California Water Service Company

2007 Urban Water Management Plan

Chico-Hamilton District

Adopted

December 21, 2007

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California Water Service Company
2007 Urban Water Management Plan
Contact Sheet

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1 Introduction

California Water Service Company (Cal Water) is an investor-owned public utility supplying water service to 1.7 million Californians through 435,000 connections. Its 25 separate water systems serve 63 communities from Chico in the North to the Palos Verdes Peninsula in Southern California. In 2000, Cal Water merged with the Dominguez Services Corporation incorporating several northern and southern California water systems. California Water Service Group, Cal Water's parent company, is also serving communities in Washington, New Mexico, and Hawaii. Rates and operations for districts located in California are regulated by the California Public Utilities Commission (CPUC) and are set separately for each of the systems. Cal Water incorporated in 1926 and has provided water service to the Chico-Hamilton City (Chico) community since 1926.

1.1 Purpose

California Water Code §10644(a) requires urban water suppliers to file with the Department of Water Resources, the California State Library, and any city or county within which the supplier provides water supplies, a copy of its Urban Water Management Plan, no later than 30 days after adoption. All urban water suppliers as defined in Section 10617 (including wholesalers), either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet annually are required to prepare an Urban Water Management Plan.

California Water Service Company will follow the California Water Code and file an Urban Water Management Plan at least once every five years on or before December 31, in years ending in five and zero. However, since California Water Service Company operates 25 Districts, updating and submitting all 25 Urban Water Management Plans in a single year is unfeasible. Therefore, the Districts have been divided into three sets that will follow an established three-year schedule. The Plan for Chico is part of the 2007 grouping and was last submitted in 2004. The next update for this District will be in 2010.

This UWMP is a foundation document and source of information for a Water Supply Assessment and a Written Verification of Water Supply. An UWMP also serves as:

- A long-range planning document for water supply,
- Source data for development of a regional water plan, and
- A source document for cities and counties as they prepare their General Plans.
- A key component to Integrated Regional Water Management Plans.

1.2 Public Review

California Water Service Company completed a draft of the Urban Water Management Plan for the District on July 1, 2007. The draft was sent to the Cities and County listed in Table 1.2-1 for review and comment. Copies of the draft plan are available at the California Water Service Company San Jose corporate, and district office for public review and comment.

California Water Service Company conducted a formal public meeting to present information on its general rate case request to the CPUC. Presentation of the Urban Water Management Plan is included in the proceedings and serves as a public review of the Urban Water Management Plan. A public hearing was held on November 8, 2007, at 7:00 p.m. at the following location:

Chico City Council Chambers
421 Main Street
Chico, California

Proof of the public hearing is presented in Appendix A

Table 1.2-1: Coordination with Appropriate Agencies (Table 1)

Agencies	Commented on the draft	Was sent a copy of the draft plan	Was sent a notice of intention to adopt
City of Chico		✓	✓
City of Hamilton City		✓	✓
Butte County Department of Water and Resources		✓	✓
Glenn County Planning Division	✓	✓	✓
Glenn County Water Advisory Committee		✓	✓

1.3 Plan Adoption

No additional comments were received by December 14, 2007. The final plan was adopted by the Vice President of Engineering & Water Quality on December 21, 2007 and was submitted to California Department of Water Resources within 30 days of approval. Appendix A presents a copy of the signed Resolution of Plan Adoption.

The agencies listed in Table 1.2-1 above will also be sent a copy of the final version of this report, as well as a copy to the California State Library.

In addition to the resolution, Appendix A also contains the following:

- Any comments received during the public review of this plan.
- Minutes from the public hearing.
- The review sheet check list from Department of Water Resources.

1.4 Water Management Tools

California Water Service Company uses the following water management tools to maximize water resources for the district:

- Hydraulic analysis will be used to identify limitations in the water distribution network and provide recommendations if main replacement is required.

