Coachella Valley Water District

Final Report

Urban Water Management Plan

December 2005

MWH

COACHELLA VALLEY WATER DISTRICT

Urban Water Management Plan

FINAL REPORT

REGISTERED PROFESSIONAL ENGINEER
DAVID J. RINGEL
No. C24015
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Section 1
Introduction

1.1 OVERVIEW OF THE URBAN WATER MANAGEMENT PLANNING ACT

The Urban Water Management Planning Act (UWMPA) was established by Assembly Bill (AB) 797 on September 21, 1983. Passage of this law by California State legislators recognized that water is a limited resource and that efficient water use and conservation would be actively pursued throughout the State. The UWMPA requires water suppliers in California, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet per year (acre-ft/yr) of water, to prepare and adopt a plan every five years which defines their current and future water use, sources of supply, source reliability, and existing conservation measures. The UWMPA requires that each water supplier prepare or update its Urban Water Management Plan (UWMP) every five years before December 31, in years ending in five and zero. The plan is to be submitted to the California Department of Water Resources (DWR).

The UWMPA has been amended eight times since 2000. These amendments have increased the reporting requirements for urban water agencies, make UWMPs pre-requisites for obtaining water-related state funding and serve as the basis for water supply assessments for new development. Among the changes are the following:

- Describe the water management tools and options used that will maximize resources and minimize the need to import water from other regions.
- Provide additional information if groundwater is identified as a source of available water including a copy of any groundwater management plan, description of groundwater basin, water rights judgments, overdraft descriptions, pumping history, etc.
- Include information on the quality of existing water sources and the manner in which water quality affects water management strategies and reliability.
- Describe plans to supplement water sources that are not consistently available.
- Prohibits urban water suppliers that fail to prepare or submit an UWMP from receiving funding under Propositions 204 (1996) and 13 (2000) or any other funding program administered by DWR.
- Describe the actual use of recycled water compared to previously projected use and a description of the amount of treated wastewater that meets recycled water standards, is being discharged, and is available for use.
- Requires DWR to consider whether a water supplier is implementing water demand management activities in evaluating grant or loan applications from the Water Conservation Account.
- Requires urban water suppliers to provide wholesale water agencies with 20-year or more water use projections for that wholesale water source and requires wholesale water agencies to provide urban water suppliers with information on the existing and planned water sources of the wholesale agency for same 20 years.
- Requires an urban water supplier to submit a copy of its plan to the State Library.

- Describe opportunities for development of desalinated water including ocean water, brackish water and groundwater as a long-term supply.

In addition, Senate Bill (SB) 610, passed in 2001, requires that UWMPs be used as the basis for water supply assessments for new large developments (500 or more dwelling units or equivalent demand). Since SB 610 required the demonstration of water supply adequacy for 20 years, DWR has suggested that new UWMPs be prepared with a 25-year planning horizon so the UWMP demand and supply projections will be valid until the next UWMP update in 2010.

In recognition of the state requirements, the Coachella Valley Water District (CVWD) has prepared this 2005 UWMP. The purpose of the plan is to document CVWD's projected water demands and its plans for delivering water supplies to CVWD's water service area. This plan includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Sections 10610-10657) of the UWMPA as updated in 2004. A copy of the UWMPA is included in **Appendix C** of this report.

1.2 COACHELLA VALLEY HISTORY AND SERVICE AREA

1.2.1 Law

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.

This section describes the Coachella Valley and the historical development and water supply of the Coachella Valley. This section also describes the history of CVWD and the services provided by CVWD. Population growth is described in **Section 2** of this report.

1.2.2 Description

The Coachella Valley lies in the northwestern portion of a great valley, the Salton Trough, that extends from the Gulf of California in Mexico northwesterly to the Cabazon area (**Figure 1-1**). This area lies primarily in Riverside County but also extends into northern San Diego County and northeastern Imperial County. The Colorado River enters this trough, and its delta has formed a barrier between the Gulf of California and the Coachella Valley. The Coachella Valley is ringed with mountains on three sides. On the west and north sides are the Santa Rosa, San Jacinto, and San Bernardino Mountains, which rise more than 10,000 feet above mean sea level (ft MSL). To the northeast and east are the Little San Bernardino Mountains, which attain elevations of 5,500 ft MSL.

The Coachella Valley is divided geographically and hydrologically into the Upper Valley and the Lower Valley. The Lower Valley is southeast of a line extending from Washington Street and Point Happy northeast to the Indio Hills near Jefferson Street, and the Upper Valley is northwest of this line.

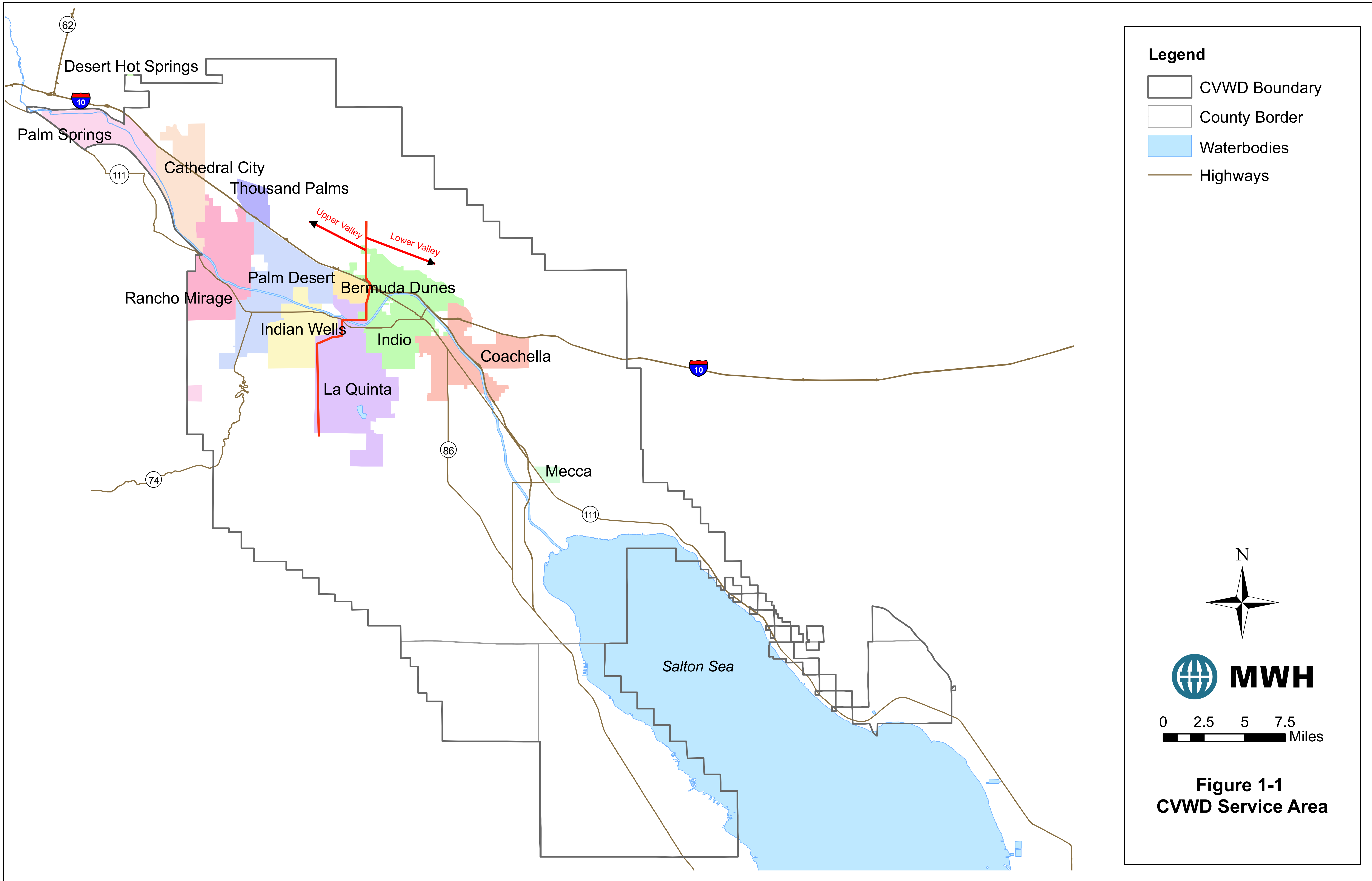


Figure 1-1
CVWD Service Area

1.2.3 Climate

Nearly all of the Colorado River Region has a subtropical desert climate with hot summers and mostly mild winters, and the average annual rainfall is quite low. Average annual precipitation ranges from three to six inches, most of which occurs in the winter. (DWR, 2005a). Average rainfall is approximately 5.7 inches per year based on data from 1900 to 1995. (NCDC, 1999) However, summer storms do occur and can be significant in some years. Clear and sunny conditions typically prevail. The region receives from 85 to 90 percent of possible sunshine each year, the highest value in the United States. Winter maximum temperatures are mild, but summer temperatures are very hot, with more than 100 days over 100 degrees Fahrenheit (º F) each year in the Imperial Valley. (DWR, 2005a)

CVWD is located in the Colorado River Region. Data from climate stations in Palm Springs, can be used as an indicator of climate in the Coachella Valley. Palm Springs has an average 24-hour temperature of 75º F (CIMIS, 2005). The average 24-hour high temperatures reach over 100º F between July and September. The record high for this area is 123º F and the record low is 19º F occurring in August and January, respectively (TWC, 2005). Average monthly temperatures, precipitation and reference evapotranspiration (ETo) are shown in **Table 1-1**.

Table 1-1
Climate

Month	Reference Evapotranspiration ETo[1] (in)	Average Rainfall (in)[2]	Average Temperature (°f)[2]
January	2.48	1.1	57.3
February	3.36	1.2	58.0
March	5.27	0.6	73.2
April	6.90	0.2	74.1
May	8.68	0.1	81.0
June	9.60	0.0	86.4
July	9.61	0.2	92.0
August	8.68	0.3	91.7
September	6.97	0.3	85.7
October	4.96	0.3	73.9
November	3.00	0.4	61.7
December	2.17	0.9	65.3
Annual Average	**71.6**	**5.7**	**75.0**

[1] Source: CIMIS, 1999 (Average ETo for Zone 18-Low Desert Valleys)
[2] Source: NCDC, 1999

Estimated relative humidity ranges from 20 to 25 percent for summer afternoons to 35 to 45 percent for winter afternoons. Wind direction is normally from the northwest at speeds of less than 13 miles per hour (mph) about 84 percent of the time. Winds of 25 miles per hour mph or more, occasionally resulting in blowing sand or dust, have been recorded only 2.4 percent of the time for the short period of wind records (NOAA, 2002). The average wind speed is 5.7 mph. (DWR, 2005a).

1.2.4 Development of the Coachella Valley

Human occupation of the Coachella Valley is believed to date back at least 12,000 years. However, there is little evidence of the people who occupied the Coachella Valley until about 1,200 years ago. By 900 AD, Native American tribes were traveling between ancient Lake Cahuilla—one of many previous "Salton Seas" covering large portions of Imperial and Coachella Valleys—and the Colorado River. Some tribes established seasonal and permanent villages. Spanish explorers ventured into the Imperial Valley occasionally after 1540, but the first written evidence that people of European descent were aware of the Coachella Valley came in 1815. The coming of the railroad in the 1870s opened the Coachella Valley up to development.

The principal economic base of the Upper Valley is resort development associated with golf courses, which began in 1926. The economic base for the Lower Valley is irrigated agriculture. These two economic sectors also drive water demands and the need for water supply management in both the Upper and Lower Valleys.

Upper Valley

The Upper Valley, largely undeveloped prior to World War II, now includes open space, urban areas, and extensive resort development. The Upper Valley includes the cities of Palm Springs, Cathedral City, Rancho Mirage, Palm Desert, and Indian Wells, along with the unincorporated communities of Bermuda Dunes, Thousand Palms, Garnet, North Palm Springs, and Whitewater. These communities include major resort destinations with hotels, restaurants, shopping areas, major residential developments, celebrity homes, and approximately 110 golf courses. In 2004, it is estimated that approximately 3.5 million visitors to the Upper Valley contributed over $356 million in hotel sales and $37 million in transient occupancy tax. (PSDRCVA, 2005) A portion of the Upper Valley lands are Native American-owned and contain several reservations. Casinos on Native American land are located near Cabazon, Indio, and Palm Springs.

Lower Valley

The economic base of the Lower Valley was established in the late 19th century by mining, railroading, and agriculture. The Lower Valley includes the cities of La Quinta, Indio, and Coachella; and two unincorporated communities, Thermal and Mecca. Agriculture is now the mainstay of the economy in the Lower Valley. Like the Upper Valley, a portion of the Lower Valley is Native American tribal land.

The development of deep-well drilling techniques advanced the settlement of the Coachella Valley. Economical well-drilling methods and pumping machinery reduced the cost of water supply, and farming activities in the Lower Valley expanded rapidly.

Completion of the Coachella Canal by the U. S. Bureau of Reclamation (Reclamation) in 1949 resulted in further expansion of irrigated farming. In 1948, about 23,000 acres were under irrigation. According to DWR records, by 1964, irrigated acreage exceeded 50,000 acres. In 2004, irrigated acreage increased to more than 78,500 acres according to CVWD's 2004-2005 annual report. Principal fruit crops are dates, table grapes, grapefruit, lemons and limes, oranges and tangerines, and watermelons. Corn, lettuce, carrots, broccoli, beans, onions, bell peppers, and squash are the principal vegetables. The Lower Valley also has fish farms and greenhouses, which have located there because warm groundwater from a geothermal area is beneficial to their operations.

According to CVWD's annual review and water quality reports (CVWD, 1993-2005), in calendar year 2004, CVWD delivered Coachella Canal water to 67,537 acres with a value of product of $556,849,377 or $8,245 per acre. Most of this production was in the Lower Valley. This excludes lands irrigated with well groundwater only. The gross crop value per irrigated acre of the Coachella Valley ranks fourth among the highest of all projects in the western United States being supplied irrigation water by Reclamation.

1.2.5 Water Development History

Over thousands of years, freshwater inflows from rainfall and snowmelt left millions of acre-feet of high-quality water in the Coachella Valley groundwater basins. Early settlers soon learned, however, that the supply of high-quality groundwater was finite. As demand on the groundwater basin increased, groundwater levels began dropping and artesian wells ceased flowing. In 1901, the California Development Company, seeking to facilitate the Imperial Valley's potential for agricultural productivity, dug irrigation canals from the Colorado River. Heavy silt loads, however, inhibited the water flow and new residents of the Coachella Valley became worried. This prompted the engineers to create a cut in the western bank of the Colorado River to allow more water to reach the Imperial Valley. Unfortunately, in 1905, heavy floodwaters broke through the engineered canal and nearly all the river's flow rushed into the Imperial and Coachella Valleys. By the time the breach was closed, the present-day Salton Sea was formed.

The groundwater table in the Lower Valley continued to drop until Colorado River water was introduced to the Coachella Valley in 1949. Groundwater levels began to rise soon after the first application of Colorado River water and quickly returned to levels that had existed prior to agricultural development. The water table remained fairly stable through the early 1980s but then began to decrease sharply. Groundwater demand had once again exceeded supply, resulting in decreases in groundwater levels of more than 60 feet in some portions of the Lower Valley.

Development of the Upper Valley (Palm Springs to Indio) has occurred primarily because of the golf and destination resort industry, which dominates the Upper Valley economy. Around 80 of the Coachella Valley's approximately 110 golf courses lie in the Upper Valley. In 1926, when the Coachella Valley's first golf course was constructed, Palm Springs was a sleepy getaway for the rich and famous. The cities of Rancho Mirage, Palm Desert, and Indian Wells were not even wide spots in the road. Today, all of these cities have world-renowned destination resorts within their borders.

As golf courses, resorts, and the corresponding population grew, so did the demand on the Upper Valley's groundwater. In 1963, CVWD and Desert Water Agency (DWA) entered into agreements to purchase water from the California State Water Project (SWP) to alleviate declining water tables in the Upper Valley. To avoid the then estimated $150 million cost of constructing a pipeline to bring SWP water to the Coachella Valley, CVWD and DWA entered into an exchange agreement with the Metropolitan Water District of Southern California (Metropolitan) to deliver water to the Coachella Valley. Metropolitan takes CVWD and DWA SWP water while delivering an equivalent amount of Colorado River water to the Coachella Valley. The exchanged Colorado River water is percolated into the ground at CVWD's Whitewater River Spreading Facility to replenish the Upper Valley's groundwater aquifer.

Averaging approximately 56,000 acre-ft/yr, more than 1.8 million acre-ft of Colorado River water has been delivered to the Upper Valley through this exchange since 1973. An advanced delivery agreement also allows Metropolitan to store excess Colorado River water in the Upper Valley's groundwater aquifer. During periods of shortages, Metropolitan uses CVWD and DWA's SWP entitlement while CVWD and DWA use the water stored by Metropolitan in the groundwater basin. Even with this additional supply of water to the Upper Valley, groundwater levels continue to decline.

Because the amount of groundwater being pumped from the Coachella Valley's groundwater basins exceeds the amount replenished, the aquifers have been in overdraft for a significant portion of the last century. Overdraft is a condition of a groundwater basin in which the amount of water extracted exceeds the amount of water recharging the basin over a period of time (DWR, 1993). The bulletin also defines "the critical condition of overdraft" as water management practices that would probably result in significant adverse overdraft-related environmental, social, or economic effects. Water quality degradation and land subsidence are two examples of such effects.

1.2.6 CVWD History

Early in this century, the Imperial Valley agricultural industry was growing and needed additional water. Imperial Valley farmers conceived a plan to tap the Whitewater River and export water from the Coachella Valley. Although the project did not materialize, the possibility of losing a valuable resource prompted the organization of CVWD to conserve and protect the water of the Coachella Valley and to develop a supplemental water source for irrigation. This supplemental source became Colorado River water delivered to the Valley via the Coachella Branch of the All American Canal. Improvement District No. 1 (ID-1) was established to include the irrigable land provided with Colorado River water. CVWD's contract with Reclamation restricts Colorado River water use to beneficial uses for lands within ID-1.

CVWD was formed in January 1918 under the County Water District Act provisions of the California Water Code. The Coachella Valley Stormwater District was formed in 1915. The two districts merged in 1937. CVWD now encompasses approximately 637,000 acres, mostly within Riverside County, but also extending into northern Imperial and northeastern San Diego counties (**Figure 1-1**). CVWD's service area includes the following populated regions of cities and unincorporated communities as show in **Table 1-2**.

Table 1-2
Cities and Unincorporated Communities in CVWD Service Area

City and Unincorporated Community Name
1. City of Cathedral City
2. City of Coachella
3. City of Indian Wells
4. City of Indio
5. City of La Quinta
6. City of Palm Desert
7. City of Palm Springs
8. City of Rancho Mirage
Riverside County (Unincorporated Communities)
9. Bermuda Dunes
10. Mecca
11. North Shore
12. Sky Valley
13. Thermal
14. Thousand Palms
15. Valerie Jean
Imperial County (Unincorporated Communities)
16. Bombay Beach
17. Desert Shores
18. Hot Mineral Spa
19. Salton City
20. Salton Sea Beach
21. San Diego County (Unincorporated)

1.2.7 CVWD Services

The water-related services provided by CVWD to most of the Coachella Valley include irrigation water delivery and conservation, domestic water delivery and conservation, wastewater reclamation and recycling, stormwater protection, agricultural drainage, water education, and groundwater recharge.

Irrigation Water Delivery and Conservation

CVWD’s Colorado River irrigation distribution system was built to include conservation measures unheard of in the 1940s and rarely used elsewhere even today. Unique to that initial system was a pipeline distribution system, a pipeline drainage system, and metered deliveries to every farm. Of the Colorado River water reaching the Coachella Valley, 98.5 percent (or approximately 300,000 acre-ft/yr) is delivered to farmers. Several water conservation and management activities are incorporated into CVWD’s irrigation distribution system.

- The Coachella Branch of the All American Canal was concrete-lined within CVWD’s water service area.

- A network of nearly 500 miles of distribution system consists entirely of buried pipeline to eliminate seepage and evaporation losses.
- CVWD's system was designed to prevent tail water by eliminating a place for it to be collected. CVWD drains are mostly buried, perforated pipelines that require water to penetrate the soil for collection.
- In 1968, CVWD built Lake Cahuilla to provide a place to store Colorado River water, to meet changing needs, and to avoid wasteful spills.
- In the mid-1960s, CVWD placed the canal system under telemetry control, allowing operators to monitor and control water delivery facilities throughout a 1,000-square-mile area around the clock from CVWD's headquarters. If more water is in a farm delivery system than can be used by the farmers on that system, an alarm sounds so the water can be cut back before significant waste occurs.
- Aquatic weeds clog canals which slow the water and increase losses through evapotranspiration and plugging meters and pipelines. CVWD has achieved complete control of aquatic vegetation through stocking of triploid grass carp in the Coachella Canal.
- Coachella Valley farmers have been at the forefront in the use of water-efficient irrigation techniques such as drip. This technique has shown water savings of up to 60 percent. More than 50 percent of the irrigated acreage in ID-1 is irrigated by drip systems. To facilitate irrigation, landowners have constructed more than 250 water-regulation reservoirs.
- CVWD has encouraged and supported the study of optimal irrigation and drainage techniques.
- In 1997, CVWD restructured its water-ordering procedures to allow water to be turned on and off at any time. Previous CVWD procedures required orders to be placed well in advance and allowed for turn-ons and turn-offs only at certain times of the day. This procedure has increased operational flexibility for irrigators and increased efficiency.

Domestic Water

CVWD provides domestic water for over 240,000 Coachella Valley residents (CVWD, 2005a). The distribution system includes 69 reservoirs, over 1,872 miles of pipelines, and 117 domestic wells.

- More than half of residential and commercial construction in the Coachella Valley is relatively recent and includes water-conserving plumbing.
- To demonstrate low-water-use plants, CVWD maintains a xeriscape demonstration garden at its Coachella headquarters and at the Palm Desert facility. These gardens of native plants employ the most water-efficient irrigation techniques available.

- An Internet Web page (www.cvwd.org) is maintained by CVWD. The CVWD website provides frequently updated Coachella Valley weather conditions, a description of the Valley's water resources, information on CVWD's functions, and a guide to Coachella Valley landscaping, including the use of native plants.

- CVWD also provides water audits to farms, golf courses and homeowner associations. Significant savings on water use have been realized because of these audits. The audit brings wasteful water use to the attention of the user and provides recommendations for greater efficiency. CVWD provides landscape workshops for homeowners. Reviews of landscape plans for major housing and commercial developments are now a part of the subdivision review process in Coachella Valley cities.

- Homeowner associations have saved as much as 50 percent on water bills after updating and modifying their irrigation systems. CVWD has set aside $500,000 to issue loans to homeowner associations at 3 percent interest over a five-year loan period. CVWD requires only that the large-scale water users be audited to confirm that there is a potential for at least a 30 percent water savings.

Wastewater Reclamation and Recycling

Sanitation service became a CVWD responsibility in 1968, when it acquired the Palm Desert Country Club Water Reclamation Plant and domestic water system. Presently, there are six water reclamation plans (WRP) providing wastewater treatment as well as recycled water (RW) supply in the CVWD service area. The existing WRPs allows CVWD to provide sanitation service to most of the areas that it serves with domestic water. The remaining areas are on septic systems. The communities served by each of the WRPs is listed below:

- WPR-1: Bombay Beach
- WRP-2: Desert Beach, Marina, North Shore
- WRP-4: communities from La Quinta to Mecca
- WRP-7: Cathedral City, Rancho Mirage, Palm Desert, Bermuda Dunes, Thousand Palms and unincorporated Riverside County
- WRP-9: Palm Desert Country Club and surrounding residential areas
- WRP-10: Indian Wells, Palm Desert, Ranch Mirage and a portion of Cathedral City

Detailed descriptions of the wastewater plants are presented in **Section 6** of this report.

Stormwater Protection

CVWD provides regional flood protection for the portion of the Coachella Valley within CVWD's stormwater unit, extending from Cathedral City to Salton City. The stormwater unit includes 59 percent (375,658 acres) of the land within the general CVWD boundary (637,634 acres).

Agricultural Drainage

Supplemental water brought into the Lower Coachella Valley for irrigation has resulted in a high groundwater table within the semi-perched zone that could saturate the root zone of crops and stifle growth or eliminate crop production. The semi-perched zone lies above the Upper aquifer and extends to the ground surface. Irrigation also concentrates salts in drainage waters as salts are leached from soils. Therefore, a drainage system is necessary for much of the Lower Valley.

CVWD operates and maintains a collector system of 166 miles of pipe ranging in size from 18 inches to 72 inches, along with 21 miles of open ditches, to serve as a drainage network for irrigated lands. All agricultural drains empty into the Coachella Valley Stormwater Channel (CVSC) except those at the southern end of the Coachella Valley, which flow directly to the Salton Sea. This system serves nearly 38,000 acres and receives water from more than 2,293 miles of on-farm drain lines (CVWD, 2005).

Groundwater Recharge

CVWD has been recharging the groundwater basin in the Upper Valley since 1919, first with local water and later with imported water. With the introduction of the SWP, CVWD became one of 29 contractors for Northern California water. DWA, in the west end of the Coachella Valley, also is a SWP contractor. With no pipeline in place to deliver SWP water to the Coachella Valley, the two local agencies worked out an agreement with Metropolitan to trade, on an acre-foot-for-acre-foot basis, CVWD's and DWA's SWP water for a like amount of Metropolitan's Colorado River water. Metropolitan's Colorado River Aqueduct (CRA) is tapped where it crosses the Whitewater River, and the exchange water is diverted to a series of 19 CVWD ponds, where it percolates to replenish the groundwater basin. In 1973, CVWD and DWA started spreading the water exchanged with Metropolitan. More than 1.8 million acre-ft of Colorado River water have been delivered through the SWP Exchange program since its inception in 1973.

In 1984, CVWD and DWA executed an advance delivery agreement with Metropolitan to recharge additional Colorado River supplies in the Upper Valley during periods of surplus water availability in the Colorado River Basin. These pre-deliveries, which also were released to the Whitewater River and recharged in the Upper Valley, amounted to over 650,000 acre-ft of exchange water released to the Whitewater River between 1985 through 1987. As of December 2004, a total of about 177,400 acre-ft of Colorado River water was stored in the groundwater reservoir. Metropolitan uses the banked supplies during periods of future water shortage in Southern California. When Metropolitan requires the stored water, it will take its Colorado River water supplies along with CVWD's and DWA's SWP water for as long as necessary, or until the banked quantity of the allotment is exhausted. CVWD and DWA, in turn, will pump the previously stored water from the basin. However, until the banked water is needed, CVWD and DWA benefit by higher groundwater levels and lower pumping costs. CVWD also has contracted with Reclamation to take surplus Colorado River water, when available, for storage in the Upper Valley. In addition, CVWD purchases SWP water on the spot market as available. This water is also exchanged with Metropolitan for Colorado River water and used for Upper Valley groundwater recharge.

In 1995, CVWD began a pilot recharge program at a site west of Dike No. 4 and south of Lake Cahuilla in the Lower Valley. The objective of the program is to determine whether groundwater could be recharged at this site to the benefit of the Lower Valley. Most of the Lower Valley is underlain by a clay layer that limits the exchange of water between the Upper and Lower aquifers. The geologic information indicates that a recharge site at Dike No. 4 is sufficiently far away from the main clay layer to allow groundwater recharge to the Lower aquifer, which is the principal aquifer supplying agricultural water to the Lower Valley. Through June 1998, approximately 1,800 acre-ft of water had been recharged experimentally at this site. This small amount of water did not have a measurable impact on groundwater levels. However, the pilot program indicates that recharge is feasible. In 1998, CVWD expanded the groundwater recharge project at Dike No. 4 to include two 3-acre ponds to evaluate recharge on a larger scale. Since its inception, 17,451 acre-ft of water has been recharged at Dike 4.

Water Education

CVWD's education efforts concentrate on water safety and outside water use. Two certified teachers on staff reach out to thousands of children annually with CVWD's "wise water use" message. A staff water management specialist works with golf courses, cities, and major developers to encourage the use of water-efficient plants and water-conserving landscape irrigation techniques. CVWD staff and Eric Johnson, one of California's leading desert landscape experts, developed *Lush and Efficient: A Guide to Coachella Valley Landscaping* (CVWD, 2001) specifically to aid Coachella Valley residents. Newsletters and other printed material promoting the wise use of water are published regularly.

1.3 CVWD 2002 WATER MANAGEMENT PLAN SUMMARY

To meet its responsibilities for ensuring that there are adequate water supplies in the future, CVWD initiated a planning process in the early 1990s. The process initially addressed the Lower Valley, but was expanded to include the entire Coachella Valley in 1995. The 2002 Coachella Valley Water Management Plan (CVWMP) was the product of that process (CVWD, 2002a). The CVWMP was adopted by CVWD Board of Directors in October 2002. The CVWMP is summarized briefly below and a copy of the executive summary is included as **Appendix E**. Copies of the full CVWMP and the Final Program Environmental Impact Report (PEIR) (CVWD, 2002a and 2002b) are available for inspection at CVWD's offices or on the CVWD website.

1.3.1 Goals and Objectives

The goal of the CVWMP is to assure adequate quantities of safe, high-quality water at the lowest cost to Coachella Valley water users. To meet this goal, four objectives were identified:

1. Eliminate groundwater overdraft and its associated adverse impacts, including:
   - groundwater storage reductions
   - declining groundwater levels
   - land subsidence

- water quality degradation

2. Maximize conjunctive use opportunities
3. Minimize adverse economic impacts to Coachella Valley water users
4. Minimize environmental impacts

1.3.2 Alternative Selection

CVWD staff and consultants identified potential water management elements for inclusion in the CVWMP. Potential management elements were subsequently organized into six categories:

1. Pumping restrictions
2. Demand reduction
3. Local water sources
4. Imported water sources
5. Water management actions
6. Water quality approaches

Each of the potential management elements was rated based on the element's ability to reduce overdraft, technical feasibility, potential environmental impacts, cost, legal and regulatory factors, and regional economic impacts. Based on these ratings, numerous potential elements were eliminated from further consideration.

The remaining "short-listed" elements were organized into the following conceptual management *Alternatives*:

1. No Project
2. Pumping Restrictions
3. Maximize Local Resources
4. Combinations of all Alternatives

With the exception of the No Project alternative, which was required under the California Environmental Quality Act (CEQA), a preliminary evaluation of each alternative was performed to determine which alternatives should be formally considered and evaluated in the CVWMP. The evaluation process involved technical analyses coupled with professional judgement and experience. After extensive review, the selected alternative was Alternative 4 – Combination of all Alternatives.

1.3.3 Implementation of the Preferred Alternative

The preferred alternative, Alternative 4, includes water conservation, groundwater recharge, and source substitution management elements. Implementation of the preferred alternative has and continues to require numerous decisions regarding the priorities for implementation, the financing mechanisms for various elements of the plan, potential cooperative agreements with other agencies, and balancing needs with available resources. Many of the elements of the CVWMP are described further in this UWMP.

A significant activity in decision-making and plan implementation is coordination and consultation with other governing agencies and tribal interests. The CVWMP stated that CVWD would not, nor should it, attempt to unilaterally implement water management activities that are within the purview of local or other governments. This coordinating effort is a major focus of implementation. Detailed implementation plans are currently being developed by CVWD for each water management category of the CVWMP. These plans, which cover residential conservation, golf course conservation, agricultural conservation and special projects, are expected to be complete in early 2006.

1.4 REGIONAL WATER AGENCY COORDINATION

1.4.1 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.

1.4.2 Interagency Coordination

CVWD shares a common groundwater source with DWA, the City of Coachella (Coachella), the City of Indio (Indio), Mission Springs Water District and Myoma Dunes Mutual Water Company (Myoma). CVWD is a contractor with the United States to receive Colorado River water. CVWD and DWA are contractors with the State to receive SWP water. Each agency that shares and/or coordinates water supplies with CVWD had an opportunity to review and comment on the CVWMP. In addition, CVWD notified all cities and the counties of Riverside and Imperial by letter in August 2005 that it was updating the UWMP and requested planning information for inclusion in the plan.

1.5 PUBLIC NOTIFICATION OF URBAN WATER MANAGEMENT PLAN UPDATE

1.5.1 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 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.

1.5.2 Public Participation

CVWD has developed an active public information and participation program in conjunction with the development and implementation of the CVWMP. CVWD formed a task force, hereafter referred to as the CVWMP Task Force, made up of interested stakeholders in January 2005. The role of the CVWMP Task Force is to advise CVWD Board of Directors on implementation of the CVWMP. The task force consists of four teams: Residential/Municipal, Agricultural, Golf Course, and Special Projects, each led by a CVWD staff member. The first three teams are focusing principally on the development and evaluation of water conservation measures for their respective use types. The Special Projects team is focusing on several major projects including the Mid-Valley Pipeline, groundwater recharge projects, and increased use of treated municipal effluent. The goal of the CVWMP Task Force is to produce the CVWMP Implementation Recommendations.

On November 15, 2005, a summary of the UWMP was presented to the CVWMP Task Force. The UWMP was made available for public review and comment on November 29, 2005. Input from CVWMP Task Force teams has been incorporated in this UWMP. No formal comments on the draft UWMP were received during the public review period.

In addition, CVWD held a public hearing to consider adoption of this UWMP on December 13, 2005 at CVWD's headquarters in Coachella. Notification of the hearing was published on November 29 and December 6, 2005 in the Desert Sun and Imperial Valley Press as required by state law. Proofs of publication are included in **Appendix D**.

1.5.3 UWMP Adoption

After a public hearing was conducted on December 13, 2005, the CVWD Board of Directors adopted this UWMP by resolution. A copy of the Resolution of Adoption is included in **Appendix D**.

This UWMP includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Urban Water Management Planning).

Section 2
Population and Water Use

2.1 LAW

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(e) (1) Quantify, to the extent records are available, past and current water use, over the same increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all o f 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).

This section describes the historical and projected population for the CVWD domestic water service area followed by a discussion of the historical and projected water use. Water usage by user class, estimated water losses and the demand projection methodology, are also discussed.

2.2 HISTORICAL POPULATION

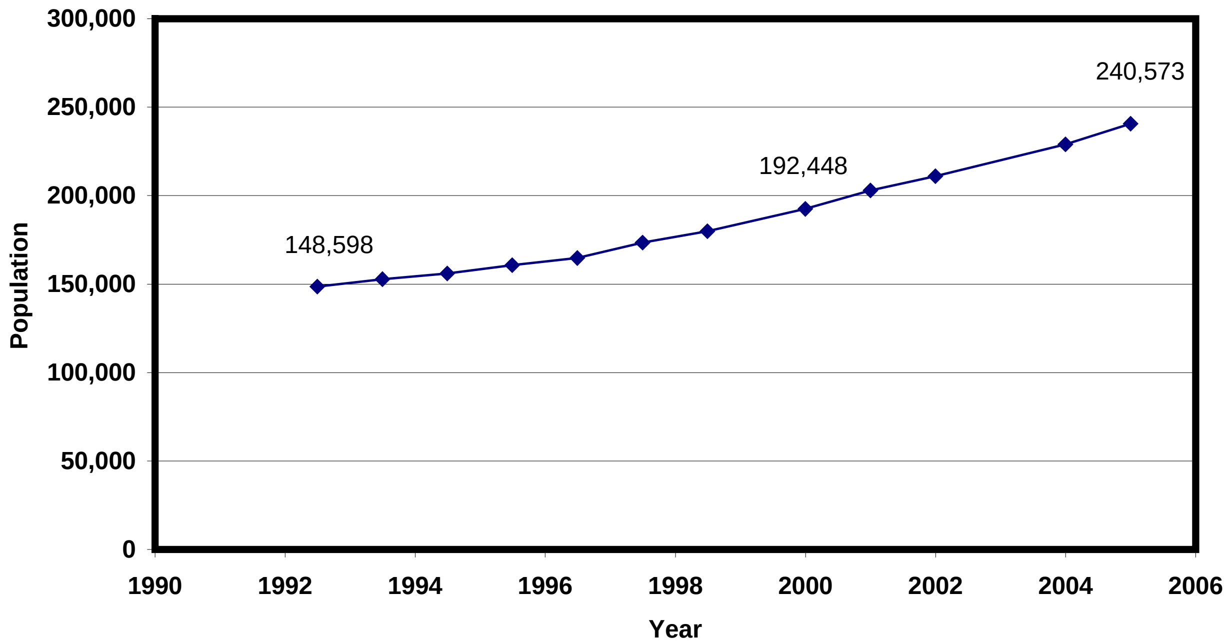
The historical population from the year 1992 to 2005 for CVWD's domestic water service area is shown in **Figure 2-1.** These values are estimated based on water service connection data.

Population within the CVWD service area has grown steadily over the last 15 years and has increased significantly over the past five years. A booming housing market, supported by readily available and affordable land, low interest rates, and a healthy Southern California economy, has been the main driver in the recent population surge. In recent years, the Coachella Valley has set all-time records for housing starts with more than 8,000 new single family and multi-family housing starts in 2004 alone (WDL, 2004).

2.3 FUTURE GROWTH PROJECTIONS

Growth projections for the Coachella Valley have been developed by the Southern California Association of Governments (SCAG) and the Coachella Valley Association of Governments (CVAG). SCAG is a regional Council of Governments (COG) that serves as the municipal planning organization for the six Southern California counties. CVAG is a joint powers agency made up of local governments in the Coachella Valley and is designated as the local COG for the Coachella Valley.

Figure 2-1
Historical Population of the CVWD Domestic Water Service Area



Source: (CVWD, 1992-2005)

The active expansion of the Coachella Valley economy and residential sector is likely to continue in future years. By 2030, the population within the greater Coachella Valley is expected to rise to nearly 675,000 (SCAG, 2005). This corresponds to a population increase of about 70 percent or 3 percent per year. Housing and employment are expected to following similar trends.

In addition to population, the water demand projections used in the UWMP are based on the number of households and employment within each city as provided by SCAG. The SCAG data that most accurately models growth for a given land use is used to project growth in water demand for that land use. For instance, SCAG household data for the City of La Quinta is used to determine growth for all residential land uses within the City of La Quinta. Similarly, population data is used to determine growth in public agencies within the city and employment data is used to determine growth in business, commercial and industrial land uses. The SCAG projections of population, number of households and jobs by city within the CVWD service area are presented in 5-year increments in **Table 2-1**, **Table 2-2** and **Table 2-3**. CVWD service area population, households and employment are projected to grow by 66, 90 percent and 78 percent, respectively, from 2005 to 2030.

Table 2-1
CVWD Service Area Population- Current and Projected by City

City	2005	2010	2015	2020	2025	2030
Cathedral City	51,312	58,847	68,075	77,177	85,932	94,327
Coachella	890	953	1,260	1,562	1,936	2,294
Indian Wells	4,732	5,278	6,786	8,273	9,698	11,065
Indio	2,581	4,120	4,707	5,287	5,935	6,556
La Quinta	34,536	41,176	45,262	49,295	53,159	56,866
Palm Desert	47,987	54,600	56,891	59,155	61,323	63,402
Palm Springs	13,802	14,130	15,614	17,073	18,484	19,838
Rancho Mirage	15,955	17,560	20,455	23,314	26,049	28,675
Unincorporated	93,074	105,324	108,651	126,716	142,609	157,089
Total	**264,869**	**301,988**	**327,701**	**367,852**	**405,125**	**440,112**

Source: SCAG, 2005, adjusted for CVWD service area.

Table 2-2
CVWD Service Area Number of Households– Current and Projected by City

City	2005	2010	2015	2020	2025	2030
Cathedral City	16,210	19,330	22,536	25,810	29,051	32,268
Coachella	204	222	265	350	451	556
Indian Wells	2,428	2,900	3,675	4,455	5,230	5,992
Indio	1,183	1,939	2,194	2,545	2,928	3,314
La Quinta	11,726	14,467	15,699	16,952	18,192	19,425
Palm Desert	21,761	25,735	27,487	29,021	30,521	32,002
Palm Springs	5,655	5,907	6,673	7,438	8,213	8,992
Rancho Mirage	7,913	9,185	10,873	12,583	14,266	15,939
Unincorporated	27,687	32,083	39,867	47,481	54,798	62,010
Total	**94,767**	**111,768**	**129,269**	**146,635**	**163,650**	**180,498**

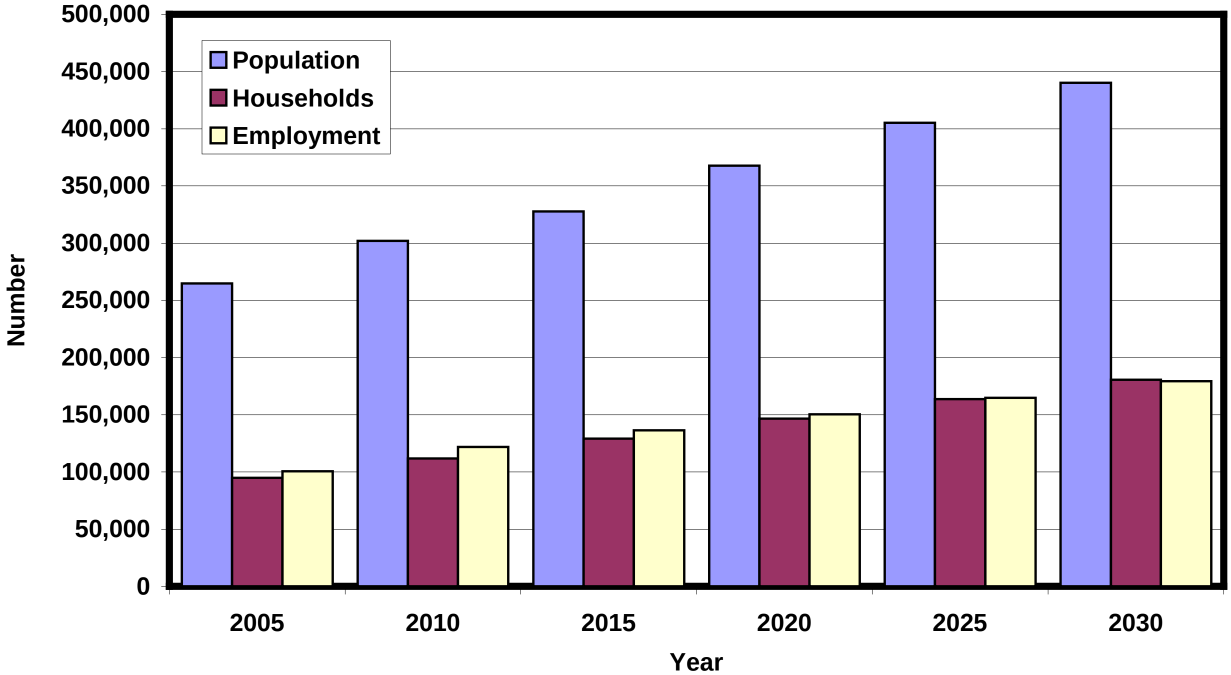
Source: SCAG, 2005, adjusted for CVWD service area.

Table 2-3
CVWD Service Area Employment – Current and Projected by City

City	2005	2010	2015	2020	2025	2030
Cathedral City	14,907	20,064	23,629	27,293	31,017	34,805
Coachella	2,335	3,160	3,219	3,554	3,900	4,274
Indian Wells	2,281	3,985	4,073	4,164	4,254	4,344
Indio	1,872	2,414	2,639	2,882	3,126	3,373
La Quinta	8,056	10,246	12,012	13,833	15,679	17,564
Palm Desert	34,316	39,159	41,385	43,650	45,940	48,258
Palm Springs	16,455	19,027	20,923	22,879	24,854	26,875
Rancho Mirage	9,870	11,046	12,026	13,025	14,040	15,068
Unincorporated	10,490	12,738	16,617	19,291	22,022	24,784
Total	**100,582**	**121,839**	**136,523**	**150,571**	**164,832**	**179,345**

Source: SCAG, 2005, adjusted for CVWD service area.

Figure 2-2
Projected Growth within CVWD Service Area



Source: SCAG, 2005, adjusted for CVWD service area.

2.4 HISTORICAL WATER USE

Historical water demands primarily include domestic, golf course, and agricultural uses. Although golf courses and agricultural lands represent a considerable water demand in the Coachella Valley, they are generally not served by CVWD's domestic water system. Most agriculture users irrigate with water from the Coachella Canal System or groundwater sources. Golf courses irrigate with a combination of imported Coachella Canal water, groundwater, and recycled water.

Table 2-4 shows the historical water usage from 1999-2004 according to user type. As shown in this table, CVWD's domestic water demand has increased from approximately 99,360 acre-ft/year in 1999 to 123,480 acre-ft/year in 2004.

Table 2-4
Historical Domestic Water Consumption

User Type	Consumption (acre-ft/year)					
	1999	2000	2001	2002	2003	2004
Single Family Residential	51,777	57,142	58,253	62,905	64,895	68,409
Multi-Family Residential	9,654	9,349	9,082	9,275	9,197	9,273
Commercial	6,104	6,444	6,351	6,471	6,512	6,821
Public	936	1,344	1,105	1,014	998	1,072
Irrigation	28,355	30,471	29,960	33,317	33,320	34,452
Temporary Construction	2,530	2,991	4,183	4,506	3,461	3,460
Total	**99,356**	**107,740**	**108,934**	**117,488**	**118,382**	**123,487**

Source: BV, 2004

2.4.1 Water Usage by Cost Center

CVWD's domestic water system is organized into four cost centers based on location and similar water supplies. A map of the CVWD cost centers can be found in **Figure 2-3.** Historical domestic water consumption by cost center is shown in **Table 2-5**.

Cost Center 35, which covers most of the central Coachella Valley, not only encompasses the vast majority of the CVWD's water demand, but has also experienced the highest growth from years 1999-2004.

The user composition of each cost center based on total water usage is presented in **Figure 2-4** (BV, 2004). Single-family residential uses represent the majority of total water usage, followed by mobile homes and trailer parks. In Cost Center 35, landscape irrigation (having separate irrigation meters) represents a significant proportion of water usage.

