a small number of homes and businesses near Wierick Road along the 15 freeway corridor about 5 miles south of the 91 freeway.

There are no long – term transfer or exchange opportunities at this time. Corona is working on two short term projects for transfer or exchange of water.

Corona has been working with Elsinore Valley Municipal Water District (EVMWD) to develop a program of water sales, transfers, and exchanges. The proposal provides transfer of water from EVMWDC to CCDWP from the Meeks & Daly well fields near the Colton and Bunker Hill Basins to Corona via the Riverside and Gage Canals. Corona would treat the water at the Lester Water Treatment Plant using a combination of membrane technology and activated carbon. Corona proposes to purchase up to 5,000 AF/Y of treated product water capacity; the balance of production would be used by Corona and EVMWD for recharge of the Coldwater Basin and potable water in EVMWD's domestic water system. This project would provide a long term offset of Corona and EVMWD's demand on potable water.

Corona has met with the Santa Ana Watershed Project Authority (SAWPA) on participating in the Integrated Chino – Arlington Desalter System Project (ICADSP) to purchase water when the project is implemented. SAWPA has hired RFB Consulting to develop the project and determine ultimate water costs. It is estimated that up to 2,500 AF/Y may be available for transfer once the ICADSP is completed.

In addition, Western Municipal Water District (WMWD) is working on developing the Riverside – Corona Feeder Project to capture and store new water in wet years in order to increase firm water supplies, reduce water costs, and improve water quality in the WMWD service area, which includes the City of Corona. The project will include about 20 wells and 28 miles of pipeline. It is estimated that approximately 18,000 AF/Y of stored groundwater from San Bernardino Valley groundwater basins may be available for transfer once the Riverside – Corona Feeder Project is completed.

Table 12 summarizes the type of opportunity, duration and proposed quantities for Corona's current transfer and exchange relationships and proposed relationships.

Table 12
Transfer and Exchange Opportunities

Agency	**Transfer or Exchange**	**Short Term**	**Proposed Quanities (AF/Y)**
The City of Riverside	Transfer	X	2,210
The City of Norco	Transfer	X	6,452
Lee Lake Water District	Transfer	X	N/A
EVMWD	Transfer	X	5,000
WMWD	Transfer	X	18,000
SAWPA	Transfer	X	2500
Totals:			**34,162**

Section 6

Water Use

Law

10631. (e) (1) Quantify to the extent records are available, past and current use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to the following uses:

- *(a) Single-family residential*
- *(b) Multifamily*
- *(c) Commercial*
- *(d) Industrial*
- *(e) Institutional/governmental*
- *(f) Landscape*
- *(g) Sales to other agencies*
- *(h) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof*

(2) Agricultural

(3) *The water use projections shall be in the same five year increments described in subdivision (a)*

Current and Projected Water Use

The City of Corona has a wide array of water users. Total current use is 44,055 AF/Y. This is up from 2000 usage figure of 39,634. Ultimately the city plans on having usage of 49,408 AF/Y by the year 2020 (projected city build out). Corona classifies their water users by sectors: residential single-family, residential multi-family, commercial, industrial, institutional/governmental, landscape and agricultural. Current and future water use as well as number of customers, is broken down by customer class identified in Table 13. The City's existing land use is depicted in Figure 3-2 from the City's Water Master Plan. A copy of Figure 3-2 is included at the end of this section.

Table 13
The City of Corona Water Use (AF/Y)