- SCADA/Water measurement provides information as to how the district is operating and gives a historical record of the district, including water levels. California Water Service Company maintains detailed records including the water sales and the customer service connections by sector and uses this information for future projections.
- Geographical Information Systems (GIS) will be used to combine several sources of information and allow land usage management tools to provide insight into the growth of the district.
- Water quality data analysis provides a detailed compositional analysis of the water and provides information on potential supply shortfalls that can result from mineral intrusion or contamination.
- Water Supply and Facilities Master Plan provides details into the district from a global perspective and evaluates the major equipment and facilities replacement schedule, and identifies long-term projects. The Water Supply and Facilities Master Plan will be prepared in 2007.

1.5 Plan Organization

This plan is organized as described in the following outline. The corresponding provisions of the California Urban Water Management Planning Act are included as references. Tables in this plan have cross-references to the tables as listed in the "Guidebook to Assist Water Suppliers in the Preparation of a 2005 Urban Water Management Plan" prepared by the California Department of Water Resources.

Table 1.5-1: Plan Organization

Section	Executive Summary	Act Provision
Contact Sheet	List of Contact Persons	-
Chapter 1	Introduction This chapter describes the requirement and the purpose of the Urban Water Management Planning Act, plan adoption, schedule, and management tools.	§10620 (d, f) §10621(a -b) §10635(b) §10642 §10643 §10644 (a) §10645
Chapter 2	Service Area Information This chapter describes the district service area and includes area information, population estimate, and climate description.	§10631 (a)
Chapter 3	Water Sources This section includes a detailed discussion of the water supply sources including a section on the water quality.	§10620 (d)(1)(2) §10631 §10633 §10634
Chapter 4	Water Shortage Contingency Plan This chapter describes the District's planning during water shortages during drought and emergency situations.	§10631 (d) §10632
Chapter 5	Water Use Provisions This chapter describes the water supply projection methodology used to estimate water demand and supply requirements to 2030 in five-year increments.	§10631

Table 1.5-1: Plan Organization		
Section	**Executive Summary**	**Act Provision**
Chapter 6	Supply And Demand Comparison This discussed the water supply outlook for the district under different hydrologic conditions in accordance with DWR guidelines. Specifically, supply and demand comparisons in five-year increments to 2030 under normal, dry-year, and multiple dry-year conditions are presented in this section.	§10635 (a)
Chapter 7	Water Demand Management Demand management measures used to benchmark conservation methods are described in this chapter.	§10631
References	References The sources of the information used in this plan are listed in this section.	-
Appendix A	Resolution To Adopt The Urban Water Management Plan This section includes the following: 1) Resolution 2) Letters to and comments from various agencies 3) Minutes from the public hearing 4) DWR Checklist	§10621 (b) §10642 §10644 (a)
Appendix B	Service Area Map This appendix includes the service area map of the district as filed with the Public Utilities Commission.	-
Appendix C	Water Supply, Demand, And Projection Worksheets This section includes the spreadsheet used to estimate the water demand for the district.	-
Appendix D	California's Groundwater Bulletin 118 Sections from the Department of Water Resources Bulletin 118 are included as a reference and details of the basin for the district.	§10631 (b)(1-4)
Appendix E	Tariff Rule 14.1 Water Conservation And Rationing Plan This section contains the tariff rule for reference.	-
Appendix F	Water Efficient Landscape Guidelines and Joint Water Conservation Recommendations For Regulated Water Companies This appendix contains two items. The first item is the Guideline for Water Efficient Landscape that California Water Service Company uses at its properties, including renovations. The second item are Water Conservation Recommendations supported by Cal Water and other Regulated Water Companies.	-
Appendix G	CUWCC Annual Reports This sections contains the reports filed with the California Urban Water Conservation Council.	§10631 (j)
Appendix H	BMP Economic Analysis Assumptions Worksheets for each BMP are presented in this section.	-
Appendix I	Butte County Groundwater Management Plan This section contains the Management Plan	§10631 (b)(1-4)

1.6 Implementation of Previous UWMP

California Water Service Company has 25 separate water service districts and maintains separate plans for each district. The plans have been divided into 3 groups, with each group being updated on a 3-year cycle, as approved by the Public Utilities Commission. The last Urban Water Management Plan for the District was published in 2004 as part of the general rate case. The BMP programs outlined in that plan and the status of each program as of last year is discussed in Section 7.6

2 Service Area Information

2.1 General Information

The Chico-Hamilton City District is located in both Butte and Glenn Counties; Chico in Butte and Hamilton City in Glenn County. The District is situated in the Sacramento River hydrologic region, within the Northeast Valley sub-area. The District is approximately 80 miles north of the City of Sacramento. Figure 2.1-1 shows a general location map of the district.