Table 2-5
Domestic Water Consumption by Cost Center

Cost Center	Consumption (acre-ft/year)					
	1999	2000	2001	2002	2003	2004
11	821	831	787	840	837	856
23	734	770	741	761	779	878
26	3,245	2,863	2,804	2,979	2,982	2,903
35	94,557	103,276	104,601	112,908	113,785	118,850
Total	**99,356**	**107,740**	**108,934**	**117,488**	**118,382**	**123,487**

Source: BV, 2004

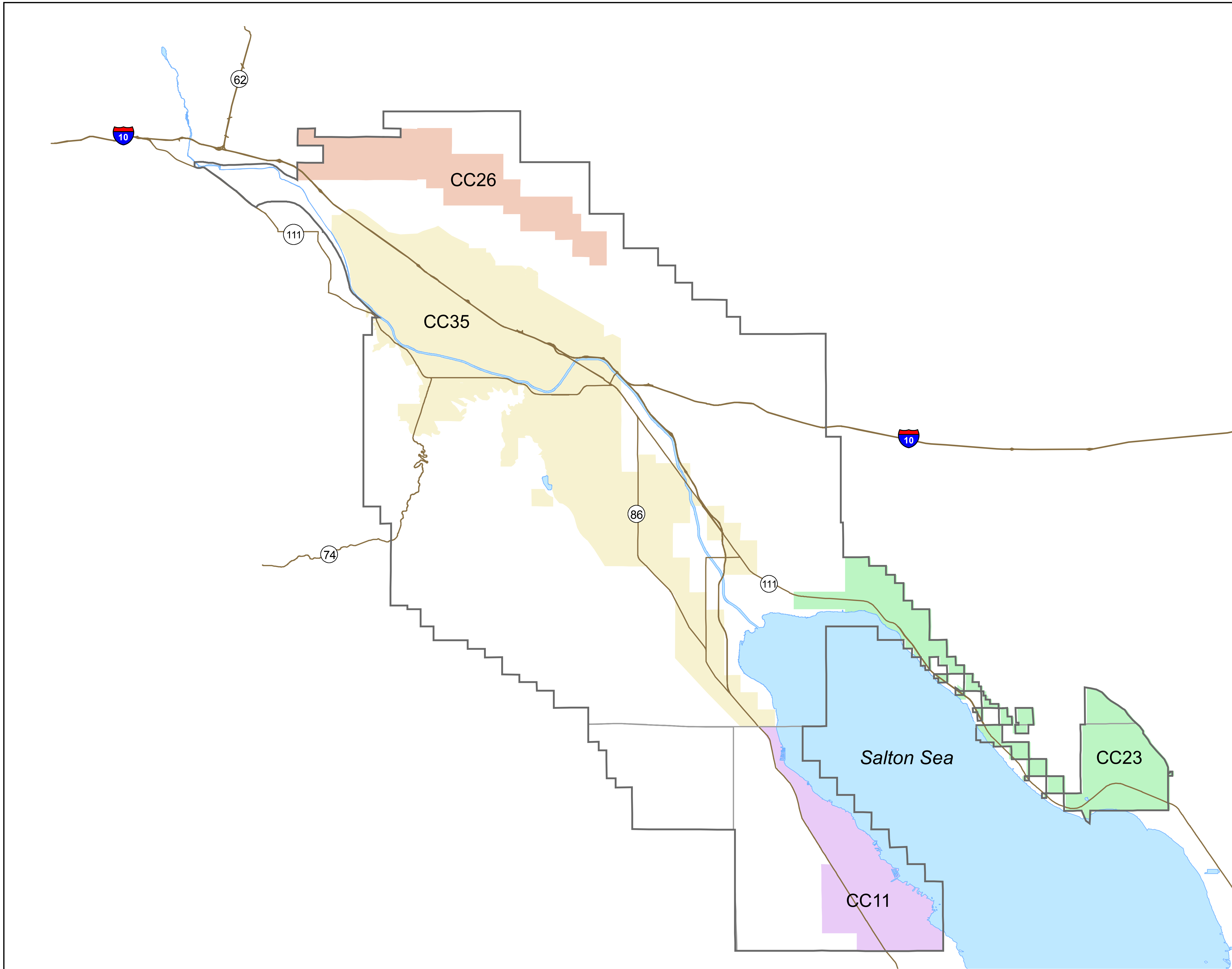
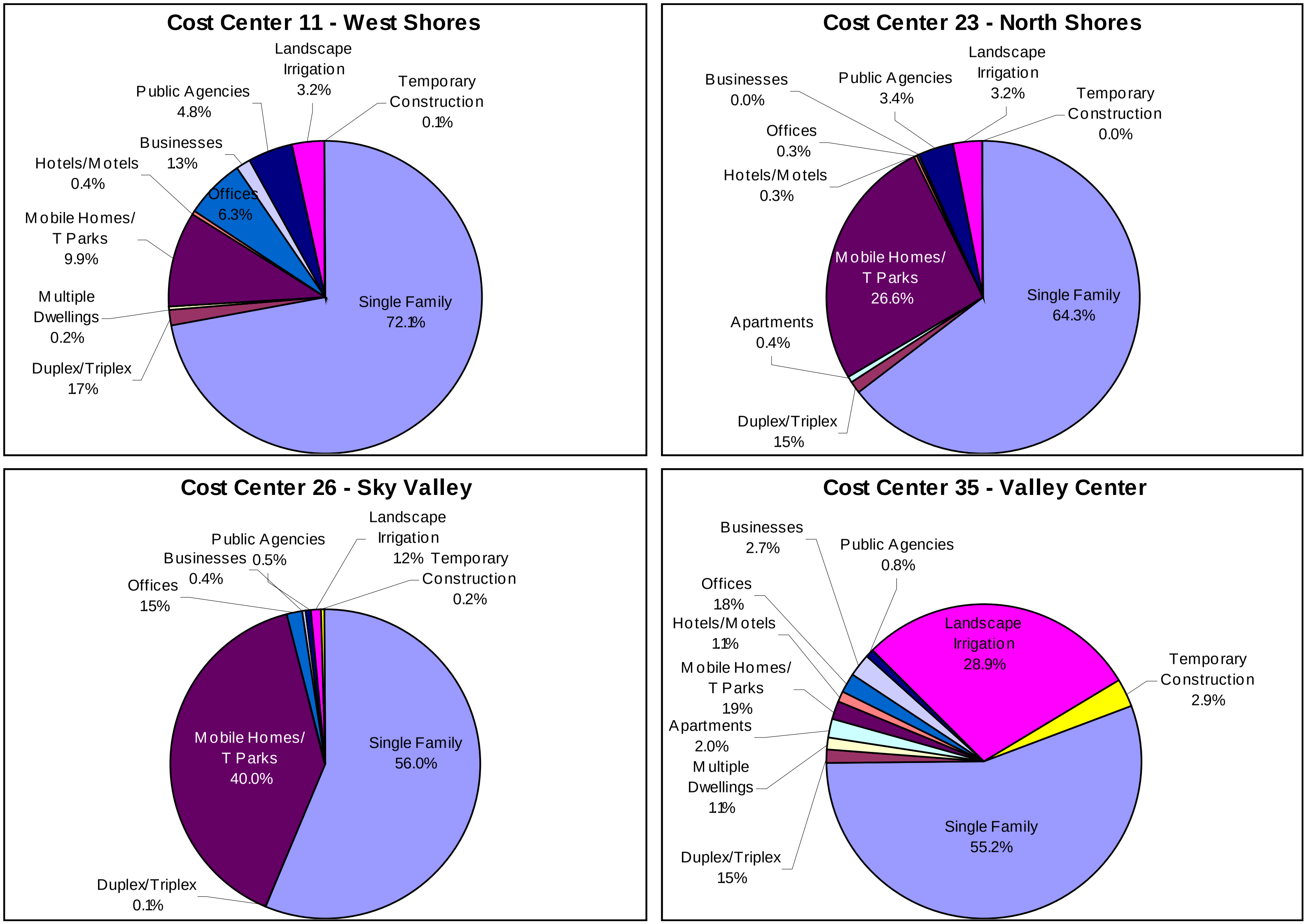


Figure 2-3
CVWD Cost Centers

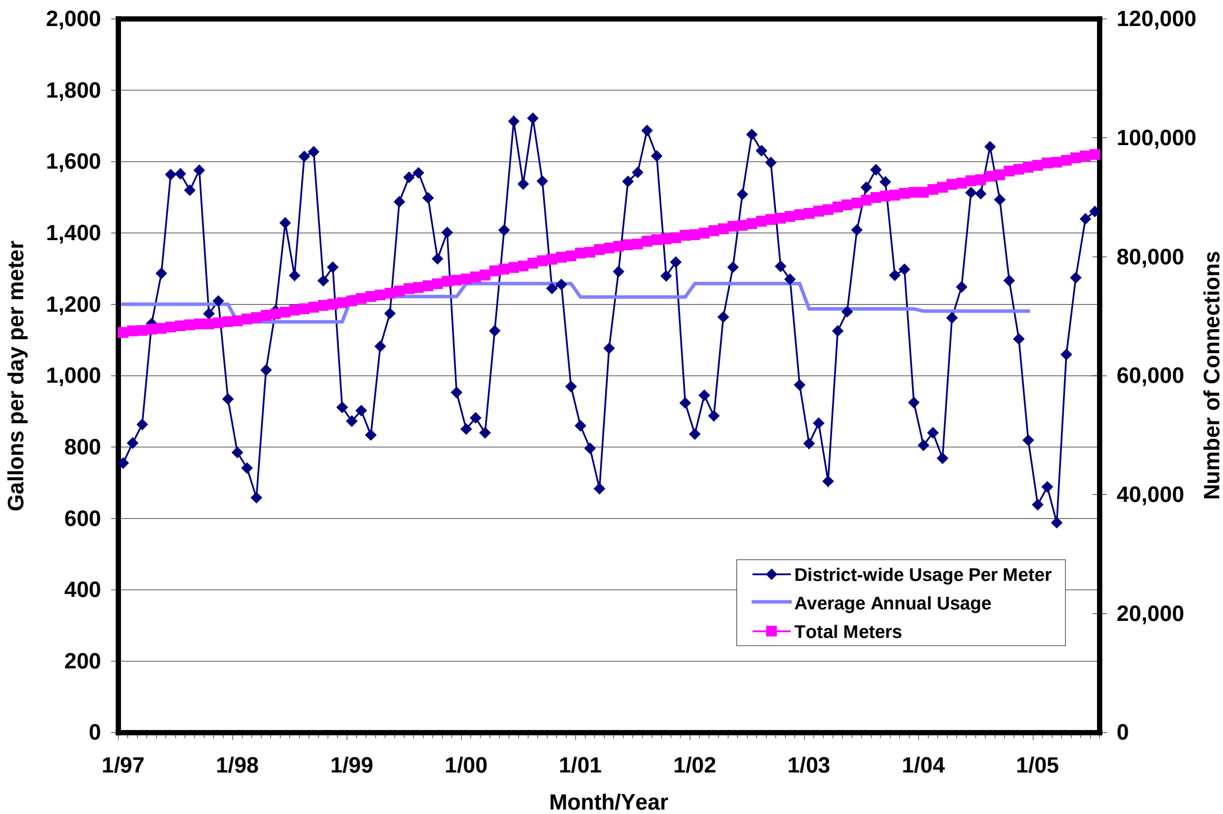
Figure 2-4
Water Usage by Cost Center and User Type



2.4.2 Water Usage per Meter

Based on historical population records and metered consumption, the water usage trend per capita is calculated for the years 1997-2005 and shown in **Figure 2-5**. It should be noted that this usage does not express the water consumption per person in gallons per day (gpd) per capita (person) because the total water usage also includes non-residential demands such as commercial, schools, parks, and landscape irrigation. The average usage per meter is about 1,210 gallons per day per meter (gpd/meter).

Figure 2-5
Water Usage per Meter- CVWD Average



Source: Production and Consumption Data (CVWD, 2005)

The number of connections has grown steadily at approximately 3-5 percent a year. The water usage per meter is highly seasonal due to irrigation, varying by approximately 800 gpd/meter. However, on a yearly basis, water usage per meter has remained relatively constant between 1997 and 2005, varying from 1,151 to 1,258 gpd/meter. An evaluation of wastewater flows per connection indicates an average wastewater flow of about 220 gpd/meter. From this, it can be inferred that outdoor usage including irrigation may represent about 80 percent of total water usage.

Billing data for 2004 indicates that there is a wide distribution of water usage per account within each user type. **Table 2-6** compares the highest water using account in 2004 and the average water using account for each user type. High water-using accounts, which are often over 10 times the average, indicate a large potential for future conservation efforts. For detailed figures of the water usage distribution for each user type, see **Figures E-4** to **E-14** in the **Appendix E**. It is believed that several of the highest water-using residential users may be misclassified in the CVWD billing system. For example, review of aerial photography for several large single family residential users reveals that the sites may be mobile home parks on one or more master meters.

Table 2-6
2004 Highest Water Usage and Average Water Usage Per Account

User Type	Highest Water Usage (acre-ft/yr)	Average Water Usage per Account (acre-ft/yr)
Residential [1]	33.06	0.76
Duplex/Triplex	29.15	1.30
Multiple Dwelling [2]	33.39	1.85
Apartments [3]	37.21	2.47
Mobile home/ Trailer Parks [4]	87.87	11.90
Hotels and Motels	59.86	6.03
Business [5]	51.90	1.09
Commercial [6]	37.86	2.71
Public Agency [7]	110.97	0.80
Irrigation [8]	86.47	8.07

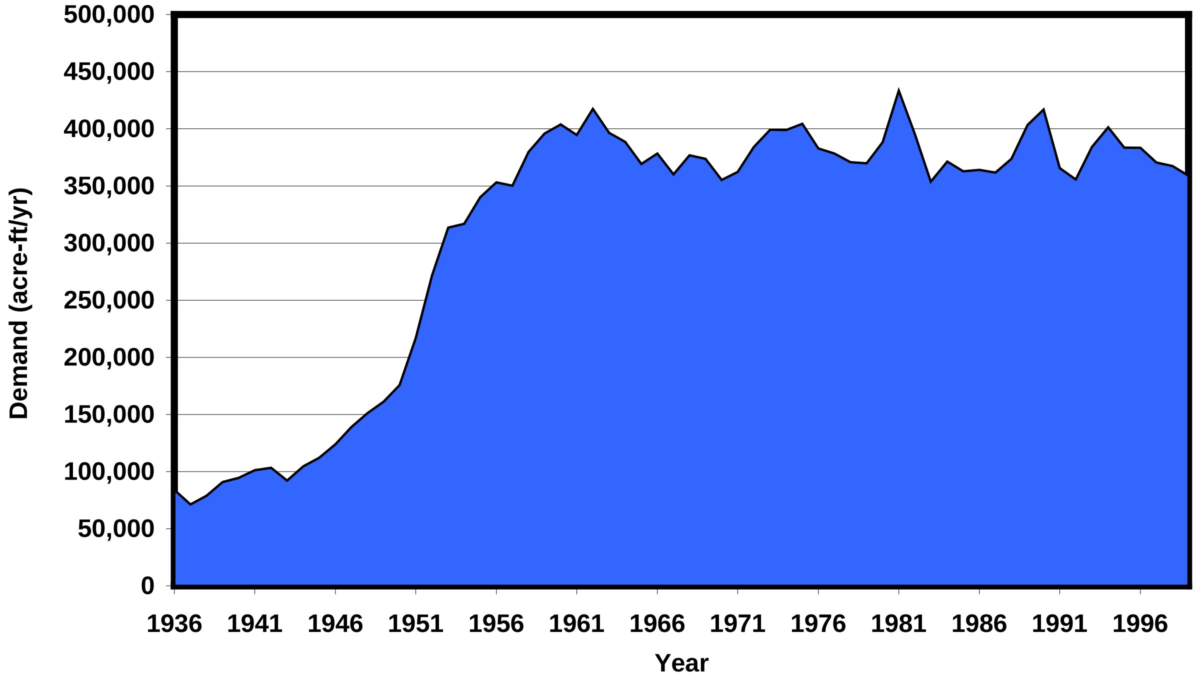
Source: Billing Database (CVWD, 2004a)
1. Residential: Single dwelling and churches
2. Multiple Dwelling: Condominiums having 4 or more units served by 1 meter
3. Apartments: 4+ units served by 1 meter and units are rented not separately owned
4. Served by a master meter
5. Business: Guardhouses, offices, drinking fountains, ice makers, etc.
6. Commercial: Water required for business such as laundry, nursery, beauty salon, clubhouse, restaurant, etc.
7. Public Agency: Hospitals, schools, fire stations, fire protection
8. Irrigation: Landscape, golf courses, swimming pools, rock washing, packing houses, road department

2.4.3 Agricultural Demands

The Coachella Valley is known for its production of a variety of crops including citrus, table grapes, dates and a variety of fruits and vegetables. **Figure 2-6** shows the historical water demand associated with agriculture including greenhouses, fish farms and duck ponds from 1936 to 1999 in the Coachella Valley (CVWD, 2002a).

Agricultural water demand increased dramatically from 1936 to the early 1960s, especially after Canal water became available. Since that time, demand has decreased slightly due to improved irrigation efficiency and development of agricultural land for urban uses, with variation due to weather and crop patterns. As of 1999, agricultural demand was 54 percent of the total Coachella Valley demand and 80 percent of the Lower Valley demand (CVWD, 2002a). The agricultural demand served by CVWD from the Coachella Canal in 2004 was 235,019 acre-ft/yr. Agricultural demand met by private groundwater production is estimated to be about 83,700 acre-ft/yr (CVWD, 2005a). Total agricultural demand for 2004 was estimated to be about 318,700 acre-ft/yr.

Figure 2-6
Historical Agricultural Demand



Source: (CVWD, 2002a)

2.4.4 Groundwater Replenishment

Three areas of the Coachella Valley are currently being recharged to replenish overdrafted aquifers. These areas are the upper and lower Whitewater River subbasins and the Mission Creek subbasin. These subbasins are described in **Section 3**.

A groundwater replenishment program using SWP exchange water has been implemented in the upper Whitewater River subbasin. CVWD and DWA hold an agreement with Metropolitan to exchange, on an acre-foot-for-acre-foot basis, CVWD's and DWA's SWP water for a like amount of Metropolitan's Colorado River water. This exchange agreement is described in **Section 3**. The exchange water is diverted to a series of 19 CVWD-owned recharge basins, where it percolates to replenish groundwater. In 1973, CVWD and DWA started spreading the water exchanged with Metropolitan. As of December 2004, more than 1.8 million acre-ft of Colorado River water have been delivered through the SWP Exchange program since its inception in 1973. A replenishment program using SWP Exchange Water has also recently started in the Mission Creek subbasin. This water is delivered and recharged by DWA.

Two pilot direct recharge programs are currently operating in the Lower Whitewater River Subbasin Management Area, the Dike 4 Pilot Recharge facility and the Martinez Canyon Pilot Recharge facility. Without recharge, groundwater levels are projected to decrease 70 to nearly

200 ft over the 36-year planning period within the Lower Whitewater River Subbasin Management Area.

In 2004, CVWD recharged 3,450 acre-ft/yr at the Dike 4 Pilot Recharge facility. The annual amounts of water delivered for recharge are shown in **Table 2-7**. Since 1997, 17,447 acre-ft of water has been recharged at Dike 4. Recharge at the Martinez pilot facility commenced operation in late March 2005.

Table 2-7
Historical Annual Groundwater Recharge Water Deliveries

Calendar Year	Recharge Facility (acre-ft/yr)			
	Whitewater Spreading Facility [1]	Dike 4 Pilot Recharge Facility	Mission Creek Spreading Facility [1]	Total
1995	61,318	--	--	61,318
1996	138,266	--	--	138,266
1997	113,677	415	--	114,092
1998	132,455	1,364	--	133,819
1999	90,601	2,802	--	93,403
2000	72,269	1,813	--	74,082
2001	707	3,572	--	4,279
2002	33,435	2,360	4,733	40,528
2003	843	1,671	--	2,514
2004	13,244	3,450	5,564	22,258
Total	**656,815**	**17,447**	**10,297**	**684,559**

Source: CVWD Engineer's Reports (CVWD, 2005b, 2005c and 2005d).
1. Total of CVWD and DWA deliveries to each facility.

2.5 FUTURE WATER DEMANDS

2.5.1 Domestic Water Demand Projection Methodology

A planning model was used to project the water consumption demands within the CVWD service area between 2005 and 2030. Land use plans, local demographic changes, parcel data, and 2004 CVWD billing data were all integrated to calculate future water demands. Projections for conservation savings and water loss were calculated separately as described in **Section 4** and **Section 2.5.3**, respectively. While the essential aspects of the water demand projection methodology are outlined below, a more rigorous explanation of the methodology and a detailed sample calculation is provided in **Appendix E**.

Local demographic changes were analyzed using land use data and SCAG projections of population, households and employment for each city and census tract combination. Land use data was obtained from Riverside County and associated cities. Since the cities have a variety of land use categories and land use definitions, land use information was categorized according to a single land use index as shown in **Table 2-8**.

Figure 2-7 shows the land use designations throughout the CVWD service area at buildout.

Table 2-8
Land Use Classification Summary

Land Use Type	Description
Low Density Residential	0-2 dwelling units/acre
Medium Density Residential	2-8 dwelling units/acre
High Density Residential	8+ dwelling units/acre
Mobile Home/Trailer parks	
Hotels and Motels	
Business	Offices, business parks, industrial
Commercial	Shopping centers, convenient stores, entertainment, retail, supermarkets, restaurants, etc.
Public Agency	Parks, community centers, schools, etc.
Irrigated Open Space	Public parks
Non-Irrigated Open Space	Conservation, natural resources, habitat areas, etc.
Native American	Native American owned land
Agriculture	Farm fields and farm homes
Golf Courses	

After land use designations were indexed, detailed parcel data was obtained from geographical information system (GIS) data provided by Riverside County (2005) and by inspection of aerial photographs (AirPhotoUSA, 2005). Parcel data was used to identify vacant or non-vacant lands. In order to capture localized differences in water demand, the CVWD service area was then compartmentalized into 3,322 separate "polygons" which each represented a unique combination of city, census tract, land use, parcel data, pressure zone and tributary area information as seen in **Figure 2-8**.

Using 2004 CVWD billing data, the water usage per meter and the number of water meters for each polygon was then calculated. All future growth in meters was assumed to occur in vacant areas and at a rate proportional to demographic changes in that polygon. The number of meters in polygons designated for conservation, Native American reservations and agricultural lands were assumed to remain constant. **Figure 2-9** shows areas of non-vacant land, areas designated for conservation, agriculture, Native American reservations and vacant land zoned for further development. **Table 2-9** summarizes the areas of non-vacant land, Native American reservations as well as the vacant areas zoned for conservation, agriculture and further development. Since the water usage per meter was assumed to remain constant for all future years, the water demand in each polygon was calculated by multiplying the number of meters projected in future years by the water usage per meter calculated from 2004 CVWD billing data.

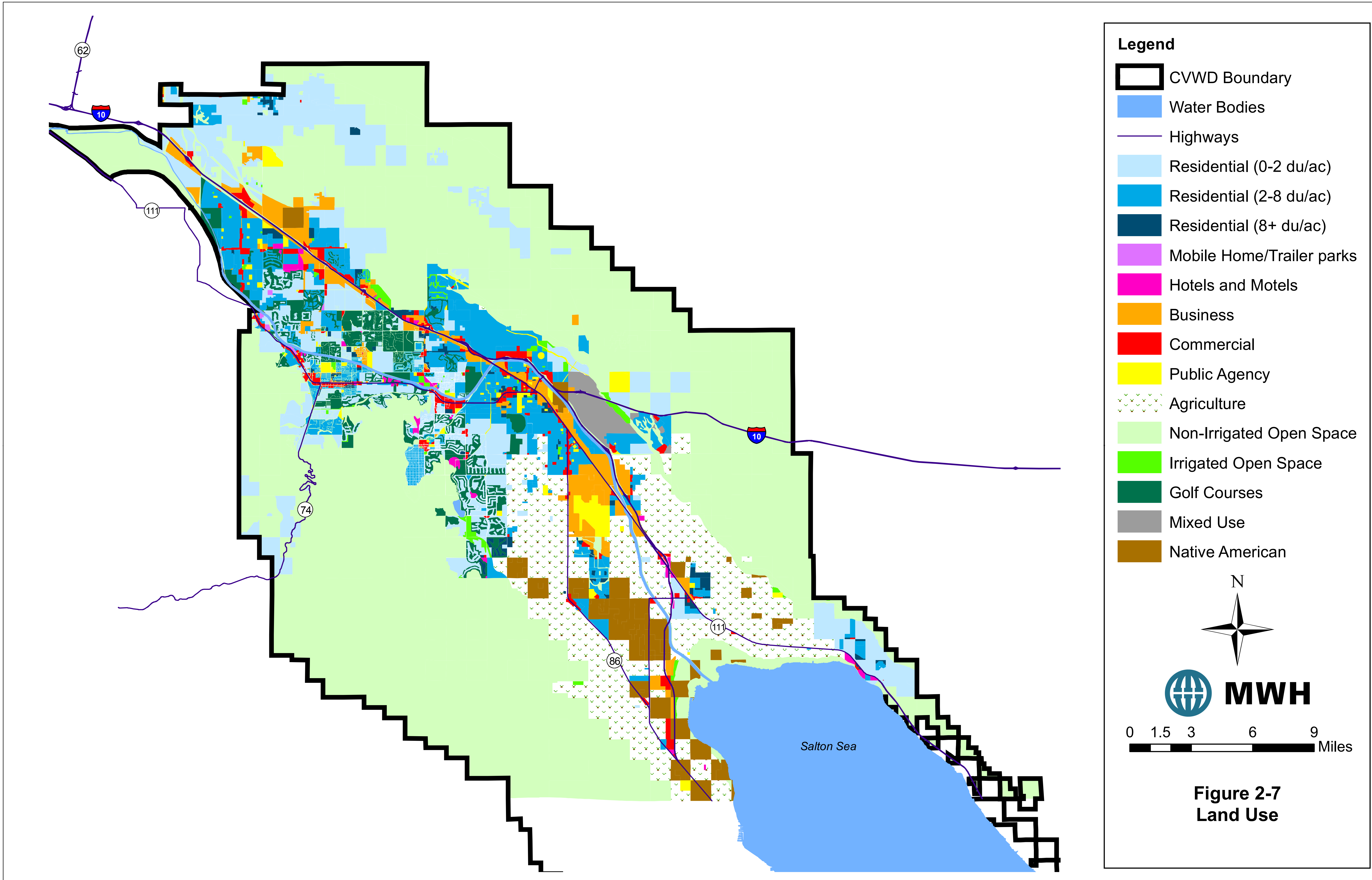


Figure 2-7
Land Use

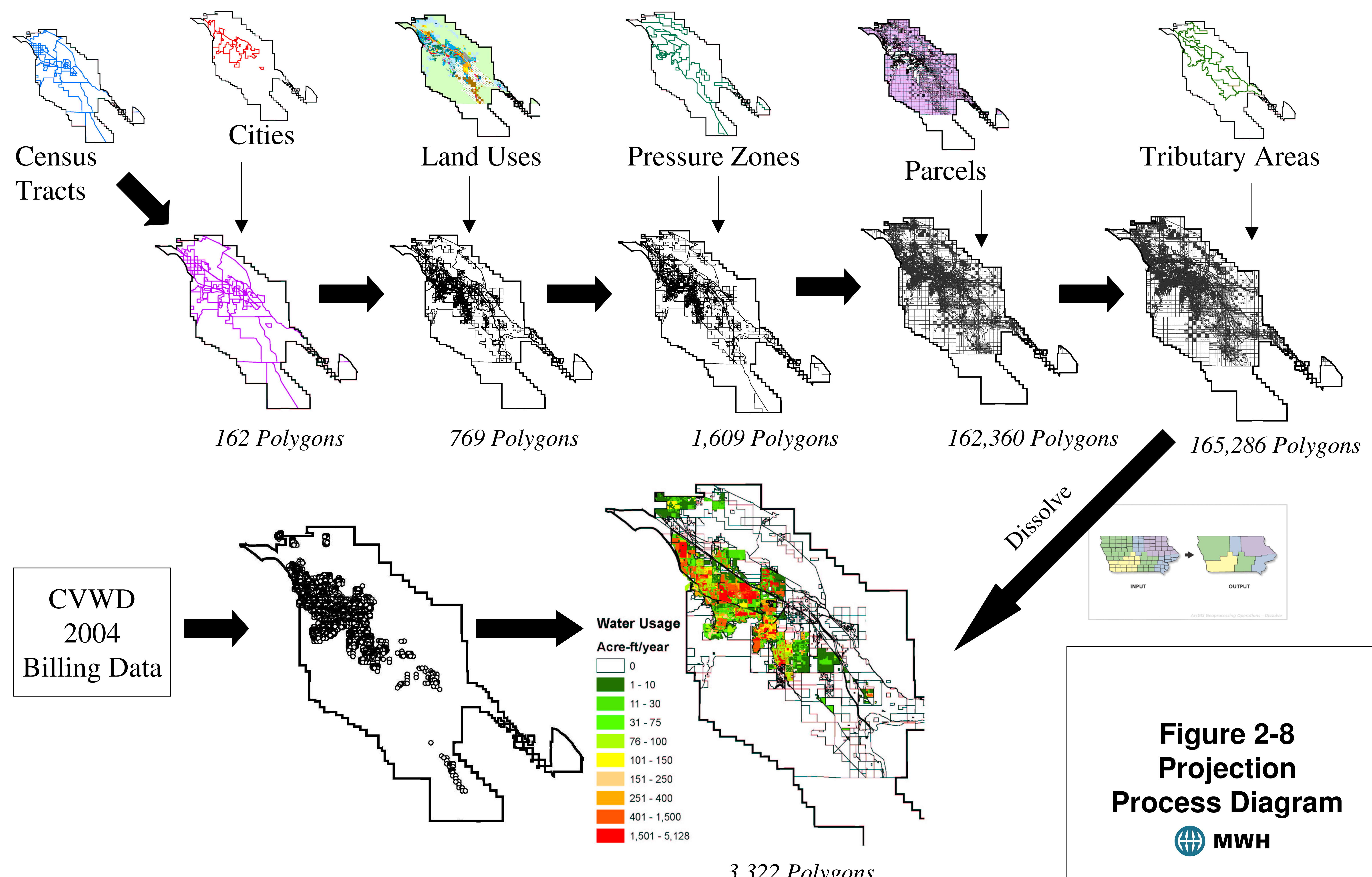


Figure 2-8
Projection Process Diagram
MWH

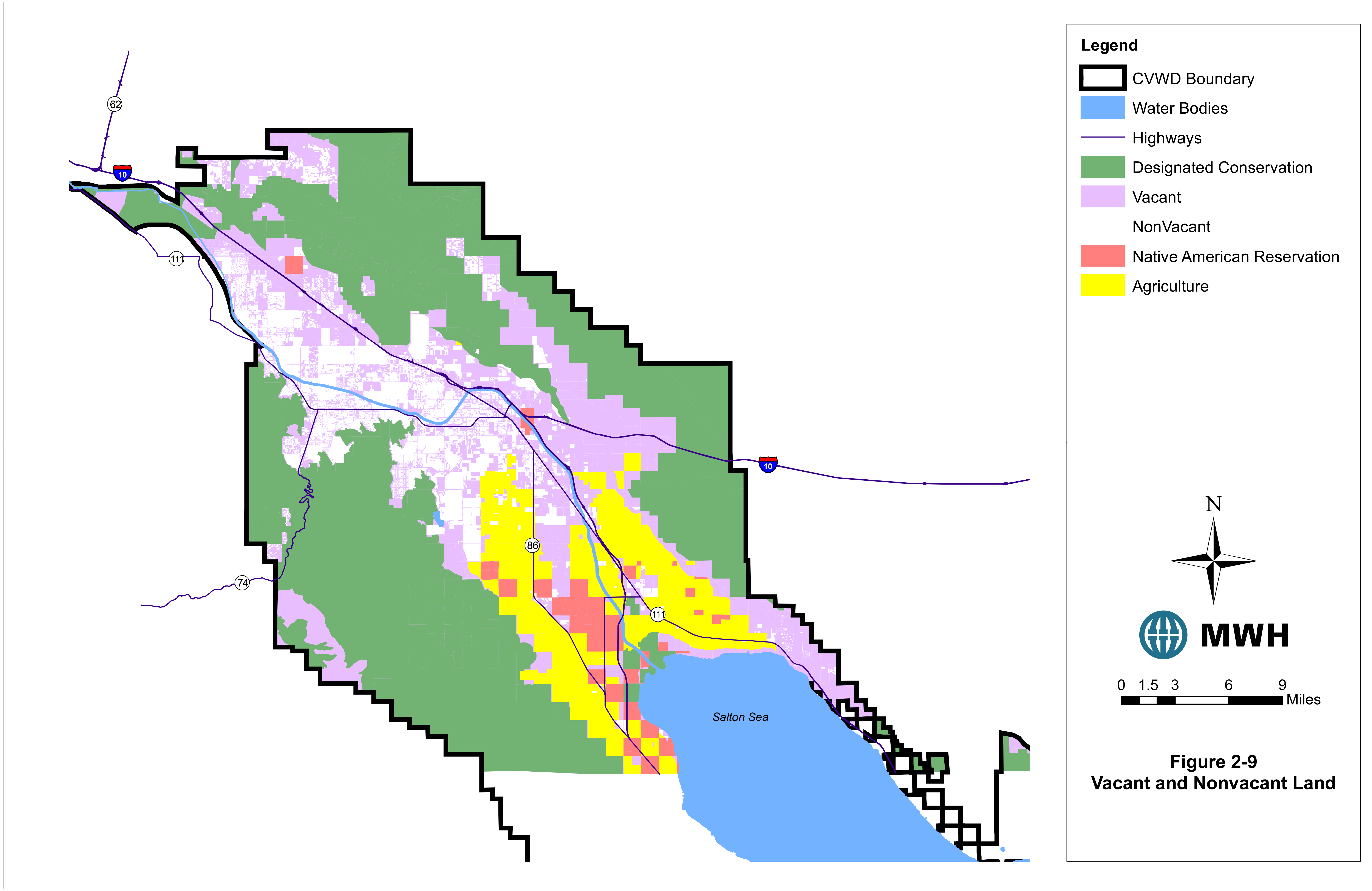


Figure 2-9
Vacant and Nonvacant Land

Table 2-9
Acres of Non-vacant and Vacant Land

Land Type	Acres
Developed	70,403
Conservation	293,515
Agriculture	51,055
Native American	15,059
Vacant for Development	92,903
Total Area	522,936

Source: GIS data from Riverside County, 2005

2.5.2 Future Domestic Water Demand Projection

As described in **Table 2-1**, the population of the CVWD service area is projected to increase from 265,000 in 2005 to 440,000 by 2030. This population increase will result in a substantial increase in water deliveries. The projected water demands for the period 2005 through 2030 in five-year increments is listed in **Table 2-10.**

As shown in **Table 2-10**, the total water consumption is projected to increase from about 123,500 acre-ft/year in 2004 to 213,400 acre-ft/year in 2030. This equates to a water demand increase of 73 percent. The number of accounts is estimated to increase from about 90,150 in 2004 to about 157,300 in year 2030.

2.5.3 Domestic Water Loss

The difference between the volume of water delivered to the distribution system (water production) and metered sales (water consumption) is often referred to as “unaccounted-for-water” or water loss. The historical water production and consumption from 1997-2004 is presented in **Figure 2-10**.

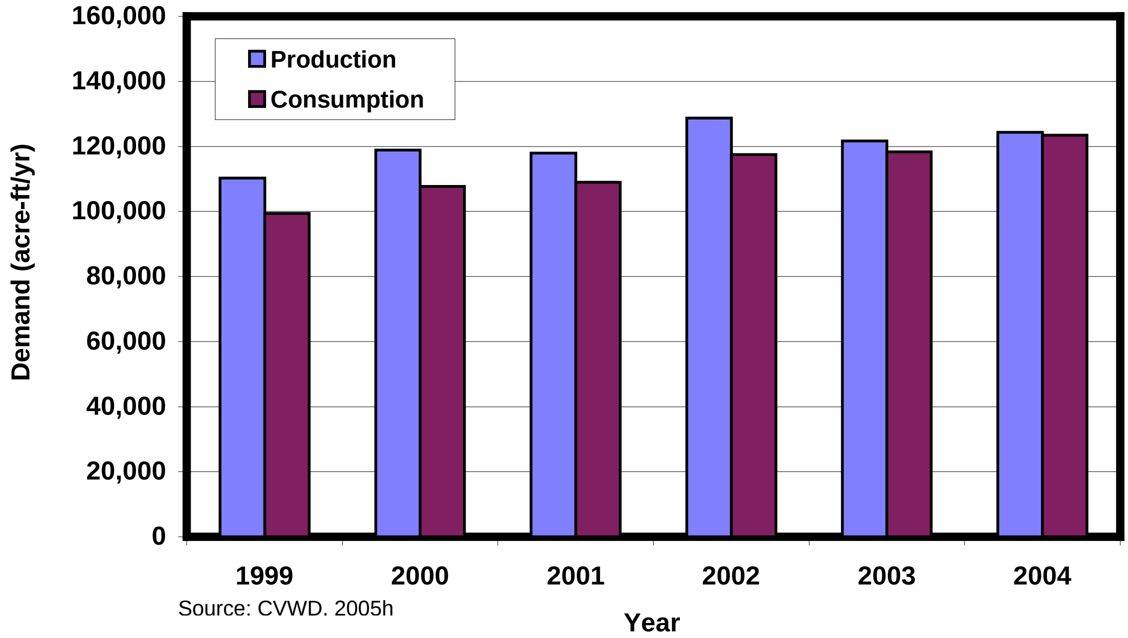
As shown in the figure, the water loss varies from year to year. This variation is typically due to time differences between meter readings for production (water supply) and usage. **Table 2-11** shows both historical and projected water production, consumption and water loss. The water loss in years 1999-2004 was based on historical production and consumption data. Due to insufficient production data in years 2003 and 2004, the average annual water loss for years 1999-2002, or 8.9 percent of consumption, was used to calculate the projected water loss for years 2005 through 2030.

Table 2-10
Past, Current and Projected Domestic Water Consumption

Year	Water Use	Single Family	Multi-Family	Commercial	Public	Irrigation	Temp. Construction[2]	Total
1999[1]	# of accounts	63,695	2,614	2,304	268	2,980	167	72,027
	Deliveries (acre-ft/year)	51,777	9,654	6,104	936	28,355	2,530	99,356
2000[1]	# of accounts	67,008	2,654	2,424	248	3,155	204	75,693
	Deliveries (acre-ft/year)	57,142	9,349	6,444	1,344	30,471	2,991	107,740
2001[1]	# of accounts	70,595	2,708	2,565	242	3,345	215	79,670
	Deliveries (acre-ft/year)	58,253	9,082	6,351	1,105	29,960	4,183	108,934
2002[1]	# of accounts	73,442	2,764	2,719	236	3,575	222	82,957
	Deliveries (acre-ft/year)	62,905	9,275	6,471	1,014	33,317	4,506	117,488
2003[1]	# of accounts	76,469	2,858	2,874	223	3,768	222	86,413
	Deliveries (acre-ft/year)	64,895	9,197	6,512	998	33,320	3,461	118,382
2004[1]	# of accounts	79,685	2,997	3,094	207	3,934	228	90,145
	Deliveries (acre-ft/year)	68,409	9,273	6,821	1,072	34,452	3,460	123,487
2005	# of Accounts	84,943	3,154	3,286	219	4,258	228	96,087
	Deliveries (acre-ft/year)	71,725	9,512	6,036	1,010	38,500	3,460	130,243
2010	# of accounts	99,334	3,887	4,733	263	6,821	228	115,266
	Deliveries (acre-ft/year)	86,813	11,173	9,121	1,278	41,970	3,460	153,814
2015	# of accounts	111,489	4,117	6,258	225	7,869	228	130,186
	Deliveries (acre-ft/year)	100,857	11,948	12,456	1,208	44,177	3,460	174,106
2020	# of accounts	121,876	4,319	7,206	282	8,304	228	142,215
	Deliveries (acre-ft/year)	112,852	12,625	14,620	1,500	45,576	3,460	190,633
2025	# of accounts	129,348	4,485	8,133	339	8,669	228	151,203
	Deliveries (acre-ft/year)	121,736	13,163	16,746	1,796	46,783	3,460	203,685
2030	# of accounts	134,205	4,596	8,910	368	9,005	228	157,313
	Deliveries (acre-ft/year)	128,260	13,567	18,381	1,981	47,762	3,460	213,410

1. Source: BV, 2004
2. Water deliveries and the number of accounts for temporary construction was assumed to remain constant at 2004 levels for all future years

Figure 2-10
Historical Water Consumption and Production



Source: CVWD. 2005h

Table 2-11
Historical and Projected Domestic Water Loss

Year[3]	Production[1] (acre-ft/yr)	Consumption[2] (acre-ft/yr)	Water Loss (acre-ft/yr)	Percent Water Loss
1999	110,295	99,356	10,939	9.9%
2000	118,903	107,740	11,163	9.4%
2001	117,941	108,934	9,007	7.6%
2002	128,708	117,488	11,220	8.7%
2003	121,718	118,382	3,336	2.7%
2004	124,381	123,487	894	0.7%
2005	142,991	130,243	12,748	8.9%
2010	168,869	153,814	15,055	8.9%
2015	191,148	174,106	17,041	8.9%
2020	209,292	190,633	18,659	8.9%
2025	223,621	203,685	19,936	8.9%
2030	234,298	213,410	20,888	8.9%

1. Source: Engineer's Report on Water Supply and Replenishment Assessment, (CVWD, 2005b, 2005c, and 2005d) and CVWMP (CVWD, 2002a)
2. Source: Historical data from BV, 2004
3. Data for future years is taken from model output

2.5.4 Non-Potable Water Usage

As described earlier in this section, CVWD delivers Coachella Canal water and recycled water for non-potable irrigation uses. The primary use of Canal water is for agricultural irrigation. However, Canal water is also used for golf course and other landscape irrigation in the Lower Valley. Recycled water is used for golf course and common area irrigation in the Upper Valley.

Local groundwater is produced for agricultural, golf course and other irrigation by many private pumpers. In the Upper Valley, groundwater production and usage is metered and reported to CVWD to determine groundwater replenishment assessments for each producer. In the Lower Valley, CVWD implemented a groundwater replenishment assessment in January 2005. Because many wells in the Lower Valley are not yet metered, there is incomplete information on current non-potable water demand using groundwater. Groundwater pumping for non-potable use within the CVWD service area was estimated to be about 160,000 acre-ft in 2005 (CVWD 2002a). In the absence of the CVWMP, this pumping is projected to increase to about 190,000 acre-ft/yr in 2030.

Implementation of the CVWMP includes the conversion of a portion of the non-potable groundwater pumping to Canal water or recycled water to reduce groundwater overdraft. The CVWMP estimated the future demand for agricultural and other non-potable water use through the year 2035 that would be served by CVWD. Those demand estimates are presented in **Table 2-12**.

Table 2-12
Historical and Future CVWD Non-Potable Water Demand

Year	Use Type (acre-ft/yr)		
	Agriculture[1]	Golf Course and Municipal[2]	Total
1999	279,219	6,902	286,121
2000	280,599	6,711	287,310
2001	269,106	6,546	275,652
2002	278,138	6,237	284,375
2003 [3]	243,606	5,639	249,245
2004 [3]	235,019	6,535	241,554
2005	274,200	35,800	310,000
2010	283,500	67,200	350,700
2015	291,000	90,100	381,100
2020	291,600	90,100	381,700
2025	314,600	90,100	404,700
2030	320,800	92,400	413,200

1. Historical Canal water deliveries include delivery to golf courses and municipal landscape irrigation.
2. Historical golf course and municipal non-potable demand is from use of recycled water.
3. Agricultural demands were reduced in 2003 and 2004 due to temporary reductions in Canal water availability

2.5.5 Groundwater Recharge

As described in **Section 2.4.4**, CVWD and DWA operates groundwater recharge programs in the upper Whitewater River and Mission Creek subbasins. CVWD is conducting pilot recharge tests in the lower Whitewater River subbasin. As part of the CVWMP, CVWD and intends to significantly expand its groundwater recharge program in the Whitewater River subbasin.

CVWD is currently conducting engineering and environmental studies leading to the selection of a specific site at Dike 4 for construction of a large-scale recharge facility. The CVWMP indicates this facility should be able to recharge approximately 40,000 acre-ft/yr. This facility is anticipated to be operational in 2006 or 2007.

Groundwater is also being directly recharged in the Martinez Canyon alluvial fan. CVWD completed construction of a pilot recharge facility and several monitoring wells in this area in March 2005. This facility is designed to recharge approximately 3,000 acre-ft/yr. If the Martinez pilot recharge program is successful, CVWD plans to construct a large-scale recharge facility that could recharge approximately 40,000 acre-ft/yr. The large-scale recharge facility is anticipated to be operational in about six years.

Groundwater recharge in the Mission Creek subbasin commenced in 2004 using SWP Exchange water. This program is jointly administered by CVWD and DWA with facilities constructed operated by DWA. This program is expected to increase as groundwater extraction increases to meet projected growth.

Table 2-13 presents the current estimated groundwater recharge demand for the period 2005-2030.

Table 2-13
Projected Groundwater Recharge Demand

Year [1]	Recharge Facility (acre-ft/yr)				
	Whitewater Spreading Facility [2]	Dike 4 Spreading Facility	Martinez Canyon Spreading Facility	Mission Creek Spreading Facility [2]	Total
2005	140,000	3,000	3,000	8,300	154,300
2010	122,600	20,000	3,000	11,200	156,800
2015	100,300	40,000	6,000	14,100	160,400
2020	101,000	40,000	30,000	16,100	187,100
2025	101,700	40,000	40,000	17,800	199,500
2030	102,300	40,000	40,000	19,100	201,400

Source: CVWD, 2002a
Notes:
1. Values shown for 2005 are based on anticipated operations. Actual values may be higher based on imported water availability. Values for 2010 through 2030 represent average annual values based on anticipated water availability.
2. Water recharged at Whitewater and Mission Creek facilities is the joint responsibilities of CVWD and DWA.

2.5.6 Total Projected Water Uses

Table 2-14 presents the total projected water uses for the CVWD service area for the period 2005 through 2030. As described in **Section 4,** passive water conservation is conservation, which is accomplished by customers upgrading their plumbing, water fixtures and water using appliances without incentives from their water provider. Active water conservation is defined as reduction in water used due to a direct incentive program being implemented by CVWD. Since passive conservation savings are already embedded within 2004 CVWD billing data, additional passive conservation is calculated by subtracting the calculated 2004 CVWD passive conservation savings from passive conservation savings in future years. Additional water conservation will be implemented as defined in the CVWMP; however, estimates of these potential conservation savings are not included in **Table 2-14**. Net consumption is consumption including savings from passive conservation and active conservation. The subtotal-domestic includes net consumption and water loss. Groundwater recharge is excluded from the total demand because groundwater recharge becomes a portion of the supply used to meet domestic and non-potable demands.