Year	Water Use Sectors	Single Family	Multi-family	Commercial	Industrial	Special Acct	Institutional/ Governmental	Landscape	Agricultural	Total
2000	# of accounts	33,616	1,355	792	792	3	99	583	35	37,275
	Deliveries AF/Y	22,863	3,405	4,122	4,122	666	817	3,230	480	39,637
	# of accounts									
	Deliveries AF/Y									
2005	# of accounts	38,164	1,538	899	899	3	112	662	40	42,319
	Deliveries AF/Y	25,956	3,866	4,680	4,680	756	927	3,668	545	45,000
	# of accounts									
	Deliveries AF/Y									
2010	# of accounts	42,593	3,213	339	631	3	10	485	34	47,308
	Deliveries AF/Y	28,968	8,072	1,766	3,282	740	79	2,686	468	46,062
	# of accounts									
	Deliveries AF/Y									
2015	# of accounts	44,140	3,329	352	654	3	10	502	35	49,026
	Deliveries AF/Y	30,020	8,366	1,831	3,401	767	82	2,783	485	47,735
	# of accounts									
	Deliveries AF/Y									
2020	# of accounts	47,743	3,601	380	707	4	11	543	38	53,028
	Deliveries AF/Y	32,471	9,048	1,980	3,679	830	89	3,010	524	51,631
	# of accounts									
	Deliveries AF/Y									
2025	# of accounts	47,743	3,601	380	707	4	11	543	38	53,028
	Deliveries AF/Y	32,471	9,048	1,980	3,679	830	89	3,010	524	51,631
	# of accounts									
	Deliveries AF/Y									
2030	# of accounts	47,743	3,601	380	707	4	11	543	38	53,027
	Deliveries AF/Y	32,471	9,048	1,980	3,679	830	89	3,010	524	51,631
	# of accounts									
	Deliveries AF/Y									

Residential – Single-Family

In the City of Corona, it is estimated that a single family residential customer averages 3.5 persons per connection. Corona is a suburban community with approximately 30% of its acreage comprised of residential use. Total system consumption for this sector was 22,863 in 2000. Current consumption levels are at 25,956 AF/Y and are expected to ultimately increase 25% by year 2020 to 32,471 AF/Y.

Although the Single-Family Residential sector is expected to experience growth over the next 15 years, the City of Corona has implemented a water use efficiency program to offset increasing water demands. The program strives to increase water use efficiency by supporting water use surveys for residential and public facilities, ultra low flush toilet replacement, and educational/informational programs. The Cities efforts will help to offset the increasing water demands over the next 15 years.

Residential – Multi-Family

Multi-family residential customers average 3.35 persons per household. Like the single-family residential sector multi-family will experience much growth over the next 15 years. Currently the sector has 1,538 connections and is expected to rise 134% to 3,601 connections at city build out in 2020. Currently the multi-family residential sector is using 3,866 AF/Y and is expected to increase to a total sector usage of 9,048 AF/Y by year 2020.

Commercial Sector

The City has a large mix of commercial customers. Corona further breaks this sector down into 3 sub-categories; general commercial, office professional, and downtown commercial. General commercial accommodates many commercial uses that service the community such as department stores, banks, supermarkets and retail stores. Office professional encompasses general business offices, finance, insurance, and real estate offices and medical offices. Downtown commercial is intended to create a pedestrian oriented street environment with such uses as retail shops, offices, services, cultural facilities, entertainment, and civic and public uses.

The current water use has grown 13.5% since the year 2000 to 4,680 AF/Y and will ultimately grow to 5,380 AF/Y in the year 2020. This growth is driven buy the demand for services with an increasing permanent population.

Industrial Sector

Corona has a large industrial base that is centered on high-tech and manufacturing uses. The industrial sector has seen much growth since 2000. The current usage for the sector is 4,680 which is a 13.5% increase from 2000 usage.

Institutional/Governmental

The City has a stable institutional and government sector, primarily local government, schools, visitor services, and a public hospital. This sector will keep pace with the growth of the city.

Landscape

Landscape sector is expected to grow with the growth of the city, fueled mainly by residential development. Increased efficiency and landscape conversions at existing parks, golf courses, and cemeteries should help offset new demand resulting from projected increases in this sector.

Agriculture

Agricultural water demand is projected to have no growth and is expected to decline over the next 20 years. The City's General Plan reflects local citizen interest in local space, quality of life, environmental values, and the long-term maintenance of a diverse economic base. Although the residents share these concerns, it is projected that most agricultural land will eventually be converted to urban use.

Section 7

Demand Management Measures

Law

10631 (f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement, including, but not limited to, all of the following:
(1) Water survey programs for single-family residential and multi-family residential customers.
(2) Residential plumbing retrofit.
(3) System water audits, leak protection and repair.
(4) Metering with commodity rates for all new connections and retrofit of existing connections.
(5) Large landscape conservation programs and incentives.
(6) High efficiency washing machine rebate programs.
(7) Public information programs.
(8) School education programs.
(9) Conservation programs for commercial, industrial, and institutional accounts.
(10) Wholesale agency programs.
(11) Conservation pricing.
(12) Water conservation coordinator.
(13) Water waste prohibition
(14) Residential ultra-low-flush toilet replacement program.