The service area is built upon the alluvium of the Sacramento River flood plain, near the confluence of Big Chico Creek and the Sacramento River. The area's climate is mild, with an average temperature of 61.0° F and an average rainfall of 25.8 inches.

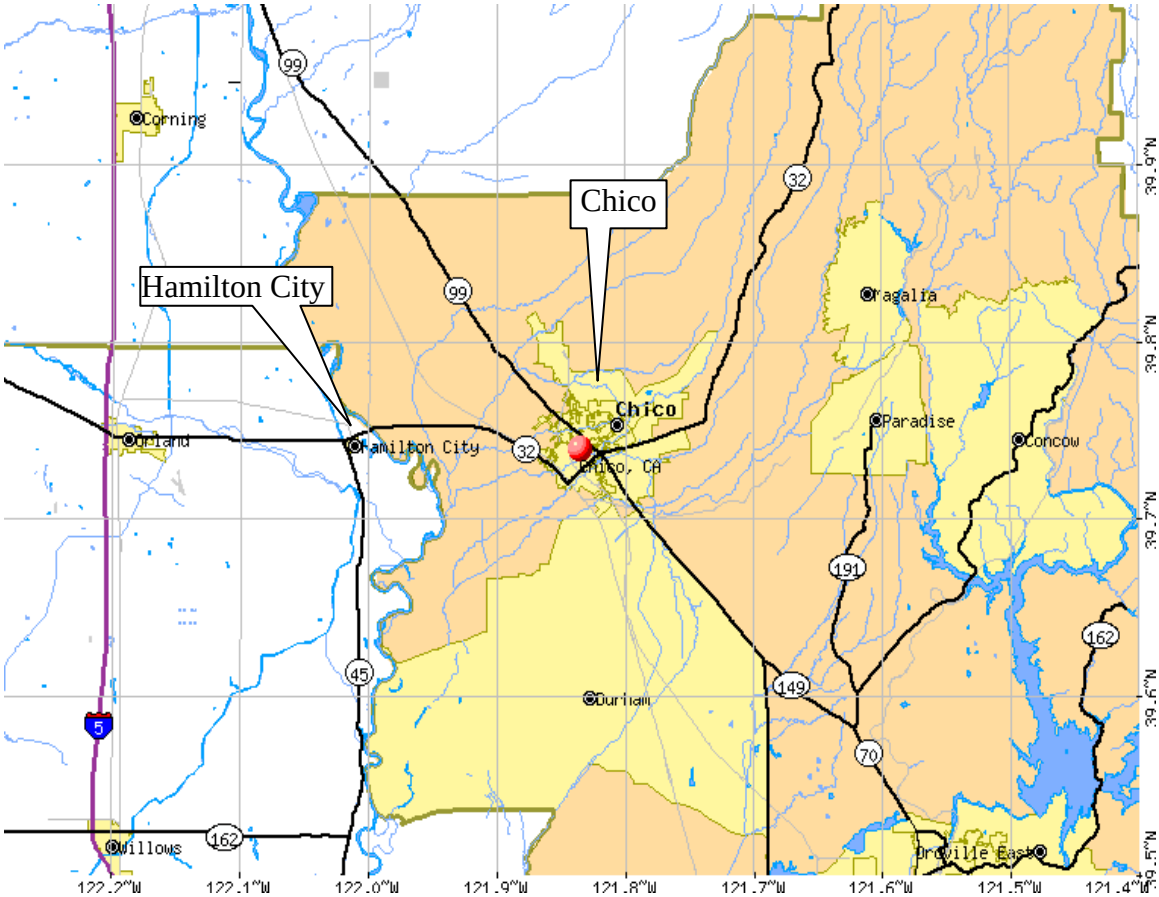
The system serves the City of Chico, Hamilton City, and unincorporated Butte County. Unincorporated properties of Butte and Glenn counties surround the district. The Hamilton City system is a small isolated system located approximately ten miles to the west of the City of Chico. There is no hydraulic connection between the two systems. For the purposes of this urban water management plan, the data for these two systems has been combined. The service area boundary is shown in Figure 2.1-2.