Table 2-14
Total Projected Water Demand with Conservation

Usage Category	Water Usage (acre-ft/yr)					
	2005	**2010**	**2015**	**2020**	**2025**	**2030**
Domestic Water Demand						
Consumption	130,243	153,814	174,106	190,633	203,685	213,410
Additional Passive Conservation	-625	-734	-836	-930	-1,018	-1,101
Active Conservation	0	-454	-907	-1,334	-1,736	-2,109
Net Consumption	129,618	152,626	172,363	188,369	200,931	210,200
Water Loss	12,748	15,055	17,041	18,659	19,936	20,888
Subtotal - Domestic	*142,366*	*167,681*	*189,404*	*207,028*	*220,867*	*231,088*
Non-potable Water Demand	310,000	350,700	381,100	381,700	404,700	413,200
Total Water Demand	**452,366**	**518,381**	**570,504**	**588,728**	**625,567**	**644,288**
Groundwater Recharge	**154,300**	**156,800**	**160,400**	**187,100**	**199,500**	**201,400**

Section 3
Water Supplies

3.1 LAW

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(a) 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

(b). 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 replace that source with alternative sources or water demand management measures, to the extent practicable.

(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.

This section describes the existing and future water supplies available to CVWD to meet its domestic and non-potable water demands. Water supply reliability is presented for normal, single dry and multiple dry years.

3.2 EXISTING WATER SUPPLIES

The principal water supplies of the Coachella Valley are local groundwater, imported Colorado River water and imported SWP water. The Coachella Canal, which brings in Colorado River water from the All-American Canal near the Mexico-U.S. border, traverses the southeastern margin of the Valley. The Canal turns southwest around the northern end of Indio and terminates at man-made Lake Cahuilla, south of La Quinta. Imported water is also obtained from the SWP, which is exchanged with Metropolitan for water from its Colorado River Aqueduct north of Palm Springs. Other water resources include local surface runoff, and treated municipal effluent.

Precipitation in this arid region is only 3 to 6 inches/yr (on average) and does not directly provide significant additional water supply because most of the precipitation evaporates or is consumed by the native vegetation. However, the aquifers are recharged by precipitation and runoff from the local mountains. During heavy storms, precipitation can generate measurable runoff that either percolates into the groundwater basin or flows into Whitewater River and ultimately to the Salton Sea.

3.2.1 Groundwater

Groundwater is the principal source of municipal water supply in the Coachella Valley. CVWD serves domestic water to most of the developed portions of the Coachella Valley and along both sides of the Salton Sea in Imperial Valley. CVWD obtains water from both the upper and lower Whitewater River subbasins and the Mission Creek subbasin. A common groundwater source, the Whitewater River subbasin, is shared by CVWD, Desert Water Agency, the cities of Indio and Coachella, and numerous private groundwater producers. The basin is divided into the upper and lower subbasins, with an estimated total storage of 30 million acre feet of water. The cities of Indio and Coachella obtain water from the lower subbasin. The Mission Creek subbasin is a common supply that is utilized by CVWD, Mission Springs Water District and private groundwater producers. Both CVWD and DWA have the legal authority to manage the groundwater basins within their respective service areas. Subject to certain legal requirements, each agency may utilize an assessment on groundwater pumping to finance the acquisition of imported and recycled water supplies and to recharge the groundwater basins. The following presents a description of the groundwater basins, historical production, groundwater levels and estimates of overdraft.

Groundwater Basin Description

The Coachella Valley groundwater basin, as described by the California Department of Water Resources (DWR), is bounded on the easterly side by the non-waterbearing crystalline rocks of the San Bernardino and Little San Bernardino Mountains and on the westerly side by the crystalline rocks of the Santa Rosa and San Jacinto Mountains. The trace of the Banning fault on the north side of San Gorgonio Pass forms the upper boundary.

The lower boundary is formed primarily by the watershed of the Mecca Hills and by the northwest shoreline of the Salton Sea running between the Santa Rosa Mountains and Mortmar. Between the Salton Sea and Travertine Rock, at the base of the Santa Rosa Mountains, the lower boundary roughly coincides with the Riverside/Imperial County Line.

Southerly of the lower boundary (Mortmar and Travertine Rock), the subsurface materials are predominantly fine-grained and low in permeability; although groundwater is present, it is not readily extractable. A zone of transition exists at these boundaries. To the north, the subsurface materials are coarser and more readily yield groundwater.

Although there is interflow of groundwater throughout the groundwater basin, fault barriers, constrictions in the basin profile and areas of low permeability limit and control movement of groundwater. Based on these factors, the groundwater basin has been divided into subbasins and subareas as described by DWR in 1964 and the United States Geological Survey (USGS) in 1971.

The boundaries between subbasins within the groundwater basin are generally based upon faults that are effective barriers to the lateral movement of groundwater. Minor subareas have also been delineated, based on one or more of the following geologic or hydrologic characteristics: type of waterbearing formations, water quality, areas of confined groundwater, forebay areas, groundwater flow divides and surface drainage divides.

The following is a list of the subbasins and associated subareas for the Lower and Upper Valleys, based on the DWR and USGS designations:

- Mission Creek subbasin
- Desert Hot Springs subbasin
- Garnet Hill subbasin
- Whitewater River subbasin
- Palm Springs subarea
- Thermal subarea
- Thousand Palms subarea
- Oasis subarea

Figure 3-1 shows the locations of the above described subbasins. The following areas are those within the Coachella Valley Water District boundaries where a supply of potable groundwater is not readily available:

- Indio Hills area
- Mecca Hills area
- Barton Canyon area
- Bombay Beach area which is adjacent to the Salton Sea
- Salton City area which is adjacent to the Salton Sea

Groundwater is pumped and exported from the Coachella Valley to meet water demands in these areas.

Mission Creek Subbasin

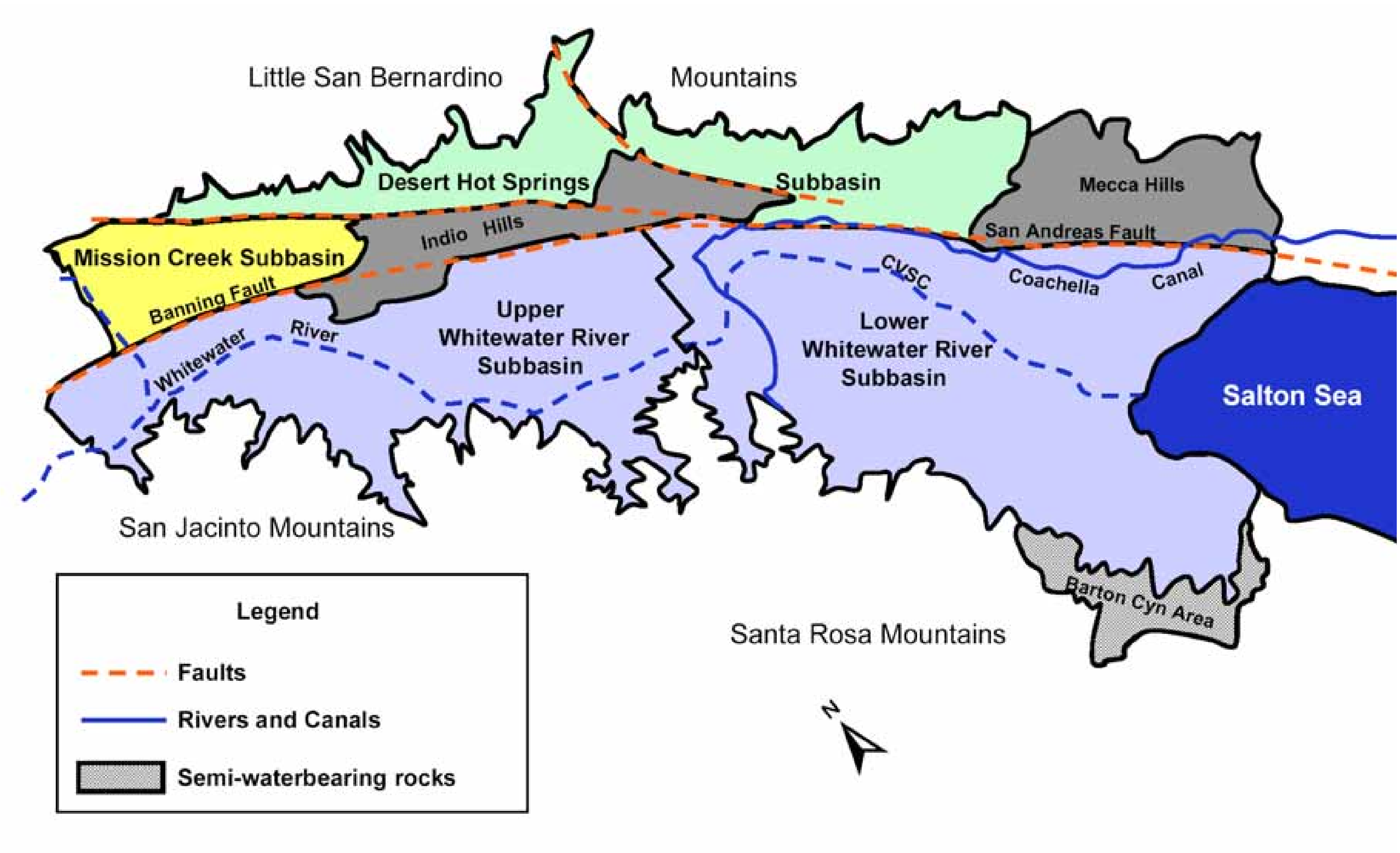
Waterbearing materials underlying the Mission Creek upland comprise the Mission Creek subbasin. The subbasin is bounded on the south by the Banning fault and on the north and east by the Mission Creek fault. It is bordered on the west by non-waterbearing rocks of the San Bernardino Mountains. To the southeast of the subbasin are the Indio Hills. The area within this boundary reflects the estimated limit of effective storage within the subbasin.

Both the Mission Creek fault and the Banning fault are effective barriers to groundwater movement, as evidenced by offset water levels, fault springs, and changes in vegetation. Water level differences across the Banning fault, between the Mission Creek and Garnet Hill subbasins, are on the order of 200 to 250 feet. Similar water level differences exist across the Mission Creek fault between the Mission Creek and Desert Hot Springs subbasins.

Desert Hot Springs Subbasin

The Desert Hot Springs subbasin is bounded to the north by the Little San Bernardino Mountains and to the southeast by the Mission Creek and San Andreas faults. The San Andreas fault separates the Desert Hot Springs subbasin from the Whitewater River subbasin and serves as an effective barrier to groundwater flow. The subbasin has been divided into three subareas: Miracle Hill, Sky Valley and Fargo Canyon. The Desert Hot Springs subbasin is not extensively developed except in the area of Desert Hot Springs. Relatively poor groundwater quality has limited the use of this subbasin for groundwater supply. The Miracle Hill subarea is characterized by hot mineralized groundwater, which supplies a number of spas in the area.

Figure 3-1
Groundwater Sub-basins in the Coachella Valley



Source: Engineer's Report for Lower Whitewater River Subbasin Area of Benefit, CVWD, 2005b

Garnet Hill Subbasin

The area between the Garnet Hill fault and the Banning fault, named the Garnet Hill subarea by DWR (1964), was considered a distinct subbasin by the USGS because of the effectiveness of the Banning and Garnet Hill faults as barriers to groundwater movement. This is illustrated by a difference of 170 feet in groundwater level elevation in a horizontal distance of 3,200 feet across the Garnet Hill fault, as measured in the Spring of 1961. The fault does not reach the surface and is probably effective as a barrier to groundwater movement only below a depth of about 100 feet.

Although some recharge to this subbasin may come from Mission Creek and other streams that pass through during periods of high flood flows, the chemical character of the groundwater plus its direction of movement indicate that the main source of recharge to the subbasin comes from the Whitewater River through the permeable deposits which underlie Whitewater Hill. Based on groundwater level measurements, this area is partially influenced by artificial recharge activities at the Whitewater Spreading Facilities at Windy Point.

Whitewater River Subbasin

The Whitewater River subbasin, known also as the Indio subbasin, comprises the major portion of the floor of the Coachella Valley and encompasses approximately 400 square miles. Beginning approximately one mile west of the junction of State Highway 111 and Interstate 10, the Whitewater River subbasin extends southeast approximately 70 miles to the Salton Sea. The subbasin is bordered on the southwest by the Santa Rosa and San Jacinto Mountains, and is separated from Garnet Hill, Mission Creek and Desert Hot Springs subbasins to the north and east by the Garnet Hill and San Andreas faults.

The limit of the Whitewater River subbasin along the base of the San Jacinto Mountains and the northeast portion of the Santa Rosa Mountains coincides with the Coachella Valley groundwater basin boundary. The Whitewater River subbasin in this vicinity includes only the recent terraces and alluvial fans. The Garnet Hill fault, which extends southeastward from the north side of San Gorgonio Pass to the Indio Hills, is a relatively effective barrier to groundwater movement in the Garnet Hill subbasin. The San Andreas Fault, extending southeastward from the junction of the Mission Creek and Banning faults in the Indio Hills and continuing out of the basin on the east flank of the Salton Sea, is also an effective barrier to groundwater movement.

The Whitewater River subbasin is divided into four subareas: Palm Springs, Thermal, Thousand Palms, and Oasis subareas. The Palm Springs subarea is the forebay or main area of recharge to the subbasin, and the Thermal subarea comprises the pressure or confined area within the basin. The other two subareas are peripheral areas having unconfined groundwater conditions.

The historical fluctuations of water levels within the Whitewater River subbasin indicate a steady decline in the levels throughout the subbasin prior to 1949. After 1949, levels in the lower Thermal subarea (south of Point Happy), where imported Colorado River water is used for irrigation, rose sharply, although water levels continued to decline elsewhere in the subbasin.

With the use of Colorado River water from the Coachella Canal, the demand on the groundwater basin in the lower Coachella Valley (generally east and south of Washington Street below Point

Happy) declined. Water levels in the deeper aquifers rose from 1950 to the early 1970s. However, water levels in this area have again declined, due to increasing urbanization and groundwater usage.

Palm Springs Subarea. The triangular area between the Garnet Hill fault and the east slope of the San Jacinto Mountains southeast to Cathedral City is designated the Palm Springs subarea, and is an area in which unconfined groundwater occurs. The Coachella Valley fill materials within the subarea are essentially heterogeneous alluvial fan deposits exhibiting little sorting and with little fine grained material content. The thickness of these waterbearing materials is not known; however, it exceeds 1,000 feet. Although no lithologic distinction is apparent from well drillers' logs, the probable thickness of Recent deposits suggests that Ocotillo conglomerate underlies Recent fanglomerate in the subarea at depths ranging from 300 to 400 feet.

Natural recharge to the aquifers in the Whitewater River subbasin occurs primarily in the Palm Springs subarea. The major natural sources include infiltration of stream runoff from the San Jacinto Mountains and the Whitewater River, and subsurface inflow from the San Gorgonio Pass subbasin to the west. Deep percolation of direct precipitation on the Palm Springs subarea is considered negligible as it is consumed by evapotranspiration.

Before the current artificial recharge program began at Whitewater, the depth to water in the subarea ranged from 200 feet below the ground surface near Cathedral City to nearly 500 feet deep at the northwestern end of the subbasin near the spreading works downstream of Windy Point.

Thermal Subarea. Groundwater of the Palm Springs subarea moves southeastward into the interbedded sands, silts, and clays underlying the central portion of the Coachella Valley. The division between the Palm Springs subarea and the Thermal subarea is near Cathedral City. The permeabilities parallel to the bedding of the deposits in the Thermal subarea are several times the permeabilities perpendicular to the bedding and, therefore, movement of groundwater parallel to the bedding predominates. Confined or semi-confined groundwater conditions are present in the major portion of the Thermal subarea. Movement of groundwater under these conditions is caused by differences in piezometric (pressure) level or head. Unconfined or free water conditions are present in the alluvial fans at the base of the Santa Rosa Mountains, as in the fans at the mouth of Deep Canyon and in the La Quinta area.

Sand and gravel lenses underlying this subarea are discontinuous and clay beds are not extensive. However, two aquifer zones separated by a zone of finer-grained materials were identified from well logs. The fine grained materials within the intervening horizontal plane are not tight enough or persistent enough to completely restrict the vertical interflow of water, or to assign the term "aquiclude" to it. Therefore, the term "aquitard" is used for this zone of less permeable material that separates the Upper and Lower aquifer zones in the southeastern part of the Coachella Valley. Capping the Upper aquifer at the surface are tight clays and silts with minor amounts of sands. Semi-perched groundwater occurs in this capping zone, which is up to 100 feet thick.

The Lower aquifer zone, composed of part of the Ocotillo conglomerate, consists of silty sands and gravels with interbeds of silt and clay. It is the most important source of groundwater in the

Whitewater River subbasin. The top of the Lower aquifer zone is present at a depth ranging from 300 to 600 feet below the surface. The thickness of the zone is undetermined, as the deepest wells present in the Coachella Valley have not penetrated it in its entirety. The available data indicate that the zone is at least 500 feet thick and may be in excess of 1,000 feet thick.

The aquitard overlying the Lower aquifer zone is generally 100 to 200 feet thick although, in small areas on the periphery of the Salton Sea, it is in excess of 500 feet in thickness. North and west of Indio, the aquitard is apparently lacking in a curving zone approximately one mile wide and no distinctions are made between the Upper and Lower aquifer zones.

The Upper aquifer zone in the Thermal subarea is similar in lithology to the Lower aquifer, although it is not as thick. Subsurface inflow to the Upper aquifer zone is less than that to the Lower aquifer zone. When water levels in the Palm Springs subarea drop, the cross-sectional area of the Upper aquifer zone available for recharge at Point Happy is reduced, thereby reducing groundwater movement to the southeast.

Capping the Upper aquifer zone in the Thermal subarea is a shallow fine-grained zone in which semi-perched groundwater is present. This zone consists of recent silts, clays, and fine sands and is relatively persistent southeast of Indio. It ranges from zero to 100 feet thick and is generally an effective barrier to deep percolation. However, north and west of Indio, the zone is composed mainly of clayey sands and silts and its effect in retarding deep percolation is limited. The low permeability of the materials southeast of Indio has contributed to the irrigation drainage problems of the area. Semi-perched groundwater has been maintained by irrigation water applied to agricultural lands south of Point Happy necessitating the construction of an extensive subsurface tile drain system.

The Thermal subarea contains the division between the upper and lower Whitewater River subbasin and their respective groundwater tables. Primarily due to the application of imported water from the Coachella Canal, and an attendant reduction in groundwater pumpage, the water table in the area southerly from Point Happy (in La Quinta) rose until the early 1970s, while the water table in the area northerly from Point Happy was dropping. This division forms the lower (southern) boundary of the management area of the DWA/CVWD Management Agreement. Water table measurements have shown no distinction between the Palm Springs subarea and the Thermal subarea. The only distinction has been the hinge effect in the Thermal subarea at Point Happy, where groundwater levels until recently were stabilized, neither rising nor falling significantly. As discussed elsewhere, this is changing, as increased pumpage is again lowering the groundwater levels in the lower Whitewater River subbasin. CVWD recently completed a study to evaluate the entire groundwater basin. This led to the development and adoption of the valley-wide CVWMP in 2002.

Thousand Palms Subarea. The small area along the southwest flank of the Indio Hills is named the Thousand Palms subarea. The southwest boundary of the subarea was determined by tracing the limit of distinctive groundwater chemical characteristics. Whereas calcium bicarbonate water is characteristic of the major aquifers of the Whitewater River subbasin, water in the Thousand Palms subarea is sodium sulfate in character.

The quality differences suggest that recharge to the Thousand Palms subarea comes primarily from the Indio Hills and is limited in supply. The relatively sharp boundary between chemical characteristics of water derived from the Indio Hills and groundwater in the Thermal subarea suggests there is little intermixing of the two waters.

The configuration of the water table north of the community of Thousand Palms is such that the generally uniform, southeast gradient in the Palm Springs subarea diverges and steepens to the east along the base of Edom Hill. This steepened gradient suggests a barrier to the movement of groundwater, or a reduction in permeability of the water bearing materials. A southeast extension of the Garnet Hill fault would also coincide with this anomaly. However, there is no surface expression of such a fault, and the gravity measurements taken during the 1964 DWR investigation do not suggest a subsurface fault. The residual gravity profile across this area supports these observations. The sharp increase in gradient is therefore attributed to lower permeability of the materials to the east. Most of the Thousand Palms subarea is located within the upper Whitewater River subbasin.

Oasis Subarea. Another peripheral zone of unconfined groundwater that is different in chemical characteristics from water in the major aquifers of the Whitewater River subbasin is found underlying the Oasis Piedmont slope. This zone, named the Oasis subarea, extends along the base of the Santa Rosa Mountains. Waterbearing materials underlying the subarea consist of highly permeable fan deposits. Although groundwater data suggest that the boundary between the Oasis and Thermal subareas may be a buried fault extending from Travertine Rock to the community of Oasis, the remainder of the boundary is a lithologic change from the coarse fan deposits of the Oasis subarea to the interbedded sands, gravel and silts of the Thermal subarea. Little information is available as to the thickness of waterbearing materials, but it is estimated to be in excess of 1,000 feet.

Groundwater Storage

In 1964, DWR estimated that the subbasins in the Coachella Valley groundwater basin contained approximately 39,200,000 acre-feet (acre-ft) of water (in the first 1,000 feet below the ground surface). The capacities of the subbasins are shown in **Table 3-1**.

Historical and Future Production

For management purposes, the Coachella Valley has been divided into three management areas: the upper Whitewater River, lower Whitewater River and Mission Creek subbasins. These management areas are defined by the respective areas that receive benefit from groundwater recharge activities. Groundwater rights in these subbasins are not adjudicated. Instead, groundwater production within these areas of benefit is subject to a replenishment assessment that recovers the costs of groundwater management and water used for groundwater recharge. The Desert Hot Springs and Garnet Hill subbasins are not currently within a management area and there is no municipal groundwater production from these subbasins.

Table 3-1
Coachella Valley Groundwater Basin-Groundwater Storage Capacity

Area	Storage (Acre-ft)[1]
San Gorgonio Pass Subbasin[2]	2,700,000
Mission Creek Subbasin	2,600,000
Desert Hot Springs Subbasin	4,100,000
Garnet Hill Subbasin	1,000,000
Subtotal	**10,400,000**
Whitewater River Subbasin	
Palm Springs Subarea	4,600,000
Thousand Palms Subarea	1,800,000
Oasis Subarea	3,000,000
Thermal Subarea	19,400,000
Subtotal	**28,800,000**
Total All Subbasins	**39,200,000**

Source: CVWD Engineer's Reports (CVWD, 2005b, 2005c, and 2005d)
1. First 1,000 feet below ground surface. California Department of Water Resources estimate (DWR, 1964).
2. The San Gorgonio Pass subbasin is located to the west of the Whitewater River subbasin and is outside of the planning areas of CVWD and DWA.

Table 3-2 presents the historical and future groundwater production within each subbasin. Groundwater production in the upper Whitewater River subbasin is principally characterized by municipal pumping by DWA and CVWD for domestic water supply and private pumping for golf course and recreational irrigation. CVWD currently accounts for about 45 percent of the pumping from this subbasin. With growth, this amount is expected to increase to about 70 percent in the future. Production in the lower Whitewater River subbasin is characterized by municipal pumping by CVWD, the cities of Indio and Coachella and the Myoma Dunes Mutual Water Company, agricultural pumping for crop irrigation and fish farming, and golf course irrigation. CVWD currently accounts for about 16 percent of the pumping from this subbasin. With growth, this amount is expected to increase to about 46 percent in the future. Production in the Mission Creek sub-basin is characterized by municipal pumping by CVWD and Mission Springs Water District, golf course irrigation and agricultural pumping for fish farming. CVWD currently accounts for about 20 percent of the pumping from this subbasin. With growth, this amount is expected to increase to about 30 percent in the future. These percentages are used to estimate CVWD's relative share of basin inflows and recharge with imported water.

CVWD currently has 107 active groundwater wells for domestic water supply; an additional 37 wells are out of service for water quality or operational reasons. **Table 3-3** summarizes CVWD's historical and future groundwater production for domestic water supply by subbasin. In response to growth, CVWD will gradually increased groundwater production to meet demands. Its policy is to continue meeting domestic demands from groundwater but to transition customers that can use other water supplies to alternate water sources so as to reduce groundwater extraction.

Table 3-2
Historical and Future Groundwater Production by Subbasin for All Producers

Year	Upper Whitewater River [1,2] (acre-ft/yr)	Lower Whitewater River [2] (acre-ft/yr)	Mission Creek [3] (acre-ft/yr)	Total (acre-ft/yr)
1995	176,298	169,400	10,102	355,800
1996	182,626	166,000	10,562	359,188
1997	180,936	165,600	9,899	356,435
1998	184,779	165,500	10,291	360,570
1999	201,368	168,300	10,974	380,642
2000	206,166	166,500	11,838	384,504
2001	203,716	166,300	12,350	382,366
2002	208,898	166,700	13,968	389,566
2003	199,278	199,800 [4]	13,768	412,846
2004	207,605	172,300	16,697	396,602
2005	209,908	156,752	17,363	384,023
2010	197,737	145,663	21,820	365,220
2015	188,394	140,129	26,245	354,768
2020	203,279	149,019	29,352	381,650
2025	218,712	137,700	32,005	388,417
2030	234,173	121,937	34,189	390,299

1. Data from Engineer's Reports for Upper Whitewater River Subbasin Area of Benefit (CVWD, 2005d)
2. Data from CVWMP back-up files (CVWD, 2002a).
3. Data from Engineer's Reports for Mission Creek Subbasin Area of Benefit (CVWD, 2005c). Projected values estimated based on SCAG growth forecasts.
4. Groundwater production temporarily increased due to a reduction in Coachella Canal water deliveries during 2003.

Table 3-3
Historical and Future CVWD Groundwater Production by Subbasin

Year	Upper Whitewater River [1] (acre-ft/yr)	Lower Whitewater River [1] (acre-ft/yr)	Mission Creek (acre-ft/yr)	Total (acre-ft/yr)
1995	74,345	15,256	2,865 [2]	92,466
1996	77,161	15,853	2,838 [2]	95,852
1997	76,001	16,546	2,104 [2]	94,651
1998	84,294	17,621	2,838	104,753
1999	86,144	21,147	3,005	110,296
2000	93,544	22,182	3,177	118,903
2001	92,945	22,572	3,268 [2]	118,785
2002	97,867	23,515	3,360 [2]	124,742
2003	92,585	25,683	3,451	121,719
2004	95,347	25,506	3,528	124,381
2005	105,647	33,204	3,515	142,366
2010	122,918	40,723	4,040	167,681
2015	138,307	45,641	5,457	189,405
2020	150,109	49,811	7,108	207,028
2025	158,429	53,527	8,911	220,867
2030	163,797	56,571	10,720	231,088

1. Data from CVWMP back-up files (CVWD, 2002a)
2. Estimated values based on Engineer's Report for Mission Creek Subbasin Area of Benefit (CVWD, 2005c)

Groundwater Levels

Historical water level declines and the conditions producing those declines have been extensively described by the USGS and DWR and are documented in the CVWMP

Although water levels have been declining throughout most of the subbasins since 1945, water levels in the southeastern portion of the valley had risen until the early 1970s because of the use of imported water from the Coachella Canal and the resulting decreased pumpage in that area. The rate of water level decline has increased since the early 1980s due to increasing urbanization and increased groundwater use by local farmers, golf courses and fish farms.

Water surface elevations in the northwestern area of the Coachella Valley are highest at the northwest end of each subbasin, illustrating that groundwater flow is from the northwest to the southeast in the Coachella Valley. Comparison of the 1936 and the 1973 water levels shows that water levels declined more than 100 feet in parts of the Palm Springs subarea and more than 70 feet in parts of the Palm Desert area during this 37-year period.

Figure 3-2 shows representative examples of the groundwater levels in the groundwater wells by years. Values shown are depth to water from the ground surface; negative values indicate water levels are above ground surface. These graphs show the historical decline in groundwater as a result of basin overdraft and the recovery experienced in portions of the upper Whitewater River subbasin.

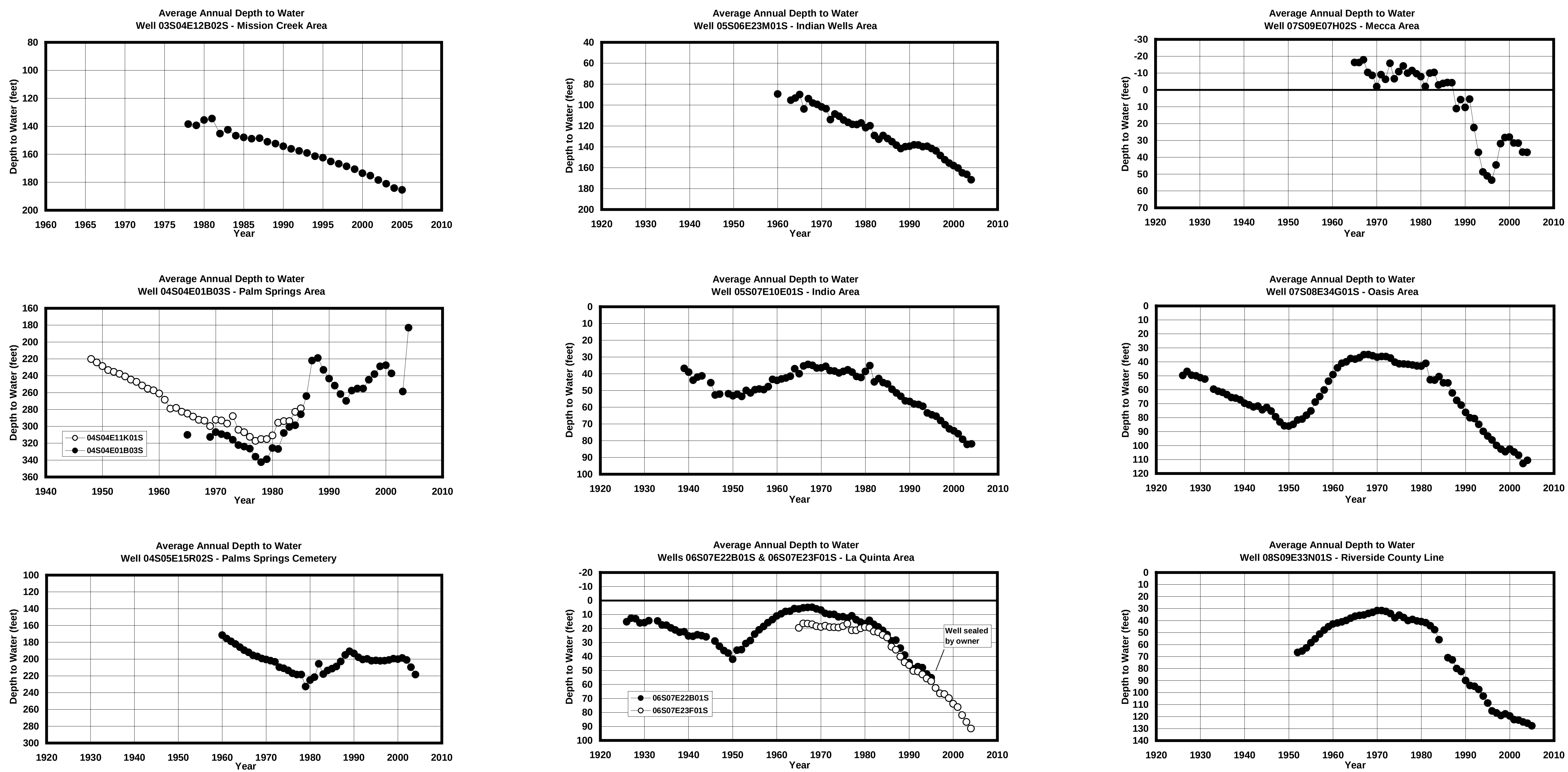
Water levels in the Mission Creek subbasin have declined about 2 ft per year for the past 25 years. The recently constructed replenishment program is expected to stabilize or reverse the water level decline. Water levels in the upper Whitewater River subbasin showed a historic declines of 2 to 4 ft per year. After the substantial recharge of Colorado River water in the mid-1980s, water levels increased significantly in the area of Palm Springs and Cathedral City. However, in the Palm Desert and Indian Wells area water levels stabilized in the early 1990s but have continued to decline in the last ten years as Metropolitan drew water out of its storage account.

Water levels in the lower Whitewater River subbasin have declined by 22 to 96 ft since the high water level conditions of the late 1960s. In the southerly Thermal and Oasis subareas, local water level decline apparently is accelerating. Over the last ten years, groundwater levels in the La Quinta area has declined 31 feet while levels in the Oasis area have declined 22 to 26 feet. The declining water table in these areas has led to the determination that a management program is required to stabilize water levels and prevent other adverse effects such as water quality degradation and land subsidence.

Groundwater Balance

The groundwater balance can be computed by estimating the inflows to and outflows from the groundwater basin. Studies performed by the USGS and CVWD have developed reasonable estimates of the long-term inflows to the basins. Groundwater inflows consist of natural recharge of runoff from the local mountains, returns from the use of applied water, artificial recharge and inflows from adjacent groundwater basins. Groundwater outflows consist of

Figure 3-2
Representative Groundwater Levels



pumping, drain flows, evapotranspiration, and outflows to adjacent groundwater basins. **Table 3-4** presents the historical and projected water balances for the Whitewater River and Mission Creek subbasins. Also shown is the combined net inflow to each subbasin and CVWD's share. The net inflow excludes artificial replenishment and production; it indicates the potential amount of water that could be extracted without the need for artificial recharge or other management actions. The information for the Whitewater River subbasin is based on modeling studies performed for the CVWMP. Information for the Mission Creek subbasin is estimated from data in the Engineer's Report on Water Supply and Replenishment Assessment (CVWD, 2005) and projected pumping.

It should be noted that the annual balance in the Whitewater River subbasin is strictly a hydrologic balance and does not reflect water quality impacts of overproduction on groundwater. These are discussed later in this section.

Overdraft

Since the early part of the 20th century, the Coachella Valley has been dependent on groundwater as a source of supply. The demand for groundwater has annually exceeded the limited natural recharge of the groundwater basin. The condition of a groundwater basin in which the outflows (demands) exceed the inflows (supplies) to the groundwater basin is called "*overdraft*".

The State of California Department of Water Resources Bulletin 160-93 describes *overdraft* as follows:

> "Where the groundwater extraction is in excess of inflow to the groundwater basin over a period of time, the difference provides an estimate of overdraft. Such a period of time must be long enough to produce a record that, when averaged, approximates the long-term average hydrologic conditions for the basin." (DWR, 1993)

DWR Bulletin 118-80 defines "overdraft as the condition of a groundwater basin where the amount of water extracted exceeds the amount of groundwater recharging the basin over a period of time." It also defines "critical condition of overdraft" as water management practices that "would probably result in significant adverse overdraft-related environmental, social, or economic effect" (DWR, 1980). Water quality degradation and land subsidence are given examples of two such adverse effects.

This overdraft condition or "mining" of the groundwater has caused groundwater levels to decrease more than 60 feet in portions of the Lower Valley and raised concerns about water quality degradation and land subsidence. Groundwater levels in the Upper Valley have also decreased substantially, except in the areas near the Whitewater Spreading Facility where artificial recharge has successfully raised water levels. Continued overdraft will have serious consequences for the Coachella Valley. The immediate and direct effect will be increased groundwater pumping costs for all water users. Wells will have to be deepened, larger pumps will have to be installed, and energy costs will increase as the pump lifts increase. Eventually, the need for deeper wells and larger pumps will have an adverse impact on agriculture and will increase the cost of water for municipalities, resorts, homes, and businesses. Continued decline

Table 3-4
Historical and Projected Groundwater Balance
Whitewater River and Mission Creek Subbasins

Year	Whitewater River Subbasin (acre-ft/yr) [2]					Mission Creek Subbasin (acre-ft/yr) [3]				
	Inflows	Outflows	Annual Balance	Net Inflow [1]	CVWD Share Net Inflow [4]	Inflows	Outflows	Annual Balance)	Net Inflow [1]	CVWD Share Net Inflow [4]
1995	387,200	413,100	-25,900	258,100	64,700	8,500	12,100	-3,600	6,500	1,900
1996	415,700	413,500	2,200	210,900	48,900	8,700	12,600	-3,900	6,700	1,800
1997	398,900	416,300	-17,400	220,200	51,100	8,500	11,900	-3,400	6,500	1,400
1998	449,000	419,500	29,500	252,400	69,300	8,600	12,300	-3,700	6,600	1,800
1999	367,200	436,400	-69,200	213,500	51,900	8,800	13,000	-4,200	6,800	1,900
2000	383,000	436,900	-53,900	249,600	69,200	9,100	13,800	-4,700	7,100	1,900
2001	314,400	435,200	-120,800	251,500	71,100	9,300	14,400	-5,100	7,300	1,900
2002	346,800	434,200	-87,400	252,300	74,600	9,900	16,000	-6,100	7,900	1,900
2003	314,600	434,500	-119,900	253,600	76,700	11,500	15,800	-4,300	7,800	2,000
2004	318,400	424,400	-106,000	243,400	71,500	16,200	18,700	-2,500	8,800	1,900
2005	400,500	424,900	-24,400	245,100	83,200	18,400	19,400	-1,000	9,100	1,800
2010	426,800	403,500	23,300	244,100	104,800	23,300	23,800	-500	10,600	2,000
2015	450,100	404,700	45,400	232,500	120,500	27,000	28,200	-1,200	12,200	2,500
2020	479,600	447,500	32,100	221,000	120,500	28,300	31,300	-3,000	13,200	3,200
2025	496,100	476,800	19,300	204,200	120,200	29,100	33,900	-4,800	14,200	4,000
2030	504,700	498,900	5,800	190,400	118,500	29,900	36,000	-6,100	14,900	4,700

1. Net inflow includes excludes artificial recharge and groundwater production.
2. Source: CVWMP backup files (CVWD, 2002a).
3. Estimated using projected pumping and recharge and data from Engineer's Report for the Mission Creek Subbasin Area of Benefit (CVWD, 2005c).
4. CVWD share is based on the relative percent of CVWD pumping to total pumping in the subbasin.

of groundwater levels could result in a substantial and possibly irreversible degradation of water quality in the groundwater basin.

Continued overdraft also increases the possibility of land subsidence within the Coachella Valley. As groundwater is removed, the dewatered soil begins to compress from the weight of the ground above, causing subsidence. Subsidence can cause ground fissures and damage to buildings, homes, sidewalks, streets, and buried pipelines - all of the structures that make the Coachella Valley livable. Recent studies indicate that as much as 7 centimeters of subsidence occurred in the Palm Desert area between 1996 and 1998.

The calculation of an annual value of overdraft that accounts for all of the components of overdraft is difficult. One method of estimating the overdraft is to look at the net annual change in freshwater storage in the basin. Change in freshwater storage is the difference between the inflows and outflows of the basin, excluding the inflows of poor-quality water (irrigation return flows and Salton Sea water) which are induced by the overdraft. By excluding these inflows, a more accurate approximation of actual annual overdraft is possible. In 2005, the change in freshwater storage in the Coachella Valley is estimated to be 136,700 acre-ft/yr. The cumulative change in freshwater storage from 1936 to 2004 is estimated to be nearly 4.8 million acre-ft, i.e., 4.8 million acre-ft of freshwater was withdrawn from the basin and not replaced. Using freshwater storage as an indicator of overdraft does not account for all aspects of overdraft such as subsidence and other water quality, environmental, social, and economic effects.

The groundwater balance and overdraft for the Whitewater River subbasin was evaluated during the preparation of the CVWMP. The groundwater balance considered historical estimates of natural return flows from water use, groundwater recharge with imported water, inflows from outside the basin, groundwater pumpage, flows to agricultural drains, evapotranspiration by native vegetation and subsurface flows to or from the Salton Sea. The CVWMP report estimated that groundwater overdraft was 32,400 acre-ft/yr in the upper Whitewater River subbasin and 104,300 acre-ft/yr in the lower Whitewater River subbasin. Between 1936 and 1999, the cumulative overdraft of the lower Whitewater River subbasin was about 4.7 million acre-ft.

CVWD and DWA estimate the current annual overdraft each year in its engineer's reports to support groundwater replenishment assessments in each of the three subbasins as shown in **Table 3-5**.

Table 3-5
Estimated Groundwater Overdraft by Subbasin– Year 2004

Subbasin	Overdraft (AF/yr)
Mission Creek	2,289
Upper Whitewater River	82,438
Lower Whitewater River	100,500
Total	**185,227**

Source: CVWD Engineer's Reports (CVWD, 2005b, 2005c and 2005d)

Although the basins are currently in overdraft, CVWD and DWA are actively participating in the implementation of management actions to reduce the overdraft and return the basin to a state of long-term balance. These management actions coupled with the significant storage capacity of the groundwater basins will provide a long term reliable supply. With recent acquisition of additional SWP water, overdraft in the upper Whitewater River subbasin is expected to be eliminated by 2015. Overdraft in the lower Whitewater River subbasin is expected to be eliminated by 2030 with increased groundwater recharge and conversion of groundwater pumpers to Coachella Canal, recycled water and desalinated drain water.

Groundwater Management Plan

The CVWMP, which was adopted by the CVWD Board in October 2002, serves as the groundwater management plan for the Whitewater River subbasin. This plan defines CVWD's long-term approach for eliminating groundwater overdraft and providing sustainable water supply for the Coachella Valley.

It is clear that the continued decline of groundwater levels and overdraft is unacceptable. CVWD is charged with providing a reliable, safe water supply to its area of the Coachella Valley now and in the future. In order to fulfill its obligations to Coachella Valley residents, CVWD must take action to prevent continuing decline of groundwater levels and degradation of water quality.

Goals and Objectives

The goal of the 2002 CVWMP is to assure adequate quantities of safe, high-quality water at the lowest cost to Coachella Valley water users. To meet this goal, four objectives have been identified:

1. Eliminate groundwater overdraft and its associated adverse impacts, including:
   - groundwater storage reductions
   - declining groundwater levels
   - land subsidence
   - water quality degradation
2. Maximize conjunctive use opportunities
3. Minimize adverse economic impacts to Coachella Valley water users
4. Minimize environmental impacts

Alternative Selection

CVWD staff and consultants identified potential water management elements for inclusion in the CVWMP. Potential management elements were subsequently organized into six categories: pumping restrictions, demand reduction, local water sources, imported water sources, water management actions, and water quality approaches. Each of the potential management elements was rated based on the element's ability to reduce overdraft, technical feasibility, potential environmental impacts, costs, legal and regulatory factors, and regional economic impacts. Based on these ratings, numerous potential elements were eliminated from further consideration.

The remaining "short-listed" elements were organized into the following conceptual management *Alternatives*:

1. No Project
2. Pumping Restrictions
3. Source Substitution
4. Combinations of all Alternatives

With the exception of the No Project alternative, which was required under CEQA, a preliminary evaluation of each alternative was performed to determine which alternatives should be formally considered and evaluated in the Plan. The evaluation process involved technical analyses coupled with professional judgement and experience. After extensive review, the selected alternative was Alternative 4 – Combination of all Alternatives.

Implementation of the Preferred Alternative

The preferred alternative includes water conservation, groundwater recharge, and source substitution management elements. Implementation of the preferred alternative will require numerous decisions regarding the priorities for implementation, the financing mechanisms for various elements of the plan, potential cooperative agreements with other agencies, and balancing needs with available resources. A significant activity in decision-making and implementation is coordination and consultation with other governing agencies and tribal interests. The CVWMP stated that CVWD would not, nor should it, attempt to unilaterally implement water management activities that are within the purview of local or other governments. This coordinating effort will be a major focus of implementation. Detailed implementation plans were developed by CVWD for each water management category following completion of the CVWMP. The full alternative analysis and implementation strategies within each water management category are discussed in the report executive summary included as **Appendix F** of this report.

Legal Authority for Groundwater Management

CVWD has the legal authority to manage the groundwater basins within its service area under the County Water District Law (California Water Code, Division 12). CVWD has specific authority under Part 6, Chapter 7 to levy and collect water replenishment assessments for the purpose of replenishing ground water supplies within CVWD. CVWD has exercised its replenishment assessment authority in the upper Whitewater River subbasin since 1973, in the Mission Creek subbasin since 2003 and in the lower Whitewater River subbasin since 2005. CVWD and DWA entered the Water Management Agreement in 1976, which was amended in 1992 to jointly manage the upper Whitewater River subbasin. This agreement formalized the water replenishment program and provided a mechanism for distributing the costs of SWP water between the CVWD and DWA benefit areas based on total production within each agency's service area. A similar agreement was implemented in 2002 for the Mission Creek subbasin.

3.2.2 Local Surface Water

Surface water sources within the Coachella Valley are shown in **Figure 3-3**. Several local streams include the Whitewater River, Snow, Falls and Chino Creeks. In 2004, stream water supplied approximately 4,300 acre-ft of water to the Upper Valley (approximately 2 percent of its water supply) to meet municipal demand by DWA. Because the stream supply is directly affected by variations in annual precipitation, the annual supply is highly variable. Since 1936, the estimated historical stream water supply has ranged from approximately 4,000 to 9,000 acre-ft/yr. CVWD does not derive any of its direct supply from surface water; however, local runoff from the Whitewater River Canyon is diverted near Windy Point to the Whitewater Spreading Facility for groundwater recharge.

3.2.3 Imported Water

CVWD has access to two sources of imported water – Colorado River water from the Coachella Canal and SWP water that is exchanged with Metropolitan for Colorado River water. These sources are described below in more detail.

The Colorado River and the Coachella Canal

The Colorado River is a critical water supply for much of Southern California. The Coachella Canal is a branch of the All American Canal that brings Colorado River water into the Imperial and Coachella Valleys. **Figure 3-4** shows the service areas of Colorado River water users and facilities within California.

History

As agriculture in the region expanded during the early 1900s, alternative sources of water including the Colorado River were considered to meet growing demand. The Imperial Valley began receiving Colorado River water in 1901 through the Alamo Canal, which was partially located in Mexico. However, this supply was not reliable due to frequent canal breaks and the lack of control south of the international border. The constant risk of flooding along the Lower Colorado River was another significant concern. This flooding risk culminated in a major flood in 1905, which washed out the Alamo Canal, causing the river to change its course and creating the Salton Sea. In the Coachella Valley, the rapid rate of groundwater extraction led to a significant decline in groundwater levels, limiting the groundwater supply. Local supplies were, therefore, not adequate to meet future demands. These problems generated interest in construction of a storage reservoir on the river and a canal that would be located entirely in the United States.