The City of Corona is committed to implementing water conservation and water recycling programs. This section discusses water conservation.

The City of Corona is a signatory to the Memorandum of Understanding regarding the Urban Water Conservation in California (MOU) and is therefore a member of the California Urban Water Council (CUWCC). The City became a signatory to the MOU on March 3, 1996 and must submit bi-annual reports to the CUWCC outlining progress towards implementing the 14 Best Management Practices (BMPs) in the MOU. BMPs are conservation practices that have been identified by the CUWWC: conferences, BMP workshops, free publications, research regarding water management practices, leadership on water legislation and networking with other agencies and special interest groups.

For the purpose of responding to the Urban Water Management Planning Act the city will address the 14 Best Management Practices. The City, has in good faith, tried to address and comply with all of the BMP targets listed in the CUWCC MOU except where mentioned below. BMP No, 10 applies only to wholesale agencies and is not reported in this plan.

See section 12 for DMM Implementation.

Agricultural Water Conservation

Due to the fact that the City of Corona has 35 agricultural water accounts, it participates in several regional agricultural water conservation programs. Corona works closely with the Riverside-Corona Resource Conservation District, the local mobile lab, to offer free landscape evaluations to encourage more water use efficiency. A portion of Corona's customers participate in Metropolitan Water District of Southern California's agricultural subsidy program where customers purchase water at reduced costs.

Section 8

Demand Management Measures Not Implemented

The City of Corona is currently implementing all relevant BMP's listed in section 7, except where noted. BMP No.10 is not implemented due to the fact it applies only to wholesale agencies and this BMP is not relevant to the City of Corona.

Section 9

Planned Water Supply Projects and Programs

The City of Corona existing supply capacity is adequate to satisfy current and future demands (See section 3). Even with Corona's current supply reliability the City has taken steps to further strengthen the integrity of their water supply. Two water supply projects are to be completed in the future to achieve this. The Rincon and El Sobrante Ground water treatment projects have been planned out adding almost 11,000 AF/Y to the current system.

The Rincon Ground Water Treatment Project

The Rincon project is to be completed in the fiscal year of 2008-2009 at a total cost of $12,330,000 in current dollars and $14,100,000 in future dollars. The proposed location is in the vicinity of Rincon St. and Alcoa. The project will yield 4.7 MGD or 5,265 AF/Y to the current system. The specific components of the project are 3 new wells, a raw water pipeline, a treatment process which will be selective resins or best available technology (BAT), a 6,500 sq. ft. building to house the process, a product pipeline, property acquisition, and a brine disposal pipeline.

The El Sobrante Ground Water Treatment Project

The El Sobrante project is to be completed in the fiscal year of 2014-2015 at a total cost of $9,700,000 in current dollars and $13,200,000 in future dollars. The proposed location is in the vicinity of Sixth St. and El Sobrante. The project will yield 4.7 MGD or 5,265 AF/Y to the current system. The specific components of the project are 3 new wells, a raw water pipeline, a treatment process which will be selective resins or best available technology (BAT), a 6,500 sq. ft. building to house the process, a product pipeline, property acquisition, and a brine disposal pipeline.

Table 17
Future Water Supply Projects

			Multiple-Dry AF years to Agency		
Project Name	**Normal -year AF to agency**	**Single-dry AF/Year to agency**	**Year 1**	**Year 2**	**Year 3**
Rincon Ground Water Treatment Project	5,265	5,265	5,265	5,265	5,265
El Sobrante Ground Water Treatment Project	5,265	5,265	5,265	5,265	5,265

The above table shows the contribution that the two projects individually make to the Cities system. In all scenarios the values are the same due to the fact that Corona does not anticipate any variations in the plants output. In addition, it is expected that the two plants will be continuously running and will only cease production for short periods of maintenance.

Section 10

Development of Desalinated Water

Temescal Desalter

Corona developed its Temescal Basin Desalter project to offset demand on MWD's imported water supplies. Construction on the desalter was completed in 2001. The Desalter has increased supply reliability, controlled costs and made better use of scarce resources. At first the Temescal Desalter was producing 11,202.20 AF/Y and served to reduce nitrate and TDS levels in local groundwater to meet drinking water quality standards (nitrate) and wastewater discharge standard (TDS). A second phase of the project Contributed an additional 5,600 AF/Y for a total of 16,803 AF/Y (see Table 18).