Major transportation links in the district include the Golden State Highway (State Route 99) and State Route 32. The Southern Pacific Railroad provides rail service to the region; it runs through Chico parallel to State Route 99. The Chico Municipal Airport is located to the north of the City.

Geologically, the area is primarily part of the flood plain for the Sacramento River. A concealed fault system known as the Chico Monocline is located to the east of town as shown in Figure 2.1-3. While this fault is inactive and shows only minor signs of offset, it appears to be a major tectonic boundary. Lassen Peak, a dormant volcano that last erupted in 1914, is located approximately 50 miles to the northeast.

As they flow through the center of Chico, the Big Chico and Little Chico Creeks provide drainage basin outlets for the northwestern Sierra Nevada Mountains. The Sacramento River channel lies between Chico and Hamilton City, located about one mile east of Hamilton City.

Figure 2.1-1: General Location of Chico-Hamilton City District – Butte/Glenn Counties



Source: http://www.city-data.com/city/Chico-California.html

Figure 2.1-2: General Service Area

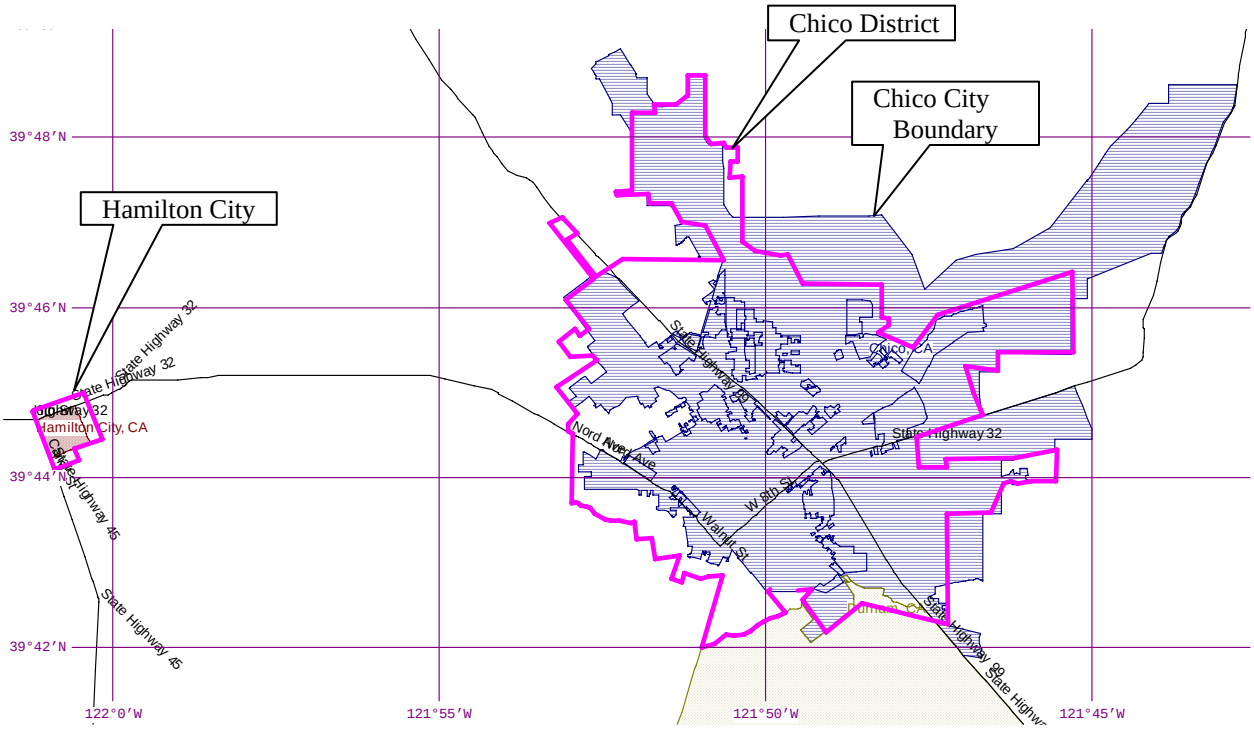
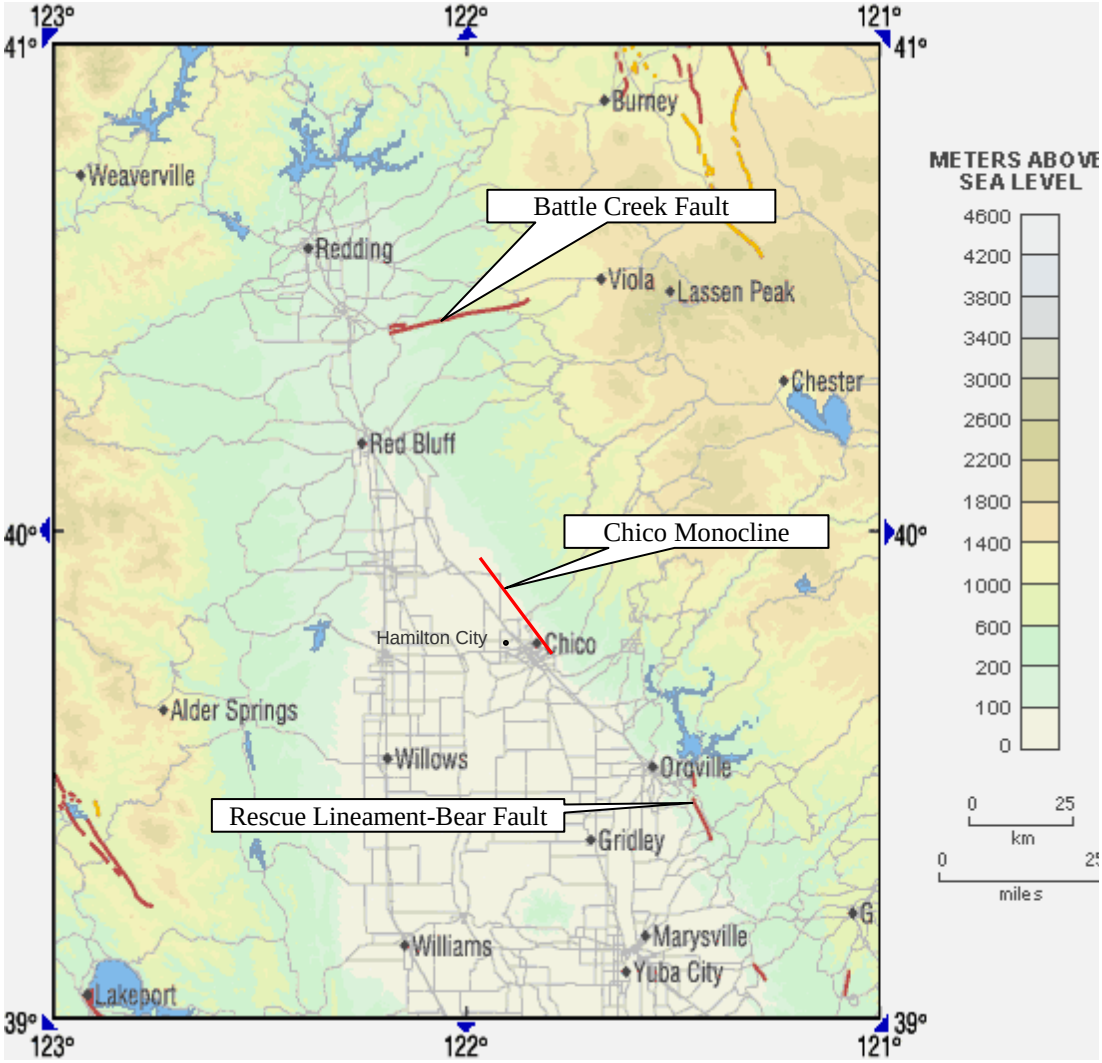