The Upper Basin States (Colorado, Wyoming, Utah and New Mexico) feared that increased use of water in the Lower Basin States (California, Arizona and Nevada) would allow them to claim a prior right to the water. Negotiations between the states and the federal government eventually culminated in signing the *Colorado River Compact* on November 24, 1922.

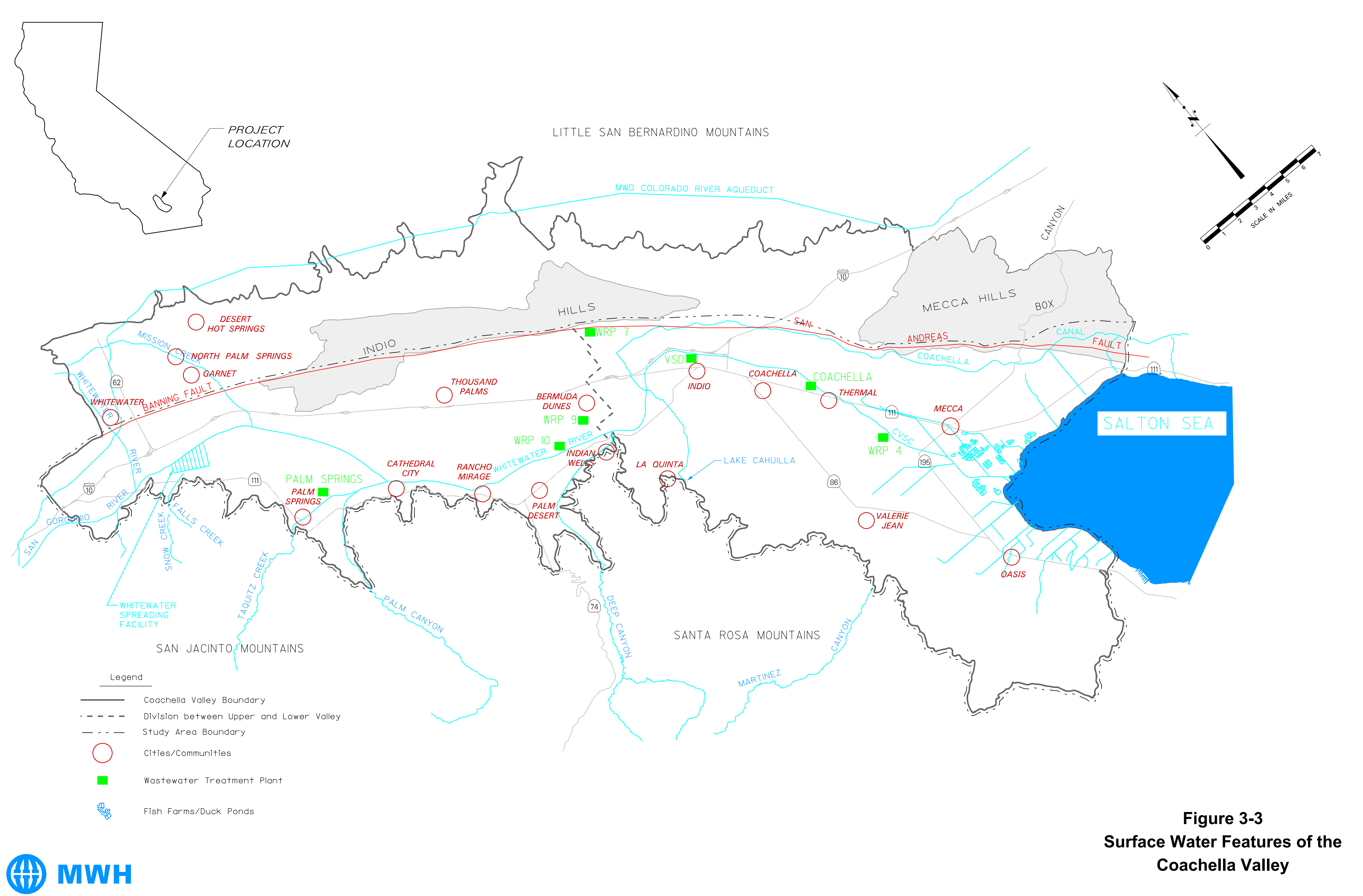


Figure 3-3
Surface Water Features of the Coachella Valley

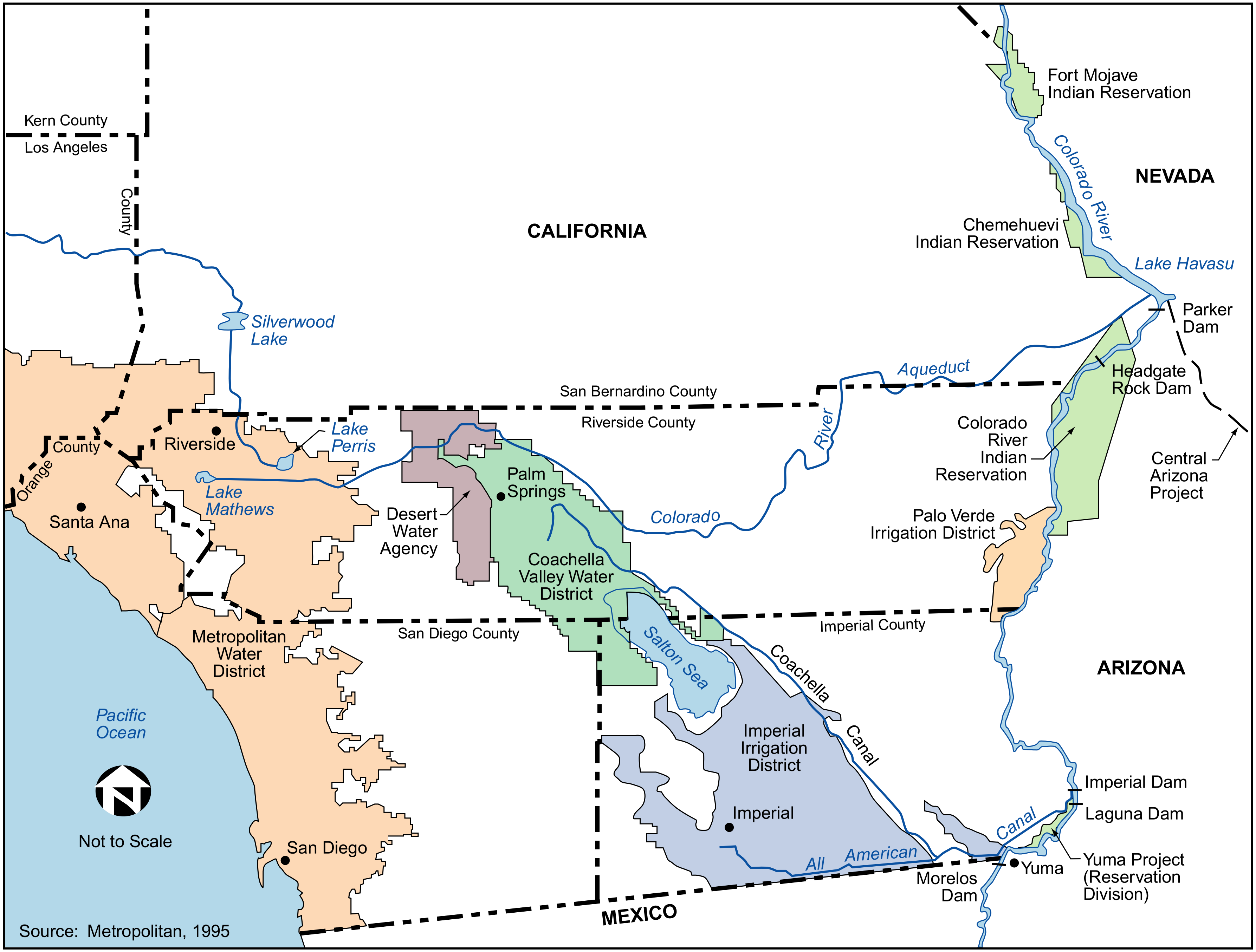


Figure 3-4
Colorado River Water Users and Facilities

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After another six years of negotiation and debate in Congress, the *Boulder Canyon Project Act* was adopted in 1928. This act authorized construction of Boulder (now Hoover) Dam and the All-American Canal. The act also authorized the Secretary of the Interior to negotiate contracts with the ultimate water users in each state and prohibited the use of river water by anyone not having a contract. In addition, the Boulder Canyon Project Act prescribed how the 7.5 million acre-ft/yr allocated to the Lower Basin States would be divided among the states.

Under the *Seven Party Agreement* dated August 18, 1931, the California agencies seeking to use Colorado River water established a system of priorities defining the designated amounts and locations for use of the water. Originally, lands in the Coachella Valley shared the same priority for water as lands in the Imperial Valley. In fact, at one point, the CVWD Board approved a contract for Colorado River water service to CVWD and the Imperial Irrigation District (IID) as one district. However, Coachella Valley farmers opposed having their lands subjected to the huge debt obligation for construction of IID's share of the Boulder Canyon Project Act facilities and they recalled the CVWD Board of Directors. The new board sought a separate contract with the federal government. The Secretary of Interior agreed to a separate contract provided CVWD constructed its own canal and reached agreement with IID on division of the water allocated to CVWD and IID. Ultimately, IID and CVWD signed the *Compromise Agreement* dated February 14, 1934, in which IID was given a prior right to the third and sixth priority water over Coachella "for irrigation and potable purposes only, and exclusively for use in the Imperial Service Area."

The contract between the United States and CVWD, signed October 15, 1934, designated a portion of the Coachella Valley service area as Improvement District No. 1 (ID-1). The contract restricts the use of Colorado River water delivered by the Coachella Canal to reasonable beneficial use for lands within the ID-1 boundary. This 136,436-acre area includes the majority of the agricultural areas in the Lower Valley and a small portion of the agricultural areas in the Upper Valley.

Construction of the All-American Canal was completed before World War II, and the U.S. Bureau of Reclamation (Reclamation) started work on the Coachella branch in 1938. The nation's involvement in World War II, along with a lack of materials and funds, halted the Coachella Canal project until 1946. The Canal was finished in 1948, with the first water supplies arriving from the Colorado River in 1949.

Water delivered to the Coachella Valley is diverted from the Imperial Dam 18 miles upstream from Yuma, Arizona into the All-American Canal. Coachella's supply is then diverted into the 122-mile-long Coachella branch, which extends from near the Mexican border northwestward to Lake Cahuilla near La Quinta. This lake, which is at the terminus of the Coachella Canal, serves as a storage reservoir to regulate irrigation water demands and provides opportunity for recreation. The capacity of the Coachella Canal is approximately 1,500 cfs.

Water Allocation

The *Law of the River* controls the allocation of the Colorado River water to the seven Colorado River Basin states. The *Law of the River* refers to the collection of interstate compacts, federal and state legislation, various agreements and contracts, an international treaty, a U.S. Supreme

Court decree, and federal administrative actions that govern the rights to use of Colorado River water. The *Colorado River Compact*, signed in 1922, apportioned the waters of the Colorado River Basin between the Upper Colorado River Basin (Colorado, Wyoming, Utah, and New Mexico) and the Lower Basin (Nevada, Arizona, and California). Annual use of water allocated by the Colorado River Compact is 15 million acre-ft: 7.5 million acre-ft to the Upper Basin and 7.5 million acre-ft to the Lower Basin, plus up to 1 million acre-ft of surplus supplies. The Lower Basin's water was further apportioned among the three Lower Basin states by the *Boulder Canyon Project Act* in 1928 and the 1964 U.S. Supreme Court decree in *Arizona v. California*. Arizona's basic annual apportionment is 2.8 million acre-ft, California's is 4.4 million acre-ft, and Nevada's is 0.3 million acre-ft. Until 2004, California had been diverting up to 5.3 million acre-ft, using the unused portions of the Arizona and Nevada entitlements and surplus water. Mexico is entitled to 1.5 million acre-ft of the Colorado River under the *1944 United States-Mexico Treaty for Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande*. However, this treaty did not specify a required quality for water entering Mexico. In 1973, the United States and Mexico signed Minute No. 242 of the International Boundary and Water Commission requiring certain water quality standards for water entering Mexico.

California's apportionment of Colorado River water is allocated by the 1931 *Seven Party Agreement* among Palo Verde Irrigation District, IID, CVWD, and Metropolitan. The three remaining parties - the City and the County of San Diego and the City of Los Angeles - are now part of Metropolitan. The allocations defined in the *Seven Party Agreements* are shown in **Table 3-6**.

The Supreme Court in *Arizona v. California* also assigned "present perfected rights" to the use of river water to a number of individuals, water districts, towns and Indian tribes along the river. These rights, which total approximately 2,875,000 acre-ft/yr, are charged against California's 4.4 million acre-ft/yr allocations and must be satisfied first in times of shortage. Under the 1970 *Criteria for Coordinated Long-Range Operation of the Colorado River Reservoirs* (Operating Criteria), the Secretary of the Interior determines how much water is to be allocated for use in Arizona, California and Nevada and whether a surplus, normal or shortage condition exists. The Secretary may allocate additional water if surplus conditions exist on the River.

Historically, CVWD has not had a specific allocation to Colorado River water. Instead, CVWD has had an undefined share of the 3.85 million acre-ft/yr allocated to the California agricultural agencies under Priority 3(a). During 1999, the California agencies negotiated the California Water Use Plan. This plan defined how California would reduce its use of Colorado River water to its 4.4 million acre-ft/yr allocation. In October, 1999, CVWD, IID, and Metropolitan reached agreement on the "Key Terms" that will be necessary elements in a formal Quantification Settlement Agreement regarding a division and quantification of their respective shares of Colorado River water. Signed in October 2003, the QSA supplements the 1931 agreement by defining the allocations of Priority 3 water users and providing for water transfers between the QSA parties.

The QSA specifically defined the Colorado River water allocation of CVWD. CVWD's base allocation is 330,000 acre-ft/yr. This allocation will increase to 459,000 acre-ft/yr by 2033 as a result of a 103,000 acre-ft/yr water transfer from IID to CVWD, a 35,000 acre-ft/yr transfer of

SWP water from Metropolitan to CVWD, and a 20,000 acre-ft/yr allocation of conserved water from Metropolitan to CVWD. CVWD provides 26,000 acre-ft/yr from lining the Coachella Canal to Metropolitan and 3,000 acre-ft/yr to settle claims of present perfected rights by Colorado River Indian tribes and other uses. **Table 3-7** presents the historical Coachella Canal Water Deliveries.

Table 3-6
Priorities and Water Delivery Contracts
California Seven-Party Agreement of 1931

Priority	Description	Acre-ft/yr
1	Palo Verde Irrigation District gross area of 104,500 acres of Coachella Valley lands	3,850,000
2	Yuma Project (Reservation Division) not exceeding a gross area of 25,000 acres within California	
3(a)	IID, CVWD, and lands in Imperial and Coachella Valleys to be served by the All American Canal	
3(b)	Palo Verde Irrigation District - 16,000 acres of mesa lands	
4	Metropolitan Water District of Southern California for use on coastal plain	550,000
	Subtotal – California's Basic Apportionment	**4,400,000**
5(a)	Metropolitan Water District of Southern California for use on coastal plain	550,000
5(b)	Metropolitan Water District of Southern California for use on coastal plain	112,000
6(a)	IID and lands in the Imperial and Coachella Valleys to be served by the All American Canal	300,000
6(b)	Palo Verde Irrigation District - 16,000 acres of mesa lands	
	Total	**5,362,000**

Table 3-7
Historical Coachella Canal Water Deliveries

Year	Diversions at Imperial Dam	Less Conveyance Losses	Net Deliveries
1995	326,210	40,281	285,929
1996	330,750	41,024	289,726
1997	332,920	51,741	281,179
1998	337,060	55,346	281,714
1999	334,010	51,989	282,021
2000	342,871	60,090	282,781
2001	325,097	52,356	272,741
2002	331,107	50,262	280,845
2003	296,808	51,739	245,069
2004	319,385 [1]	80,929	238,456

1. The diversions from Imperial Dam in 2004 include about 20,000 acre-ft of Colorado River water for the Salton Sea

State Water Project (SWP)

To recharge groundwater supplies, CVWD and DWA obtain imported water supplies from the SWP, which is managed by the DWR. CVWD and DWA are two of 29 agencies holding long-term water supply contracts with the State of California for SWP water. SWP water originates from rainfall and snowmelt in Northern California. Runoff is stored in Lake Oroville, the project's largest storage facility, and then released down the Feather River to the Sacramento River and the Sacramento-San Joaquin Delta. Water is diverted from the Delta into the Clifton Court Forebay and then pumped into the 444-mile-long California Aqueduct. SWP water is stored in San Luis Reservoir, which is jointly operated by the DWR and Reclamation. Six pumping stations lift the water more than 3,000 feet and energy is recovered at power plants along the aqueduct.

Table A water (formerly known as "entitlements") is the maximum contractual amount of water that a SWP contractor can request each year. The Table A amounts are used to apportion the available supply and certain SWP costs among SWP contractors. CVWD's original Table A amount was 23,100 acre-ft/yr while DWA's was 38,100 acre-ft/yr, for a combined total of 61,200 acre-ft/yr. In 2003, CVWD completed a water transfer with Tulare Lake Basin Groundwater Storage District to acquire 9,900 acre-ft/yr of Table A Water. In 2004, CVWD and DWA completed a 100,000 acre-ft/yr transfer of Table A water from Metropolitan. A third water transfer with Berrenda Mesa Water District that would add 16,000 acre-ft/yr of Table A Water to CVWD and DWA is expected to be effective completed in 2006 with the water being available in 2010. When these transfers are complete, CVWD and DWA will have Table A amounts of 133,100 acre-ft/yr and 54,000 acre-ft/yr, respectively for a combined total of 187,100 acre-ft/yr.

CVWD and DWA do not directly receive SWP water. Instead, their SWP water is delivered to Metropolitan pursuant to the Exchange Agreement. Metropolitan, in turn, delivers an equal amount of Colorado River water to CVWD and DWA at the Whitewater River. CVWD is participating in the SWP East Branch Enlargement to provide the capacity to obtain additional water from the SWP when it is available.

Over 1.8 million acre-ft of SWP water has been delivered through the SWP Exchange Agreement since the inception of SWP deliveries in 1973. A portion of the water delivered has been banked by Metropolitan for future use under the Advance Delivery agreement. However, until the banked water is needed, CVWD and DWA benefit by higher water levels and lower pumping costs. The recharge program, which has been monitored, modeled, and studied by the U.S. Geological Survey and CVWD, has helped to balance the inflow and outflow of groundwater from the upper Whitewater River subbasin.

In 1996, CVWD and DWA recognized the need for additional imported water in order to eliminate groundwater overdraft. Since then, the two districts have purchased additional Pool A, Pool B, and interruptible water from the SWP resulting in average additional deliveries of 41,200 acre-ft/yr. These additional supplies are not expected to be available in the future and cannot be relied upon to provide a reliable long-term source of water to the Coachella Valley. In 2004, SWP exchange water purchases used for recharge in the Upper Valley totaled 46,215 acre-ft/yr, of which about 18,000 acre-ft/yr was carried over to 2005. Only 191 acre-ft/yr of water was purchased from the SWP Turn-back Pool in 2004. **Table 3-8** presents the historical SWP Colorado River Water Exchange Deliveries.

Table 3-8
Historical State Water Project Deliveries

Year	Table A Amount (acre-ft/yr)[1]			Deliveries (acre-ft/yr)	
	CVWD	DWA	Total	Table A [2]	Total [3]
1985	16,989	27,000	43,989	43,989	251,994
1986	18,210	29,000	47,210	47,210	298,201
1987	19,431	31,500	50,931	50,931	104,372
1988	20,652	34,000	54,652	54,652	1,097
1989	21,873	36,500	58,373	58,373	12,479
1990	23,100	38,100	61,200	61,200	31,721
1991	23,100	38,100	61,200	18,360	14
1992	23,100	38,100	61,200	27,624	40,870
1993	23,100	38,100	61,200	61,200	60,183
1994	23,100	38,100	61,200	37,359	32,325
1995	23,100	38,100	61,200	61,200	61,318
1996	23,100	38,100	61,200	61,200	138,266
1997	23,100	38,100	61,200	61,200	113,677
1998	23,100	38,100	61,200	61,200	132,455
1999	23,100	38,100	61,200	61,200	90,601
2000	23,100	38,100	61,200	55,080	72,269
2001	23,100	38,100	61,200	23,868	707
2002	23,100	38,100	61,200	2,840	38,168
2003	23,100	38,100	61,200	37,213	843
2004	33,000	38,100	71,100	18,597	18,808
20-yr Average	22,678	36,475	59,153	49,514	74,782
Total since 1973	**574,711**	**918,500**	**1,493,211**	**1,235,383**	**1,807,815**

1. Table A amount is maximum annual contract amount.
2. Table A deliveries are annual allocation of Table A water based on SWP operational constraints.
3. Total deliveries are actual Exchange Water deliveries at the Whitewater River turnout and include Table A deliveries, surplus water and advance deliveries by Metropolitan (CVWD, 2005c and 2005d)

3.2.4 Recycled Water

Recycled municipal wastewater has historically been used for irrigation of golf courses and other municipal greenbelt and landscape areas. Recycled water was not used prior to 1965 and remained below 500 acre-ft/yr until the late 1980s. Usage in the Upper Valley dramatically increased in the late 1980s, reaching 8,100 acre-ft in 2004.

CVWD's three largest WRP's – WRP-10, WRP-7 and WRP-4, currently treat a combined daily average of 16 MGD. WRP-10 serves the communities of Indian Wells, Palm Desert, and Rancho Mirage as well as a portion of Cathedral City. WRP-7 serves areas northeast of Interstate 10 north of Indio. WRP-4 located near Thermal, became operational in 1986 and allows CVWD to serve communities from La Quinta to Mecca. WRP-4 is a secondary treatment facility, and is under consideration of upgrading to tertiary treatment for recycling use. **Table 3-9** presents the historical recycled water supply by WRPs for golf course and greenbelt irrigation use.

Table 3-9
Historical Recycled Water Supply

Year		Annual Flow (acre-ft/yr)						
		WRP-1	WRP-2	WRP-4	WRP-7	WRP-9	WRP-10	Total
1998	Treated	83	28	2,765	1,323	370[1]	12,334	16,903
	Reused	0	0	0	924	370[1]	4,871	6,165
1999	Treated	77	21	2,992	1,627	370[1]	11,770	16,857
	Reused	0	0	0	1,292	370[1]	5,610	7,272
2000	Treated	34	21	2,866	2,142	370	11,147	16,580
	Reused	0	0	0	1,949	370	4,763	7,082
2001	Treated	34	18	3,735	2,010	360	10,913	17,070
	Reused	0	0	0	1,826	360	4,720	6,906
2002	Treated	31	21	4,002	2,010	370	11,279	17,713
	Reused	0	0	0	1,860	370	4,376	6,606
2003	Treated	37	21	4,398	2,265	368	11,638	18,727
	Reused	0	0	0	1,844	368	3,793	6,005
2004	Treated	43	21	5,331	2,372	358	12,101	20,226
	Reused	0	0	0	1,857	358	4,677	6,892

Source: WRP Flow Data (CVWD, 2005f)

3.3 FUTURE WATER SUPPLIES

In addition to water conservation, CVWD and DWA will need to obtain additional water supplies to eliminate current and future overdraft. Evaluation of many potential alternative supplies has identified four sources that will be augmented as part of the CVWMP. These sources are the Quantification Settlement Agreement, exchanges and transfers, recycled water and desalinated agricultural drainage water. The steps to be taken to augment these supplies are discussed below.

3.3.1 Quantification Settlement Agreement (QSA)

On October 10, 2003, a landmark agreement was signed between CVWD, IID, San Diego County Water Authority, Metropolitan, the State of California and the U.S. Department of the Interior to quantify water distribution allotments of Colorado River water in California. The agreement further provides additional Colorado River water to CVWD from shares of IID and Metropolitan. The total ultimately available to CVWD would be up to 459, 000 acre-ft/yr during the lifetime of the agreement known as QSA. Under the QSA, CVWD's share of Colorado River water is a reliable supply rather than one that could be at risk. This agreement quantifies the rights of each agency and allows the transfer of water between willing buyers and sellers. The QSA includes:

- Capping IID and CVWD Priority 3 water at 3.1 million acre-ft and 330,000 acre-ft, respectively
- Modification to the 1988 IID/Metropolitan Water Conservation Agreement
- Amendment to the 1989 Metropolitan/IID/CVWD/PVID Approval Agreement and transferring 20,000 acre-ft/yr to CVWD
- Conservation and transfer of 200,000 acre-ft/yr from IID to SDCWA
- Exchange Agreement between SDCWA and Metropolitan
- Conservation and transfer of 103,000 acre-ft/yr from IID to CVWD
- Lining the All-American Canal and the Coachella Canal and transfer of conserved water to Metropolitan less 16,000 acre-ft/yr for the San Luis Rey Indian Water Rights Settlement
- Sharing obligations to provide 14,500 acre-ft/yr from IID and CVWD for miscellaneous present perfected rights
- Transferring 35,000 acre-ft/yr of SWP water from Metropolitan to CVWD
- Potential water transfers between 25,000 and 111,000 acre-feet annually from the Palo Verde Irrigation District to Metropolitan
- Quantification of surplus water available under Priority 6 and 7
- Sharing of shortages between CVWD and IID when there is less than 3.85 million acre-ft/yr available to Priorities 1, 2, 3a and 3b
- The term of the QSA is 75 years

Under the QSA, CVWD's consumptive use entitlement under its share of the Priority 3 allotment is capped at 330,000 acre-ft/yr at Imperial Dam for the quantification period, less an amount of water equal to that conserved by CVWD for the benefit of others as identified in the QSA and subject to adjustments as provided in the Inadvertent Overrun and Payback Policy (IOP). CVWD agrees to forbear use of up to 3,000 acre-ft/yr to satisfy the present perfected rights (PPRs) of miscellaneous and Indian rights holders. CVWD also agrees to reduce its diversion by 26,000 acre-ft/yr due to lining the Coachella Canal. Metropolitan will provide 20,000 acre-ft/yr to CVWD at Imperial Dam under the 1989 Approval Agreement for the 1988 Metropolitan/IID Water Conservation Agreement. CVWD has the option to purchase water from IID in two phases – a first phase of 50,000 acre-ft/yr and a second phase of 53,000 acre-ft/yr. This water would be made available by the implementation of water conservation measures by IID which are financed by the payments for water by CVWD. The first phase would be available beginning in 2008 and the second phase would be available beginning in 2018. Under the terms of the QSA, CVWD would initially acquire the water in increments of 4, 000 acre-ft/yr for the first four years, increasing to 5,000 acre-ft/yr in 2012 with a one-time increment of 18,000 acre-ft/yr in 2018, reaching full entitlement by 2026. After 2048, IID is relieved of its obligation to provide the second 53,000 acre-ft/yr of water and Metropolitan is obligated to provide up to 50,000 acre-ft/yr to replace the IID conserved water. CVWD may acquire the water at rates of 3,000 acre-ft/yr and 4,000 acre-ft/yr given one year's notice to IID. Metropolitan will transfer 35,000 acre-ft/yr of its SWP Table A water to CVWD on a permanent basis and will deliver this water without reduction due to SWP supply availability. CVWD, IID and Metropolitan have agreed to provide 16,000 acre-ft/yr of water from the lining of the All-American and Coachella Canals as part of the San Luis Rey settlement. During wet years, CVWD will also have access to 119,000 acre-ft/yr of Priority 6 water after Metropolitan and IID have received 38,000 acre-ft/yr and 63,000 acre-ft/yr, respectively.

If there is less than 3.85 million acre-ft/yr available to Priorities 1, 2, 3a, and 3b, the deficiency is borne by CVWD and IID. CVWD and IID shall negotiate a consensual sharing of the shortfall. In the event that a consensual resolution cannot be reached, either CVWD or IID may commence litigation to resolve the allocation of the shortfall. During the litigation process, the shortfall shall be provisionally allocated 75 percent to IID and 25 percent to CVWD until IID is reduced to its PPR, after which all remaining shortfalls would be borne entirely by CVWD. If IID were reduced to its PPR, water transfers under the QSA would be suspended.

An inadvertent overrun is defined as Colorado River water that is diverted, pumped or received by an entitlement holder in excess of the water user's entitlement for that year beyond the control of the water user. The Inadvertent Overrun and Payback Policy (IOP) establishes a policy to identify and account for inadvertent overruns and define subsequent payback provisions. The IOP limits CVWD to a maximum overrun of approximately 10 percent of its normal year entitlement. Depending on the water level in Lake Mead, the overrun must be paid back within one to three years using water management measures over and above the normal consumptive use of water. If CVWD is charged with an inadvertent overrun, CVWD plans to reduce its use of Colorado River water for groundwater recharge. The IOP states that overruns are forgiven in the event of a flood control or space building release from Lake Mead.

When all water transfers have been completed, CVWD will have a total diversion of 459,000 acre-ft/yr at Imperial Dam as shown in **Table 3-10**. After deducting estimated conveyance losses, about 444,000 acre-ft/yr will be available for use in the Coachella Valley.

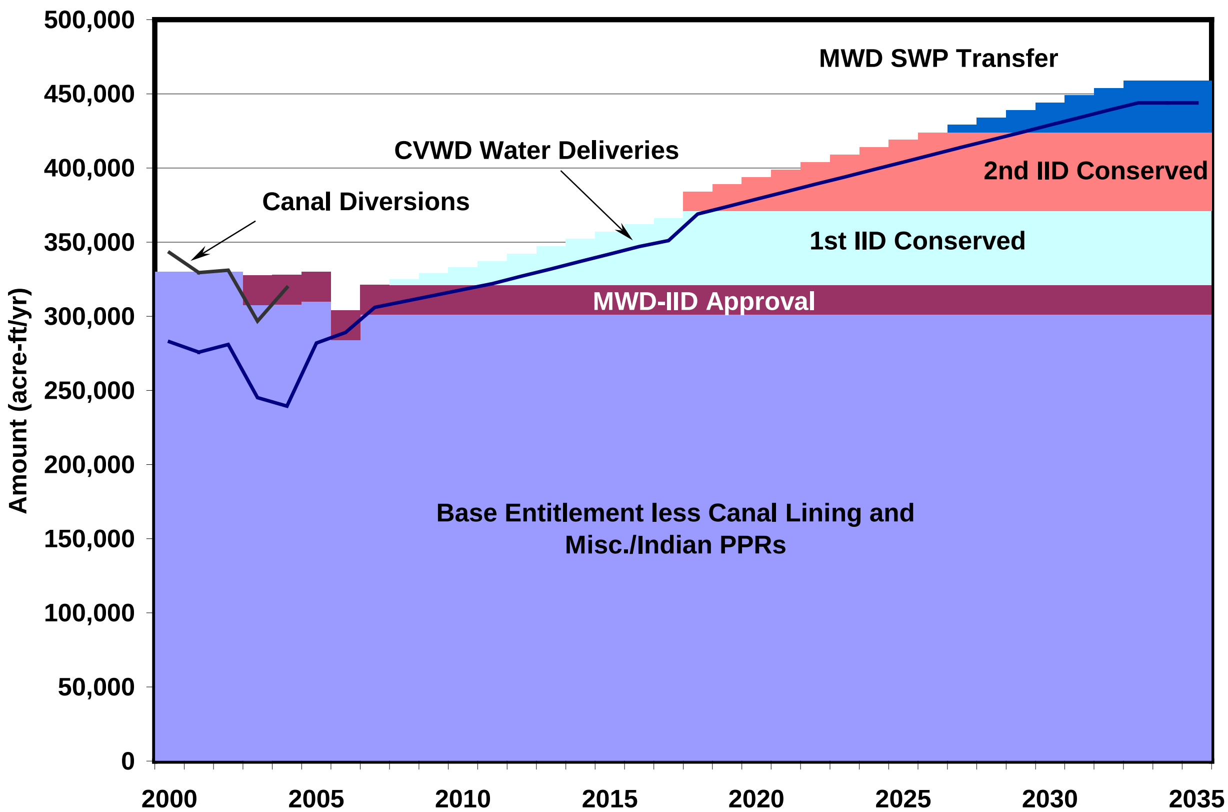
Table 3-10
CVWD Deliveries under Quantification Settlement Agreement

Component	Amount – acre-ft/yr
Base Allotment	330,000
1988 MWD/IID Approval Agreement	20,000
Coachella Canal Lining (to Metropolitan)	-26,000
To Miscellaneous/Indian PPRs	-3,000
IID/CVWD First Transfer	50,000
IID/CVWD Second Transfer	53,000
Metropolitan SWP Transfer	35,000
Total Diversion at Imperial Dam	**459,000**
Less Conveyance Losses[1]	-15,000
Total Deliveries to CVWD	**444,000**

1. Assumed conveyance losses after completion of Coachella Canal lining.

Figure 3-5 presents a build-up curve for Colorado River water to CVWD under the agreement impacted by the timing of the various projects to be implemented under the CVWMP.

Figure 3-5
CVWD Colorado River Water Deliveries with QSA



3.3.2 Water Exchanges and Transfers

CVWD and DWA have actively pursued a number of water exchanges and transfers beginning in 1973. These current agreements and potential opportunities are described below.

Metropolitan Water Exchange Agreement

To avoid the cost of constructing facilities to convey its SWP water, CVWD and DWA executed the water exchange agreements with Metropolitan in 1967. Under the terms of these agreements, CVWD and DWA deliver their SWP Table A water deliveries to Metropolitan and Metropolitan delivers an equal amount of Colorado River water from its Colorado River Agreement to CVWD and DWA at the Whitewater River turnout. This agreement was amended in 1983 to extend the term of the agreement from 1990 until the end of CVWD's and DWA's SWP contract but no later than 2035.

Metropolitan Advance Delivery Agreement

In 1984, CVWD and DWA entered into an advance delivery agreement with Metropolitan. This agreement allows Metropolitan to deliver exchange water in advance of receiving CVWD's and DWA's SWP water. This agreement allowed CVWD and DWA to percolate additional Colorado River supplies in the upper Whitewater River subbasin during periods of surplus water availability in the Colorado River Basin. Water stored in the basin is accounted for by tracking differences between Colorado River water delivered to CVWD and DWA and DWR's deliveries to Metropolitan. The storage capacity of this agreement is 600,000 acre-ft or more if agreed to by the three agencies.

During the four-year period from 1984 through 1987, Metropolitan released more than 550,000 acre-ft of exchange water to the Whitewater River. As of December 31, 2004, Metropolitan had approximately 177,400 acre-ft of Colorado River water remained in the groundwater basin from the storage program. Metropolitan has utilized banked water supplies during periods of water shortage in Southern California. When Metropolitan requires the stored water, it takes both the Colorado supplies and CVWD's and DWA's Table A deliveries for as long as necessary or until the banked quantity is exhausted. CVWD and DWA, in turn, will pump the previously stored water from the basin and will pay for SWP water delivered to Metropolitan.

Tulare Lake Basin Transfer Project

The Tulare Lake Basin Transfer Project consisted of the permanent sale, assignment and transfer of 9,900 acre-ft/yr of SWP Table A Water from the Tulare Lake Basin Water Storage District (TLBWSD) to CVWD. This transfer project was completed in early 2004. TLBWSD is located in portions of Kern, Kings and Tulare Counties in the western San Joaquin Valley. CVWD now owns and administers the 9,900 acre-ft/yr of transferred Table A Water increasing its Table A amount to 33,000 acre-ft/yr. The ultimate use of the transferred water would be for groundwater replenishment to help eliminate existing groundwater overdraft. The project involved no construction; the transfer is accomplished entirely via existing facilities. The State of California's total existing contractual commitment for the delivery of water from the SWP is unchanged.

The transferred water has the same reliability as other SWP Table A water supplies. Because CVWD uses SWP water for groundwater replenishment in the Coachella Valley, there is no impact of the variable supply reliability of SWP water on retail water delivery. The Coachella Valley groundwater basin has an estimated storage capacity of nearly 30 million acre-ft, which significantly buffers variations in annual supplies.

CVWD adopted a negative declaration pursuant to CEQA on January 13, 2004. The amendments to the SWP contracts of CVWD and TLBWSD were executed with DWR on February 23, 2004. Completion of this transfer increased CVWD's SWP Table A amount to from 23,100 to 33,000 acre-ft/yr.

Metropolitan 100,000 acre-ft/yr Water Transfer – 2003 Exchange Agreement

Metropolitan historically has not made full use of its SWP Table A contract amount in normal and wet years. Under the 2003 Exchange Agreement, CVWD and DWA acquired 100,000 acre-ft/yr of Metropolitan's State Water Project Table A water as a permanent transfer. The water would be exchanged for Colorado River water and either recharged at the existing Whitewater River Spreading Basins or delivered via the Coachella Canal for irrigation purposes in the Palm Desert-Rancho Mirage area of the Upper Valley. The transferred water may also be subtracted from Metropolitan's Advance Storage account. CVWD and DWA would assume all SWP costs associated with this water except as described below.

The terms of the agreement provide that CVWD will obtain 88,100 acre-ft/yr and DWA will obtain 11,900 acre-ft/yr of Metropolitan's SWP Table A Water. CVWD and DWA would assume all capital costs associated with capacity in the California Aqueduct to transport this water and variable costs to deliver the water to Perris Reservoir. Metropolitan would retain other rights associated with the transferred water including interruptible water service, carryover storage in San Luis Reservoir and flexible storage at Castaic and Perris Reservoirs.

Metropolitan has the option to callback the water in years when Metropolitan determines it needs the water. This option must be exercised no later than April 30 of each year. Metropolitan's callback options are to be exercised in two 50,000 acre-ft blocks. Between years 2004 and 2015, Metropolitan can exercise its option to call back the first 50,000 acre-ft block in any year but must make 100,000 acre-ft of water available in at least three years if CRA is flowing full. In this period, Metropolitan may call back the second 50,000 acre-ft block in any year without limitation. Between years 2016 and 2035, Metropolitan may call back the first 50,000 acre-ft a maximum of 10 times and the second 50,000 acre-ft a maximum of 15 times. In those years when the option is exercised, Metropolitan would reimburse CVWD and DWA for all fixed and variable SWP costs for that year.

Short-term operating criteria are established that cover the years 2005 through 2009. These criteria specify that Metropolitan will deliver no less than 17,000 acre-ft/yr of water if SWP allocations are at least 50 percent of the Table A amounts. If the allocation is less than 50 percent, Metropolitan is required to make up the difference in this five-year period. The parties also agreed to develop long-term operating criteria. The 2003 Exchange Agreement also established the maximum amount of total exchange water delivery at 216,000 acre-ft/yr if Metropolitan does not exercise its call-back option. The maximum exchange delivery is reduced to 165,000 acre-ft/yr if Metropolitan makes a call-back.

The environmental impacts of this transfer were evaluated in the Program EIR for the CVWMP and SWP Transfer that was certified by the CVWD Board in October 2002. The Metropolitan Board certified the CVWMP PEIR as a responsible agency on October 14, 2003. Metropolitan's SWP contract was amended on October 23, 2003. CVWD's and DWA's SWP contracts were amended on October 24, 2003. The transfer became effective on January 1, 2005. Completion of this transfer increased CVWD's SWP Table A amount to from 33,000 to 121,100 acre-ft/yr and DWA's Table A amount from 38,100 acre-ft/yr to 50,000 acre-ft/yr.

To estimate the average supply from this transfer conservatively, it is assumed that Metropolitan would exercise its option to call-back the 100,000 acre-ft/yr in 5 years out of every 8 years when SWP supplies are reduced. The actual frequency of call-back would depend on the availability of Metropolitan's water supplies to meet its demands.

Berrenda Mesa Water Transfer

The Berrenda Mesa Water Transfer involves the transfer of 16,000 acre-ft/yr of unused SWP Table A Water from Berrenda Mesa Water District (BMWD) and provisions for a permanent water supply to CVWD and DWA. BMWD is a subagency of Kern County Water Agency (KCWA). KCWA is a SWP contractor that wholesales and distributes water to thirteen local water districts.

Under the proposed Project, CVWD would acquire 12,000 acre-ft/yr and DWA would acquire 4,000 acre-ft/yr of the transferred Table A Water. CVWD and DWA would administer the transfer of Table A Water, through the existing Exchange Agreement with Metropolitan for an equal amount of Colorado River water released in the Coachella Valley from the CRA.

The water to be transferred from BMWD is associated with land taken out of agricultural production approximately 10 years ago. In the interim, the water has primarily been marketed to agencies outside BMWD on the SWP annual spot market. Purchasers have included the Berrenda Mesa Project, the Pioneer Power Plant Project, the Kern Water Bank, the Environmental Water Account (EWA) by exchange, and others. The purchasers and the amounts of water each purchased have varied each year, but have been within Kern County. No purchaser is dependent on the availability of this water at any given time.

Upon approval of the SWP water sale/transfer to CVWD and DWA, the BMWD contract with KCWA and the KCWA contract with DWR would be amended to reflect the reduction of up to 16,000 acre-ft/yr of Table A Water. CVWD's SWP contracts with DWR would be amended to reflect the increase of 12,000 acre-ft/year of Table A Water to CVWD. DWA's SWP contract with DWR would be amended to reflect the increase of 4,000 acre-ft/year of Table A Water.

CVWD and DWA are currently conducting environmental analysis of this transfer and expect to complete the transfer in early 2006. Upon completion of this transfer, CVWD's SWP Table A amount would be increased from 121,100 to 133,100 acre-ft/yr and DWA's Table A amount from 50,000 to 54,000 acre-ft/yr. The transfer is to be effective beginning in 2010.

IID-CVWD Groundwater Storage Agreement

As part of the QSA, CVWD and IID signed an agreement that allows IID to store a portion of its Colorado River water supply in the Coachella Valley groundwater basin. Water would be delivered to CVWD for storage in the basin through direct or in-lieu recharge methods at existing or proposed CVWD facilities. Recharge of IID water would be subordinate to CVWD's recharge needs and would be subject to a 5 percent loss for evaporation, canal leakage and other similar causes. IID would have a storage account in the groundwater basin and the storage would be subject to a 5 percent annual loss. CVWD would return the stored water to IID by reducing its consumptive use of Colorado River water by the amount request by IID or the amount in storage. The maximum amount of storage available to IID is not specified but would be determined by CVWD based on physical storage space, the needs of CVWD and other parties with pre-existing storage rights, the availability of recharge facilities and CVWD's ability to reduce its use of Colorado River water. The term of this agreement is the same as the other QSA agreements, 75 years.

MWD-CVWD Groundwater Storage Program

In 2000, CVWD and Metropolitan completed a feasibility evaluation of a conjunctive use/surplus water storage program in the Coachella Valley. This study evaluated options to increase groundwater storage through direct and in-lieu recharge methods. Direct recharge included increased use of the Whitewater Spreading Facility and the construction of new recharge facilities in the lower Whitewater River subbasin. In-lieu recharge included construction of conveyance facilities to deliver additional Colorado River water to agricultural and golf course users to replace their current groundwater pumping. Stored water would be recovered through increased groundwater extraction in dry years coupled with reduced Colorado River deliveries to CVWD. Metropolitan would like to develop a conjunctive use project to store up to 500,000 acre-ft of water and produce 100,000 to 175,000 acre-ft/yr of dry year yield. Due to reduced Colorado River water availability, further development of this storage program has been deferred.

Future Water Acquisitions

Under the CVWMP, CVWD and DWA would continue to acquire additional permanent water supplies, as they become available. These supplies could include SWP Table A water, other water transfers or participation in out-of-basin water development projects. CVWD and DWA would continue their current practice of purchasing SWP turnback pool and interruptible water, during wet years as available from other SWP contractors. In addition, CVWD and DWA would evaluate the purchase of water during dry years from programs such as the Governor's Drought Water Bank based on supply availability and costs. The goal of these purchases and acquisitions is to achieve the proposed long-term average deliveries of 140,000 acre-ft/yr for the Coachella Valley. Based upon the current estimates SWP supply reliability and the assumed call-back of water by Metropolitan, CVWD and DWA may need to acquire about 46,000 acre-ft/yr of additional Table A water in the future. Acquisition of additional permanent water supplies would be subject to specific CEQA documentation when such acquisition is identified.

3.3.3 State Water Project

Table 3-11 summarizes the anticipated average availability of SWP water based on the existing Table A amount, exchange agreements and SWP supply availability.

This estimate is based on CVWD and DWA receiving the projected average SWP deliveries as estimated by DWR in its Draft State Water Project Delivery Reliability Report, published in November 2005 (DWR, 2005b). Average supply values are used since CVWD and DWA can utilize the large storage capacity of the groundwater basin to capture both wet and dry year flows. As stated previously, due to the difficulty in estimating when Metropolitan might call-back the 100,000 acre-ft/yr of transferred Table A water, it is assumed that callbacks would occur in the driest 62.5 percent of the time. CVWD's share of the average SWP supply is based on the relative amount of groundwater pumping in the Mission Creek and upper Whitewater River subbasins within the CVWD service area that is subject to replenishment assessments. This share increases from about 48 percent to about 65 percent of the total pumping in these subbasins.

Table 3-11
Summary of Future SWP Supplies

Year	SWP Table A Amount (acre-ft)/yr	Average Reliability [1] (Percent)	Average Yield (acre-ft/yr)	Metropolitan Callback [2] (acre-ft/yr)	Average Supply (acre-ft/yr)	CVWD Avg. Supply[3] (acre-ft/yr)
2005	171,100	85.7%	146,600	-48,200	98,400	46,000
2010	187,100	83.6%	156,400	-46,200	110,200	62,000
2015	187,100	81.5%	152,500	-44,200	108,300	70,600
2020	187,100	79.4%	148,600	-42,100	106,400	70,100
2025	187,100	77.3%	144,700	-40,100	104,500	68,100
2030	187,100	77.3%	144,700	-40,100	104,500	66,500

1 Average SWP reliability based on requested deliveries from DWR, Draft State Water Project Delivery Reliability Report 2005.
2 Metropolitan callback amount is based on Metropolitan calling back the transferred 100,000 acre-ft of Table A water in the driest 62.5 percent of years.
3 CVWD average SWP supply is the proportionate share of the average SWP supply to the Coachella Valley based on the percent of groundwater produced for domestic supply by CVWD in the upper Whitewater and Mission Creek subbasins. The remaining water would offset pumping by pumpers in the CVWD and DWA service areas.