Table 18
Continuing Opportunities for Desalinated Water

Sources of Water	Yield AF/Y	Start Date	Type of Use
Temescal Desalter	16,803	2001	Potable Water

The Temescal Desalter was the City of Corona's only opportunity for desalinated water. The City does not have future opportunities or needs.

Section 11

Current or Projected Supply Include Whole Sale Water

The City of Corona receives water from the Western Municipal Water District (WMWD) who is a member of Metropolitan Water District. The City of Corona has been purchasing on average 25,000 AF/Y for the past several years and plans to continue to do so. WMWD provides the City of Corona water through two sources, the Mills Pipeline and raw water from the Sierra Del Oro and Lester Water Treatment Plants. The Mills pipeline is already treated water and is sent directly to the City's system. The Sierra Del Oro and Lester Plant Water is raw water and is sent to the City's plant for treatment. The City of Corona does not anticipate a change in the water quantities that they purchase from WMWD now or in the future.

Below is Table 19 which details the source of water and the future total quantities expected to be purchased by Corona. Table 20 details the break down of the water sources from WMWD to Corona with their relative prospective quantities.

Table 19
Agency demand projections of wholesale supply (AF/Y)

Wholesaler	2010	2015	2020	2025	2030
Metropolitan Water District	24,660	27,292	28,111	28,954	29,823

Table 20
Existing and Planned Sources of Water Available (AF/Y)

Wholesaler Sources	2010		2015		2020		2025		2030	
	Source Capacity	Planned Use	Source Capacity	Planned Use	Source Capacity	Planned Use	Source Capacity	Planned Use	Source Capacity	Planned Use
Mills Pipeline	7,278	1,120	7,278	1,120	7,278	1,120	7,278	1,120	7,278	1,120
Sierra Del Oro and Lester Water Treatment Plant	32,585	23,540	32,585	26,172	32,585	26,991	32,585	27,834	32,585	28,703

Section 12

Determination of DMM Implementation

The following pages are the City's 2004-1999 CUWCC BMP Reports

Section 13

Water Shortage Contingency Plan

Law

10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:

10632 (c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

Water Shortage Emergency Response

The City of Corona has invested a considerable effort and capital in developing a diverse water supply to ensure redundancy and flexibility in dealing with interruption of its water supplies. However, the City's Multi-Function Hazard Plan needs to be revised to include a water supply and distribution element that is consistent with the guidelines of the California State Office of Emergency Services.

Supplemental Water Supplies

To offset future potential water shortages due to drought or disaster, the City has developed multiple water supplies.

Desalination

The City constructed its Temescal Basin Desalter as a cost effective water supply; it became operational in March 2001. An additional benefit is that the Desalter helps mitigate water shortage during times of drought and emergencies.

Water Transfers

See the Transfer or Exchange Opportunities, Section 5.

Long Term Additional Water Supply Options

See the Transfer or Exchange Opportunities, Section 5.

Water Shortage Contingency Ordinance/Resolution

Law

> *10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which ale within the authority of the urban water supplier:*
>
> *10632(h) A draft water shortage contingency resolution or ordinance.*

City of Corona Water Shortage Response

As mentioned earlier, the City adopted a resolution adopting a program of voluntary reduction of nonessential uses of water to reduce consumption by 15% in 1991 (Appendix C). The City also implemented penalty rates during a water shortage emergency. The City adopted these resolutions in 1995 and revised them in 1997 and should be applied during declared water shortages (Appendix D).

Stages of Action

Law

> *10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:*
>
> *10632 (a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply and an outline of specific water supply conditions which are applicable to each stage.*

Rationing Stages and Reduction Goals

The City of Corona currently has voluntary reduction goals in place. However, the City relies on approximately 50% imported water from the Metropolitan Water District (MWD) and therefore refers to MWD's Water Surplus and Drought Management Plan.

This plan is a comprehensive drought and water management plan designed to protect Southern California from water shortages for the next 10 years. This plan was adopted by MWD on April 13, 1999. The Water Surplus and Drought Management Plan is the result of 18 months of intensive collaboration between Metropolitan, its 27 member agencies, and retail agencies, and demonstrates a commitment to regional supply reliability.