Figure 2.1-3: Major Fault Lines near the Chico-Hamilton City District



Source: USGS

2.2 Service Area Population

Cal Water's Chico District is growing at a rate of 2.49% based on growth in total services over the past five years. Based on available space and past experiences a similar rate of growth is expected to continue into the future. The ten year average growth rate is 2.32% and the 25 year growth rate is 2.65%

The Chico and Hamilton City systems are surrounded by and include large undeveloped parcels. Many of these have been used for agricultural functions, but as urban development encroaches, the use of this land for agriculture diminishes. City of Chico has established a Green Line prohibiting development to the west, protecting fertile agricultural lands.

The average annual services for calendar year 2006 was 26,288. In 2006, 50 percent of the single-family residential services were unmetered, flat rate services. All new construction services are required to be metered and each year some previously flat rate, unmetered services convert to metered status. Once converted, the historically "Grandfathered" unmetered services cannot return, but must remain metered. When completed, Cal Water's recently instituted Flat Rate Conversion Program will eliminate all flat rate residential services. According to the current schedule, the Flat Rate to Meter Program will convert 1,176 meters per year until all residential services are metered.

In 2006, single-family residential services accounted for 84.4 percent of all services, multi-family residential were 1.6 percent and commercial 12.4 percent, with all other service connection classes comprising 1.6 percent.

Based on 2000 U.S. Census data, considering actual service connection growth and assuming that density has remained unchanged since the census was conducted, Cal Water estimates that as of December 2006, the district's population is approximately 96,890. A density of 3.12 persons per residential service (single family services plus multifamily units) was used for this estimate.

Estimate of the population serviced by Cal Water is based on overlaying the U.S. Census 2000 Block data with the service area map (SAM), as shown in Figure 2.2-1. A summary of the census data for the Year 2000 is shown in Table 2.2-1. LandView 5 and MARPLOT ® software were used to generate the data[1].

Cal Water estimates the service area's population could reach 171,570 by 2030. Table 2.2-2 lists the population growth in 5 year increments.

Table 2.2-1: Summary of Census 2000 Data			
	Census Blocks	Population	Housing Units
Chico Service Area	1,040	83,005	34,460
Hamilton City	35	2,066	589