3.3.4 Treated Municipal Effluent

CVWD operates six WRP's designated WRP-1, WRP-2, WRP-4, WRP-7, WRP-9 and WRP-10. Water is recycled from the WRP-7, WRP-9 and WRP-10 facilities for non-potable irrigation. When the recycled water demand is low in winter months, these facilities discharge effluent to percolation ponds where it eventually becomes part of the groundwater supply. WRP-4 currently discharges its effluent to the CVSC, which flows to the Salton Sea. CVWD anticipated installing tertiary treatment at this plant in the next five years. Effluent is not currently recycled from WRP-1, WRP-2 and WRP-4. WRP-4 effluent is anticipated to be reused beginning in 2010 as recommended in the CVWMP. These plants are described in more detail in **Section 6** of this report. The projected recycled water supply is presented in **Table 3-12**. The detailed wastewater flow projection is presented in **Section 6**.

3.3.5 Desalinated Agricultural Drain Water

In 1997, CVWD filed an application with the State Water Resources Control Board to appropriate all waters in the CVSC (up to a maximum of 150 cfs) draining from lands irrigated in ID-1. The application was submitted with the intent to protect local water resources. Initial diversions must take place by 2013, building up to full diversion in 2063.

The CVWMP envisions that up to 11,000 acre-ft/yr of agricultural drain water will be desalted to a quality equivalent to Canal water and delivered for irrigation use by 2023. Delivery of this water would begin in 2008 at a rate of about 4,000 acre-ft/yr and reaches 11,000 acre-ft/yr in approximately fifteen years. **Table 3-13** presents the anticipated timing for development of this source. The actual timing could be revised depending on CVWD supply needs.

Table 3-12
Future Recycled Water Supply

Tributary Area/WRP	Wastewater Flow (acre-ft/yr)						
	2004	2005	2010	2015	2020	2025	2030
Seven Palms/Sky Valley[1]	0	9	81	285	528	798	1,070
WRP-1 [2]	43	43	43	43	45	47	49
WRP-2 [2]	21	36	111	184	269	330	365
WRP-4 [3]	5,331	5,546	6,190	6,589	6,902	7,175	7,368
WRP-7 [4]	2,372	2,658	2,848	3,113	3,318	3,448	3,543
WRP-9	358	358	0	0	0	0	0
WRP-10 [4]	12,101	12,297	14,034	15,375	16,286	16,962	17,392
Undefined Tributary Areas[1]	289	603	1,771	2,775	3,688	4,340	4,835
Total Wastewater	**20,515**	**21,551**	**25,077**	**28,363**	**31,036**	**33,100**	**34,621**
Recyclable Wastewater [4]	**14,831**	**15,313**	**23,071**	**25,076**	**26,506**	**27,585**	**28,303**

1 No existing/planned treatment plants
2 Effluent does not currently meet tertiary treatment standards.
3 CVWD is considering installation of tertiary treatment at this plant. This effluent is assumed to be recyclable after 2010
4 Effluent currently meets tertiary treatment standards.

Table 3-13
Projected Desalinated Agricultural Drain Water Flows

Year	Annual Flow (acre-ft/yr)
2005	0
2010	4,000
2015	8,000
2020	8,000
2025	11,000
2030	11,000

Source: CVWMP (CVWD 2002a)

The Coachella Canal and its distribution system were constructed by and are owned by the federal government for the purpose of delivering Colorado River water for irrigation and domestic use in the ID-1 service area. Colorado River water is federal water that by contract cannot be used outside ID-1. Since the reclaimed agricultural drainage water is non-federal, it is not subject to the contractual restrictions regarding use of Canal water within the ID-1 service area. CVWD anticipates that an equal amount of Canal water can be delivered to golf courses or the portion of the Oasis area located outside ID-1. Preliminary discussions with Reclamation officials indicated that such an exchange of treated, reclaimed drain water might be feasible. CVWD would obtain approval from the Reclamation, if required, prior to conveying this water in the distribution system or delivering it outside of ID-1.

Approximately 13.6 million gallons per day (mgd) of drain water would be diverted and filtered prior to desalination. The desalination facility would have a 10-mgd capacity that will produce about 7.5-mgd of product water. Approximately 3.5 mgd of the flow would be bypassed and blended with the product water to produce the desired quality. The treatment process would produce about 2.6 mgd of filter backwash and brine waste. Preliminary studies have considered both on-site and off-site evaporation ponds for brine disposal. On-site evaporation ponds would require about 530 acres of surface area due to the relatively low total dissolved solids (TDS) of the brine. Alternatively, the brine could be conveyed to the Salton Sea either in the CVSC or a parallel brine outfall. Evaporation ponds located near the sea could remove an equivalent amount of salt by evaporating Salton Sea water. Approximately 110 acres of ponds would be required in this case.

CVWD is currently conducting a pilot treatment study to evaluate the feasibility of various desalination processes. CVWD recently received a grant from the DWR Proposition 50 Water Desalination Proposal. The proposal requested funds for a pilot desalination project to compare reverse osmosis with solar still "dewvaporation" of agricultural drainage runoff within the Coachella Valley and reuse this resource. CVWD will receive $596,000 from the program and will match the same for a total pilot project cost of approximately $1.2 million.

The project has five goals:

1. To demonstrate an innovative low-energy intensive solar still brackish water desalination technology
2. To evaluate performance of the technology compared to conventional reserve osmosis
3. To assess bank filtration pretreatment as a means of reducing reverse osmosis costs
4. To assess generated brine volumes and disposal options
5. To determine the economics of recovering this water resource and complete a feasibility study for full-scale implementation

3.3.6 Water Supply Summary

The historical and future water supply during average years is summarized below in **Table 3-14.**

3.3.7 Water Supply Reliability

The available supplies and water demands for CVWD's service area were analyzed to assess the region's ability to satisfy demands during three scenarios: a normal water year, single dry year, and multiple dry years. The tables in this section present the supply-demand balance for the various drought scenarios for the twenty-five year planning period 2005 to 2030. It is expected that the region will be able to meet 100 percent of its dry year domestic water demand under every scenario. **Table 3-15** and **Table 3-16** present the supply reliability for the CVWD supply sources during normal, single dry and multiple dry water year events.

In general, all CVWD water supply sources can provide for 100 percent of the demands in the Coachella Valley for a substantial period of time.

Table 3-14
Historical and Projected Average Water Supply – CVWD

Year	Ground-Water Supply [1] (acre-ft/yr)	Canal Water Supply [2] (acre-ft/yr)	SWP Exchange Water [3] (acre-ft/yr)	Recycled Water (acre-ft/yr)	Desalinated Drain Water (acre-ft/yr)	Total Supply (acre-ft/yr)
1995	66,600	285,929	45,214	11,100	0	408,843
1996	50,700	289,726	100,376	11,520	0	452,322
1997	52,400	281,179	83,407	12,550	0	429,536
1998	71,100	281,714	99,729	13,657	0	466,200
1999	53,800	282,021	70,446	13,397	0	419,664
2000	71,100	282,781	56,161	13,289	0	423,331
2001	73,000	272,741	3,242	12,923	0	361,905
2002	76,500	280,845	26,912	13,289	0	397,546
2003	78,600	245,069	3,177	13,903	0	340,749
2004	73,400	238,456	16,167	14,831	0	342,854
2005	85,100	282,000	46,000	15,300	0	428,400
2010	106,700	318,000	62,000	23,100	4,000	513,800
2015	123,100	342,000	70,600	25,100	8,000	568,800
2020	123,700	379,000	70,100	26,500	8,000	607,300
2025	124,200	404,000	68,100	27,600	11,000	634,900
2030	123,200	429,000	66,500	28,300	11,000	658,000

Projected values are rounded to nearest 100 acre-ft/yr.
1. CVWD share of net groundwater inflow to Whitewater and Mission Creek subbasins, shared with DWA service area and private pumpers.
2. Net water deliveries to Coachella Valley excluding conveyance losses.
3. Anticipated average availability assuming Metropolitan call-backs 50 percent of the time in dry years.

Table 3-15
Supply Reliability by Source - 2005

Supply Source	Average / Normal Water Year	Single Dry Year [1]	Multiple Dry Years [2]		
			Year 1	Year 2	Year 3
Groundwater	100%	100%	100%	100%	100%
Canal Water	100%	100%	100%	100%	100%
Recycled Water	100%	100%	100%	100%	100%
SWP Water [3]	86%	0%	0%	0%	0%
Desalinated Drain Water[4]	0%	0%	0%	0%	0%

1 Assumes a repeat of 1977 drought.
2 Assumes a repeat of 1990-1992 drought.
3 Values expressed as a percent of maximum Table A allocations.
4 Not on line in 2005.

Table 3-16
Supply Reliability by Source - 2030

Supply Source	Average / Normal Water Year	Single Dry Year [1]	Multiple Dry Years [2]		
			Year 1	Year 2	Year 3
Groundwater	100%	100%	100%	100%	100%
Canal Water	100%	100%	100%	100%	100%
Recycled Water	100%	100%	100%	100%	100%
SWP Water [3]	77%	0%	0%	0%	0%
Desalinated Drain Water	100%	100%	100%	100%	100%

1 Assumes a repeat of 1977 drought.
2 Assumes a repeat of 1990-1992 drought.
3 Values expressed as a percent of maximum Table A allocations.

Groundwater

The Garnet Hill, Mission Creek and Whitewater River subbasins contains about 32.4 million acre-feet in groundwater storage in the upper 1,000 feet. Although each subbasin is subject to groundwater overdraft, the current overdraft is not expected to affect groundwater reliability. Net inflows to these basins range from 204,000 to 260,000 acre-ft/yr excluding imported water recharge. Although the net inflow varies from year to year, the vast storage capacity acts as a significant buffer for this variation. When combined with the implementation measures of the CVWMP, the groundwater supply is considered fully reliable.

Coachella Canal Water

Due to the prolonged Colorado River Basin drought, the seven Basin States have been holding discussions to develop draft consensus recommendations for guidelines to manage future water shortages on the river. Until this process is completed in late 2007, the only basis for allocating water is the existing priority system. CVWD's and California's high priority as defined in the *Law of the River* and the terms of the QSA make CVWD's Coachella Canal supply fully reliable. As discussed previously, CVWD's supply would only be reduced if a drought occurs such that the Arizona, Nevada and Metropolitan allocations are eliminated. This has a very low probability of occurrence.

Several lawsuits have been filed challenging the validity of the QSA. The effect of these suits on the terms of the QSA is uncertain at this time. Until these suits are resolved, the QSA is being implemented.

SWP Water

CVWD and DWA currently have contracts with the State of California for a combined Table A amount of 171,100 acre-ft/yr of SWP water. Reliability studies performed by DWR indicate that the SWP can provide a long-term average supply of about 86 percent of Table A delivery requests for 2005 conditions and 77 percent for 2025 conditions. Minimum supplies in a single dry year such as a repeat of 1977 would be 5 percent of Table A requests. The lowest average supply in three consecutive years of drought (such as a repeat of 1990-92) is 34 percent of Table A for 2005 conditions and 26 percent for 2025 conditions (DWR, 2005b). The reliability for 2030 is assumed to be the same as estimated by DWR for 2025.

Under the terms of the 1984 and 2003 Exchange Agreements, Metropolitan can discontinue deliveries of SWP Exchange Water during droughts or make deliveries from its advance storage account. Consequently, in single and multiple dry years, it is assumed that no deliveries of SWP water would be made. Due to the significant groundwater storage capacity, CVWD and DWA can draw upon stored water and recover additional water during normal and wet years.

The reliability estimates for SWP supplies are based on the assumption that current facilities and regulatory conditions continue in the future. DWR and Reclamation are actively developing projects that are intended to improve the reliability of the SWP. However, environmental and regulatory changes could further affect SWP reliability.

Recycled Water

Recycled water is a significant potential local resource that could be used to help reduce overdraft. Recycled water currently plays a limited role in the Coachella Valley's water supply. In the Upper Valley, municipal wastewater is the only source of recycled water. Currently, all wastewater produced in the Upper Valley is reused through direct application for irrigation or percolated into the groundwater basin. This trend is expected to continue. One difficulty in recycling wastewater effluent for irrigation involves supply and demand. Flows to Coachella Valley treatment plants are greatest in the high-tourism winter months, when irrigation demands are lowest. Flows are conversely lowest in summer, when irrigation demand is highest. This imbalance results in the need to pump groundwater during the summer months. The recycling water supply for irrigation is approximately 6,500 acre-ft/yr in 2004 and it is a reliable source of supply.

Desalinated Agricultural Drain Water

Agricultural drainage and other water in the CVSC has been consistently in excess of 50,000 acre-ft/yr for the past 10 years, with drainage water making up about half of this flow. Implementation of the CVWMP is expected to increase the amount of drain water as groundwater levels rise, forcing poor quality shallow groundwater into the drains. By 2015, agricultural drainage flows in the CVSC are expected to be 45,000 acre-ft/yr, increasing to 98,000 acre-ft/yr by 2035 (CVWD, 2002b). Since this flow does not significantly vary based on hydrology, this source is considered to be fully reliable.

3.3.8 Frequency and Magnitude of Supply Deficiencies

There have never been supply deficiencies associated with the groundwater source. The Coachella Canal experienced a one-time shortfall in 2003 prior to the signing of the QSA when the Secretary of the Interior reduced California's Colorado River entitlement to 4.4 million acre-ft/yr. To make up for the shortfall, CVWD purchased water from the Palo Verde Irrigation District. This shortfall is not expected to be repeated. During summer months, recycled water supplies are not sufficient to meet all current demands; users are required to use their private wells or other water sources to supplement the recycled water supply. CVWD plans to supplement the recycled water supply with Coachella Canal water. Finally, CVWD's and DWA's SWP Table A water is used to recharge the groundwater basin and is currently used as a direct supply source. During drought periods, the SWP water is delivered to Metropolitan with CVWD and DWA receiving SWP water from Metropolitan's storage account. In the worst case scenario, it is anticipated that this replenishment water is eliminated for three consecutive dry years.

3.3.9 Plans to Assure a Reliable Water Supply

Groundwater and Canal Water

As discussed in the Introduction, CVWD is implementing the CVWMP to address the overdraft of the groundwater basin. When fully implemented, this plan will ensure that the water levels remain stable and that the groundwater remains a long-term viable source. Also as mentioned previously, CVWD has signed the QSA to secure rights to a permanent supply of the Colorado River water. These two sources represent 97.5 percent of the historical water supply and could supply 100 percent of the water demand, if necessary.

SWP Water

In 1996, CVWD and DWA recognized the need for additional imported water in order to eliminate groundwater overdraft. Since then, the two districts have purchased additional Pool A, Pool B, and interruptible water from the SWP resulting in average purchases of 142,000 acre-ft/yr. These additional supplies are not expected to be available in the future and cannot be relied upon to provide a reliable long-term source of water to the Coachella Valley.

The CVWMP identifies the need for average deliveries of 140,000 acre-ft/yr of SWP exchange water of which 103,000 acre-ft/yr is for recharge at the Whitewater Spreading facility and 37,000 acre-ft/yr is for direct use on mid-Valley golf courses. Currently, CVWD and DWA have acquired SWP Table A water of 187,100 acre-ft/yr. As discussed earlier, the Table A amount is expected to provide an average supply of 122,500 acre-ft/yr in 2010 reducing to 116,300 acre-ft/yr in 2025. CVWD and DWA are continuing to identify additional opportunities for acquiring additional SWP Table A water. Based on the average SWP reliability in 2025, CVWD and DWA would need to acquire at least 46,000 acre-ft/yr of additional Table A water. To the extent possible, additional Table A water would be obtained from other SWP contractors. If adequate Table A water cannot be obtained, surplus SWP water would continue to be purchased on a year-to-year basis as needed and as available.

CVWD and DWA are currently evaluating the feasibility of constructing a new aqueduct to convey SWP water directly to the Coachella Valley. This facility would allow CVWD and DWA to improve the quality of water delivered to the Valley and would improve the reliability of supply by providing conveyance capacity in the event of an outage of the Colorado River Aqueduct. CVWD and DWA are identifying potential partners that may interested in participating in the construction of this proposed aqueduct.

Other Sources

The other two sources, recycled water and surface water are not as significant, but reasonable efforts will be made to ensure their long-term reliability.

Section 4
Water Conservation

4.1 LAW

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(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.*

(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).

This section describes CVWD water conservation goals, its existing and proposed conservation programs and addresses all of the requirements of the UWMP relative to demand management.

4.2 WATER MANAGEMENT PLAN CONSERVATION GOALS

Water conservation is an important component of water resource management, not only for CVWD but also for the entire Southern California region. For a variety of reasons, the Coachella Valley region remains a high growth area. This growth in population puts pressure on CVWD to meet the anticipated water demand over the next 25 year and beyond. Implementation of conservation programs helps reduce the expected increase in water demand.

CVWD has had a water conservation program since the 1960s. However, a significant expansion of the program's scope and goals has been spawned by the CVWMP (CVWD, 2002a). The implementation phase of this plan is presently under development and is due to be completed in early 2006.

CVWD recognizes the importance of conserving water in order to reduce pressure on the groundwater supply. CVWD's conservation goals have been identified as a part of the CVWMP to reduce water use through conservation programs, which are listed in **Table 4-1**. The expansion and elaboration of these goals and their associated schedule will be addressed in the CVWMP Implementation Task Force Recommendations, which is presently being prepared.

The State Memorandum of Understanding (MOU) regarding Urban Water Conservation in California sets guidelines to achieve a baseline level of water conservation in a given water service area (CUWCC, 2004). Signers of the MOU agree to comply and set goals to meet the standards outlined in the MOU. CVWD is not a signatory to the MOU. Therefore, a discussion of the following 14 Demand Management Measures (DMM) listed in **Table 4-2** is included below. In addition to these DMMs, other actions being taken by CVWD to conserve water are discussed later in this section.

Table 4-1
Minimum Water Conservation Goals

Water Use Category	Percent of 2005 Use Conserved Goal	Schedule for Goal
Municipal	10%	2010
Golf Courses		
Existing in 1999	5%	2010
Built after 1999	Case-by-Case	
Industrial	Case-by-Case	
Crop Irrigation	7%	2015
Fish Farms	Case-by-Case	
Duck Clubs	Case-by-Case	
Greenhouses	Case-by-Case	
Total Demand	7%	2015

Source: (CVWD, 2002a)

Table 4-2
Demand Management Measure Programs

DMM No.	Demand Management Measures
1	Water Survey Program for Single-Family and Multi-Family Residential Customers
2	Residential Plumbing Retrofit Program
3	System Water Audits, Leak Detection and Repair Program
4	Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections Program
5	Large Landscape Conservation Programs and Incentives Program
6	High-Efficiency Washing Machine Rebate Program
7	Public Information Program
8	School Education Program
9	Conservation Programs for CII Accounts Program
10	Wholesale Agency Programs
11	Conservation Pricing Program
12	Water Conservation Coordinator Program
13	Water Waste Prohibition Program
14	Residential Ultra-Low-Flush Toilet Replacement Program

Indoor water use conservation is broken down into two components, active and passive. Active water conservation is defined as reduction in water used due to a direct incentive program being implemented by CVWD. Passive water conservation is that which is accomplished by customers upgrading their plumbing, water fixtures and water using appliances without incentives from their water provider.

It should be noted that most CVWD water and wastewater customers have been brought online within the last 30 years. For this reason, and the fact that about 80 percent of water use in CVWD is for irrigation, CVWD expects that its programs targeting outdoor water use will be the most cost effective method to foster water conservation within its service area.

It should also be noted that water losses and treated wastewater in the CVWD service area are captured and returned to the watershed groundwater basin or are otherwise reused for irrigation.

4.3 WATER SURVEY PROGRAM FOR SINGLE-FAMILY AND MULTI-FAMILY RESIDENTIAL CUSTOMERS

In the initial stages of planning, CVWD is preparing to implement a water survey/audit program. The implementation plan of this program will be included in the CVWMP Implementation Task Force Recommendations. The program will address indoor and outdoor residential water use. CVWD will provide residential water surveys/audits consisting of the following:

- **Indoor:** CVWD will provide homeowners with a self-test interior water use audit kit and demonstrate its use.
- **Outdoor:** CVWD staff will conduct an abbreviated outdoor landscape water audit modeled after the intensive audit procedure utilized on large landscapes and golf courses. The service will be offered to residential water users who use greater than 500 gpd/account consumption rates.

Table 4-3 below shows the historical number of residential customers in CVWD's service area. These residential customers have the potential to be positively impacted by the program. As this program is still in the planning phases, goals to be reached by 2010 have not yet been developed. These goals will be clearly defined in the CVWMP Implementation Task Force Recommendations. An evaluation of the success and cost/benefit of the program will be developed to identify conservation trends from surveyed households.

Table 4-3
Historic Residential Water Customers Summary

Residential Customers	1999	2000	2001	2002	2003	2004
Single Family	63,695	67,008	70,595	73,442	76,469	79,685
Multi Family	2,411	2,449	2,503	2,558	2,650	2,755
Duplex/Triplex	*1,052*	*1,064*	*1,084*	*1,098*	*1,137*	*1,192*
Multiple Dwellings	*616*	*623*	*625*	*626*	*656*	*679*
Apartments	*742*	*762*	*794*	*835*	*858*	*884*
Total Residential	**66,105**	**69,457**	**73,098**	**76,000**	**79,119**	**82,440**

Source (BV, 2005a)

4.4 RESIDENTIAL PLUMBING RETROFIT PROGRAM

In 1992, CVWD launched a program that included low flow showerhead distribution and plumbing fixture rebates. The community met the program with limited interest. Out of 1,000 kits that were assembled, only 350 were picked up in two years. Presently, residential plumbing upgrades are being realized via advances in local plumbing codes, which set higher appliance water efficiency standards for all new construction as well as renovations. Presently, CVWD has no active incentive program for customers to retrofit existing plumbing fixtures. CVWD has legal authority to develop this DMM. It is projected that with the increased awareness of today's public, a completed CVWMP Implementation Task Force Recommendations, and targeted promotions, an active plumbing retrofit incentive program could be more effective than in the past and subsequently reduce water consumption.

Plumbing retrofit products such as low-flow showerheads and faucet fixtures have been on the market more than 10 years and are now sufficiently developed to be technically sound products. The use and/or distribution of these products have social value as it brings conservation products, literally, in direct contact with area users, thereby raising awareness of water conservation efforts. Furthermore, the use of these products has the potential to reduce customer water bills. The use of these products provides neither significant direct or indirect health benefit nor detriment. Although this DMM is financially feasible, CVWD's primary focus will be to reduce outdoor water use, which accounts for 80 percent of water use in CVWD's service area. This DMM will be reviewed as part of the CVWMP Implementation Task Force Recommendations. **Table 4-4** and **Table 4-5** show the affects of passive conservation practices, a rate of fixture replacement by customers due to property turn over, remodeling etc.

Table 4-4
Historic Conversion of Plumbing Fixtures

Actual	2001	2002	2003	2004	2005
# of single family devices	401	439	476	511	546
# of multi-family devices	11,236	12,304	13,341	14,347	15,322
Percent of 1992 Fixtures Upgraded	24%	26%	28%	31%	33%
Actual expenditures - $	$0	$0	$0	$0	$0
Actual water savings - acre-ft/yr	565	618	670	721	770

Table 4-5
Projected Conversion of Plumbing Fixtures

Planned	2006	2007	2008	2009	2010
# of single family devices	580	613	644	675	705
# of multi-family devices	16,268	17,186	18,076	18,940	19,777
Percent of 1992 Fixtures Upgraded	35%	37%	39%	40%	42%
Projected expenditures - $	$0	$0	$0	$0	$0
Projected water savings - acre-ft/yr	982	1,182	1,369	1,545	1,711

Natural replacement of fixtures is estimated at 2 percent and the proposed program would distribute fixture kits with the goal of 10 percent replacement rate assuming that 75 percent of kits distributed are installed. CVWD would therefore be augmenting the replacement rate by 5.5 percent. This program will result in reaching a 75 percent of fixture replacement by 2013, the goal established in the MOU for the completion of this program. Without this program, 75 percent fixture replacement would occur near the year 2023.

4.5 SYSTEM WATER AUDITS, LEAK DETECTION AND REPAIR PROGRAM

CVWD has no plans to expand its residential water audit or leak detection activities, which are presently performed on an as needed basins. CVWD has legal authority to develop this DMM. CVWD routinely evaluates historical data on water production and consumption. As shown in **Table 2-11**, between 1999 and 2004, annual water losses have not exceeded 9.9 percent and with an average annual water loss of 8.8 percent. According to CUWCC, an existing system is considered to be in excellent condition when water losses are lower than 10 percent (Fiske, 2001). As the CVWD water losses are below this recommendation, the expansion of current leak detection and repair program is not necessary at this time. Although leak and/or line break repairs are performed by CVWD, no records of these activities, including system audits or leak detection program data are available. CVWD will expand its record keeping associated with their leak detection activities as part of the CVWMP Implementation Task Force Recommendations with data including, but not limited to:

- Incident description
- Number of leaks repaired per year
- Annual leak repair cost
- Water leak size
- Suspected water loss duration
- Cost of leak detection/mile of pipeline

The domestic water system was directly built as well as added to the system as communities were built on neighboring County land, developed into cities and thereafter incorporated into CVWD's service area. **Table 4-6** below is a summary of the amount of distribution piping in the CVWD system. The bulk of pipelines installed and acquired by CVWD were installed in the 1970s to present. Consequently, aging infrastructure is not a significant component of water losses.

Table 4-6
CVWD Distribution Piping Summary

Year	Distribution Piping (miles)
1992	1,401
1993	1,429
1994	1,451
1995	1,479
1996	1,523
1997	1,568
1998	1,605
1999	1,645
2000	1,670
2001	1,680
2002	1,731
2003	1,782
2004	1,872

Source: CVWD annual reports 1992 through 2005

CVWD, on an as needed basis, performs the monitoring and repair of water leaks and breaks. CVWD's goals are to maintain less than a 10 percent annual water loss in their distribution system. This goal will be measured by reviewing monthly water consumption and production data currently being tracked by CVWD. Expansion of this program would enhance the agency's knowledge and awareness of their system, which would allow them to more accurately target problem areas for future maintenance or replacement.

4.6 METERING WITH COMMODITY RATES FOR ALL NEW CONNECTIONS AND RETROFIT OF EXISTING CONNECTIONS PROGRAM

One hundred percent of CVWD's customers are metered. The meters are billed based on volume of use. CVWD does have mixed use meters serving both domestic use and landscaping irrigation. All future water users require metering on their service connection. No commodity rate program or retrofitting program is required because 100 percent of existing water users are metered.

4.7 LARGE LANDSCAPE CONSERVATION PROGRAMS AND INCENTIVES PROGRAM

Within the CVWD service area, there are two principal groups of large landscape customers—those with separate irrigation meters on the domestic water system and those with private wells for golf course or agricultural irrigation. Irrigation accounts for approximately 80 percent of total domestic water usage and large landscape customers represent about 30 percent of domestic water use. Over 80,000 acre-ft/yr of groundwater is pumped by private well owners for golf course irrigation in CVWD. One of CVWD's goals is to reduce new water use by these customers. CVWD has legal authority to develop this DMM. **Table 4-7** shows a summary of ongoing and proposed water conservation measures that are or will be undertaken by CVWD associated with its large landscape irrigators. The activity status of each of the conservation measures is also included, which shows that some activities are functioning presently and others are planned for the near future. The projected cost benefit of the proposed and ongoing programs under this DMM will be explored in CVWMP Implementation Task Force Recommendations.

4.7.1 Expand Landscape Irrigation Retrofit Low-Interest Loan Program

The intent of the current irrigation retrofit low-interest loan program is to assist large domestic water meter users with older, inefficient irrigation systems with financing improvements. The current program offers low interest (3 percent) loans for up to $50,000 for the replacement of inefficient irrigation systems. The program was initiated in 1992 and averaged only two loan approvals per year through 1996. In the past three years, only one loan application has been both submitted and approved. Four homeowner associations expressed interest in obtaining a loan in FY 2004-2005 by requesting application forms, but none have applied. **Table 4-8** shows the program activity between 2001 and 2005.

Table 4-7
Large Landscape Conservation Program Summary

Short Term Projects	**Status**
Expand landscape irrigation retrofit low-interest loan program ($50,000 cap)	Ongoing
Commercial Protector Del Agua Program	Ongoing
Water audits for large water users	Ongoing
Adoption of model landscape ordinance by Coachella Valley cities to establish water budget and landscaping criteria for new development	Ongoing
Plan checking for compliance with landscape ordinance	Ongoing
Random inspection of landscape projects in compliance with landscape ordinance approval plans	Proposed
ETo Clock Rebate Pilot Program	Proposed
Curbside sprinkler retrofit rebate/loan program	Proposed
Full time inspection of landscape projects to insure installation matches approved plans	Proposed
Long Term Projects	
Maximum Water Allowance tiered rate pilot program for Class 11 meters only	Proposed

Table 4-8
Large Landscape Irrigation Loan Program Summary 2001-2005

Actual	2001	2002	2003	2004	2005
# of budgets developed	0	0	2	0	0
# of surveys completed	0	0	2	0	0
# of follow-up visits	0	0	2	0	0
actual expenditures - $	$0	$0	$50,000	$0	$0
actual water savings - acre-ft/yr	0.0	0.0	25.5	0.0	0.0

Source: Correspondence with Conservation Coordinator (CVWD, 2005e)

CVWD proposes to revise this program. The new program would increase participation by widening eligibility criteria. The loan cap would be increased to $100,000 per participant, which will increase the accessibility of the program as well as accommodate increased irrigation system hardware costs since 1992.

The goal of this program is to increase program participation to a minimum of six loans per year by expanding eligibility to a larger selection pool consisting of all Class 11 irrigation meter sites, all landscape recycled water user sites, all landscape canal water user sites and all sites utilizing private groundwater wells as their source of landscape irrigation water. Measurement of these goals through 2010 will be performed by comparing the number of loans implemented per year versus the goal number of loans to be implemented. Prior to CVWD's recent conservation efforts, no goals had been established for this program.

4.7.2 Commercial Protector Del Agua Program

Commercial and recreational landscape irrigation systems are often improperly installed, poorly maintained and inefficiently scheduled by transitory landscape maintenance personnel who are often unskilled and uneducated in the science and practice of landscape irrigation efficiency. Career landscape maintenance professionals have little or no in-valley, irrigation science educational opportunities.

The original Protector Del Agua program was developed by the Irrigation Training Research & Training Center at Cal Poly San Luis Obispo as an introductory landscape irrigation water conservation training program for the landscape industry employee.

The 3-hour program consisted of a 1-hour slide show illustrating basic landscape irrigation conservation principles followed by a series of hands-on laboratory demonstration exercises. The program was given in either the English or Spanish language and concluded with the awarding of Certificates of Completion.

It was offered to the local landscape industry in the early 1990s by the three Coachella Valley water districts through the local Resource Conservation District.

Approximately 300 landscape employees were awarded certificates before attendance began to drop off and the program was discontinued locally. The program was continued and expanded by Metropolitan who subcontracted out the execution of the improved and expanded landscape water conservation training program to Water Wise Consulting. This firm will contract with CVWD to bring this newly revised and expanded program to those larger CVWD water users employing landscape maintenance employees or a professional landscape maintenance service.

The goal of this program is to continue to provide, develop and improve the Protector Del Agua program through 2010 via the use of a contracted consultant to run the program. The measure of success of this program will be performed by surveying participants in the program as well as monitoring and measuring the annual attendance at the program.

4.7.3 Water Audits for Large Water Users

The purpose of the large landscape irrigation audit program is to assist the user in maximizing the efficient operation of the irrigation system by measuring performance, generating irrigation schedules and recommending improvement actions.

The goals of this audit program are to determine the irrigation uniformity, efficiency and application rate of each approved site, suggest modifications in design, operation, maintenance and scheduling and estimate the water and energy savings associated with the suggested modifications. A report summarizing the audit's findings and recommendations is hand-delivered and explained to the irrigation manager.

Audit sites are chosen based on excessive water consumption or in response to a request for audit services. CVWD's Water Management Specialist evaluates and approves each site. A Notice to Proceed Letter is sent to the Resource Conservation District authorizing the audit. CVWD staff also conduct audits periodically. All auditors must take the Irrigation Association's Landscape Irrigation Auditor course and pass the Certified Landscape Irrigation Auditor's Examination.

Once a site is approved, the owner or operator of the facility is contacted and an appointment is made to conduct the audit. After measurements and calculations are completed, a summary report and custom irrigation schedules are delivered to CVWD for approval. Upon approval, the report is delivered and explained to the site operator by the auditor. Payment is then authorized to the auditor. The large landscape audit program operates continuously and completes approximately 20 landscape audits per year. The success of this program will be measured by the annual water reduction achieved by large water users participating as a result of the program.

4.7.4 Adoption of Model Landscape Ordinance by Coachella Valley Cities to Establish Water Budget and Landscaping Criteria for New Development

CVWD has developed a landscape irrigation ordinance, CVWD's Landscape Water Conservation Ordinance No. 1302, for acceptance and implementation by cities and communities within its service area. (**Appendix G**) As shown in **Table 4-9**, three cities have accepted this ordinance which was unveiled in 2003 and five cities meet or exceed the CVWD ordinance.

Table 4-9
City/Community Compliance with CVWD Landscape Irrigation Ordinance

No.	City/Community Name	CVWD Landscape Irrigation Ordinance Status
1	Rancho Mirage	Accepted
2	Palm Desert	Meets or exceeds CVWD Ordinance
3	Indian Wells	Meets or exceeds CVWD Ordinance
4	Coachella	No Ordinance
5	Indio	Under Review
6	Cathedral City	No Ordinance
7	Palm Springs	Accepted
8	La Quinta	Accepted
9	Riverside County (Unincorporated Communities)	Has lower standard ordinance

The development of this program is still in progress. The goal of the program is to have all cities and communities in CVWD's service area in compliance or exceeding the completed irrigation ordinance within the next year. The measure of the programs success will be the percent of properly installed irrigation system in alignment or exceeding the landscape ordinance.

4.7.5 Plan Checking for Compliance with Landscape Ordinance

New and rehabilitated landscape sites are required to submit water conserving landscape plans to CVWD's Water Management Department for a plan check prior to construction. The plan check is conducted to insure that the water conserving features of the new landscape meet the provisions of CVWD's Landscape Water Conservation Ordinance No. 1302. Each proposed site is given an annual maximum water allowance based on planted area, plant water use zone, moderate landscape plant water use rates and high irrigation system application efficiency. The landscape designer must utilize a combination of plant choice and irrigation system choice such that the estimated annual water use of the finished landscape does not exceed the annual maximum water allowance assigned. In addition certain irrigation system design practices are mandated, such as setting sprinklers back from street curbs, or prohibited, such as overhead sprinkling of street median strips.

The site plans and calculations are submitted to CVWD's Water Management Department for review and correction. Once the plans are in full compliance with the ordinance, the plans are signed and the developer is allowed to apply for water service and proceed with construction.

Fees are charged for this plan check service. Including income from these fees, the cost to CVWD to implement this program is approximately $81,000/year. Based on past performance, annual water savings generated by this program is approximately 1,644 acre-ft/yr.

The goal of this program is to reduce landscape irrigation consumption by mandating high efficiency irrigation systems and low water use landscaping wherever possible. To determine the success of the program, the pre and post plans check water use will be recorded.

4.7.6 Random Inspections of Landscape Projects for Compliance with Landscape Ordinance

All new and rehabilitated landscape sites are required to submit water conserving landscape plans to CVWD's Water Management Department for a plan check prior to construction. The plan check is conducted to insure that the water conserving features of the new landscape meet the provisions of CVWD's Landscape Water Conservation Ordinance. Recent investigations of excessive water use and nuisance water complaints have revealed that many of these new sites did not construct their landscape to include the approved water conservation features.

The purpose of the random inspection program is to ensure that plan-checked, water conserving landscapes are being installed as approved by conducting random onsite inspections. The inspections thereby indirectly signal to the landscape construction industry that CVWD is spot checking completed landscape irrigation systems for plan-check compliance and will require errors and omissions to be corrected or face the possibility of discontinued water service.

Once a number of violators have been required to make expensive corrective actions, word of mouth communication among contractors is expected to encourage compliance without the necessity of a full time inspection program of all approved sites (currently about 140 per year). The measurement of success of this program will be the recorded percent of "in-compliance" designation of each randomly inspected site. The goal of the program is that 100 percent of the randomly inspected sites will be near or in compliance with CVWD ordinances by 2010.

4.7.7 ETo Clock Rebate Program

The purpose of this rebate program is to financially assist large water users in reducing landscape irrigation water consumption by purchasing an advanced irrigation controller capable of synchronizing their landscape irrigation schedules with seasonal variations in Coachella Valley reference evapotranspiration (ETo) rates.

ETo is a scientific description of the rate at which plant water use varies with the weather. Since the weather changes from season-to-season, week-to-week and even day-to-day, programming irrigation controllers frequently and efficiently remains one of the landscape industry worker's most neglected tasks.

It is not only neglected, but it is also a skilled task requiring special knowledge of soil, plant, and weather conditions not possessed by the average landscaper. Providing educational opportunities to master the art and science of irrigation is one solution to this problem. An alternative solution for the commercial landscaper is a new type of irrigation clock that reprograms itself according to seasonal variations in ETo after the initial calibrating program has been professionally installed.

Another alternative is for CVWD to broadcast ETo data directly to commercial clocks. This alternative would allow CVWD to partition ETo data to each of the five identified ETo zones within the Coachella Valley as well as to shut off all receiving clocks during rain or high wind conditions.

Both approaches have been previously budgeted and were implemented as an experimental trial project in 2005. Assuming documentation of successful reduction in irrigation applications, each program will be expanded and continued into 2006. CVWD will offer a rebate coupon to eliminate the additional cost of the advanced controller in order to encourage the adoption of this new technology. The measurement of success of this program will be documenting water reduction by each participating user as well as showing an annual increase in applications for the rebate as the region grows.

4.7.8 Curbside Sprinkler Retrofit Program

The purpose of this rebate program is to provide financial incentive to assist large landscape irrigation system owners and operators in eliminating landscape irrigation street water applications by purchasing and installing new sprinklers with improved water application efficiency. Street water from improperly chosen and positioned curbside sprinkler heads is one of CVWD's most common and visible examples of water waste. The problem stems almost entirely from improper sprinkler choice and positioning.

CVWD has eliminated the source of this problem from new developments by specifying strict rules regarding sprinkler choice and placement in its plan check program. Many older developments, however, were completed prior to the plan check program and continue to irrigate street sidewalk surfaces. The curbside sprinkler retrofit program provides an economic incentive to the owner or operator of large landscape irrigation systems to upgrade the curbside sprinkler irrigation stations to the current Landscape Water Conservation Ordinance specifications of pressure regulating stems, adjustable arc nozzles, low trajectory nozzles, pressure compensating nozzles and Seal-a-Matic sprinkler bodies. Sprinklers with these run-off elimination options are more costly than conventional sprinklers. CVWD will offer a rebate coupon to make up the cost difference to encourage purchase and installation. The measurement of the success of this program will be a marked reduction in curbside over-irrigation complaints and a reduction in water use by applicant to this program.

4.7.9 Full-Time Inspection of Landscape Projects to Insure Installation Matches Approved Plans

A small number of plan check compliance inspections conducted by the Water Management Department in response to nuisance water or excessive water use complaints revealed that many of the sources of these complaints were sites which did not install their landscapes to the specifications of their signed and approved landscape water conservation design plans. With the hiring of a second Water Management Specialist in 2002, the Water Management Department initiated a plan check inspection program of randomly selected sites.

The results of the 2002 program revealed a large number of sites that were out of compliance with their approved plan and required expensive and time consuming corrections by the landscape contractor. Under this new proposed program, a full-time inspector would be hired to conduct random inspection of new irrigation construction sites. It is expected that the possibility of a random inspection resulting in the requirement of expensive corrections will serve as a sufficient motivation for contractors to install these landscapes according to their approved specifications. If the threat of a possible inspection is not sufficient motivation for contractors to install irrigation systems as approved, mandatory inspections on all job sites would ensure full compliance with the Landscape Water Conservation Ordinance and assist CVWD in realization of its full water conservation potential.

The scope and number of inspectors hired under this will depend on biannual reviews of the success of the program. The primary goal of this program will be that site inspections will report no major system modifications required. Major system modifications shall be defined as requiring more than 3 days of work to bring system in to compliance with CVWD approved plans or costing the contractor over $3,000. The goal of this program will be to obtain 100 percent compliance (no major modifications required) by 2010, in other words, a 25 percent increase in compliance per year beginning in 2006. The measurement of success of this program will be the recorded percent of “in-compliance” of each inspected site. If, in the event that the primary goal of the program is lagging and not being consistently met or exceeded after 4 review periods, CVWD will require mandatory inspection of all irrigation construction sites and hire the necessary staff to perform this task.

The secondary goal of this program will be the percent of projects completed in accordance with CVWD approved plans each year. It should be noted that although many construction sites may be out of compliance and require major modification, which does not go towards the program’s primary success, they may go towards the secondary goal of the program.

4.7.10 Maximum Water Allowance Tiered Rate Pilot Program for Class 11 Meters Only

This proposed conservation program is still under review and has not been fully defined by CVWD. It is the plan of CVWD to develop the scope and assess the feasibility of this program as part of the CVWMP Implementation Task Force Recommendations.

4.8 HIGH-EFFICIENCY WASHING MACHINE REBATE PROGRAM

Presently, CVWD does not provide high-efficiency washing machine rebates. CVWD is the principal water and wastewater provider within its service area and has legal authority to develop this DMM. Nearly all of the wastewater generated in CVWD is reused or is returned to the groundwater. CVWD is presently developing its water CVWMP Implementation Task Force Recommendations where the high-efficiency washing machine rebate DMM will be discussed.

The promotion and use of high-efficiency washing machines has social value as it brings conservation products, literally, in direct contact with area users, thereby raising awareness of water conservation efforts. Furthermore, the use of these products has the potential to reduce customer water, wastewater, gas and electric bills. The use of these products provides no direct health benefit or detriment. The indirect benefits of this are that less energy and detergents are used to operate the machines. This would reduce the need for groundwater pumping and replenishment, collection, treatment and the subsequent reuse or disposal of wastewater as well as the numerous environmental benefits of reducing energy consumption.

Exhibit 1 of the MOU guidelines provides a guideline for calculating the benefits of this program were used (CUWCC, 2004). By 2006, there would be a projected minimum of 16,000 customers with old washing machines that could participate in the program. Analysis shows that this program would not be cost beneficial for a two-year period and would have a cost-to-benefit ratio of just less than 1.0. This analysis of the program assumes a cost of water of $573 and does not include savings to the customer due to lower water and electric bills as well as soap. The analysis assumes a program issuing 1,000 rebates per year at $200 per rebate for the two-year program period. This program is not economically feasible as shown in **Table 4-10**.

Approximately 80 percent of water use in the CVWD service area is for irrigation purposes. Nearly all discharge from washing machines would be discharged to CVWD's sewer system where essentially all water is recycled. The implementation of this program would not significantly save discarded water in the CVWD service area. Because of this phenomenon, CVWD has chosen to focus primarily on outdoor water use conservation programs. CVWD will investigate the feasibility of supplementing a washing machine rebate program with outside funding sources, which could prolong the program and increase its benefit to the public.

Table 4-10
Washing Machine Rebate Cost Effectiveness Summary

Amortized Costs ($/yr)	$45,108
Amortized Benefits ($/yr)	$28,675
Discount Rate	4%
Time Horizon	15
Cost of Water	$967
Water Savings (acre-ft/yr)	46.7

4.9 PUBLIC INFORMATION PROGRAMS

There are several public information programs being operated presently by CVWD. The purpose of these programs is to educate the public on conservation programs being planned and/or implemented by CVWD as well as educational tips that customers can use to lower their water usage. **Table 4-11** below is a list of CVWD's current public information tools, several of which will be expanded as part of the CVWMP Implementation Task Force Recommendations.

Table 4-11
Public Information and Education Programs

Projects	Status
Publications – Lush and Efficient	Ongoing
Demonstration Garden	Ongoing
Annual Horticulture workshop	Ongoing
WMP Education – in-house and for Public	Ongoing
Expanded water education program for residential users	Ongoing
Add water conservation page to CVWD website, including water use calculator	Ongoing

4.9.1 Publications – Lush and Efficient

CVWD prepared *Lush and Efficient*: *A Guide to Coachella Valley Landscaping* (CVWD, 2001). CVWD staff is currently working with a publisher to create an updated version of this highly popular book, although it will not be complete for distribution until 2006. Funds for the new edition have already been approved by the Board of Directors. First printed in 1988 as a 64-page publication, it was revised, expanded and reprinted in 2001 as a 160-page book. Approximately 1,500 of the 2001 edition are still available for distribution. The books are available for purchase directly from CVWD for $10 and retail outlets for about $20. They are distributed free to select tour groups and participants in CVWD's annual landscape workshop.

In 2004, the Board of Directors approved funding for an interactive, water-efficient landscaping CD, which will compliment the 2006 book. Through the CD, users will be able to view sample water-efficient yards and select plants based on a variety of criteria. The measurement of interest and success of this program will be to show a steady and/or increase in the number of copies distributed.

4.9.2 Demonstration Gardens

The major portion of metered water distributed by CVWD is used outside with about 70 – 80 percent of purchased water being used to maintain landscapes. Since CVWD's boundaries fall within the California Department of Water Resources' highest ET zone (18), it takes more water to grow landscapes here than in any other portion of California. The Coachella Valley shares this highest water use designation with the Palo Verde Valley, Imperial Valley and Death Valley.

One way to reduce landscape water requirements is to use native desert plants in landscaping. Desert native plants have evolved both anatomical and physiological mechanisms that allow them to survive on annual rainfall alone.

Within the Coachella Valley, which is one of the lowest annual rainfall areas in the state, desert plants from other, wetter deserts can be utilized with a minimum amount of irrigation. CVWD has identified and illustrated these plant choices in its publication *Lush & Efficient*. CVWD's two demonstration gardens, one at its headquarters in Coachella and the other at its office in Palm Desert, provide the landscape industry and the general public an opportunity to observe the plants in a landscape setting. DWA also has a demonstration garden at its headquarters. The gardens also provide an opportunity for CVWD's Water Management staff to vary the water applications to the plants and determine an effective water-use "plant factor" for calculating irrigation water schedules for low water-using plants from local ET weather stations.

Initiated in 2002, CVWD has spent $158,000 through 2005, to build the demonstration gardens. CVWD has not maintained separate operations, maintenance, security, staffing and other cost data. CVWD will begin monitoring this data for inclusion it in its CVWMP Implementation Task Force Recommendations as well as monitor the number of visitors entering the gardens and perform surveys of visitors to the facilities. The objective measurements of interest and success of this program will be attendance at the gardens and subjective measurements achieved through the feedback from visitor surveys.