Developed as part of Metropolitan's Integrated Resources Plan (IRP), the new program establishes management principles ensuring water supplies to Southern California residents and businesses 100 percent of the time through 2025.

The plan describes shortage conditions in escalating intensity - shortage, severe shortage and extreme shortage. In the early stages of a drought, sufficient water supplies would allow Metropolitan to meet full service demands and make partial or full deliveries to interruptible programs, sometimes using stored water. A severe shortage condition would reflect insufficient supplies, obliging Metropolitan to make withdrawals from storage, call on its water transfers, and possibly invite voluntary conservation through public outreach.

Under extreme shortage conditions, Metropolitan would allocate imported water supplies to its member agencies based on the type of shortage, monthly delivery requirements, and availability of supplies. Although hydrology studies indicate Metropolitan will not need to allocate water over the next 10 years, it is MWD's responsibility to be prepared in the unlikely event of a drought more severe than what we've experienced in the past.

The new plan refrains from spelling out an exact allocation methodology, but rather provides principles for the development of a strategy should the need arise.

Prohibitions, Consumption Reduction Methods and Penalties

Law

> 10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
>
> 10632 (d) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.
> 10632 (e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.
> 10632 (f) Penalties or charges for excessive use, where applicable.

The City of Corona currently has adopted penalty rates to be implemented during water shortages or times of drought. The City currently relies heavily on water use efficiency programs and the development of local resource programs to reduce the need for imported water and to offset the increase in demand due to growth. The City relies on MWD's Water Surplus Water Management Plan to secure water reliability during drought and water emergencies. The City also has a recycled water system to help offset demand due to growth.

Revenue and Expenditure Impacts and Measures of Outcome Impacts

Law

> 10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
>
> 10632 (g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (1'), inclusive, on the revenues and expenditures of the urban water supplier...
>
> 10632 (g)
> n analysis of the impacts of each of the] proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

The City has developed a financial plan for its water utility that sets rates to fund operation, maintenance and depreciation. Funds are set aside for depreciation in the Water Capital Replacement Fund and used to replace and update equipment and technology to improve system redundancy, source of supply and reduce operating costs. The City's Department of Water & Power has set a goal of maintaining operating reserves, the Water Utility Fund balance, equal to seven months operating expense for the entire utility. The City has not created a formal rate-stabilization fund.

Reduction Measuring Mechanism

Law

> 10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:
>
> 10632 (i) A mechanism for determining actual reductions in water use pursuant to the
> urban water shortage contingency analysis.

Mechanism to Determine Reductions in Water Use

The City of Corona does not currently have a water shortage contingency analysis.

Section 14

Recycled Water Plan

Recycled Water

The City of Corona owns and operates three wastewater treatment facilities. Wastewater Treatment Plant # 1 was originally built in 1968 and was expanded and upgraded in 1998 to meet new stringent environmental standards. The plant currently has a total of 9 MGD or 10,082 AF/Y of Title 22 disinfected tertiary effluent, and 2.5 MGD of secondary effluent. Wastewater Treatment Plant # 2 discharges secondary effluent to percolation ponds and has not been upgraded at this time. The plant discharges 3 MGD or 3,360 AF/Y. The City may consider upgrading Wastewater Treatment Plant # 2 to Title 22 effluent standards in the future. Wastewater Treatment Plant # 3 has a total of 1 MGD or 1,120 AF/Y of Title 22 disinfected tertiary effluent water for irrigation purposes but will eventually add the capacity for three times that amount.

The City currently has the capacity to supply 1,350 AF/Y of disinfected tertiary Title 22 water as recycled waster for appropriate uses by customers and for use by the city it self. The recycled water quality is excellent. The city supplies Title 22 effluent to a 64-acre park north east of Wastewater Treatment Plant # 1. The City adopted their Recycling Water Master Plan in 2001 and is still current. The Recycled Water Master Plan is scheduled for updating in 2006. During the preparation of this master plan, a marketing survey was conducted which identified potential future users to include, schools, landscape management districts, parks, golf courses etc. Use of recycled water was well received in the community. The survey also concluded that there are agricultural, commercial landscapes, and industrial customers that would like to convert a portion of their water use to recycled water when it becomes available.

Furthermore, the City has also participated in the Southern California Comprehensive Water Reclamation and Reuse Study sponsored by the United States Bureau of Reclamation in conjunction with the Santa Ana Watershed Project Authority, which is examining region wide wastewater facilities, infrastructure and capacities.