Figure 2.2-1: Approximated SAM with US Census 2000 Tract Map

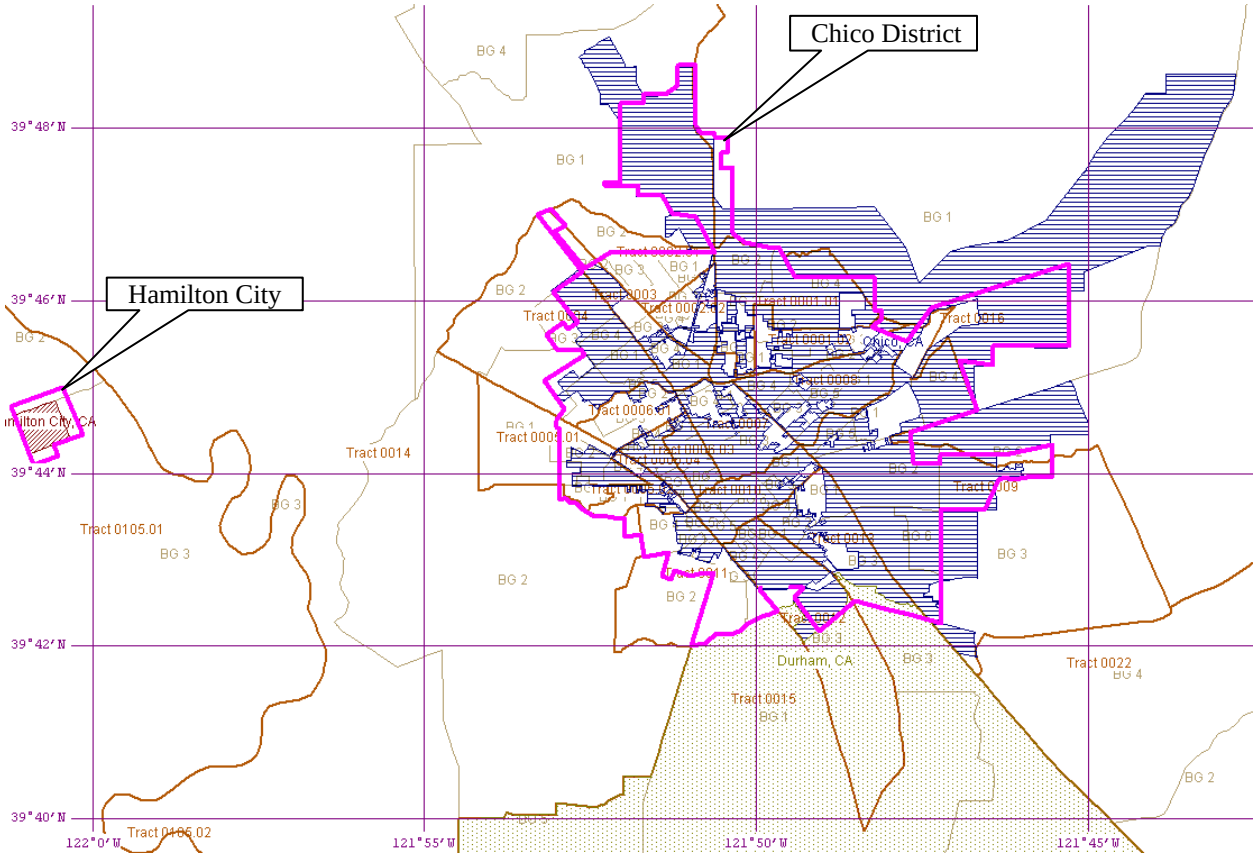
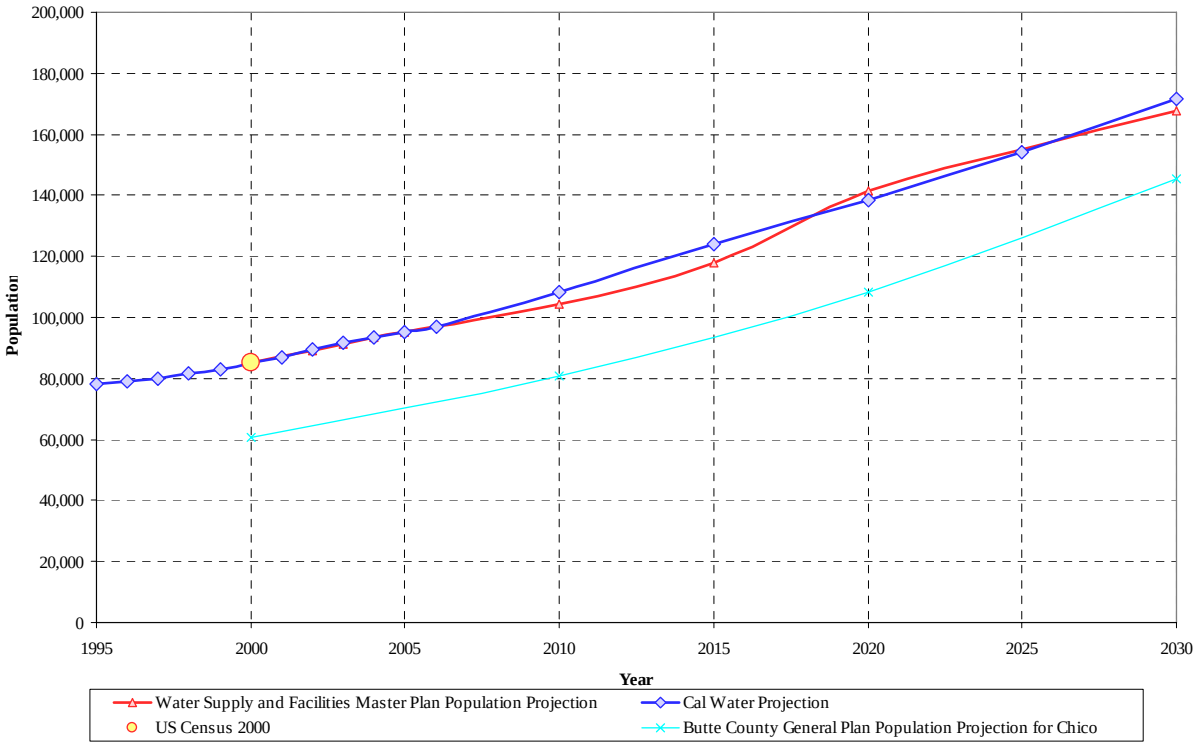