4.9.3 Annual Horticulture Workshop

Started 18 years ago with about 30 people attending a half-day session at College of the Desert, this program has been sold out nearly every year since despite increases in the number of presentations. In 2004, CVWD offered the half-day classes four times to more than 400 attendees. Speakers include CVWD staff and community members who are experts in various fields related to landscaping. Participants are given a copy of *Lush & Efficient* and other xeriscape information. The measurement of interest and success of this program will be through steady and/or increase in the number of people attending the course offered under this program.

4.9.4 WMP Education – In-House and for Public

CVWD educates staff about the CVWMP through internal newsletters. The public was educated through the first Coachella Valley Water Symposium, a daylong event held at the Renaissance Esmeralda in Indian Wells in October 2004. The event featured expert speakers in all the stakeholder groups and was well attended by community leaders. The main goal of the symposium was to solicit stakeholder input on how to implement the goals of the CVWMP. The public also is educated through external newsletters and brochures, the public display at the Riverside County Fair and National Date Festival and speaking engagements. The measurement of success of this program will be to maintain the steady distribution of this publication based on monitored interest in the content.

4.9.5 Expanded Water Education Program for Residential Users

While CVWD has a long-standing tradition of promoting conservation at the Riverside County Fair and National Date Festival through a booth and display, 2005 will be the first in which the display – with a heavy emphasis on residential landscaping – is loaned to other government agencies to be showcased to a larger number of people. In 2004, the display made a record number of appearances at various conferences and events, including the Association of

California Water Agencies (ACWA), Colorado River Water Users Association (CRWUA), AgSummit 6 and the Coachella Valley Water Symposium.

Under this program, welcome packets will be distributed to new residential accounts. The packet provides basic information about CVWD, but is more heavily aimed at water conservation techniques. This program is currently being developed and success of the program will be monitored by surveying users subject to this program.

4.9.6 Add Water Conservation Page to CVWD Website, Including Water Use Calculator

CVWD's website needs a section devoted to conservation, further divided for homeowners, businesses, golf courses, and agriculture. The site, currently in its infancy (http://www.cvwd.org/Conservation.htm), should grow to include tips, articles, a suggested irrigation guide for grass lawns and water-efficient landscaping, and a water-use calculator among other ideas. A sister site developed by CVWD called *Mind Your Water* (www.mindyourwater.com) is linked to the CVWD website and describes many of CVWD's current conservation efforts, includes water saving tips as well as recent conservation press releases. The purpose of this site is to emphasize the need to reduce outdoor water use, and provides information on how to conserve water in landscaping. The measurement of interest and success of this program will be to show a steady and/or increase in the number of hits to the proposed web site.

4.10 SCHOOL EDUCATION PROGRAMS

CVWD has legal authority to develop this DMM. CVWD has an established school education program. CVWD has a manager of the program as well as several full time teachers on staff implementing the program. Presently there are two components to the program. The first is the presentation of classroom lesson plans and the second is science fair promotion and sponsorship. **Table 4-12** below is a statistical summary of the achievements of the program. All school lesson plans were developed using California State Board of Education Standards and Frameworks.

Table 4-12
School Education Program Summary

Parameter (2004-2005)	Affected Audience
Grade visited – State Board of Education standard	Kindergarten – CA Health Framework; Expectation #3
	2 – CA Health Framework; Expectation #3
	3 – CA Social Science Framework; Standard 3.2
	4 - CA History-Social Science Framework (Local History)
	5 – CA Science Framework; Earth Science; Standard(s) 5.3a-e & 5.4a-d
	6 - CA Science Framework; Earth Science 6.1b & 6.2a-d
Students taught	15,784
Science fair awards sponsored	12
Science fair conservation materials distributed	7,500
Total students benefited by program	16,356

To measure the effectiveness of the program, participating audiences will be surveyed and their responses recorded. The cost to implement this program will also be monitored so that a cost-benefit ratio for both direct and indirect benefits can be measured. Future goals of the program include expanding the grade level of students taught as well as the development of classroom materials that can be distributed to classroom teachers.

4.11 CONSERVATION PROGRAMS FOR CII ACCOUNT SUMMARY

The CVWD service area is not a heavily industrialized area and most water use, up to 80 percent in fact, is used for irrigation. Much of existing passive conservation by commercial, industrial and institutional (CII) customers is due to current plumbing codes. CVWD has legal authority to develop and implement this DMM. The programs in **Table 4-13** are currently under development by CVWD and the feasibility of each will be reviewed as part of the CVWMP Implementation Task Force Recommendations.

Table 4-13
CII Water Conservation Program Summary

Long Term Projects	Status
Restaurant pre-rinse spray valve rebate Program (Class 8 meters)	Proposed
Hotel low-flow shower/faucet rebate/loan Program (Class 8 meters)	Proposed
Toilet replacement/rebate program	Proposed
Water Broom	Proposed

4.12 WHOLESALE AGENCY PROGRAMS

CVWD is not a wholesale water provider to any agency, municipality or group and therefore does not require the implementation of this DMM.

4.13 CONSERVATION PRICING PROGRAM

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
- Billing for water and sewer services 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 long-run marginal cost or the cost of adding the next unit of capacity to the system

CVWD has an existing uniform rate billing structure for all customers. This rate varies by cost center. **Table 4-14** Below is a summary of the historical and current rates system for CVWD. As described in the MOU, this rate structure can be classified as "conservation pricing".

Table 4-14
CVWD Billing Rate Summary

	Charges Effective 7/1/1999	Charges Effective 7/1/2000	Charges Effective 7/1/2001	Charges Effective 7/1/2002	Charges Effective 7/1/2003	Charges Effective 1/1/2005
Meter Size (Inches) Monthly Readiness to Serve Charge ($/meter)						
5/8	5.50	5.50	5.50	5.50	5.50	5.50
3/4	5.50	5.50	5.50	5.50	5.50	5.50
1	5.50	5.50	5.50	5.50	5.50	5.50
1-1/2	9.00	9.00	9.00	9.00	9.00	9.00
2	12.00	12.00	12.00	12.00	12.00	12.00
3	20.00	20.00	20.00	20.00	20.00	20.00
4	25.00	25.00	25.00	25.00	25.00	25.00
6	30.00	30.00	30.00	30.00	30.00	30.00
Multiple Unit Charge Above first unit ($/unit)						
All Users	3.25	3.25	3.25	3.25	3.25	3.25
Consumption Charge ($/ccf)						
Cost Center 11	0.75	0.80	0.80	0.84	0.84	0.89
Cost Center 23	0.93	0.98	0.98	0.98	0.99	1.07
Cost Center 26	0.66	0.68	0.68	0.68	0.82	0.84
Cost Center 35	0.59	0.61	0.61	0.61	0.64	0.66
Standby/Availability Charge ($/acre) of vacant land or per lot if lot is less than one acre						
All Lots	23.00	23.00	23.00	23.00	23.00	23.19

CVWD also charges for sanitation services. Residential customers are charged a flat monthly rate per equivalent dwelling unit (EDU) varying from $15.10 to $22.60 per EDU depending on location. Commercial customers are charged a unit rate per 100 cu.ft. of water used. This rate varies from $0.77 to $1.08 per 100 cu.ft.

Irrigation (canal water) customers are charged a unit rate per acre-foot of water used. CVWD has not evaluated the effect of alternative rate structures on Canal water usage.

CVWD has the legal authority to implement this DMM. Direct benefits of this program would impose financial incentives to water users to implement water conservation practices. Negative impacts could include a potential decline in growth of both residential and business development. It is unclear at this time if a restructured water rate program would effectively provide a reduction in water use with minimal impact to local water users. CVWD will perform a rate analysis to determine the feasibility of this program from both CVWD and user perspective.

4.14 WATER CONSERVATION COORDINATOR PROGRAM

CVWD currently has an active water conservation coordinator as well as support staff for CVWD's conservation program. Supporting positions include a water management supervisor, water management specialist, water management technician, and a water management aide. Conservation staffing began in 2001 with a staff of two people including a water management specialist and a water management technician. In 2005, a water conservation coordinator was appointed who now manages the four person conservation staff. A staff of up to 15 is planned for the years up to 2010 (**Table 4-15**, **Table 4-16**).

Table 4-15
Historic CVWD Conservation Staffing Summary

Actual	2001	2002	2003	2004	2005
# of full-time positions	2	3	4	4	5
# of full/part-time staff	0	0	0	0	0
actual expenditures - $	$141,200	$226,100	$299,600	$321,466	$377,500

Table 4-16
Projected CVWD Conservation Staffing Summary

Planned	2006	2007	2008	2009	2010
# of full-time positions	6	8	11	13	15
# of full/part-time staff	0	0	0	0	0
projected expenditures - $	$587,560	$828,891	$1,186,400	$1,466,100	$1,801,700

4.15 WATER WASTE PROHIBITION PROGRAM

CVWD does not have a water waste prohibition ordinance. CVWD has legal authority to develop this DMM. CVWD has historically transferred this authority to each of the member cities within its boundaries, some of which respond to and enforce citizen complaints about water waste. **Table 4-17** is a summary that shows how each member City addresses water waste within their boundaries. As the table shows, not all cities have methods to control water waste in their communities. Reducing visible water waste incidents such as a rigorous broken sprinkler head program has a minor direct impact on water conservation by reducing water wasted by these systems. Indirect social benefits of this program include raising the image of water conservation "at home" and helps to maintain aesthetic quality of a given community. The challenges to the program are the costs to implement the program.

CVWD will review and develop, if appropriate, a model water waste ordinance that could be uniformly adopted by its member cities and the county as part of the CVWMP Implementation Task Force Recommendations. The use of a community/volunteer based model, which would use volunteers to be responsible for patrolling and reporting violators could be used to add to the cost feasibility of this program. Through simple promotions on its web site or in its monthly billing, CVWD can engage the public in reporting to the agency with specific data on water waste incidents to help CVWD identify and resolve unchecked occurrences. If implemented, future water savings from the program could be developed and recorded.

Table 4-17
Water Waste Prohibition City Program Summary

No.	City/Community Name	Landscape Irrigation Ordinance Status
1	Indian Wells	No official punitive measures
2	Coachella	No official punitive measures
3	Indio	Will enforce and/or temporarily shut of water if broken sprinkler head complaint filed
4	Rancho Mirage	No official punitive measures
5	Palm Desert	Pool draining permit required, City will send warnings for broken sprinkler heads, otherwise no official punitive measures
6	Cathedral City	Pool draining permit required, otherwise no official punitive measures
7	Palm Springs	Pool draining permit required, otherwise no official punitive measures
8	La Quinta	Pool draining permit required, City will send warnings for broken sprinkler heads, otherwise no official punitive measures
9	Riverside County	No official punitive measures

CVWD's water softener ordinance falls under the CVWD Regulation Governing Sanitation Services, Part IX, Paragraph 9-1, Item 19, which specifically prohibits brine discharges to its waste water collection system. CVWD staff checks commercial sites as part of its sanitation system source control program, checking approximately 1,800 sites per year. In 2004 and 2005, one quarter of one CVWD employees time was dedicated to the program. This should increase to one full time staff person working on this program 100 percent of their time by 2006 or 2007 for a cost of about $120,000.

In the residential sector, CVWD is producing a pamphlet to inform homeowners of the prohibition of brine discharge. There are no punitive measures planned.

4.16 RESIDENTIAL ULTRA-LOW-FLUSH TOILET REPLACEMENT PROGRAM

Presently there is no ultra-low-flush toilet (ULFT) replacement program provided by CVWD. CVWD is the principal water and wastewater provider within its service area and has legal authority to develop this DMM. Nearly all of the wastewater generated in CVWD is reused or is returned to the groundwater basin by percolation. In addition, the significant new construction in recent years must comply with the plumbing code requirements for installation of ULFTs. Consequently, the water savings benefits of such a program are relatively low. CVWD is presently developing its water CVWMP Implementation Task Force Recommendations where this program will be discussed.

The promotion and use of these toilets has social value as it brings conservation products, literally, in direct contact with area users, thereby raising awareness of water conservation efforts. Furthermore, the use of these products has the potential to reduce customer water and electric bills. The use of these products provides no direct health benefit or detriment.

ULFTs were first introduced to the US market in 1980 and the manufacturing of older, less efficient toilets designs was halted shortly thereafter. It is estimated that natural replacement of residential toilets occurs every 20-30 years or at a rate of about 3 percent per year (CUWCC, 2004). Using this methodology, approximately 25 percent of the toilets from pre-1980 would still be installed in 2025. If a nine-year program were implemented as described in **Table 4-18**, CVWD could reach nearly a 99 percent level of conversion. Initial calculations of the benefits of this program show a 1.9 benefit-to-cost ratio. **Table 4-19** and **Table 4-21** below shows the present passive conversion of toilets to ULFTs for single and multi-family customers and **Table 4-20** and **Table 4-22** show the proposed conversion schedule. As 80 percent of water use in the CVWD service area is used outdoor, CVWD's conservation programs will focus primarily on outdoor water conservation measures.

Table 4-18
ULFT Cost Effectiveness Summary

Amortized Program Costs	$22,564
Amortized Program Benefits	$42,841
Discount Rate	4%
Time Horizon (yrs)	9 yrs
Cost of Water ($/acre-ft)	$355
Water Savings (acre-ft/yr)	64

Table 4-19
Actual Single Family Actual ULFT Conversion

	2001	2002	2003	2004	2005
total # of ULF rebates	0	0	0	0	0
cumulative # of ULF passive installs	9,538	9,899	10,253	10,600	10,939
total # of ULF installs	9,538	9,899	10,253	10,600	10,939
total annual # of ULFT installs	368	361	354	347	340
projected expenditures - $	$0	$0	$0	$0	$0
projected water savings - acre-ft/yr	477	495	513	530	547

Table 4-20
Planned Single Family Planned ULFT Conversion

	2006	2007	2008	2009	2010
total # of ULF rebates	2,426	4,582	6,497	8,195	9,698
cumulative # of ULF passive installs	11,272	11,599	11,918	12,232	12,539
total # of ULF installs	13,698	16,181	18,415	20,427	22,237
total annual # of ULFT installs	2759	2483	2235	2011	1810
projected expenditures - $	$230,817	$230,817	$230,817	$230,817	$230,817
projected water savings - acre-ft/yr	685	809	921	1,021	1,112

Table 4-21
Actual Multi-Family Actual ULFT Conversion

	2001	2002	2003	2004	2005
total # of ULF rebates	0	0	0	0	0
cumulative # of ULF passive installs	328	341	353	365	377
total # of ULF installs	328	341	353	365	377
total annual # of ULFT installs	13	12	12	12	12
projected expenditures - $	$0	$0	$0	$0	$0
projected water savings - acre-ft/yr	16	17	18	18	19

Table 4-22
Planned Multi-Family Planned ULFT Conversion

	2006	2007	2008	2009	2010
total # of ULF rebates	84	158	224	282	334
cumulative # of ULF passive installs	388	399	410	421	432
total # of ULF installs	472	557	634	703	765
total annual # of ULFT installs	95	85	77	69	62
projected expenditures - $	$7,946	$7,946	$7,946	$7,946	$7,946
projected water savings - acre-ft/yr	24	28	32	35	38

4.17 RESIDENTIAL CONSERVATION PROGRAMS

Table 4-23 shows a summary of proposed water conservation measures that will be taken by CVWD associated with its local residences. The activity status of each of the conservation measures is also included, which shows that some activities are functioning presently and others are planned for the near future. The cost benefit and water savings of this program will be developed as part of the CVWMP Implementation Task Force Recommendations.

4.17.1 Generate ETo Zone Map Program

Reference evapotranspiration (ETo) refers to an is a measurement of water consumption from an irrigated area. With ETo information, the irrigator has a reliable standard by which to determine how much irrigation water to apply with each irrigation. The California Department of Water Resource's CIMIS (California Irrigation Management Information System) obtains this information from a series of special ETo weather stations located throughout California. CVWD maintains five permanent CIMIS stations within the Coachella Valley and currently broadcasts one all-encompassing average ETo prediction figure to be used valley-wide for irrigation scheduling through its weather forecasting service. Two years of data from an ongoing urban "Non-Ideal" CIMIS site study using portable weather stations have given us enough data to indicate that there are at least five distinct ETo zones in the Upper Valley with an ETo variance range of 35 percent. In other words, landscape plants in the Upper Valley areas require

Table 4-23
Residential Programs

Short Term Projects	Status
Generate ETo zone map	Ongoing
Residential ETo clock rebate program	Ongoing
Residential Curbside sprinkler retrofit rebate/loan program	Proposed
Residential Protector Del Agua program	Proposed
Generic (peel off) irrigation schedule guide for lawn watering with reference to website	Proposed
Develop residential landscape irrigation schedule website	Proposed
Residential water audits (indoor/outdoor)	Proposed
Long Term Projects	
Landscape irrigation retrofit financial incentive program	Proposed
Residential water restrictions – days/hours	Proposed
Low interest loans to improve landscaping	Proposed
Tiered water rates – residential	Proposed
Cash for Grass	Proposed

35 percent less water on any given day than the same plants along Interstate 10, but the average residential homeowner is typically unaware of these geographical differences in local plant water use. A local ETo map is currently under construction for distribution to urban landscape irrigators. It is hoped that further study will reveal even more precise ETo zone boundaries allowing for reduced residential water applications within those areas of the Coachella Valley characterized by lower ETo rates. The measurement of success of the program will be the continuation of data recording, expanding testing station technology and successful implementation of the data into CVWD's other water conservation programs.

4.17.2 Residential ETo Clock Rebate Program

The purpose of this rebate program is to financially assist residential water users in reducing landscape irrigation water consumption by purchasing an advanced irrigation controller capable of synchronizing their landscape irrigation schedules with seasonal variations in Coachella Valley evapotranspiration rates. This program, presently in a pilot phase and described under **Section 4.7** of this report, is aimed at reducing irrigation water consumption. CVWD will offer the homeowner a rebate coupon to eliminate the additional cost of the advanced controller in order to encourage the adoption of this new technology.

If determined to be successful, the pilot program will be expanded for both residential and large-scale irrigators. The measurement of success of this program will be to maintain and/or increase the number of applications to this program each year and track and show a decrease in applicant water usage at their home by comparing pre- and post-timer installation data for applicants to the program. This program was approved by Board in September 2005. Rebates are $50 for a 6-station and $100 for an 8-station controller.

4.17.3 Residential Curbside Sprinkler Retrofit Program

The purpose of this rebate program is to provide financial incentives to assist residential irrigation system owners and operators in eliminating landscape irrigation street water applications by purchasing and installing new sprinklers with improved water application efficiency As discussed earlier in **Section 4.7** of this report.

CVWD will offer a rebate coupon to make up the cost difference to encourage the purchase and installation of curbside sprinklers. The measurement of the success of this program will be a marked reduction in curbside over-irrigation complaints and a reduction in water use by applicants to this program.

4.17.4 Residential Protector Del Agua Program

Residential landscape irrigation systems are often improperly installed, poorly maintained and inefficiently scheduled by owners who are often unskilled and uneducated in the science and practice of landscape irrigation efficiency. The purpose and scope of this program is described in **Section 4.7** of this report.

The goal of this program is to continue to provide, develop and improve the Protector Del Agua program through 2010 via the use of a contracted consultant to run the program. The measure of success of this program will be performed by surveying participants in the program as well as monitoring and measuring the annual attendance at the program.

4.17.5 Generic (Peel-off) Irrigation Schedule Guide for Lawn Watering with Reference to Website

The setting of the irrigation clock to irrigate turf grass is one of the homeowner's most difficult tasks. In order to program lawn irrigation efficiently, the programmer must know his irrigation system's distribution uniformity and precipitation rate. This requires a catch-can test and complicated mathematical computations. Most residential landscape irrigators simply guess and adjust the clock according to plant response. Since most irrigated landscape plants do not respond adversely to over-irrigation, the average residential turf grass irrigation schedule over waters.

CVWD, which has sponsored irrigation system auditing since 1987, has accumulated enough catch-can test data that it can create a simple, but effective, generic monthly irrigation schedule based on the average catch-can test results from over 400 local landscape irrigation audits on both spray-head and rotary sprinklers. This schedule will be printed out as a sticker to place on the clock as an effective, starting point, reference to turf grass sprinkler scheduling.

A reference to CVWD's website will provide the means to obtain a more precise irrigation schedule based on on-site measurements.

4.17.6 Develop Residential Landscape Irrigation Schedule Website

In an attempt to assist the California homeowner with the procedures and calculations involved in synchronizing the landscape irrigation schedule with plant water requirements and irrigation system performance parameters, two public agencies, the University of California, Davis and California State University, Fresno have developed internet turf grass irrigation scheduling guides that walk the consumer through the development of a customized irrigation schedule.

CVWD will test the applicability of these statewide programs to the unique climate of the Coachella Valley, determine each program's user friendliness and provide a link to one of these services on its website. If customer feedback indicates that more local plant, soil, or water-use detail is required than is provided by these state-wide programs, or that the programs are too difficult to execute, CVWD will construct its own irrigation scheduling website program, to optimize savings and simplify use. The measurement of interest and success of this program will be to show a steady and/or increase in the number of hits to the proposed web site and show a low or lowered water use by registered users of the web site.

4.17.7 Landscape Irrigation Retrofit Financial Incentive Program

Under this proposed program, subsidies would be provided to convert existing irrigation systems to high efficiency systems. This proposed conservation program is still under review and has not been fully defined by CVWD. It is the plan of CVWD to develop the scope and assess the feasibility of this program as part of the CVWMP Implementation Task Force Recommendations.

4.17.8 Residential Water Restrictions – Days/Hours

This program would restrict the time of day residential units could irrigation on their property. This proposed conservation program is still under review and has not been fully defined by CVWD. It is the plan of CVWD to develop the scope and assess the feasibility of this program as part of the CVWMP Implementation Task Force Recommendations.

4.17.9 Low Interest Loans to Improve Landscaping

This program would expend low interest loans to residential customers to improve their irrigation systems. This proposed conservation program is still under review and has not been fully defined by CVWD. It is the plan of CVWD to develop the scope and assess the feasibility of this program as part of the CVWMP Implementation Task Force Recommendations.

4.17.10 Tiered Water Rates – Residential

This program would change the present residential billing rate system to a tiered system to provide further incentive for customers to conserve water. This proposed conservation program is still under review and has not been fully defined by CVWD. It is the plan of CVWD to develop the scope and assess the feasibility of this program as part of the CVWMP Implementation Task Force Recommendations.

4.17.11 Cash for Grass Program

The purpose of this program would be to offer residential customers a buy-back rebate for converting irrigated, grass turf landscaping in their yard to high efficiency Xeriscape landscaping. This program has been implemented successfully in many communities in the United States. These communities include Albuquerque NM, El Paso TX as well as Las Vegas NV. The programs have been able to provide economically feasible rebates ranging from $0.20 to $0.50 per square foot of grass turf removed. Due to the success of these major programs, CVWD will review the feasibility of this program as part of their CVWMP Implementation Task Force Recommendations.

4.18 GOLF COURSES WATER CONSERVATION

CVWD does not deliver domestic water for golf course irrigation. However, it does deliver Canal water, recycled water or a blend of canal and recycled water to selected golf courses. Most golf course demand is met by private groundwater pumping. One element of this is golf course water conservation measures. CVWD's Water Management Plan Implementation Task Force is evaluating a variety of measures to reduce golf course water use.

Table 4-24 below shows a summary of proposed water conservation measures that will be taken by CVWD associated with its golf courses. The activity status of each of the conservation measures is also included, which shows that some activities are functioning presently and others are planned for the near future.

Table 4-24
Golf Course Conservation Programs

Short Term Projects	**Status**
Efficient Irrigation Practices for Courses Existing in 2003	
1. Irrigation audits on all golf courses	Ongoing
2. Provide soil moisture monitoring services	Proposed
Efficient Irrigation Practices for Courses Built After 2003	
1. Plan checking: Reduce recreational turf plant factor of 0.82 to 0.7 on fairways and 0.6 on rough/driving range	Proposed
2. Complete irrigation audits on all new golf courses	Proposed
3. Provide soil moisture monitoring services	Proposed
Inspect golf courses for plan check compliance	Proposed
Monitor maximum allowable water allowance compliance for new courses	Ongoing
Golf Course Water Efficiency Certificate program	Proposed
Long Term Projects	
Golf course turf restrictions	Ongoing
Tiered groundwater overdraft surcharge – supplemental impact fee	Proposed
Tiered Water Pricing	Proposed

4.18.1 Efficient Irrigation Practices for Courses Existing in 2003

Irrigation Audits on All Golf Courses

The purpose of the golf course irrigation audit program is to assist the irrigator in maximizing the efficient operation of the irrigation system by measuring performance, generating irrigation schedules and recommending improvement actions.

The goals of this audit program are to determine the irrigation uniformity, efficiency and application rate of each approved site, suggest modifications in design, operation, maintenance and scheduling and finally estimate the water and energy savings associated with the suggested modifications. A report summarizing the audit's findings and recommendations is hand-delivered and explained to the golf course irrigator.

Audit sites are chosen based on excessive water consumption or in response to a request for audit services. CVWD's Water Management Specialist evaluates and approves each site. A Notice to Proceed Letter is sent to the Resource Conservation District authorizing the audit. CVWD staff also conduct audits periodically. All auditors must take the Irrigation Association's Golf Course Irrigation Auditor course and pass the Certified Golf Course Irrigation Auditor's Examination.

Once a site is accepted for auditing, the owner or operator of the facility is contacted and an appointment is made to conduct the audit. After measurements and calculations are completed, a summary report and custom irrigation schedules are delivered to CVWD for approval. Upon approval, the report is delivered and explained to the site operator by the auditor. Payment is then authorized to the auditor. The golf course audit program operates continuously and completes approximately five audits per year. Sixty-nine existing golf courses have received audits to date. The measurement of interest and success of this program will be to show a steady and/or decrease in the water use at each of the audited golf courses.

4.18.2 Provide Soil Moisture Monitoring Services

The current trend in golf course irrigation scheduling is to utilize weather-based stations to determine ET rates and schedule irrigation accordingly. In addition to utilizing ET rates to schedule irrigation, water application control can be gained by knowing the amount of water that reaches the plant roots or beyond. Soil moisture monitoring is key to providing this information.

With each irrigation application comes spray drift, evaporation losses and irrigation system inefficiencies. Conservatively estimating a 0.02 inch loss per irrigation application, a 125 acre golf course irrigating every day will lose 7 inches of water per year or 73 acre-feet annually. Furthermore, the practice of light, frequent irrigation promotes shallow roots and concentrates salts in the diminished, active root zone. In both instances, additional irrigation water is often required to grow high quality turf grass.

The purpose of a CVWD soil moisture monitoring program is to encourage golf course superintendents to fully utilize their soil's available water holding capacity to save water by reducing the number of daily irrigation applications, promoting deep and healthy roots and reducing the build up of salts in the active root zone. It is important to note that monitoring soil moisture levels is not a substitute for monitoring ET rates.

Efficient irrigation schedules require both soil moisture and ET data in the determination of frequency and duration of irrigation applications. CVWD's Golf Course Water Management Specialist will initially assist the golf course superintendent in the use of a CVWD -owned soil moisture sensor in refining irrigation applications. If the superintendent is convinced of the utility of incorporating soil moisture readings into his or her scheduling calculation, CVWD will rebate 50 percent of the cost of a soil moisture sensing system up to $1,000 for use on the golf course. The measurement of interest and success of this program will be to show a steady and/or decrease in the water use ate each of the participating golf courses.

4.18.3 Plan Checking: Reduce Recreational Turf Grass Plant Factor of 0.82 to 0.7 on the Fairways and 0.6 on the Roughs and Driving Range

CVWD adopted Ordinance No. 1302 in March 2003. It establishes effective water efficient landscape requirements for newly established and rehabilitated landscapes including golf courses.

The ordinance allows flexibility of landscape system design by establishing plant water use factors (PF). These factors can be multiplied by their planted area and divided by irrigation efficiency to indicate total irrigation water use over a given landscape area. The product is called the estimated water use (EWU). By comparing the EWU to the maximum water allowance (MWA) established by the ordinance, it can be determined whether a proposed landscape complies with the ordinance.

Normal management of a combination of warm and cool season landscape turf in the Coachella Valley is assigned a PF of 0.70. For purposes of the ordinance, landscape turf is distinguished from recreational turf. Recreational turf is defined as turf that serves as a playing surface for sports and recreational activities. Athletic fields, golf courses, parks and school playgrounds are all examples of areas utilizing recreational turf grass.

The current landscape water conservation ordinance assigns recreational turf grass a PF of 0.82 to compensate for the wear and tear of vehicular and foot traffic on golf courses, sports turf and other heavily trafficked turf grass areas. This gives any golf course turf grass area an MWA value that is 17 percent higher than landscape turf that has a PF of 0.70.

Field observations of golf course traffic patterns, however, have revealed that some areas of the golf course roughs and driving range receive very little traffic, while other areas receive only moderate traffic (fairways). Greens and tees receive heavy traffic because every player crosses the same area.

The intent of this program is to work with the golf course industry to develop a zonal PF MWA that conserves water while maintaining high golf course turf grass quality. The goal is to reduce PFs to 0.6 on driving range/rough areas and to 0.7 on fairways after demonstrating acceptable turf quality and water savings through voluntary adoption on one or two golf courses.

In lieu of, or in addition to assigning new plant factors, CVWD, in cooperation with golf industry representatives may work to establish other needed requirements. Prescriptive alternatives could include a maximum acreage of turf/spray per hole, a maximum percentage of turf/spray on the entire golf course, establishment of leaching factors, or other considerations. The measurement of interest and success of this program will be to show a steady and/or decrease in the water use ate each of the participating golf courses.

4.18.4 Complete Irrigation Audits On All New Courses

The purpose of the golf course irrigation audit program is to assist the irrigator in maximizing the efficient operation of the irrigation system by measuring performance, generating irrigation schedules and recommending improvement actions as described in **Section 4.7** of this report. The measurement of interest and success of this program will be to show a steady and/or decrease in the water use ate each of the participating golf courses.

4.18.5 Inspect Golf Courses For Plan Check Compliance

The only way to insure that irrigation and landscape systems are installed according to approved plan is to conduct on-site inspections. CVWD currently does not have personnel assigned to conducting these inspections. The goal of this program is to conduct on-site inspections for every new golf course that is installed. The result of these inspections would be verification of proper installation, or follow up to insure that installations out of compliance will be brought into compliance. The measurement of success of this program will be that audited golf courses comply with conservation mandates by CVWD.

4.18.6 Monitor Maximum Water Allowance Compliance

One feature of the plan check program is the assignment of an Annual MWA to each golf course based on planted area and the installation and operation of an efficient irrigation system. The purpose of the golf course MWA compliance monitoring program is to determine whether each golf courses' annual consumption falls below its assigned MWA value.

At the close of each calendar year, CVWD's Golf Course Water Management Specialist will obtain each new golf course' water records and compare consumption to allowance. Those courses failing to meet their MWA for two consecutive years will be required to participate in CVWD's irrigation audit program, or similar appropriate program, to assist irrigators in meeting their assigned MWA. The measurement of the success of this program will be to show a that the reviewed courses comply with their MWA values.

4.18.7 Golf Course Water Efficiency Certificate Program

The California Certified Water-Efficient Golf Course Program is a new education program being promoted by the California Golf Course Superintendent's Association. The purpose of the golf course irrigation self-audit program is to educate the golf course superintendent in the principles of efficient irrigation management by administering a self-test questionnaire covering the knowledge required to efficiently irrigate his or her individual course. Points are assigned each question and the accumulation of sufficient points results in being designated a California Certified Water-efficient Golf Course.

The goal will be for the Golf Course Water Management Specialists to work with the local Hi-Lo Desert Golf Course Superintendent's Association to get every golf course within the Coachella Valley certified as Water Efficient within five years. The measurement of interest and success of this program will be that the program is implemented as a permanent program that all courses will be required to comply with.

4.18.8 Golf Course Turf Restrictions

This measure could include restrictions on the allowable acreage of turf on new golf course. Such restrictions would be in addition to the limitations included in the existing landscape ordinance.

This proposed conservation program is still under review and has not been fully defined by CVWD. It is the plan of CVWD to develop the scope and assess the feasibility of this program as part of the CVWMP Implementation Task Force Recommendations.

4.18.9 Tiered Groundwater Overdraft Surcharge – Supplemental Impact Fee

This measure could include the development of a surcharge or supplemental impact fee in addition to the groundwater replenishment assessment. Current State law requires that replenishment assessments in an area of benefit be uniform for all pumpers. Consequently, CVWD may not currently have the legal authority to implement this measure.

This proposed conservation program is still under review and has not been fully defined by CVWD. It is the plan of CVWD to develop the scope and assess the feasibility of this program as part of the CVWMP Implementation Task Force Recommendations.

4.18.10 Tiered Pricing

This measure could include the development of tiered water pricing for golf courses. Since CVWD does not serve domestic water for golf course irrigation, this measure would likely apply to Canal or recycled water service.

This proposed conservation program is still under review and has not been fully defined by CVWD. It is the plan of CVWD to develop the scope and assess the feasibility of this program as part of the CVWMP Implementation Task Force Recommendations.

Section 5
Water Shortage Contingency Plan

5.1 LAW

10632 The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that 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 condition described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water suppliers, 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.

5.2 INTENT OF THE PLAN

CVWD's Water Shortage Contingency Plan was originally prepared to comply with AB 11x (1991). That bill required every urban water supplier to file a plan, because of the worsening 1986-1992 drought. The bill essentially modified Section 10632 of the California Water Code.

Key requirements of the current Section 10632 are summarized and discussed in the following sections.

5.3 STAGES OF ACTION

The key element of the plan is an ordinance with phased water use restrictions and a drought rate structure. The drought plan provides the following stages and action levels:

Table 5-1
Water Supply Shortage Stages and Reduction Goals

Stage	Action	Water Use Reduction Goal, percent
1	Voluntary	10 %
2	Mandatory	10 %
3	Mandatory	20 %
4	Mandatory	50 %

The trigger levels (to move from one stage to the next) depend on the local water situation. Based on voluntary response during Stage 1, CVWD's General Manager-Chief Engineer can determine that it is necessary to implement Stage 2 to protect the public welfare and safety. Prior to the implementation of each mandatory phase, CVWD 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 to the hearing, and CVWD shall notify the public of its determination by public proclamations.

5.4 ESTIMATE OF MINIMUM SUPPLY IN THE NEXT THREE YEARS

CVWD has several water supply sources that enable it to withstand imported water reductions better than agencies that are solely dependent on imported water supply.

CVWD and DWA receive delivery of their SWP Table A water through exchange with Metropolitan at the Whitewater River and the Mission Creek Turnouts on the Colorado River Aqueduct. Under the terms of the Advance Delivery Agreement, Metropolitan has stored water in the upper Whitewater River subbasin in advance of CVWD's and DWA's Table A deliveries. Metropolitan may discontinue direct delivery of Exchange Water to these turnouts if the water is needed to meet Metropolitan's demands. During such years, Metropolitan would make its required deliveries from its storage account in the groundwater basin. As of December 2004, Metropolitan had approximately 177,400 acre-ft of water in storage. Based on a review of modeled SWP deliveries for 1990-1992 (Study 6), it is expected that CVWD and DWA would receive 34.3 percent of their Table A current water (171,100 acre-ft/yr) or an average of about 58,700 acre-ft/yr over three years, assuming Metropolitan does not exercise its call-back option.

For water shortage planning purposes, it is assumed that Metropolitan would take the entire amount of CVWD and DWA Table A Water Deliveries for the succeeding three years and essentially deplete the Advance Delivery Storage account. Although CVWD and DWA would not have access to SWP Exchange Water in these three years, the vast storage capacity of the

Whitewater River subbasin (about 28.8 million acre-ft) would be more than adequate to meet the projected groundwater extraction needs of CVWD, DWA and all private pumpers. Without replenishment, the decline in storage would be less than 0.5 percent of the basin storage each year.

CVWD's allocation of Colorado River water from the Coachella Canal is defined by the Law of the River and the QSA. Under the QSA, CVWD is scheduled to receive 321,000 acre-ft/yr of water in 2006 and 2007, increasing to 325,000 acre-ft/yr in 2008 at the Imperial Dam diversion. Under the Intermittent Overrun and Payback Policy, CVWD has an obligation to payback 17,000 acre-ft of water in 2006 as a result of overruns in 2001 and 2002. Consequently, its supply would be reduced to 304,000 acre-ft/yr in 2006. The actual water deliveries to CVWD users are expected to be 289,000 acre-ft/yr in 2006, 306,000 acre-ft/yr in 2007 and 310,000 acre-ft/yr in 2008 after deducting conveyance and operating losses. Because of CVWD's Priority 3B allocation, this supply would not be reduced during a dry period unless the drought was so severe that Colorado River supplies are inadequate to supply both Arizona's allocation of 2.8 million acre-ft and Metropolitan's Priority 4 allocation of 550,000 acre-ft/yr. Given the current storage in Lake Mead (15 million acre-ft) and Lake Powell (12 million acre-ft) and minimum historical inflows to Lake Powell of 5 million acre-ft/yr, it is unlikely that such a reduction to CVWD would take place in the next three years. Reclamation and the seven basin states are currently formulating water shortage guidelines and coordinated management strategies for the Lower Colorado River Basin. These guidelines are expected to be developed by late 2007.

Since the majority of CVWD's water supply is from groundwater sources and Coachella Canal water, the period of "driest" historical supply may not be a good indicator of shortages in supply. Instead, projections of driest multiple years of water supply for years 2006, 2007 and 2008 were used in this analysis. The three-year minimum water supplies are shown in **Table 5-2.**

Table 5-2
Three-Year Minimum Water Supply
(acre-ft/yr)

Supply Source	2006	2007	2008
Groundwater	88,300	91,800	99,400
Groundwater Storage	71,700	85,600	86,500
Coachella Canal Water	289,000	306,000	310,000
State Water Project	0	0	0
Recycled Water[1]	16,600	17,900	19,200
Total Supply	**465,600**	**501,300**	**515,100**

(1) Source: CVWD, 2004b.

The minimum supplies listed in **Table 5-2** are based on the following assumptions:

- Groundwater supply is readily available and equal to projected potable water production
- Recycle water supplies, from WRP-7, WRP-9 and WRP-10, are assumed to be equal to the projected recycled water demands
- CVWD does not have access to SWP Table A deliveries

5.5 CATASTROPHIC SUPPLY INTERRUPTION PLAN

Because of the significant amount of groundwater in storage, both natural and imported, CVWD does not anticipate any significant short term, drought or emergency water supply deficiencies.

In the event of a major catastrophe, the availability of groundwater will not be affected. CVWD has a number of generators that can be used to operate wells and booster stations in case of power failure.

Most of CVWD's pressure zones are served by steel reservoirs located at higher elevations. Several of the reservoirs are equipped with automatic valves that close during a seismic event, thereby preserving the stored water. Likewise, most of the pressure zones have ties to other zones, which permits CVWD to transfer water to any zone that may suffer deficiencies. CVWD has portable pumps and temporary above ground pipe is available to allow water service to be provided should earthquakes damage portions of the system.

CVWD remotely monitors the status of most key facilities at CVWD headquarters, which enables it to detect areas affected by disasters. Also most of CVWD's employees live within a short driving distance of CVWD facilities; therefore, CVWD is capable of addressing any emergency in a quick and efficient manner.

5.6 WATER USE RESTRICTIONS

The water use restrictions for each Stage are listed in **Table 5-3**.

Table 5-3
Mandatory Prohibitions

Restriction	Voluntary Restrictions Stage
• No landscape irrigation between 11am and 4pm • No runoff from irrigation • Water efficient landscaping encouraged	Stage 1
	Mandatory Restrictions Stages
• No landscape irrigation between 6am and 6pm unless hand-held hose or drip irrigation or reclaimed water is used • Irrigation only three times per week	Stage 2
• No water served in restaurants unless requested • Irrigation only twice a week • Commercial car washing using recycled water only • No filling swimming pools	Stage 3
• No golf course watering, except greens, unless reclaimed water is used • Irrigation only once a week • Water rationing by customer class • No turf planting at new homes until drought is over	Stage 4

Examples of water consumption reduction methods and the projected percent of reduction are presented in **Table 5-4.**

Table 5-4
Consumption Reduction Methods

Consumption Reduction Method	Stage When Method Takes Effect	Projected Reduction (percent)
Demand Reduction Program	Varies	Varies with Stage
Voluntary Rationing	Varies	10 (Total)
Education Program	Varies	10 (Total)
Plumbing Fixture Replacement	Varies	10 (Total)
Mandatory Rationing	Varies	Up to 50 (Total)
Flow Restrictions	Varies	Up to 50 (Total)
Use Prohibitions	Varies	Up to 50 (Total)

Mandatory levels of water use restriction include penalties for customers for non-compliance. This includes warning, fines, flow restriction, and finally, water service shut-off. Penalties and charges for non-compliance are summarized in **Table 5-5**.

Table 5-5
Penalties and Charges

Penalties or Charges	Stage When Penalty Takes Effect
First Violation – Notice of Non-Compliance	2 through 4
Second Violation – Fine, Flow Restriction, or Water Service Shutoff	2 through 4
Referral of Misdemeanor Charge	2 through 4

5.7 ANALYSIS OF REVENUE IMPACTS OF REDUCED SALES DURING SHORTAGES

A reduction in the amount of water consumed will lead to a reduction in revenue and expenses for CVWD. These reductions will have an impact on CVWD's ability to finance its operations during periods of water shortages.

Revenues would decrease as a result of reduced water sales to customers of CVWD. Revenue reductions for years 2006 to 2008 were calculated based upon the following assumptions:

- Water reduction goals shown in **Table 5-1** by stage are met
- Water sales revenues from 2006-2008 are projected by scaling up 2004 revenues by the projected quantity of water delivered
- Revenues from availability charges, meter and service fees, other operating revenues, property taxes and investment income in year 2004 remain constant for all future times

Table 5-6 is a summary of projected revenue reduction by stage and year for years 2006 to 2008. All revenues are shown in 2004 dollars.

Table 5-6
Reduced Revenues Due to Water Shortage

Stage	2006	2007	2008
2 (10% Reduction)	$4,775,572	$4,942,388	$5,109,204
3 (20% Reduction)	$9,551,143	$9,884,776	$10,218,409
4 (50% Reduction)	$23,877,858	$24,711,940	$25,546,022

Expenditures by CVWD are also expected to decrease in the event of a water shortage. Reductions are expected in source supply and pumping expenses. Expenditure reductions for years 2006-2008 are shown in **Table 5-7** in 2004 dollars.

Expense reductions were calculated based on the following assumptions.

- Water reduction goals shown in **Table 5-1** by stage are met.
- Utilities and purchased power pumping expenses from 2006 to 2008 are projected by scaling up 2004 expenses by the projected quantity of water delivered at each stage
- Payroll expenses increase by 5% from 2004 payroll expenses during any stage of shortage
- All other expenses including transmission and distribution expenses and non-operating expenses in year 2004 remain constant for all future times

Table 5-7
Reduced Expenditures Due to Water Shortage

Stage	2006	2007	2008
2 (10% Reduction)	$1,382,681	$2,012,883	$2,234,784
3 (20% Reduction)	$2,933,817	$4,194,221	$4,638,022
4 (50% Reduction)	$7,587,225	$10,738,236	$11,847,739

The net revenue impact of revenue loss and expenditure reductions from reaching reduction goals is calculated as revenue reduction minus expenditure reduction. The net revenue calculations are provided in **Table 5-8** in 2004 dollars.

Table 5-8
Net Revenue Reduction by Stage

Stage	2006	2007	2008
2 (10% Reduction)	$3,392,890	$2,929,505	$2,874,421
3 (20% Reduction)	$6,617,326	$5,690,555	$5,580,386
4 (50% Reduction)	$16,290,632	$13,973,704	$13,698,283

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 5-9**.

Table 5-9
Proposed Measures to Overcome Revenue and Expenditure Impacts

Proposed Measure	Summary of Impacts
Rate Adjustment	• Increased savings to General Fund • In normal years, CVWD would receive more money than required for normal operations (increased profit). • Water customers resistance
Use of Accumulated Reserves	• Increased savings to General Fund during non events • 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

5.8 WATER SHORTAGE CONTINGENCY ORDINANCE/RESOLUTION

CVWD's draft water shortage contingency ordinance is provided below.

A RESOLUTION TO DECLARE A WATER SHORTAGE EMERGENCY

WHEREAS, the Coachella Valley Water District is an urban water supplier providing water to approximately 100,000 customers; and

WHEREAS, the demand for water service is not expected to lessen; and

WHEREAS, when the water supply will not be adequate to meet the ordinary demands and requirements of water consumers without depleting CVWD's water supply to the extent that there may be insufficient water for human consumption, sanitation, fire, protection, and environmental requirements. This condition is likely to exist until water supplies are restored and/or until water system damage resulting from a disaster re repaired and normal water service is restored.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Coachella Valley Water District as follows:

1. *The Board of Directors hereby directs the General Manager-Chief Engineer to find and declare that a water shortage emergency condition exists, which threatens the adequacy of water supply, until CVWD's water supply is deemed adequate. After the declaration of a water shortage emergency, the General Manager-Chief Engineer is*

directed to determine the appropriate rationing levels and implement the necessary emergency response measures.

2. *Furthermore, the Board of Directors shall periodically conduct proceedings to determine additional restrictions and regulations which may be necessary to safeguard the adequacy of the water supply for domestic, sanitation, fire protection, and environmental requirements.*

5.9 WATER USE MONITORING MECHANISMS

Water use monitoring mechanisms that are being implemented to date by CVWD are summarized in **Table 5-10.**

Table 5-10
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 for AMR (every 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, Coachella Canal, SWP, recycled water and inter-agency connections)	Determine monthly or annual system losses when compared with billing records.

Section 6
Recycled Water

6.1 LAW

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. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies 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 recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.
(c) 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.
(d) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years.
(e) 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.
(f) 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 and 'to promote recalculating uses.

6.2 EXISTING WASTEWATER SYSTEM

CVWD began providing sanitation service in 1968 when it acquired WRP-9 and the then associated sewer collection systems. This plant and plants near Palm Desert, Thermal, North Shore, Bombay Beach, and Indio allow CVWD to provide sanitation service to most of the Coachella Valley that it serves with domestic water. CVWD 's three major WRP's have a current combined capacity of 20 million gallons per day (mgd). The largest of the three, WRP-10, serves the communities of Indian Wells, Palm Desert, Rancho Mirage and a portion of Cathedral City. Tertiary, or third stage treatment facilities at this plant allow CVWD to provide recycled water to irrigate several area golf courses. WRP-7, located northeast of Indio, underwent a $7 million major modification in 1997 enabling it to also carry on tertiary treatment. This plant is able to take sewage from the area and produce high quality recycled water to the Palm Desert Sun City resort and its golf courses. The other major facility, WRP-4, near Thermal, was opened in 1986 and allows CVWD to service communities from La Quinta to Mecca where sewer responsibilities were assumed in 1985.