Section 15

Water Quality Impacts on Reliability

General

The quality of water served by the City of Corona has to be in compliance with the Federal standards as well as the State of California Department of Health Services (CDHS) standards as set forth in Title 22 of the California Code of Regulations. These standards set the maximum contaminant levels (MCL) of constituents allowed in drinking water. In addition to the Federal and State standards, provisions of the California Health and Safety Code specify that larger (>10,000 service connections) water utilities identify water quality measurements that exceeded any state Public Health Goals (PHGs).

Constituents of Concern

The following constituents of concern have been detected in the City's water system:

<u>Trichloroethylene (TCE).</u> The PHG for TCE is 0.8 ppb. The Federal maximum contaminant level (MCL) or drinking water standard for TCE is 5 ppb. The City has detected TCE in 9 of 21 wells at a level of 2 ppb in Well #7A, 3 ppb in Well #8A, 1.2 ppb in Well #9A, 4.1 ppb in Well #15, 2.5 ppb in Well #17A, 3.3 ppb in Well #19, 2 ppb in Well #22, 0.95 ppb in Well #24 and 3.1 ppb in Well #25. The levels detected were below the MCLs at all times.

<u>Tetrachloroethylene (PCE).</u> The PHG for PCE is 0.06 ppb. The MCL or drinking water standard for PCE is 5 ppb. The City has detected PCE in 1 of 21 wells, Well #19, at a level of 1.4 ppb. The levels detected were below the MCLs at all times.

<u>Dibromochloropropane (DBCP).</u> The PHG for Dibromochloropropane is 1.7 ppt, and the MCL or drinking water standard for Dibromochloropropane is 200 ppt. The City has detected Dibromochloropropane in 2 of 21 wells, Well #13, at a level of 94 ppt and Well 17A at 12 ppt. The levels detected were below the MCLs at all times.

<u>Lead and/or Copper.</u> There is no MCL for Lead or Copper. Instead the 90th percentile value of all samples from household taps in the distribution system cannot exceed an Action Level of 0.015 mg/l for lead and 1.3 mg/l for copper. The PHG for lead is .002 mg/l. The PHG for copper is 0.17 mg/l. Lead and copper were not detected in any of the City's source water samples in 2004. Extensive sampling of the City's distribution system in 2003, found that the City's 90th percentile value for lead was 0.0019 mg/l and for copper was 0.31 mg/l. The City's water system is in full compliance with the Federal and State Lead and Copper Rule.

<u>Nitrates.</u> The PHG for Nitrates is 10 ppm as nitrate-nitrogen, or 45mg/l as Nitrate (NO3). The MCL or drinking water standard for Nitrates is 45 mg/l (as NO3). The City has detected nitrates in all of our 21 wells at an average level of 12 ppm in Well #3, 66.8 ppm in Well #7A, 67.1 ppm in Well #8A, 62 ppm in Well #9A, 73.3 ppm in Well #11, 68.7 ppm in Well 12A, 107.6 ppm in Well 13, 74.1 ppm in Well 14, 11 ppm in Well #15, 56.4 ppm in Well #17A, 75 ppm in Well #19, 13.7 ppm in Well 21, 52.2 ppm in Well 22, 10.1 ppm in Well 24, 76.9 ppm in Well 25, and 0.3

ppm in Well #26. The City lowers nitrate concentrations in these wells by operating multiple blending stations, which mix high nitrate well water with treated water. The system's water meets the above standards by at least a 10% margin of safety.

It is anticipated that the future Rincon and El Sobrante Well Fields may also contain nitrates. If nitrate concentrations at the proposed well fields surpass the MCL, then the City will treat the well water with the Best Available Technology. Currently, the Best Available Technology for removing nitrates at the anticipated levels is selective resin treatment.