6.2.1 Water Reclamation Facilities

CVWD owns and operates a total of six WRP's with a total capacity of 30.63 mgd. WRP-7, WRP-9, and WRP-10, generate reclaimed water for golf courses, large landscape areas and groundwater recharge. The other WRP's include: WRP-1, WRP-2, and WRP-4. Flows from the western part of CVWD are generally directed to WRP-9 and WRP-10. A summary of location and capacity of the treatment plants is listed in **Table 6-1**. **Figure 6-1** shows the location of WRP's and service area.

Table 6-1
CVWD WRP Location, Capacity and Average Daily Flow

WRP Number	Location	WRP Secondary Treatment (mgd)	WRP Tertiary Treatment Capacity (mgd)	Average Daily Flow[1] (mgd)	Average Daily RW Flow[1,3] (mgd)
WRP-1	Bombay Beach	0.15	0.0	0.038	0
WRP-2	North Shore	0.033	0.0	0.019	0
WRP-4[2]	Thermal	7.0	0.0	4.75	0
WRP-7	Indio Hills	5.0	2.5	2.11	1.65
WRP-9	Palm Desert Country Club	0.40	0.0	0.33	0.33
WRP-10	City of Palm Desert	18.0	15.0	10.803	4.17
Total		**30.583**	**17.5**	**18.047**	**6.15**

1 Source: CVWD WRP data spreadsheet (CVWD, 2005f)
2 Does not include 2.9 mgd expansion currently under construction
3 WRPs not generating RW flow are recharging to groundwater/evaporating plant effluent

WRP-1

WRP-1 serves the Bombay Beach community near the Salton Sea. WRP-1 has a design capacity of 150,000 gallons per day (gpd) and consists of two mechanically-aerated concrete-lined oxidation basins, two unlined stabilization basins, and six evaporation-infiltration basins. WRP-1 currently receives an average of 40,000 gpd of domestic sewage, and final disposal of treated secondary effluent is by evaporation and/or infiltration.

WRP-2

WRP-2 serves the nearby North Shore community housing. WRP-2 has two types of treatment facilities: an activated sludge treatment plant capable of providing secondary treatment to a maximum of 180,000 gpd, and an oxidation treatment basin having a design treatment capacity of 33,000 gpd. The oxidation treatment basin is mechanically aerated and is lined with a single synthetic liner. The activated sludge treatment plant is used only when the maximum daily flow exceeds 33,000 gpd, otherwise the oxidation basin is used for treatment. WRP-2 is currently discharging an average of 18,000 gpd of treated secondary effluent into four evaporation-infiltration basins for final disposal.

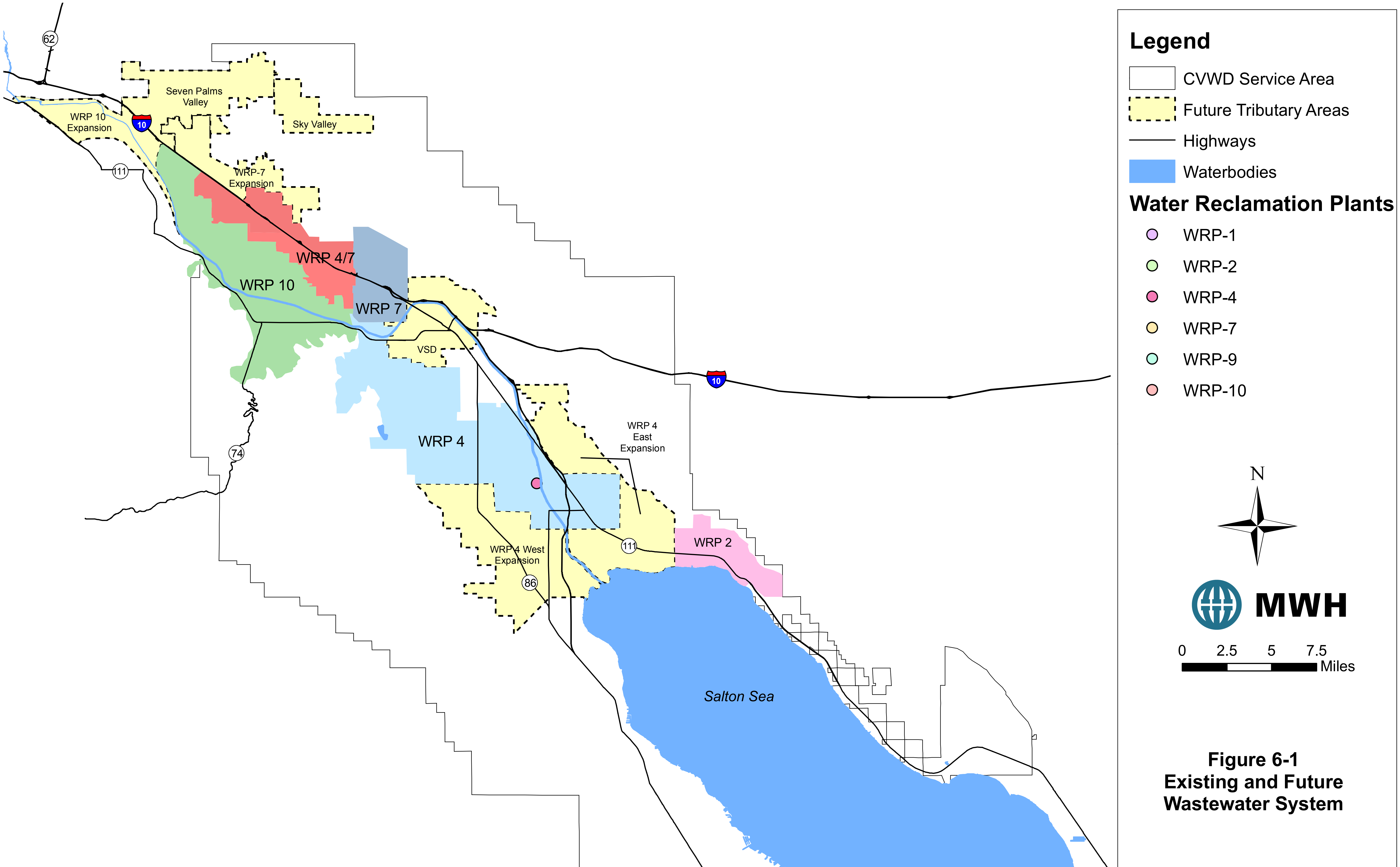


Figure 6-1
Existing and Future Wastewater System

WRP 4

WRP-4 is a 7.0 mgd treatment facility located in Thermal. WRP-4 provides preliminary treatment at headworks facilities consisting of two pre-aeration ponds, screens, a conveyor, a washer/compactor, a headworks building, and an odor control system. There are 16 aeration lagoons, 8 polishing ponds, and chlorination/dechlorination process units. After treatment, the effluent is chlorinated using chlorine gas and dechlorinated using sulfur dioxide solution prior to discharge to the CVSC via an outfall pipe under an National Pollution Discharge Elimination System (NPDES) permit. Biosolids is transported by truck from the facility for composting and beneficial reuse purposes. The annual average flow to the facility is approximately 4.75 mgd.

The facility is to be expanded in the near future from 7.0 mgd to 9.9 mgd. The expansion will consist of aeration basins, secondary clarification and a sludge pumping station. Waste activated sludge will be thickened and dewatered for off-site processing and disposal by a private contractor. A 9.9 mgd chlorination and dechlorination facility is currently under construction.

A draft NPDES permit for the treatment and discharge of 9.9 mgd at WRP-4 has been prepared by the Regional Water Quality Control Board RWQCB). The stringent requirements of the draft NPDES permit have caused CVWD to conclude that effluent discharge to the CVSC may no longer be prudent.

WRP-7

WRP-7 is located in north Indio on Avenue 38 at Madison Street. The plant is a 5.0 mgd secondary treatment facility with a current tertiary treatment capacity of 2.5 mgd. The tertiary treated wastewater is used for irrigation of greenbelt areas and golf courses in the Sun City area. The current average flow from primary residential sources is 2.11 mgd. The plant consists of two extended aeration basins and two circular clarifiers. Six polishing ponds follow the clarifiers in the treatment process. Biosolids from the belt press and solids removed from the bottoms of the ponds are transported by truck off-site for composting and use as fertilizer. Recycled water that is not used for irrigation is percolated at on-site and off-site ponds. A 5 mgd expansion of the tertiary treatment system is presently under designed. When the expanded tertiary treatment system is constructed, the plant will have a total of 7.5 mgd of tertiary treatment capacity.

WRP-9

WRP-9 is located at 77-400 Fred Waring Drive in Palm Desert. This 0.40 mgd secondary treatment facility is presently planned for decommissioning within the next 3 years. Flows previously treated at this plant will be redirected to WRP-10. WRP-9 treats approximately 0.33 million gallons a day of wastewater from the residential development surrounding the Palm Desert Country Club.

The WRP consists of the following treatment units: A grit chamber, two secondary clarifiers, one chlorine contact chamber, and one aerobic digester, and two infiltration basins. One basin is lined for storage of treated wastewater. Raw wastewater in excess of the design capacity does enter this facility during peak flows. However, this excess influent is pumped WRP-10.

Secondary effluent from WRP-9 is mixed with well water and used to irrigate the Palm Desert Country Club golf course.

WRP-10

WRP-10 is located at 43-000 Cook Street, Palm Desert. WRP-10 consists of an activated sludge treatment plant, a tertiary wastewater treatment plant, a lined holding basin, six storage basins, and 21 infiltration basins.

The combined secondary wastewater treatment design capacity of the WRP is 18 mgd. The secondary treatment plant consists of three mechanical bar screens, one aerated grit chamber, one vortex type grit chamber, 16 aeration basins, and 14 secondary clarifiers. The tertiary filters are rated for 15 mgd. Secondary sludge is pumped to the solids handling facility for thickening and dewatering.

WRP-10 treats an annual average daily flow of 10.8 mgd from the activated sludge plant. Just less than fifty percent of this plant's effluent receives tertiary treatment for reuse and is delivered to customers through an existing recycled water distribution system. The remaining secondary effluent is piped to a holding basin and/or the six storage basins, and then to the 21 infiltration basins for final disposal.

The solids removed from the grit chamber are being disposed at an approved landfill by contracting the service of a private contractor. In the event that the private contractor is unable to provide service for secondary sludge removal and disposal, secondary sludge will be transported to WRP-4 as a contingency plan for temporary storage.

Design of a modernized and energy efficient process air system is currently being designed. The design includes providing blowers and control systems to provide sufficient process air to manage 24 mgd of wastewater flow. Unlined ponds located on the site are used to percolate secondary effluent. Most secondary effluent receives tertiary treatment and is used for irrigation of local golf courses. CVWD plans to expand the recycled water delivery system by blending tertiary effluent with Coachella Canal water for distribution to golf courses. This expansion is expected to commence in 2008.

6.2.2 Historical and Projected Wastewater Flows

The historical wastewater flow and reuse rate are shown in **Table 6-2.** Wastewater flow projections were calculated using a process similar to the domestic water demand methodology described in **Section 2**. Land use plans, local demographic changes, parcel data, and 2004 CVWD billing data were all integrated to calculate projected wastewater flows. But a few key differences between the water and wastewater projection methodologies are highlighted below.

Instead of projecting the number of water meters and water usage, the number of wastewater connections and the water usage associated with these wastewater connections were projected. Since some water usage is lost through irrigation and is not collected in the wastewater system, a retention factor of 16 percent (based on historical data from CVWD WRP's) was used to convert water

Table 6-2
Historical Wastewater Flows and Reuse for Irrigation Use

Year		Annual Flow (acre-ft/yr)						
		WRP-1	WRP-2	WRP-4	WRP-7	WRP-9	WRP-10	Total
1998	Treated	83	28	2,765	1,323	370[1]	12,334	16,903
	Reused	0	0	0	924	370[1]	4,871	6,165
1999	Treated	77	21	2,992	1,627	370[1]	11,770	16,857
	Reused	0	0	0	1,292	370[1]	5,610	7,272
2000	Treated	34	21	2,866	2,142	370	11,147	16,580
	Reused	0	0	0	1,949	370	4,763	7,082
2001	Treated	34	18	3,735	2,010	360	10,913	17,070
	Reused	0	0	0	1,826	360	4,720	6,906
2002	Treated	31	21	4,002	2,010	370	11,279	17,713
	Reused	0	0	0	1,860	370	4,376	6,606
2003	Treated	37	21	4,398	2,265	368	11,638	18,727
	Reused	0	0	0	1,844	368	3,793	6,005
2004	Treated	43	21	5,331	2,372	358	12,101	20,226
	Reused	0	0	0	1,857	358	4,677	6,892

1 Estimated data as records are not available

to wastewater flows. As with the water meters, all future growth in the number of wastewater connections was assumed to occur in vacant areas and at a rate proportional to demographic changes.

There are and will continue to be water accounts that are not connected to the wastewater system, but instead, use septic tanks for their wastewater needs. Some of these users will switch to the wastewater system over the next 25 years. It was assumed that for every 5 year period from 2010 to 2030, 20 percent of the water accounts not having wastewater accounts (water accounts that use septic tanks), would adopt new wastewater accounts.

Projected wastewater flow and reuse is presented in **Table 6-3**.

Table 6-3
Projected Wastewater Flow by WRP/Tributary Area

Tributary Area/WRP	Wastewater Flow (acre-ft/yr)						
	2004	2005	2010	2015	2020	2025	2030
Seven Palms/Sky Valley[1]	0	9	81	285	528	798	1,070
WRP-1 [2]	43	43	43	43	45	47	49
WRP-2 [2]	21	36	111	184	269	330	365
WRP-4 [3]	5,331	5,546	6,190	6,589	6,902	7,175	7,368
WRP-7 [4]	2,372	2,658	2,848	3,113	3,318	3,448	3,543
WRP-9	358	358	0	0	0	0	0
WRP-10 [4]	12,101	12,297	14,034	15,375	16,286	16,962	17,392
Undefined Tributary Areas[1]	289	603	1,771	2,775	3,688	4,340	4,835
Total Wastewater	**20,515**	**21,551**	**25,077**	**28,363**	**31,036**	**33,100**	**34,621**
Recyclable Wastewater [4]	**14,831**	**15,313**	**23,071**	**25,076**	**26,506**	**27,585**	**28,303**

1 No existing/planned treatment plants
2 Effluent does not currently meet tertiary treatment standards.
3 CVWD is considering installation of tertiary treatment at this plant. This effluent is assumed to be recyclable after 2010
4 Effluent currently meets tertiary treatment standards.

6.2.3 Existing and Potential Recycled Water Use

Table 6-4 presents a summary of the recycled water usage projected in the 2000 CVWD UWMP for 2005 with the estimated actual 2005 usage. The 2005 projection was developed for the CVWMP and included recycled water usage for both the CVWD and DWA service areas. The actual 2005 usage is only for the CVWD service area.

Table 6-4
Comparison of 2000 Recycled Water Projection with 2005 Actual

User type	2000 Projection for 2005 (acre-ft/yr)	2005 Actual Use (acre-ft/yr)
Greenbelt Area	900	754
Golf Course	11,250	6,162
Groundwater Recharge	16,800	7,939
Total	**28,950**	**14,855**

In the Upper Valley, municipal wastewater is the only source of recycled water. Currently, all wastewater produced in the Upper Valley is reused through direct application for irrigation or percolated into the groundwater basin. This trend is expected to continue.

From a groundwater balance approach, there are only minor differences between replacing groundwater with recycled wastewater for direct irrigation purposes and percolating it back into the basin. Recycled water not used for purposes in the Upper Valley is percolated back into the groundwater basin. Therefore, recycling water for irrigation purposes has little net impact on the amount of water available for use in the Upper Valley although there are water quality benefits.

Because recycled water has relatively high nitrogen concentrations, long-term percolation could eventually lead to degradation of the groundwater supply. The Regional Board has also voiced concerns that use of recycled water on golf courses may be a source of nitrate pollution in the Upper Valley. The RWQCB is concerned that golf courses using recycled water are overwatering. However, since recycled water rates are comparable to the costs of pumping groundwater, there is no economic incentive to overwater. In addition, studies at the University of California at Riverside have indicated that little nitrate moves past the root zone in well-managed courses (CTC, 1998). Use of nitrate-rich recycled water for irrigation reduces the amount of artificial fertilizer needed on golf courses and other turf areas, thus lowering the nitrate loading on the entire basin. Therefore, recycling water for irrigation purposes has substantial water quality benefits over percolation.

One difficulty in recycling wastewater effluent for irrigation involves supply and demand. Flows to Coachella Valley treatment plants are greatest in the high-tourism winter months, when irrigation demands are lowest. Flows are conversely lowest in summer, when irrigation demand is highest. This imbalance results in the need to pump groundwater during the summer months.

Both CVWD and DWA will continue to encourage recycled water use to the maximum extent practical. Municipal recycled water use in the Upper Valley is projected to increase from 8,900 acre-ft in 2004 to 20,000 acre-ft in 2015 and to 22,500 acre-ft by 2030.

The primary uses of recycled water are for groundwater basin recharge and landscape watering (golf courses and greenbelt areas). **Table 6-5** lists existing recycled water users. Currently, CVWD produces about 6,900 acre-ft/yr of recycled water for irrigation use and approximately 2,000 acre-ft/yr for in-plant water use. In addition to these users, CVWD delivers Coachella Canal water to a number of golf courses in the Lower Valley.

The locations of golf courses that are currently served by non-potable water (either recycled or a blend of recycled water and Coachella Canal water) is shown on **Figure 6-2.** Also shown on this figure are the locations of future users that would be served recycled and/or Coachella Canal water in the future.

CVWD is currently planning a significant expansion of its non-potable water system with the Mid-Valley Pipeline project. This project will deliver a blend of Canal and recycled water from WRP-10 allowing CVWD to meet its goals of reducing pumping by golf courses in the Rancho Mirage-Palm Desert-Indian Wells area. A pumping station will pump Canal water into a 60-in diameter or larger pipeline paralleling the CVSC from the Coachella Canal to WRP-10. Water would be stored in a 5 MG balancing reservoir at WRP-10 and blended with recycled water for distribution to golf courses in the Mid-Valley area. Planning studies have identified 50,200 acre-ft/yr of golf course demand plus a 10 percent allowance for smaller irrigation users. Phase 1 of the project would serve the eight existing golf courses that use recycled water plus three additional nearby courses. This phase cold be operational in mid-2008.

The second phase would expand the distribution system to serve 12 additional courses by late 2009. Future phases would further extend the system to serve 28 more golf courses. When this project is complete, groundwater overdraft in the Mid-Valley area will be significantly reduced.

Table 6-5
Existing Recycled Water Users

User	Use	Source	Delivery	Usage (acre-ft/yr)
Mountain Vista Golf Club	36 Hole Golf Course	WRP-7		1,857
Palm Desert Country Club	27 Hole Golf Course	WRP-9		200
Casa Blanca HOA	32 Acre HOA Greenbelt	WRP-10	Small tank	115
Desert Willow	36 Hole Golf Course	WRP-10	5 MG Bladder	1,078
Indian Ridge	36 Hole Golf Course	WRP-10	Pressure Flow	1,361
Marriott's Desert Springs	36 Hole Golf Course	WRP-10	Lake	272
Mountain View Falls HOA	21 Acre HOA Greenbelt	WRP-10	Pressure Flow	114
Palm Desert Greens	18 Hole Exec. Course	WRP-10	Lake	713
Palm Desert High School	20 Acre Athletic Fields	WRP-10	Pressure Flow	106
Portola Country Club	9 Hole Exec. Course	WRP-10	Lake	204
Santa Rosa Country Club	18 Hole Golf Course	WRP-10	Lake	390
Silver Sands Racquet Club	75 Acre HOA Greenbelt	WRP-10	Small tank	287
The Golf Center	9 Hole Exec. Course	WRP-10	Lake	87
Vista del Montañas HOA	25 Acre HOA Greenbelt	WRP-10	Small tank	132
Total				**6,916**

Source: Powerpoint presentation (CVWD, 2005)

CVWD is also expanding its delivery of Coachella Canal water in the Lower Valley for golf course irrigation. As agricultural land converts to urban uses, developers frequently construct golf courses as an amenity for the new residents. To avoid the increased use of groundwater for irrigation, the existing Canal water delivery system can be used to supply the new golf courses. **Table 6-6** summarizes the projected non-potable demands and supplies through 2030.

Table 6-6
Projected Recycled and Non-Potable Water Use

Year	Demand (acre-ft/yr)			Supply (acre-ft/yr)				
	Agri-culture	Golf Course and Green-belt	Total Demand	SWP Exchange Water	Coachella Canal	Recycled Water	Desal-inated Agric. Drainage	Total Supply
2005	274,200	35,800	310,000	0	294,700	15,300	0	310,000
2010	283,500	67,200	350,700	17,400	306,200	23,100	4,000	350,700
2015	291,000	90,100	381,100	39,700	308,300	25,100	8,000	381,100
2020	291,600	90,100	381,700	39,000	308,200	26,500	8,000	381,700
2025	314,600	90,100	404,700	38,300	327,800	27,600	11,000	404,700
2030	320,800	92,400	413,200	37,700	336,200	28,300	11,000	413,200

Source: CVWD, 2002a.

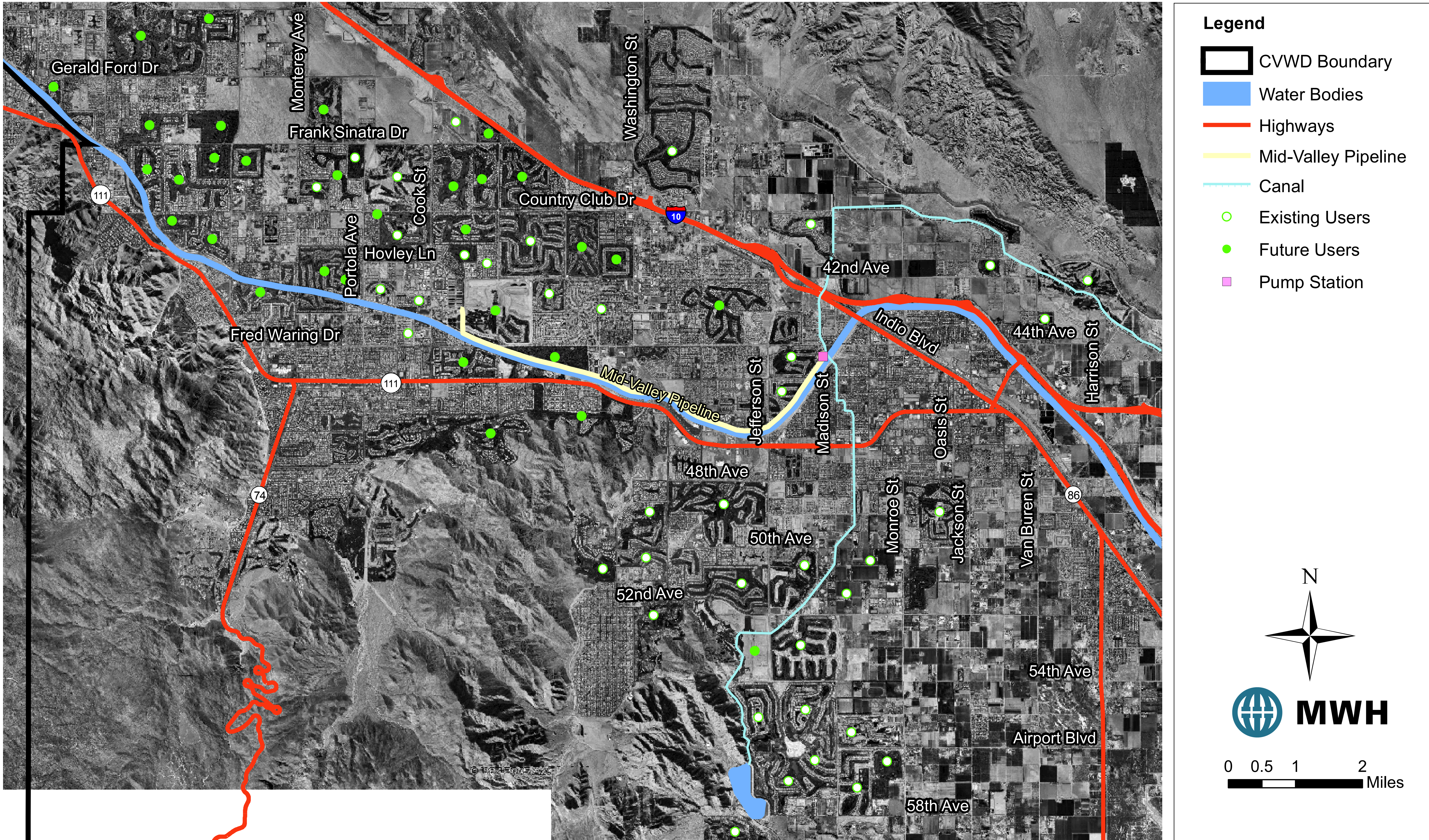


Figure 6-2
Existing and Future
Non-Potable Water Users

6.2.4 Technical and Economical Feasibility

The technical and economic feasibility of serving recycled water depends upon the identification of end users in conjunction with the construction of additional distribution facilities, recharge basins, pump stations and tertiary treatment process to achieve Title 22 requirements. Currently CVWD is beginning work on a wastewater treatment and sewer system master plan to further evaluate the wastewater system, WRPs and related water systems. As discussed previously, CVWD also recently completed a feasibility report evaluating the Mid-Valley Pipeline project.

6.2.5 Actions to Encourage Reuse

The guiding policy for the use of recycled water is defined in the California Water Code. Chapter 7 Article 1 of the Porter-Cologne Act is known as the "Water Recycling Law", and states, in part,

> "The legislature finds and declares that a substantial portion of the future water requirements of this state may be economically met by beneficial use of recycled water. The legislature further finds and declares that the utilization of recycling water by local communities for domestic, agriculture, industrial, recreational, and fish and wildlife purposes will contribute to the peace, health, safety, and welfare of the people of the state. Use of recycled water constitutes the development of "new basic water supplies" as that term is used in Chapter 5 (commencing with Section 12880) of Part 6 of Division 6."

Section 13550 of the Water Recycling Law states that potable domestic water use for non-potable demands is "a waste of water if recycled water is of adequate quality and is available for these (non-potable) uses and can be furnished at a reasonable cost to the user." In addition, recycled water could also be used if it "is not detrimental to public health and will not adversely affect downstream water rights, degrade water quality, and is not injurious to plant life, fish, and wildlife." Water quality and health effects pose concerns to the public in regards to the use of this source. However, regulations and guidelines for recycled water have been established by the California Department of Health Services (DHS) and are published in the Code of California Regulations - Title 22. These regulations and guidelines provide water utilities with requirements for treatment, water quality and reliability of the recycled water before public use.

CVWD has long encouraged the use of recycled water for irrigation purposes. In addition, CVWD has typically recovered as much wastewater effluent as possible through the use of percolation basins to return the water to the groundwater basin. The lack of an adequate tertiary-treated recycled water supply has limited the use of this source in the past. With the implementation of the Mid-Valley Pipeline Project, CVWD will be able to significantly augment the recycled water supply of WRP-10 and add new recycled users. The effect of this will be to reduce groundwater pumping and overdraft in the upper Whitewater River subbasin.

Where practical, CVWD requires new developments to use recycled water as a condition of receiving domestic and sanitation services from CVWD. The developments will then use the recycled water as it becomes available. CVWD also has a policy of requiring that new golf courses either use recycled water or canal water where it is available.

Section 7
Water Quality Effects on Reliability

7.1 LAW

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier in the same five-year increments in subdivision of (a) of Section 10631 and the manner in which water quality affects the water management strategies and supply reliability.

This section describes the water quality characteristics of CVWD's water supplies and the potential effects water quality may have on supply reliability.

7.2 COACHELLA CANAL

Although it is a continuously flowing system with high dissolved oxygen concentrations, Canal water turbidity and temperature can vary greatly. Canal water is typically clear in the winter when flows are low, and murky (underwater visibility of about 1 foot) in the summer when the water velocity is high enough to scour silt settled on the concrete canal bottom and prevent fine particles from settling out. The principal chemical constituents in Canal water that are of concern are total dissolved solids, perchlorate and selenium. As a surface water source, Canal water is not suitable for domestic use without treatment. **Table 7-1** is a summary of Coachella Canal Water Quality.

7.2.1 Total Dissolved Solids (TDS)

TDS is the total amount of mineral salts dissolved in water. TDS is a general indicator of the chemical content of water but does not have an effect on human health. The principal concerns associated with elevated TDS include increased detergent usage, scaling of plumbing fixtures and appliances, restricted plant growth and crop yield, and undesirable tastes. The US Environmental Protection Agency (USEPA) established a non-enforceable secondary drinking water standard of 500 mg/L for TDS based on aesthetics. The DHS has three TDS water quality standards. It has a recommended secondary maximum contaminant level (MCL) for TDS of 500 mg/L for a higher degree of consumer acceptance. An upper limit of 1,000 mg/L is used if it is neither reasonable nor feasible to provide more suitable waters. A short-term maximum of 1,500 mg/L is acceptable only for existing systems on a temporary basis pending construction of treatment facilities or development of acceptable new water sources. The water quality objective for TDS in the Colorado River is 879 mg/L below Imperial Dam. Historically, Canal water TDS has averaged 748 mg/L, ranging from 585 mg/L to 1,077 mg/L. (CVWD, 2002b) **Figure 7-1** shows the historical salinity of water in the Coachella Canal and Metropolitan's Colorado River Aqueduct.

Studies performed by Reclamation indicate salinity below Parker Dam is projected to increase to 928 mg/L by 2015 without additional salinity controls. However, in the Implementation

Table 7-1
Summary of Coachella Canal Water Quality

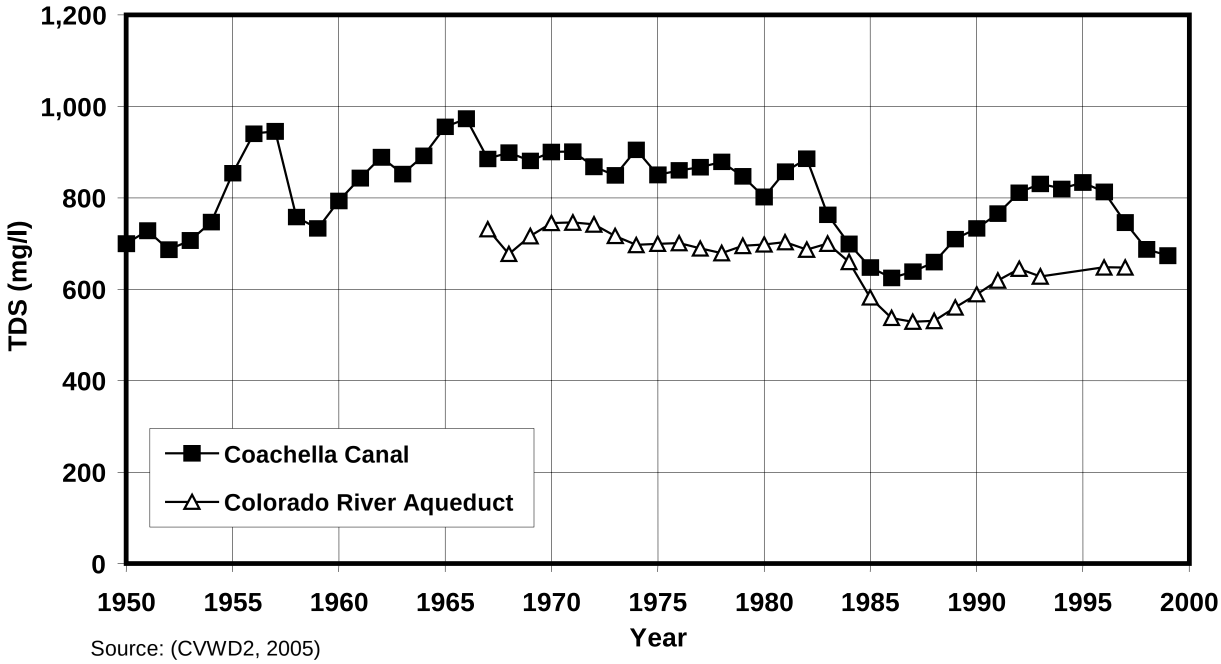
Parameter	Units	Water Quality Objective [a]	California Drinking Water MCL	Canal Water 1987-1999	
				Range	Average
General Parameters					
Color	units	NS	15 [1]	NA	NA
Odor	units	NS	3 [1]	NA	NA
pH	units	NS	NS	7.4 – 8.8	8.2
Turbidity	units	NS	5 [1]	NA	NA
Hardness	mg/L	NS	NS	NA	NA
Sodium	mg/L	NS	NS	81 – 172	118
Calcium	mg/L	NS	NS	68 – 101	82
Potassium	mg/L	NS	NS	2.5 – 13	4.9
Magnesium	mg/L	NS	NS	24.4 – 38.3	31.2
Strontium	mg/L	NS	NS	0.49 – 2.19	1.15
Lithium	mg/L	NS	NS	0.01 – 0.27	0.11
Carbonate	mg/L	NS	NS	0 – 11.9	1.1
Bicarbonate	mg/L	NS	NS	144 – 217	175
Chloride	mg/L	NS	500 [1]	74 – 165	105
Nitrate (as Nitrate)	mg/L	NS	45	ND – 5.49	0.6
Nitrite (as N)	mg/L	NS	1	ND – 0.36	0.03
Nitrate + Nitrite (as N)	mg/L	10	10	ND – 1.24	0.13
Iron	mg/L	NS	0.3 [1]	0.14 – 0.65	0.44
Manganese	mg/L	NS	0.05 [1]	0.017 – 0.022	0.015
Sulfate	mg/L	NS	500 [1]	227 – 367	290
Boron	mg/L	NS	1 [4]	0.02 – 0.4	0.18
Methylene Blue Active Substance	mg/L	NS	0.5 [1]	NA	NA
Perchlorate	µg/L	NS	6 [4]	ND [5]	ND [5]
Total Dissolved Solids	mg/L	NS	1,000 [1]	585 – 1,077	748

Table 7-1 (Continued)
Summary of Coachella Canal Water Quality

Parameter	Units	Water Quality Objective [a]	California Drinking Water MCL	Canal Water 1987-1999	
				Range	Average
Trace Metals					
Aluminum	µg/L	NS	1,000; 200 [1]	156 – 780	455
Antimony	µg/L	NS	6	ND – 2	1.5
Arsenic	µg/L	50	50; 10 [2]	ND – 4.2	2.1
Asbestos	MFL	NS	7	NA	NA
Barium	µg/L	1	1,000	150 – 160	154
Beryllium	µg/L	NS	4	ND – 0.2	0.08
Cadmium	µg/L	10	5	ND – 0.2	0.16
Chromium	µg/L	50	50	ND – 1.6	0.7
Copper	µg/L	NS	1,300[3]; 1,000 [1]	ND – 2.5	2
Cyanide	mg/L	NS	0.15	NA	NA
Fluoride	mg/L	0.8-2.4	2	0.24 – 2.3	0.41
Lead	µg/L	50	15[3]	ND – 2.4	1.4
Mercury	µg/L	2	2	ND – 0.2	0.04
Nickel	µg/L	NS	100	0.7 – 1.6	0.9
Selenium	µg/L	10	50	0.6 – 6.4	3.5
Silver	µg/L	50	100 [1]	ND – 15	0.6
Thallium	µg/L	NS	2	ND	ND
Zinc	mg/L	NS	5 [1]	ND – 0.015	0.01

Source: Coachella Valley Water District, unpublished file data, 1985 – 1999. Samples are taken at Avenue 52.
ND - Not detected NA - Not available NS - No standard
a Regional Board, 2001
1 Secondary MCL
2 Arsenic MCL of 10 µg/L will be fully effective in 2006
3 State Action Level
4 Data from CVWD samples collected in 2004 and 2005.

Figure 7-1
Historical Salinity of Water in the Coachella Canal and Metropolitan's Colorado River Aqueduct



Source: (CVWD2, 2005)

Agreement Environmental Impact Statement (IAEIS), Reclamation assumed that additional salinity control projects will be constructed to meet the adopted numeric objective of 879 mg/L (USBR, 2002). It was assumed in the CVWMP PEIR that the TDS concentration of the Coachella Canal will increase to 879 mg/L by 2015 and remain at that concentration through 2077 without the implementation of a Reclamation IAEIS alternative. Analysis in the IAEIS indicates the Implementation Agreement, Inadvertent Overrun and Payback Policy, and QSA will result in an 8 mg/L increase in the TDS of Colorado River water above that which is projected without these projects (USBR, 2002). Although this results in a TDS that is minimally higher than the water quality objectives, it is within the current monthly fluctuation. Reclamation assumed that additional salinity control measures would be implemented by the Colorado River Basin Salinity Control Program to meet the objective but on a different schedule than would be necessary under the Future Baseline conditions (USBR, 2002). Other general mineral constituents would be expected to increase in proportion to the changes in TDS. However, none would increase sufficiently to violated any water quality standard. Consequently, the TDS of Canal water would not affect supply reliability.

7.2.2 Perchlorate

Perchlorate (ClO_4^-) is a contaminant from the solid salts of ammonium, potassium or sodium perchlorate. Ammonium perchlorate has been used as an oxygen-adding component in solid fuel propellant for rockets, missiles and fireworks. Perchlorate compounds are also used in air bag inflators, nuclear reactors, electronic tubes, lubricating oils, electronic plating, aluminum refining, leather tanning and finishing, rubber and fabric manufacture and in the production of paints, enamels and dyes. Perchlorate is highly mobile in aqueous systems and it can persist under typical groundwater and surface water conditions for decades.

For several years, it has been known that perchlorate interferes with the ability of the thyroid gland to utilize iodine to produce thyroid hormones. In 1997, the DHS established a health-based notification level for perchlorate of 18 µg/L. Health & Safety Code §116455 requires a drinking water system to notify the governing body of the local agency in which users of the drinking water reside (*i.e.*, city council and/or county board of supervisors) when a contaminant in excess of an action level or a MCL is discovered in drinking water well, or when the well is closed due to the contaminant's presence. DHS recommends that the drinking water system take the source out of service if a contaminant is present at more than 10 times the perchlorate action level.

In January 2002, the USEPA National Center for Environmental Assessment (NCEA) released a draft revised risk assessment for perchlorate which concluded that the health risks associated with perchlorate are greater than previously determined. As a result of the release of the draft NCEA health risk assessment, DHS lowered its notification level for perchlorate from 18 µg/L to 4 µg/L, which is the detection limit (January 2002). On March 11, 2002, the California Office of Environmental Health Hazard Assessment (OEHHA) proposed a Public Health Goal (PHG) of 6 µg/L for perchlorate. The PHG is a level of drinking water contaminant at which adverse health effects are not expected to occur from a lifetime of exposure. In March 2004, OEHHA published a final perchlorate PHG of 6 µg/L. The National Academy of Sciences' January 2005 report on the health implications of perchlorate recommended a reference dose (RfD) of 0.0007 milligrams per kilogram per day. In February 2005, EPA established the official RfD for perchlorate. This level is equal to a drinking water equivalent level of 24.5 ppb and has been adjusted to protect the most sensitive populations. DHS subsequently revised its perchlorate notification level to 4 µg/L. DHS anticipates proposing a perchlorate MCL in 2005. The MCL will be set as close as technically and economically feasible to the PHG.

Perchlorate was initially detected by Metropolitan at a level of 9 µg/L at Lake Havasu. Recent measurements at Lake Havasu have been below the detection limit. In 2001 and 2002, IID detected perchlorate in the All-American Canal system ranging from 4.2 to 5.6 µg/L. No perchlorate was detected in the Coachella Canal water during 2004 and 2005.

The source of perchlorate in Colorado River water has been determined to be the Kerr-McGee Chemical Company and the former PEPCON perchlorate manufacturing facilities in Henderson, Nevada. Perchlorate waste from decades of poor disposal practices has permeated into the groundwater under the manufacturing site which flows into the Las Vegas Wash and then into Lake Mead. Kerr-McGee, working with the Nevada Division of Environmental Protection (NDEP), constructed a slurry wall to slow the migration of the perchlorate plume to Las Vegas Wash, began extracting perchlorate-contaminated groundwater, and has operated an interim 450 gallons per minute (gpm) groundwater treatment system since 1999. Kerr-McGee began operation of a larger (825 gpm) treatment facility in late March 2002 (Crowley, 2002) which is presently reducing perchlorate entering Lake Mead. This new plant is currently online.

The Southern Nevada Water Authority (SNWA) monitors the quality of water in Las Vegas Wash and reports that the concentration of perchlorate has fallen by approximately 40 to 50 percent in less than two years (Vickman, 2002). Similarly, Metropolitan has observed similar reductions since 1997. A perchlorate washout model was developed to predict the perchlorate levels over time indicate perchlorate levels leaving Lake Havasu would drop below detection limits by the end of 2004 and would continue to decline in the future.

7.2.3 Selenium

Selenium is a relatively minor component of the total dissolved solids (salinity) found in the Colorado River, but it has been found to have a significant impact on wildlife, such as birds and fish. Water quality standards for the protection of wildlife vary between 2 µg/L and 5 µg/L in the Colorado River Basin. In California, the standard is currently 10 µg/L; however, the USEPA has indicated that this standard could be lowered to 2 µg/L (USEPA, 2002). High salinity and selenium levels are often associated with marine shales and saline soils. Studies are under way by Reclamation and the U.S. Department of Agriculture to determine if salinity control might also help control selenium loading (DOI, 2001).

Reclamation evaluated selenium data in the Colorado River Basin to estimate the sources and amounts of selenium being transported through the Colorado River System. Of the points evaluated on the river system, the inflow to Lake Powell had the highest annual loading of dissolved selenium. The majority of the selenium in the Colorado River System apparently comes from upgradient of Lake Powell. Selenium load drops significantly in Lake Powell. Selenium loads and concentrations decrease between Lake Powell and Parker Dam as the river passes through several reservoirs. This suggests that there is little selenium loading in the lower river and that the mainstem reservoirs are trapping selenium in the sediments. The loading is highest from the Gunnison River drainage (a tributary to the Colorado River above Lake Powell) (USBR, 2002)

Colorado River irrigation water is a source of selenium in the CVWD service area. The concentration of selenium in Canal water ranged from 0.6 to 6.4 µg/L and averaged 3.5 µg/L. Periodically, farmers leach their fields, and the excess salts and selenium dissolve out of the root zone. This water is discharged into the subsurface tile drain system. Ultimately, concentrations of dissolved salt and selenium are discharged into the CVSC and CVWD drains and flow into the Salton Sea.

The USEPA has proposed development of a Total Maximum Daily Load (TMDL) for selenium that will target selenium throughout the Colorado River Basin and focus on source reduction in the basin. Correspondence from the RWQCB states that: “It is our understanding that the proposed selenium TMDL would focus on selenium throughout the upper and lower Colorado River Basin States (Colorado River Watershed), and would address selenium reduction at the sources, but could also include management practices to address concentrating of selenium in Imperial Valley.” (RWQCB, 2002)

7.3 STATE WATER PROJECT

CVWD and DWA obtain imported water supplies from the SWP, which is managed by DWR. CVWD and DWA executed agreements in 1963 with the State of California to purchase supplies from the SWP, primarily to help alleviate the groundwater overdraft in the Upper Valley. State Water Project water is exchanged with Metropolitan for Colorado River water. This water is an important component of a source for groundwater recharge in the Upper Valley.

7.3.1 SWP Water Quality

The quality of water from the SWP is generally good. The TDS of water delivered to Metropolitan from the East Branch has historically varies from 112 mg/L to 375 mg/L. Total hardness varies from 54 to 131 mg/L as $CaCO_3$. TDS and hardness are typically lower in wet years and higher in dry years. In spite of its lower mineral content, SWP water contains more total organic carbon as well as bromide, both of which are precursors for creating disinfection byproducts. Since CVWD does not take direct delivery of SWP water, its quality is not of current concern.

7.3.2 Metropolitan's Colorado River Aqueduct

The CRA conveys river water from Lake Havasu to Lake Mathews in western Riverside County. Construction of the aqueduct was completed in 1941. The facility consists of 242 miles of canals, pipelines and tunnels along with five pumping stations that lift Colorado River water over 1,600 feet. The aqueduct has a capacity of 1,800 cfs or 1.3 million acre-ft/yr. This aqueduct passes along the easterly side of CVWD and crosses the Whitewater River channel north of Palm Springs. The proximity of the aqueduct to the Coachella Valley made it a logical choice for delivering imported water to the valley.

The average historical quality of the water delivered through Metropolitan's CRA is better than Coachella Canal water in terms of TDS (1987 to 1999 average of 617 mg/L compared to 748 mg/L, respectively). The lower TDS of the CRA water results from its intake location at Parker Dam, which is upriver of the All-American Canal diversion point at Imperial Dam.

The water quality objective for Colorado River water below Parker Dam is 747 mg/L. Projections of future salinity at this location are described in a Salinity Management Study completed for Metropolitan and Reclamation (Bookman-Edmonston, 1998). TDS values are predicted to range from 650 to 850 mg/L for wet and dry periods, respectively, between 1999 and 2035. For the period 1987 to 2004, the quality of Exchange Water met all surface water quality objectives for municipal and domestic supply defined by the Regional Board.

Metropolitan conducted initial monitoring of its Colorado River water supply in June 1997 and then initiated monthly monitoring for perchlorate in October 1997 with the collection of samples from the Colorado River Aqueduct and other locations in its system. Since the inception of the monitoring program, perchlorate levels in Colorado River Aqueduct water supplies have ranged from non-detect (<4 µg/L) to 9 µg/L. The general downward trend in this data is indicative of the effect of control measures implemented to date. In 1997, CVWD tested 10 water sources and found perchlorate at 6 µg/L just downstream of the Whitewater Turnout from the Metropolitan Aqueduct. In the summer of 2005, Metropolitan detected perchlorate in the range of 2-4 µg/L.

Studies performed by Reclamation indicate salinity below Parker Dam is projected to increase to 810 mg/L by 2015 without additional salinity controls (USBR, 2002). However, in the IA EIS, Reclamation assumed that additional salinity control projects will be constructed to meet the adopted numeric objective of 747 mg/L (USBR, 2002). It was assumed in the Water Management Plan PEIR that the TDS concentration of the Colorado River Aqueduct will increase to 747 mg/L by 2015 and continue at that concentration through 2077 without the Project. Analysis in the IAEIS indicates the IAEIS, IOP, and QSA will result in a 1 mg/L increase in the TDS of Colorado River water above that which is projected without these projects (USBR, 2002). Although this results in a TDS that is minimally higher than the water quality objectives, it is within the current monthly fluctuation. Reclamation assumed that additional salinity control measures would be implemented to meet the objective but on a different schedule than would be necessary under the Future Baseline conditions (USBR, 2002).

7.4 CURRENT GROUNDWATER QUALITY

The following section presents effects of current water quality in the Coachella Valley on reliability. This evaluation includes identification of areas of concern in terms of water quality and discusses sources of water (i.e. Canal water, Exchange Water and recycled water) used in the basin that affect groundwater quality and water resource reliability. Although these components may not immediately affect the quality of the groundwater produced from the deeper aquifers, there is a potential for these waters to migrate downward.

Table 7-2 summarizes the Coachella Valley groundwater quality for the time period from 1996 to 2004. This time period represents the most recent data available from most groundwater wells throughout the Valley. The data presented in this table include water quality data from both municipal supply and irrigation wells. Therefore, the water quality is more variable than is generally produced for municipal supply. In addition, the water quality in a given well depends upon well depth (or the screened interval of the water supply well), proximity to faults, presence of surface contaminants, proximity to recharge basins, and other hydrogeologic and cultural features.

Six parameters had concentrations that exceeded either a primary or secondary drinking water standard at various locations in the time period from 1996 to 2004. These included TDS, nitrate, sulfate, chloride, fluoride and arsenic. Each of these constituents is described below.

7.4.1 Total Dissolved Solids (TDS)

The concentration of TDS in groundwater is a good general indicator of groundwater quality produced in the basin and is often used to evaluate differences in quality among different water sources and identify historical trends. For example, during the 1930s, TDS concentrations throughout the Coachella Valley were typically less than 250 mg/L, except in localized areas. In the 1970s, the groundwater typically contained 300 mg/L TDS in the Upper aquifer and 150 to 200 mg/L TDS in the Lower aquifer (DWR, 1979). A recent well in the Mecca area was drilled over 1600 feet down and encountered salt water.

Table 7-2
Summary of Existing Groundwater Quality in the Coachella Valley

Constituent	Units	Water Quality Objective	MCL	Groundwater
General Parameters				
Color	units	NS	15 [1]	ND to 5
Odor	units	NS	3 [1]	0.5 to 2
Turbidity	NTU	NS	5 [1]	0.03 to 7.8
Hardness	mg/L	NS	NS	0.8 to 6,430
Sodium	mg/L	NS	NS	17 to 3,900
Calcium	mg/L	NS	NS	0.3 to 2,310
Potassium	mg/L	NS	NS	0.3 to 56
Magnesium	mg/L	NS	NS	ND to 213
Carbonate	mg/L	NS	NS	ND to 280
Bicarbonate	mg/L	NS	NS	ND to 50
Chloride	mg/L	NS	500 [1]	0.6 to 9,600
Nitrate (as Nitrate)	mg/L	NS	45	ND to 145
Iron	mg/L	NS	0.3 [1]	ND to 0.28
Manganese	mg/L	NS	0.05 [1]	ND to 0.05
Sulfate	mg/L	NS	500 [1]	0.3 to 1,980
Total Dissolved Solids	mg/L	NS	500, 1,000. 1,500[3]	111 to 19,500
Trace Metals				
Aluminum	μg/L	NS	1,000, 200 [1]	ND to 300
Antimony	μg/L	NS	6	ND to 3
Arsenic	μg/L	50	50, 10 [2]	0.3 to 100
Barium	μg/L	1,000	1,000	ND to 100
Beryllium	μg/L	NS	4	ND to 0.5
Cadmium	μg/L	10	5	ND to 0.68
Chromium	μg/L	50	50	0.7 to 22
Copper	μg/L	NS	1,300; 1,000[1]	ND to 50
Fluoride	mg/L	0.8-2.4	2	0.01 to 8.6
Lead	μg/L	50	15[3]	ND to 15
Mercury	μg/L	2	2	ND to 1
Nickel	μg/L	NS	100	ND to 5
Selenium	μg/L	10	50	ND to 11
Silver	μg/L	50	100 [1]	ND to 5
Thallium	μg/L	NS	2	ND to 0.8
Zinc	mg/L	NS	5 [1]	ND to 0.05

Source: Data compiled from unpublished CVWD files
ND = Not detected NS = No standard

1 Secondary MCL
2 Arsenic MCL of 10 μg/L will be fully effective in 2006
3 Total dissolved solids secondary MCL of 500 mg/L is the recommended level, 1,000 mg/L is the upper level and 1,500 mg/L is the short-term level.

DWR also evaluated the historical water quality in the Semi-perched aquifer. This study indicated that water quality in the Semi-Perched aquifer varies greatly by area, well depth and overlying land use. Electrical conductivity measurements in the Semi-Perched aquifer in 1975 ranged from 740 to 12,400 microsiemens per centimeter (ms/cm). This conductivity translates into an approximate TDS concentration range of 500 to 8,900 mg/L. No wells perforated in the Semi-perched aquifer are currently monitored. Because the water collected in the agricultural drain system originates in the Semi-perched aquifer, the TDS concentrations in the Coachella Valley drains were assumed to be similar. (DWR, 1979) The current concentrations in the drains are consistent with measurements from the 1970s and do not seem to suggest a drastic change in the quality of the Semi-perched aquifer since that time.

Figure 7-2 shows a plot of TDS concentration of wells in the Coachella Valley for the time period 1996 to 1999. The water quality of specific wells by state well number throughout the Valley are also provided in **Table 7-3**. This table also indicates the township, range and section where the well is located, the aquifer from where the well draws water and the perforated intervals. The majority of these wells still in operation are not used or owed by CVWD.

As shown in **Figure 7-2**, concentrations of TDS are generally below 500 mg/L in the Upper Valley except in limited areas adjacent to the Whitewater Spreading Facility and in the Palm Desert area. In particular, there is a cluster of wells in the vicinity of Palm Desert with TDS concentrations from 500 to 1,000 mg/L. These concentrations appear to occur in the areas where the aquitard is absent or thin, allowing surface waters with higher TDS concentrations to percolate directly into the Lower aquifer.

In the Lower Valley, there are several areas where the TDS concentrations exceed the DHS recommended secondary MCL of 500 mg/L as well as the upper limit secondary MCL of 1,000 mg/L in both the Upper and Lower aquifers. An additional area of high TDS concentrations above 1,000 mg/L is present in a region outlined between communities of Indio, Coachella, La Quinta, and Valerie Jean. A third region of elevated TDS concentrations is present between the communities Oasis and Mecca. In this region, numerous water quality measurements were above 1,000 mg/L. Most of the higher concentrations in the Oasis area occur in the area where the Upper and Lower aquifers are merged because of the absence of aquitards (presence of unconfined conditions). In addition, there may be a potential fault in this area (referred to as the Oasis Fault by Bechtel, 1967).

Declining groundwater levels have reduced or eliminated upward groundwater flow into the agricultural drains and have created the potential for high-TDS water in the Semi-perched aquifer to remain in the basin and eventually migrate downward to the Upper aquifer and eventually to the Lower aquifer. Similarly, declines in water levels in the Lower aquifer increase the downward migration of higher-TDS groundwater from the Upper aquifer into the Lower aquifer. This occurs particularly along the margins of the basin where the aquitard separating the two zones is thin or absent and in areas where the Lower aquifer is pumped more. This degrades water quality in the Lower aquifer.

Implementation of the CVWMP is expected to reverse this vertical migration of poor quality water into the deeper aquifers. Since the quality of the deep groundwater is excellent and management activities are in place to maintain the quality, TDS will not affect groundwater supply reliability.

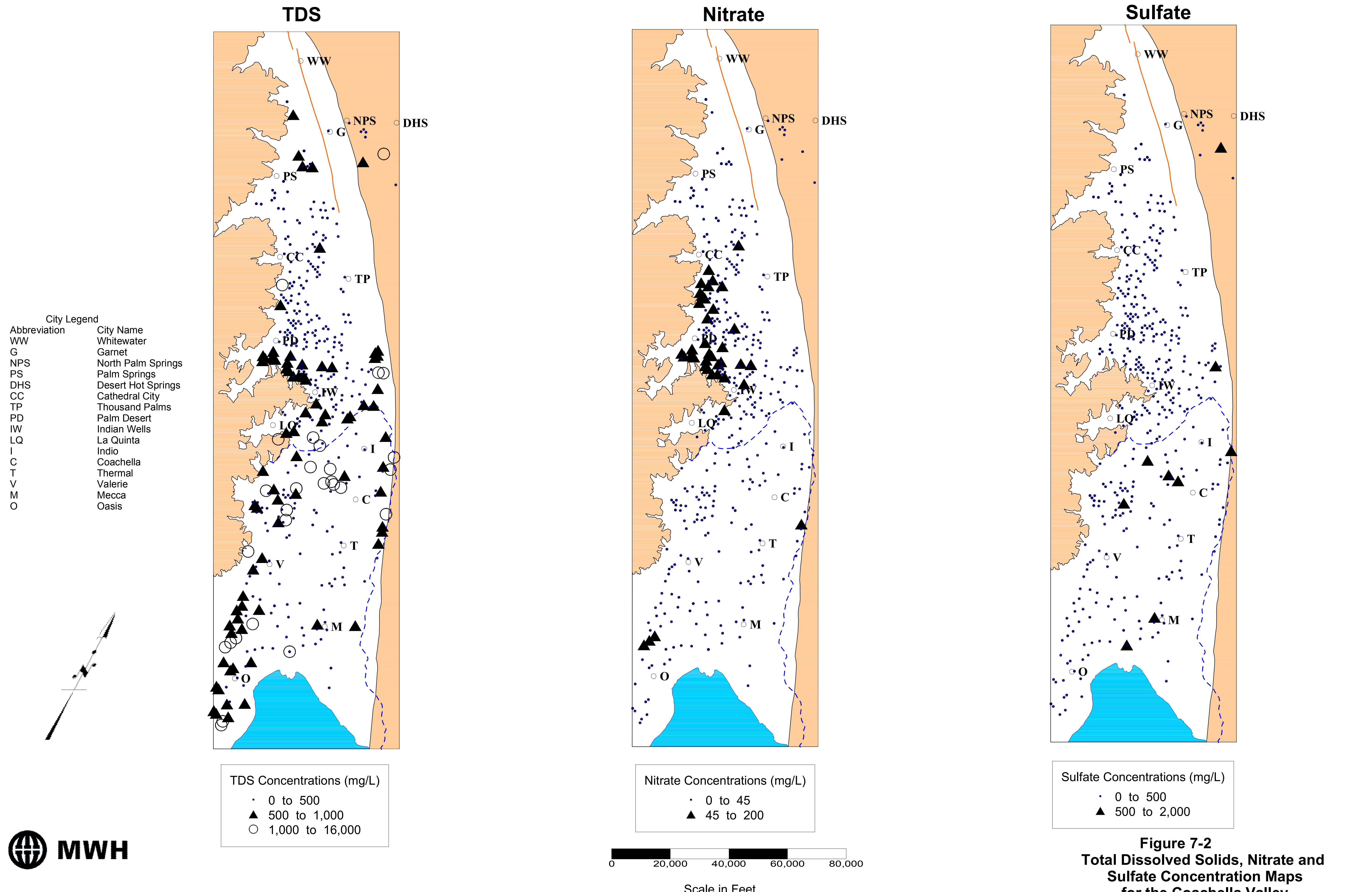


Figure 7-2
Total Dissolved Solids, Nitrate and Sulfate Concentration Maps for the Coachella Valley

Table 7-3
Summary of Water Quality for Selected Wells in the Coachella Valley

State Well Number	Aquifer	Top of Perforations (feet)	Bottom of Perforations (feet)	TDS (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Arsenic (μg/L)
Whitewater Spreading Facility									
03S04E34H	Unconfined	530	726	378	NA	135	36	NA	NA
03S04E36M	Unconfined	900	1100	505	NA	200	52	NA	NA
Palm Springs Area									
04S05E04N	Unconfined	520	890	265	3.4	43	12	0.9	NA
04S05E05K	Unconfined	408	748	355	3.4	104	30	0.8	NA
04S05E09F	Unconfined	410	670	324	4.3	76	23	0.8	NA
Cathedral City Area									
04S05E22L	Unconfined	400	600	228	22.5	33	15	0.5	NA
04S05E27E	Unconfined	456	835	184	2.2	16	6	0.6	NA
04S05E28F	Unconfined	500	925	204	4.8	23	11	0.4	NA
04S05E26B	Lower	1050	1360	193	2.6	16	12	0.6	NA
04S05E26K	Lower	400	820	223	15.1	27	9	0.6	NA
Palm Desert Area									
05S06E02D	Unconfined	350	1250	177	2.9	21	10	0.7	2.6
05S06E21R	Unconfined	250	480	745	99.0	195	110	0.2	NA
05S06E05B	Lower	850	1045	181	2.2	18	7	0.6	1.7
05S06E12M	Lower	200	500	726	83.0	193	104	0.5	NA
05S06E12N	Lower	470	946	171	2.2	16	7	0.6	NA
05S06E22J	Lower	342	554	287	17.4	58	31	0.2	3.7
Indio Area									
05S07E04C	Unconfined	520	800	736	1.0	332	73	3.9	1.9
05S08E31C	Unconfined	513	818	173	2.7	30	10	0.7	2.2
05S08E28M	Upper	208	268	593	0.2	245	63	5.2	5.6
05S07E10D	Lower	200	530	817	0.5	342	116	1.3	4.2
05S07E24M	Lower	250	660	280	4.6	63	23	0.6	NA

Table 7-3(Continued)
Summary of Water Quality for Selected Wells in the Coachella Valley

State Well Number	Aquifer	Top of Perforations (feet)	Bottom of Perforations (feet)	TDS (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Arsenic (μg/L)
La Quinta									
05S07E30A	Unconfined	550	990	220	18.7	38	14	0.3	NA
06S07E04R	Upper	189	297	184	1.9	37	14	0.4	NA
06S07E04D	Lower	472	592	226	12.1	56	19	0.2	NA
Valerie Jean									
07S07E03A	Unconfined	250	452	268	12.0	53	54	0.4	4.7
07S08E19G	Unconfined	270	520	461	19.9	130	82	0.4	NA
07S07E01M	Lower	195	654	176	1.7	26	13	0.6	5.7
07S08E27A	Lower	491	811	167	NA	29	11	1.5	38.0
07S08E27M	Lower	340	660	511	15.5	180	103	0.5	7.3
Oasis									
08S08E04G	Unconfined	175	845	700	33.1	200	167	0.4	2.3
08S09E31Q	Unconfined	230	350	630	7.4	162	123	1.3	2.0
08S08E11H	Lower	560	876	352	NA	91	56	2.9	97.2
08S08E24A	Lower	800	900	274	NA	35	50	4.0	43.8
Coachella									
06S07E02D	Upper	0	0	497	9.1	151	73	0.5	NA
06S08E06M	Upper	300	380	1,873	7.8	689	290	1.0	NA
06S08E12Q	Upper	170	380	393	7.2	133	57	2.1	13.0
06S08E11A	Lower	400	842	737	25.3	296	120	0.8	5.5
06S08E20H	Lower	430	670	162	2.0	24	8	0.9	3.0
Mecca									
07S08E26H	Upper	300	340	235	6.0	55	22	1.3	37.0
07S09E30R	Upper	350	390	382	0.1	185	13	2.5	32.0
07S09E30R	Lower	1430	1470	16,065	2.8	618	8,903	1.1	66.0
07S09E30R	Lower	1220	1260	3,275	0.6	1,667	500	2.9	4.2
07S09E30R	Lower	730	770	338	0.1	51	23	6.2	32.5

7.4.2 Chloride & Sulfate

Throughout the Upper and Lower Valleys, sulfate concentrations are typically below the secondary standard of 500 mg/L. However, a small number of wells scattered throughout the Lower Valley do indicate elevated sulfate concentrations. Increased sulfate may result from the use of Canal water, Salton Sea intrusion or downward migration of Semi-perched aquifer water into the Lower aquifer.

Table 7-3 shows chloride concentrations in the Coachella Valley are typically below the secondary standard of 500 mg/L. Two wells exceed the MCL for chloride. The first is the North Salton Sea monitoring well located between the communities of Oasis and Mecca, on the north shore of the Salton Sea. Chloride concentrations in this well (07S09E30R) are similar to seawater and may indicate Salton Sea intrusion at depth or the existence of a lens of ancient saltwater. The second well with elevated chloride levels is located to the south of the community of Oasis and approximately three miles to the west of the Salton Sea. Both wells are screened to depths greater than 1,000 feet and may indicate the presence of ancient saltwater at depth.

7.4.3 Nitrate

Nitrates in groundwater are believed to be derived from fertilizers applied to agricultural lands and golf courses, effluent from septic tanks and wastewater treatment plants (DWR, 1979), plowing under of native, nitrogen fixating mesquite bosques on date tree farms followed by flood irrigation along the Whitewater River (Pillsbury, 1948), or combinations thereof. The primary MCL for nitrate is 45 mg/L.

Nitrate concentrations during the 1930s were typically less than 4 mg/L throughout the Valley. By the late 1970s, in wells adjacent to the Whitewater River, nitrate concentrations had increased to more than 45 mg/L (DWR, 1979). **Figure 7-2** shows the locations throughout the Valley where nitrate concentrations currently (based upon data from 1996 to 1999) exceed the primary MCL of 45 mg/L as NO_3. An area of high nitrate shallow groundwater follows the approximate trace of the Whitewater River from Cathedral City to east of La Quinta. Municipal wells generally avoid this high nitrate groundwater by using deep perforations. In addition, a cluster of high nitrate concentrations is present northwest of the community of Oasis. These elevated concentrations may be a result of fertilizers in the unconfined area. Several municipal wells belonging to DWA in Palm Springs are already restricted in use because the water in those wells shows nitrate concentrations of up to 70 mg/L. Discharges of wastes from individual domestic septic tank/leachfield systems, water recycling, widespread application of fertilizers, and discharges of domestic wastes to evaporation/percolation ponds are the likely source of the nitrate contamination (RWQCB, 1998).

CVWD has about 12 wells that exceed the nitrate MCL. These wells are not currently in service. If nitrate continues to elevate in these areas, CVWD would consider wellhead treatment if alternative groundwater supplies cannot be developed.

7.4.4 Fluoride

Wells possessing fluoride levels above the MCL of 2 mg/L are generally limited to two groups of wells in the Lower Valley. The first group of wells is located to the east of the communities of

Indio and Coachella. These concentrations may reflect the influence of the San Andreas Fault Zone, located immediately to the east. The second cluster of wells with elevated fluoride concentrations is located between the communities of Oasis and Mecca. Elevated fluoride concentrations in this area are the result of naturally occurring sources and generally occur in shallow wells. CVWD avoids drilling wells in areas that are detected to have elevated fluoride concentrations. The concentration of fluoride is shown in **Table 7-3**.

7.4.5 Perchlorate

The history of perchlorate testing in the Coachella Valley has been as follows:

- In 1997, CVWD tested 10 water sources and only found perchlorate at 6 µg/L just downstream of the Whitewater Turnout from the Metropolitan Aqueduct.
- In 2000, an unconfirmed detection of perchlorate at 10 µg/L was found in the shallow aquifer zone (435-455 ft below ground surface) in a test bore sample for Well 5715, located near Jefferson Street and Avenue 48. No perchlorate was detected in the completed well.
- In 2001, all active CVWD wells were tested twice, in May and in October/November. Only Well 6721 (not in service), near Jefferson Street and Avenue 54, had detectable perchlorate (5.0 µg/L and 5.9 µg/L by two different laboratories) (CVWD, unpublished file data). DWA detected perchlorate in Wells 9 and 21 in concentrations ranging from 5.4 to 6.4 µg/L.
- In 2001 and 2002, IID detected perchlorate in the All-American Canal system ranging from 4.2 to 5.3 µg/L.
- In 2004 and 2005, CVWD tested the Coachella Canal and no perchlorate was detected.

Available data suggest that perchlorate concentrations in completed wells in the DWA and CVWD services areas have been at or below the PHG. Nevertheless, this constituent remains a concern for all users of Colorado River water.

Recent research indicates very low levels of perchlorate (<1 µg/L) is detected in virtually every source of groundwater tested. It is presumed that perchlorate occurs naturally in groundwater at these low levels. In general however, perchlorate levels are generally declining in the Coachella Valley.

7.4.6 Arsenic

From Mecca to Oasis, naturally occurring arsenic is found in the Coachella Valley groundwater and appears associated with local faults. The MCL for arsenic will be lowered to 10 µg/L beginning in 2006. As shown in **Figure 7-3**, there are numerous monitoring wells that have arsenic concentrations above the current revised federal MCL of 10 µg/L. Many wells within CVWD have arsenic concentrations above the revised federal MCL. CVWD has identified six of its domestic water wells that were tested and showed arsenic levels above the revised federal MCL. **Table 7-4** below is a summary of these wells and the actions being taken to remediate the arsenic concentrations.

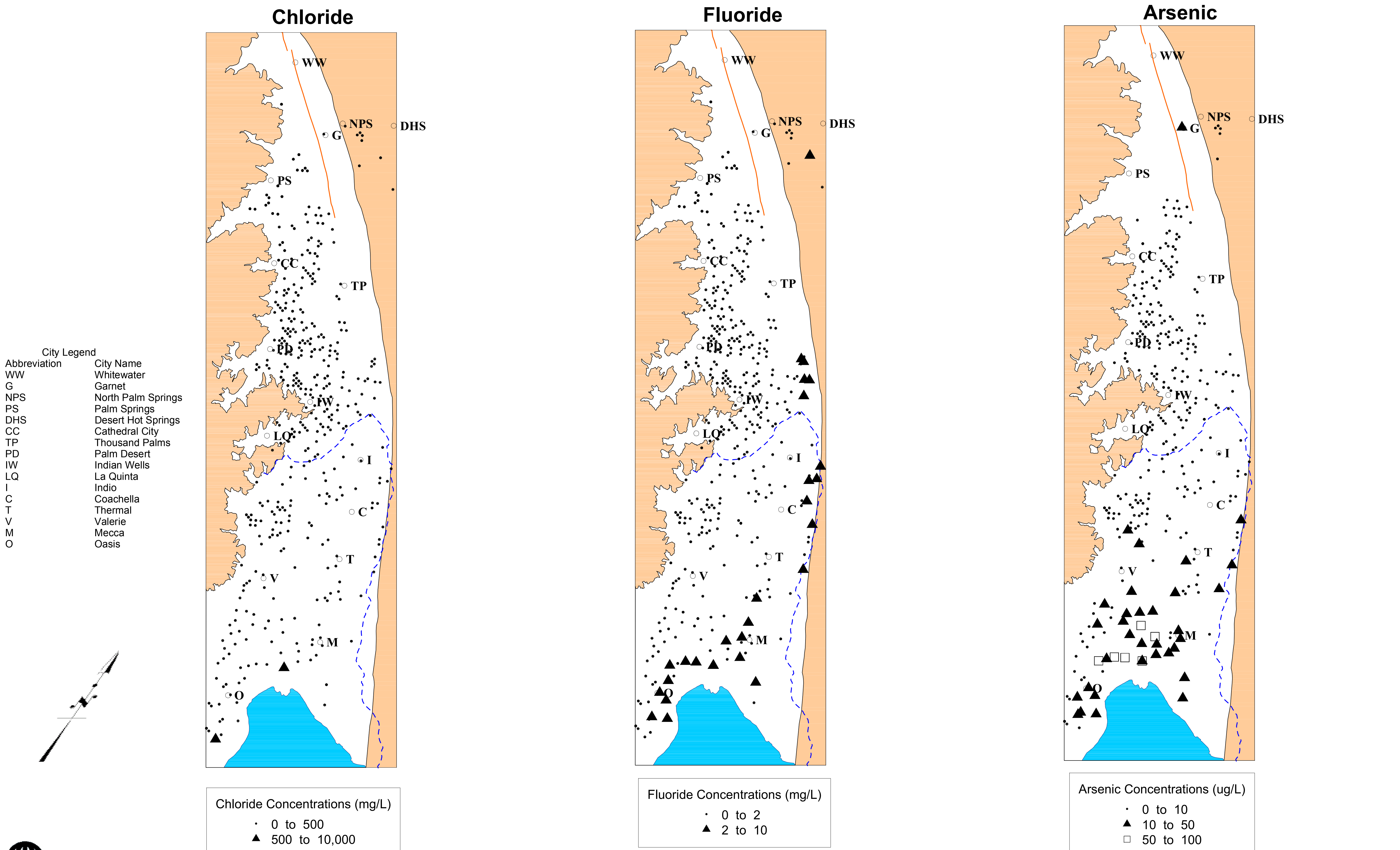


Figure 7-3
Chloride, Fluoride and Arsenic Concentration Maps for the Coachella Valley

Table 7-4
CVWD Groundwater Well Arsenic Remediation for Potable Water Use

CVWD Well Number	Treatment Flow Capacity (gpm)	Average Arsenic Concentration (µg/l)	Arsenic Remediation Effort
7801	-	>>10	To be abandoned
7802	4,000	11	Arsenic Removal System - Under Construction[1]
7803	4,000	11	Arsenic Removal System - Under Construction[1]
6806	4,000	13	Arsenic Removal System - Under Construction
7991	1,000	36	Treatment Plant - Operational
7992	-	>>10	To be abandoned

1. A combined arsenic removal system for 7802 and 7803 will be constructed

Regulations

Under the 1996 Amendments to the Safe Drinking Water Act, USEPA was required to publish a revised standard for arsenic by January 2001; before this time, the current standard was 50 micrograms per liter (µg/L). USEPA published a proposed revised Maximum Contaminant Limit (MCL) of 5 µg/L on June 22, 2000. After public review and comment, on January 16, 2001, USEPA finalized a rule setting the MCL for arsenic to 10 µg/L. On March 20, 2001, the current administration withdrew the arsenic standard of 10 µg/L for additional scientific review. After months of review by outside technical experts, on October 31, 2001, EPA Administrator Whitman announced that the 10 µg/L standard for arsenic would remain. The effective date of the 10 µg/L MCL for arsenic was February 22, 2002, which means that the new standard is in effect legally, as well as for purposes of Consumer Confidence Report requirements. The new standard becomes enforceable on January 22, 2006.

The detection limit for purposes of reporting (DLR) in California is 2 µg/L. The DLR represents a level where the DHS is confident about the quantification of a contaminant in drinking water. This essentially means that if DHS proposes a lower standard for arsenic, the standard would fall within the range of 2 µg/L to 10 µg/L. However, over the last year or so, comments made by DHS staff appear to indicate that they are not inclined to establish an MCL lower than the USEPA MCL. However, it should be noted that at this time (December 2005) DHS has not published any formal opinions regarding a state MCL.

Arsenic Treatment

A summary of the arsenic concentrations in the six wells in CVWD's service area used a potable water sources is summarized in **Table 7-4**. Also shown in the flowrate for each arsenic treatment system proposed or in operation. The treatment system at Well 7991 is operational and producing treated water with effluent arsenic levels that are less than the USEPA MCL of 10 µg/L. Construction of treatment facilities for Wells 7802, 7803 and 6806 is nearing completion and these facilities are expected to be operational in January 2006. The technology selected for the facilities was ion exchange with a brine minimization process and brine treatment that will produce a small volume of non-RCRA hazardous solid waste and a non-hazardous liquid waste. It should be noted that before the USEPA limit for arsenic was revised to 10 µg/L, these wells were within the USEPA regulations for arsenic and that utilities have been given until January 22, 2006 to make the necessary modifications to their systems to comply with the revised MCL.

7.4.7 Other Constituents

According to the Regional Board, leaking underground storage tanks in the more porous areas of the Coachella Valley allow a significant amount of pollutants (e.g., petroleum hydrocarbons) to reach groundwater. In addition, the gasoline oxygenate known as MTBE (methyl tertiary-butyl ether) has become a major problem. According to the Regional Board, MTBE leaks have caused water districts within the Coachella Valley to temporarily shut down, and even abandon, drinking water wells. MTBE has been detected in monitoring wells at approximately 50 locations throughout the Coachella Valley since 1996, most of which are located in the communities of Cathedral City, Coachella and Indio (RWQCB, 2004). CVWD water quality monitoring has not detected MTBE in any of its domestic water wells. MTBE occurs primarily in the shallow groundwater, whereas the CVWD wells draw water from deep aquifers.

Within CVWD's domestic system, the only volatile organic compound (VOC) detected is total trihalomethanes (THMs, a by-product of chlorination used for disinfection). Concentrations of THMs range from ND to 0.01 mg/L, lower than the MCL of 0.08 mg/L. No other VOCs were detected within CVWD's domestic system.

CVWD has one active well with tetrachloroethene (PCE) levels less than the MCL. PCE is a dry-cleaning solvent that is commonly in groundwater in urban areas.

Dibromochloropropane (DBCP) has been detected in four CVWD wells, all of which are less than the MCL. Three of these wells have been deactivated due to nitrate contamination. Recent monitoring for the forth well shows DBCP levels below detection. There appears to be areas of DBCP in Palm Desert, Indian Wells and La Quinta. The source of the DBCP is believed to be grape vineyards located north of Interstate 10 in the 1960s and 1970s.

7.4.8 Groundwater Quality Effects on Reliability

The only current water quality issue that could potentially affect groundwater reliability is arsenic. CVWD is completing the construction of three arsenic removal facilities in the Lower Valley. When on line in 2006, these facilities will eliminate arsenic as a concern from these wells. If DHS or USEPA adopts a lower MCL for arsenic in the future, CVWD may need to blend or treat additional wells to comply future standards.

Section 8
Water Service Reliability

8.1 LAW

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.

8.2 WATER SERVICE RELIABILITY

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 **Table 8-1** through **Table 8-21.**

- The projected water demand in a "Normal Water Year" are based on the average annual water demand projections presented in **Section 2**.
- The projected water demand in a "Single Dry Year" and "Multiple Dry Year" are 4.7 percent greater than normal potable and non-potable water demands based on the variation in historical domestic water consumption per connection for 1991 through 2004.
- Water conservation projections from the analysis in **Section 4** are included in the projected water demands. This is referred to as the "base water conservation amount."
- Multiple dry year periods consist of three consecutive years.
- 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.
- All years are considered normal years for the normal year evaluation.
- Every year of each 5-year period is considered as a dry year for the single dry year evaluations, because each year is evaluated separately.
- In a single dry year and multiple dry years, the amount of SWP exchange water is reduced to zero based on the agreement between CVWD, DWA and Metropolitan. In these years, SWP water deliveries are either discontinued or made from Metropolitan's Advance Delivery storage account.
- During dry year periods, water supply can be augmented by the extra storage in the groundwater basin during wet years.

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.

8.2.1 Normal Water Year

CVWD's water supply is broken down into five categories: groundwater, Canal water, SWP exchange water, recycled water and desalinated drain water. **Table 8-1** presents the projected water supply for CVWD during a normal water year. A portion of the demand is met from groundwater storage in 2010 and 2015 while storage increases in subsequent years because of CVWMP groundwater recharge and source substitution activities.

Table 8-1
Projected Normal Water Year Supply

Supply Sources	2010 (acre-ft/yr)	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)
Groundwater	106,700	123,100	123,700	124,200	123,200
Groundwater Storage [1]	4,581	1,705	-18,572	-9,334	-13,712
Coachella Canal Water	318,000	342,000	379,000	404,000	429,000
SWP Exchange Water	62,000	70,600	70,100	68,100	66,500
Recycled Water	23,100	25,100	26,500	27,600	28,300
Desalinated Drain Water	4,000	8,000	8,000	11,000	11,000
Total Supply	518,381	570,505	588,728	625,566	644,288

1. Groundwater storage is the difference between demands and supplies. A positive number indicates groundwater pumped from storage; a negative number indicates water to storage.

The projected normal year demands are summarized in **Table 8-2.** Projected normal year water demands, as developed in **Section 4**, incorporate projected domestic, agricultural and golf course and municipal non-potable water demand including projected active and passive conservation.

Table 8-2
Projected Normal Water Year Demand

Demand	2010 (acre-ft/yr)	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)
Domestic Water including Conservation	167,681	189,405	207,028	220,866	231,088
Golf Course and Municipal Non-potable	67,200	90,100	90,100	90,100	92,400
Agriculture	283,500	291,000	291,600	314,600	320,800
Total Demand	518,381	570,505	588,728	625,566	644,288
% of year 2005	115%	126%	130%	138%	142%

Table 8-3 compares the supply and demands during a normal water year showing that there are sufficient water supplies in a normal year to meet the projected demands.

Table 8-3
Normal Year Supply and Demand Comparison

	2010 (acre-ft/yr)	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)
Supply totals	518,381	570,505	588,728	625,566	644,288
Demand totals	518,381	570,505	588,728	625,566	644,288
Difference	0	0	0	0	0
Difference as % of Supply	0%	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%	0%

8.2.2 Single Dry Year

The water supplies and demands for CVWD service area over next twenty-five years were analyzed in the event that a single dry year occurs, similar to the drought that occurred during 1977. The following tables, **Table 8-4**, **Table 8-5**, and **Table 8-6**, present the supply, demands and comparison between these two during a single dry year. As shown in demand and supply comparison table, all supply will meet the demand projection. In dry years, CVWD will need to extract water from groundwater storage to meet the total demand projection. This temporary overextraction replaces SWP supplies that are diverted to Metropolitan in dry years.

Table 8-4
Projected Single Dry Year Supply

Water Supply	2010 (acre-ft/yr)	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)
Groundwater	106,700	123,100	123,700	124,200	123,200
Groundwater Storage [1]	90,945	99,119	79,199	88,168	83,069
Coachella Canal Water	318,000	342,000	379,000	404,000	429,000
SWP Exchange Water	0	0	0	0	0
Recycled Water	23,100	25,100	26,500	27,600	28,300
Desalinated Drain Water	4,000	8,000	8,000	11,000	11,000
Total Supply	542,745	597,319	616,399	654,968	674,569

1. Groundwater storage is the difference between demands and supplies. A positive number indicates groundwater pumped from storage; a negative number indicates water to storage.

Table 8-5
Projected Single Dry Year Demand

Demand	2010 (acre-ft/yr)	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)
Domestic Water including Conservation	175,562	198,307	216,759	231,247	241,949
Golf Course and Municipal Non-portable	70,358	94,335	94,335	94,335	96,743
Agriculture	296,825	304,677	305,305	329,386	335,878
Total Demand	542,745	597,319	616,399	654,968	674,569
% of Projected Normal	104.7%	104.7%	104.7%	104.7%	104.7%

Table 8-6
Projected Single Dry Year Supply and Demand Comparison

	2010 (acre-ft/yr)	2015 (acre-ft/yr)	2020 (acre-ft/yr)	2025 (acre-ft/yr)	2030 (acre-ft/yr)
Supply totals	542,745	597,319	616,399	654,968	674,569
Demand totals	542,745	597,319	616,399	654,968	674,569
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%

8.2.3 Multiple Dry Years

The water demands and supplies for CVWD service area over next twenty-five years were analyzed in the event that a multiple dry year event occurs. **Table 8-7** presents the available water supply to CVWD during a multiple dry year period assuming the three consecutive dry years are year 2007 through year 2009.

Table 8-7
Projected Supply During Multiple Dry Year Period Ending 2010

Water Supply	2006 (acre-ft/yr)	2007 (acre-ft/yr)	2008 (acre-ft/yr)	2009 (acre-ft/yr)	2010 (acre-ft/yr)
Groundwater	88,300	91,800	99,400	102,700	106,700
Groundwater Storage [1]	24,769	85,574	86,498	91,721	4,581
Coachella Canal Water	289,000	306,000	310,000	314,000	318,000
SWP Exchange Water	46,900	0	0	0	62,000
Recycled Water	16,600	17,900	19,200	20,500	23,100
Desalinated Drain Water	0	0	0	0	4,000
Total Supply	465,569	501,274	515,098	528,921	518,381

1. Groundwater storage is the difference between demands and supplies. A positive number indicates groundwater pumped from storage; a negative number indicates water to storage.

The projected demands during the period between 2006-2010 with multiple dry years in 2007 through 2009 are shown in **Table 8-8**. The demands in the relevant dry year includes a demand factor of 104.7 percent.

Table 8-8
Projected Demand During Multiple Dry Year Period Ending 2010

Demand	2006 (acre-ft/yr)	2007 (acre-ft/yr)	2008 (acre-ft/yr)	2009 (acre-ft/yr)	2010 (acre-ft/yr)
Domestic Water including Conservation	147,429	159,659	164,960	170,261	167,681
Golf Course and Municipal Non-portable	42,080	50,633	57,208	63,783	67,200
Agriculture	276,060	290,982	292,930	294,877	283,500
Total Demand	465,569	501,274	515,098	528,921	518,381
% of Projected Normal	100.0%	104.7%	104.7%	104.7%	100.0%

The comparison between the available water supplies and projected demands for multiple dry years in the period 2006-2010 is presented in **Table 8-9.** As shown in this table, the available supplies are sufficient to meet the projected demand, which means that CVWD has sufficient supply to meet the demands under multiple dry year conditions.

Table 8-9
Projected Supply and Demand Comparison During Multiple Dry Year Period Ending 2010

	2006 (acre-ft/yr)	2007 (acre-ft/yr)	2008 (acre-ft/yr)	2009 (acre-ft/yr)	2010 (acre-ft/yr)
Supply totals	465,569	501,274	515,098	528,921	518,381
Demand totals	465,569	501,274	515,098	528,921	518,381
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 8-10 through **Table 8-12** present the supply, demands and comparison between supply and demands during Year 2011 and 2015, with 2011 and 2015 as normal water years, 2012 through 2014 as the three consecutive dry years. The demand and supply comparison shows that during period 2011 and 2015, available supplies are sufficient for the demand projection.

Table 8-10
Projected Supply During Multiple Dry Year Period Ending 2015

Water Supply	2011 (acre-ft/yr)	2012 (acre-ft/yr)	2013 (acre-ft/yr)	2014 (acre-ft/yr)	2015 (acre-ft/yr)
Groundwater	112,900	114,500	115,600	121,100	123,100
Groundwater Storage [1]	-94	93,574	97,189	96,404	1,705
Coachella Canal Water	322,000	327,000	332,000	337,000	342,000
SWP Exchange Water	65,700	0	0	0	70,600
Recycled Water	23,500	23,900	24,300	24,700	25,100
Desalinated Drain Water	4,800	5,600	6,400	7,200	8,000
Total Supply	528,806	564,574	575,489	586,404	570,505

1. Groundwater storage is the difference between demands and supplies. A positive number indicates groundwater pumped from storage; a negative number indicates water to storage.

Table 8-11
Projected Demand During Multiple Dry Year Period Ending 2015

Demand	2011 (acre-ft/yr)	2012 (acre-ft/yr)	2013 (acre-ft/yr)	2014 (acre-ft/yr)	2015 (acre-ft/yr)
Domestic Water including Conservation	172,026	184,660	189,209	193,758	189,405
Golf Course and Municipal Non-portable	71,780	79,949	84,744	89,539	90,100
Agriculture	285,000	299,966	301,536	303,107	291,000
Total Demand	528,806	564,574	575,489	586,404	570,505
% of Projected Normal	100.0%	104.7%	104.7%	104.7%	100.0%

Table 8-12
Projected Supply and Demand Comparison During Multiple Dry Year Period Ending 2015

	2011 (acre-ft/yr)	2012 (acre-ft/yr)	2013 (acre-ft/yr)	2014 (acre-ft/yr)	2015 (acre-ft/yr)
Supply totals	528,806	564,574	575,489	586,404	570,505
Demand totals	528,806	564,574	575,489	586,404	570,505
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 8-13 through **Table 8-15** present the supply, demands and comparison between supply and demands during Year 2016 and 2020, with 2016 and 2020 as normal water years, 2017 through 2019 as the three consecutive dry years. Available supplies are sufficient to support all demands during multiple dry year 2016 through 2020.

Table 8-13
Projected Supply During Multiple Dry Year Period Ending 2020

Water Supply	2016 (acre-ft/yr)	2017 (acre-ft/yr)	2018 (acre-ft/yr)	2019 (acre-ft/yr)	2020 (acre-ft/yr)
Groundwater	123,300	123,300	123,400	123,600	123,700
Groundwater Storage [1]	-30	96,991	82,427	80,763	-18,572
Coachella Canal Water	347,000	351,000	369,000	374,000	379,000
SWP Exchange Water	70,500	0	0	0	70,100
Recycled Water	25,380	25,660	25,940	26,220	26,500
Desalinated Drain Water	8,000	8,000	8,000	8,000	8,000
Total Supply	574,150	604,951	608,767	612,583	588,728

1. Groundwater storage is the difference between demands and supplies. A positive number indicates groundwater pumped from storage; a negative number indicates water to storage.

Table 8-14
Projected Demand During Multiple Dry Year Period Ending 2020

Demand	2016 (acre-ft/yr)	2017 (acre-ft/yr)	2018 (acre-ft/yr)	2019 (acre-ft/yr)	2020 (acre-ft/yr)
Domestic Water including Conservation	192,930	205,688	209,378	213,068	207,028
Golf Course and Municipal Non-portable	90,100	94,335	94,335	94,335	90,100
Agriculture	291,120	304,928	305,054	305,180	291,600
Total Demand	574,150	604,951	608,767	612,583	588,728
% of Projected Normal	100.0%	104.7%	104.7%	104.7%	100.0%

Table 8-15
Projected Supply and Demand Comparison During Multiple Dry Year Period Ending 2020

	2016 (acre-ft/yr)	2017 (acre-ft/yr)	2018 (acre-ft/yr)	2019 (acre-ft/yr)	2020 (acre-ft/yr)
Supply totals	574,150	604,951	608,767	612,583	588,728
Demand totals	574,150	604,951	608,767	612,583	588,728
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 8-16 through **Table 8-18** present the supply, demands and comparison between supply and demands during Year 2021 and 2025, with 2021 and 2025 as normal water years, 2022 through 2024 as the three consecutive dry years. The comparison between demand and supply shows that available supplies are sufficient for the projected demand during multiple dry year period 2021 through 2025.

Table 8-16
Projected Supply During Multiple Dry Year Period Ending 2025

Water Supply	2021 (acre-ft/yr)	2022 (acre-ft/yr)	2023 (acre-ft/yr)	2024 (acre-ft/yr)	2025 (acre-ft/yr)
Groundwater	123,200	123,200	124,200	124,200	124,200
Groundwater Storage [1]	-16,124	83,486	84,380	86,274	-9,334
Coachella Canal Water	384,000	389,000	394,000	399,000	404,000
SWP Exchange Water	69,700	0	0	0	68,100
Recycled Water	26,720	26,940	27,160	27,380	27,600
Desalinated Drain Water	8,600	9,200	9,800	10,400	11,000
Total Supply	596,096	631,826	639,540	647,254	625,566

1. Groundwater storage is the difference between demands and supplies. A positive number indicates groundwater pumped from storage; a negative number indicates water to storage.

Table 8-17
Projected Demand During Multiple Dry Year Period Ending 2025

Demand	2021 (acre-ft/yr)	2022 (acre-ft/yr)	2023 (acre-ft/yr)	2024 (acre-ft/yr)	2025 (acre-ft/yr)
Domestic Water including Conservation	209,796	222,554	225,452	228,349	220,866
Golf Course and Municipal Non-portable	90,100	94,335	94,335	94,335	90,100
Agriculture	296,200	314,938	319,754	324,570	314,600
Total Demand	596,096	631,826	639,540	647,254	625,566
% of Projected Normal	100.0%	104.7%	104.7%	104.7%	100.0%

Table 8-18
Projected Supply and Demand Comparison During Multiple Dry Year Period Ending 2025

	2021 (acre-ft/yr)	2022 (acre-ft/yr)	2023 (acre-ft/yr)	2024 (acre-ft/yr)	2025 (acre-ft/yr)
Supply totals	596,096	631,826	639,540	647,254	625,566
Demand totals	596,096	631,826	639,540	647,254	625,566
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 8-19 through **Table 8-21** present the supply, demands and comparison between supply and demands during Year 2026 and 2030 with 2026 and 2030 as the normal water year, 2027 through 2029 as the three consecutive dry years. The comparison between demand and supply shows that available supplies are sufficient for the projected demand during multiple dry year period 2026 through 2030.

Table 8-19
Projected Supply During Multiple Dry Year Period Ending 2030

Water Supply	2026 (acre-ft/yr)	2027 (acre-ft/yr)	2028 (acre-ft/yr)	2029 (acre-ft/yr)	2030 (acre-ft/yr)
Groundwater	123,700	123,200	123,200	123,400	123,200
Groundwater Storage [1]	-9,929	86,728	85,509	84,089	-13,712
Coachella Canal Water	409,000	414,000	419,000	424,000	429,000
SWP Exchange Water	67,800	0	0	0	66,500
Recycled Water	27,740	27,880	28,020	28,160	28,300
Desalinated Drain Water	11,000	11,000	11,000	11,000	11,000
Total Supply	629,311	662,808	666,729	670,649	644,288

1. Groundwater storage is the difference between demands and supplies. A positive number indicates groundwater pumped from storage; a negative number indicates water to storage.

Table 8-20
Projected Demand During Multiple Dry Year Period Ending 2030

Demand	2026 (acre-ft/yr)	2027 (acre-ft/yr)	2028 (acre-ft/yr)	2029 (acre-ft/yr)	2030 (Acre-ft/yr)
Domestic Water including Conservation	222,911	235,528	237,668	239,808	231,088
Golf Course and Municipal Non-portable	90,560	95,298	95,780	96,261	92,400
Agriculture	315,840	331,983	333,281	334,579	320,800
Total Demand	629,311	662,808	666,729	670,649	644,288
% of Projected Normal	100.0%	104.7%	104.7%	104.7%	100.0%

Table 8-21
Projected Supply and Demand Comparison During Multiple Dry Year Period Ending 2030

	2026 (acre-ft/yr)	2027 (acre-ft/yr)	2028 (acre-ft/yr)	2029 (acre-ft/yr)	2030 (acre-ft/yr)
Supply totals	629,311	662,808	666,729	670,649	644,288
Demand totals	629,311	662,808	666,729	670,649	644,288
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%