Fluoride. The PHG for Fluoride is 1 ppm. The MCL or drinking water standard for Fluoride is 2 ppm. Fluoride is naturally present in most of the City's 21 wells. The average levels are 0.31 ppm in Well #3, 0.42 ppm in Well #7A, 0.43 ppm in Well #8A, 0.4 ppm in Well #9A, 0.37 ppm in Well #11, 0.32 ppm in Well 12A, 0.34 ppm in Well 13, 1.8 ppm in Well 14, 0.0 ppm in Well #15, 0.43 ppm in Well #17A, 0.38 ppm in Well #19, 0.31 ppm in Well 21, 0.42 ppm in Well 22, 1.7 ppm in Well 24, 0.26 ppm in Well 25, and 2.62 ppm in Well #26. The City lowers fluoride concentrations by operating multiple blending stations that mix well water with treated water. The system's water meets the CDHS standard for fluoride by at least a 10% margin of safety.

Cadmium. The PHG for Cadmium is 0.07 ppb. The MCL or drinking water standard for Cadmium is 5 ppb. The City has not detected Cadmium in any City wells. Colorado River Water, tested by Metropolitan Water District had an occasional sample detecting cadmium with a high of 1.4 ppm. Metropolitan Water District raw water is treated at the City's Lester and Sierra del Oro water Treatment Plants and mixed at blending stations with well water and water from the Temescal Desalter to lower the concentration of cadmium. The water that is delivered in the system meets the standard established by the CDHS by a safety margin of no less than 10%.

Corona Sanitary Landfill and Future Groundwater Concerns

In September 1999, the Riverside County Waste Management Department (RCWMD) reported their findings of a groundwater model aimed at determining the extent of a Trichloroethylene (TCE) plume stemming from the Corona Sanitary Landfill. Their model, based on the landfill as the lone contaminant source, could not reproduce the TCE concentrations found in surrounding wells. RCMWD concludes that there may be other contaminant sources or unknown geological influences affecting the TCE concentrations in the offsite wells. If TCE concentrations at the proposed El Sobrante Well Field surpass the Maximum Contaminant Level (5 µg/L), then the City will pre-treat the well water with the Best Available Technology, prior to selective resin treatment. Currently, the Best Available Technology for removing TCE is Granulated Activated Carbon.

Section 16

Water Service Reliability

Law

10635 (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of the water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the supplier with the total projected water use over the next 20 years in five year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water suppliers.

- *(b) The urban water suppliers shall provide that portion of its urban water management plan prepared pursuant to this article to any city of county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.*
- *(c) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.*
- *(d) Nothing in this article is intended to change existing law concerning an urban water supplier's obligation to provide water service to its existing customers or potential future customers.*

Projected Normal Water Year Supply and Demand

See Tables 21 – 23 for projected normal water year supply and demand for years 2010 – 2030.

Table 21
Projected Normal Water Year Supply-AF/Y

	2010	2015	2020	2025	2030
Supply	94,974	104,718	104,718	104,718	104,718
% of Normal Year	132%	145%	145%	145%	145%

Table 22
Projected Normal Water Year Demand-AF/Y

	2010	2015	2020	2025	2030
Demand	46,470	47,939	49,408	49,408	49,408
% of year 2005	103%	107%	110%	110%	110%

Table 23
Projected Normal Year Supply and Demand Comparison

	2010	2015	2020	2025	2030
Supply Totals	94,974	104,718	104,718	104,718	104,718
Demand Totals	46,470	47,939	49,408	49,408	49,408
Difference	48,504	56,779	55,310	55,310	55,310
Difference as % of Supply	51%	54%	53%	53%	53%
Difference as % of Demand	104%	118%	112%	112%	112%

Projected Single Dry Water Year Supply and Demand

See Tables 24-26 for projected single dry water year supply and demand for years 2010 – 2030.

Table 24
Projected Single Dry Water Year Supply-AF/Y

	2010	2015	2020	2025	2030
Supply	92,481	101,969	101,969	101,969	101,969
% of Normal Year	97%	97%	97%	97%	97%

Table 25
Projected Single Dry Water Year Demand-AF/Y

	2010	2015	2020	2025	2030
Demand	41,823	43,145	44,467	44,467	44,467
% of year 2005	90%	90%	90%	90%	90%

Table 26
Projected Single Dry Year Supply and Demand Comparison

	2010	2015	2020	2025	2030
Supply Totals	92,481	101,969	101,969	101,969	101,969
Demand Totals	41,823	43,145	44,467	44,467	44,467
Difference	50,658	58,824	57,502	57,502	57,502
Difference as % of Supply	55%	58%	56%	56%	56%
Difference as % of Demand	121%	136%	129%	129%	129%

Projected Multiple Dry Water Year Supply and Demand 2006-2010

See tables 27 – 29 for projected multiple dry water year supply and demand for years 2006-2010.

Table 27
Projected Multiple Dry Water Year Supply-AF/Y

	2006	2007	2008	2009	2010
Supply	44,791	44,791	44,791	47,489	47,489
% of Normal Year	50%	50%	50%	50%	50%

Table 28
Projected Multiple Dry Water Year Demand-AF/Y

	2006	2007	2008	2009	2010
Demand	38,250	38,984	39,719	40,453	41,922
% of year 2005	85%	86%	89%	89%	93%

Table 29
Projected Multiple Dry Water Year Supply and Demand Comparison

	2006	2007	2008	2009	2010
Supply Totals	44,791	44,791	44,791	47,487	47,487
Demand Totals	38,250	38,984	39,719	40,453	41,922
Difference	6,541	5,807	5,072	7,034	5,565
Difference as % of Supply	15%	13%	11%	15%	12%
Difference as % of Demand	17%	15%	13%	17%	13%

Projected Multiple Dry Water Year Supply and Demand 2011-2015

See Tables 30 – 32 for projected multiple dry water year supply and demand for years 2011 – 2015.

Table 30
Projected Multiple Dry Water Year Supply-AF/Y

	2011	2012	2013	2014	2015
Supply	46,240	46,240	50,984	50,984	50,984
% of Normal Year	50%	50%	50%	50%	50%

Table 31
Projected Multiple Dry Water Year Demand-AF/Y

	2011	2012	2013	2014	2015
Demand	42,817	43,712	44,607	45,502	46,397
% of year 2005	95%	97%	99%	101%	103%

Table 32
Projected Multiple Dry Water Year Supply and Demand Comparison

	2011	2012	2013	2014	2015
Supply Totals	46,240	46,240	50,984	50,984	50,984
Demand Totals	42,817	43,712	44,607	45,502	46,397
Difference	3,423	2,528	6,377	5,482	4,587
Difference as % of Supply	7%	5%	13%	11%	9%
Difference as % of Demand	8%	6%	14%	12%	10%

Projected Multiple Dry Water Year Supply and Demand 2016-2020

See Tables 33 – 35 for projected multiple dry water year supply and demand for years 2016 – 2020.

Table 33
Projected Multiple Dry Water Year Supply-AF/Y

	2016	2017	2018	2019	2020
Supply	50,984	50,984	50,984	50,984	50,984
% of Normal Year	50%	50%	50%	50%	50%

Table 34
Projected Multiple Dry Water Year Demand-AF/Y

	2016	2017	2018	2019	2020
Demand	46,497	46,597	46,597	46,597	46,597
% of year 2005	103%	104%	104%	104%	104%

Table 35
Projected Multiple Dry Water Year Supply and Demand Comparison

	2016	2017	2018	2019	2020
Supply Totals	50,984	50,984	50,984	50,984	50,984
Demand Totals	46,497	46,597	46,697	46,797	46,897
Difference	4,487	4,387	4,287	4,187	4,087
Difference as % of Supply	9%	9%	8%	8%	8%
Difference as % of Demand	10%	9%	9%	9%	9%

Projected Multiple Dry Water Year Supply and Demand 2021-2025

See Tables 36 – 38 for projected multiple dry water year supply and demand for years 2021 – 2025.

Table 36
Projected Multiple Dry Water Year Supply-AF/Y

	2021	2022	2023	2024	2025
Supply	50,984	50,984	50,984	50,984	50,984
% of Normal Year	50%	50%	50%	50%	50%

Table 37
Projected Multiple Dry Water Year Demand-AF/Y

	2021	2022	2023	2024	2025
Demand	46,897	46,897	46,897	46,897	46,897
% of year 2005	104%	104%	104%	104%	104%

Table 38
Projected Multiple Dry Water Year Supply and Demand Comparison

	2021	2022	2023	2024	2025
Supply Totals	50,984	50,984	50,984	50,984	50,984
Demand Totals	46,897	46,897	46,897	46,897	46,897
Difference	4,087	4,087	4,087	4,087	4,087
Difference as % of Supply	8%	8%	8%	8%	8%
Difference as % of Demand	9%	9%	9%	9%	9%

Section 17

Adoption & Implementation of UWMP

(See attached Ordinance)