Table 2.2-2: Population - Current and Projected (Table 2)						
	2005	2010	2015	2020	2025	2030
Service Area Population	95,350	108,210	123,870	138,420	154,000	171,570

The population estimates for the district are compared to projections made by other governmental agencies, as shown in Figure 2.2-2. Cal Water's population projection is compared to the projections presented by Butte County and to those in Cal Water's Chico District Water Supply and Facilities Master Plan.

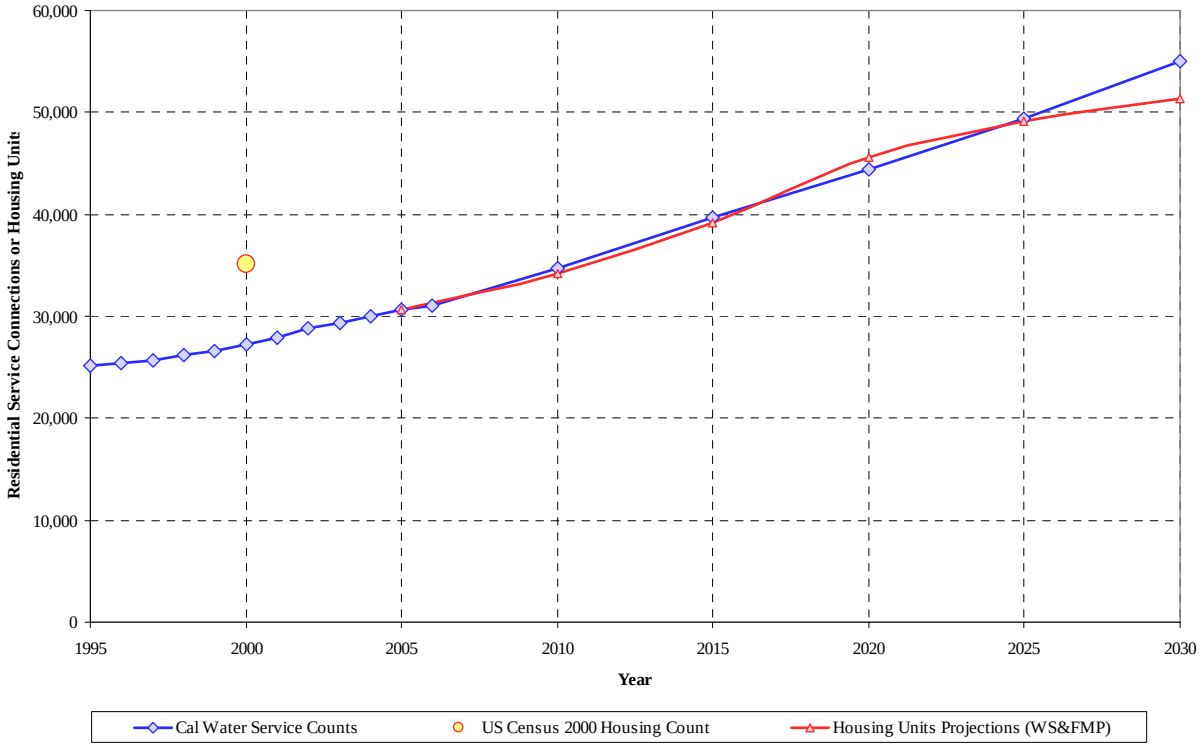
Figure 2.2-2: Estimated Population Comparison



From the graph above, we can see that the growth rate projected by California Water Service Company is very similar the projected rate of increase estimated by Butte County. However, Cal Water's estimate includes Hamilton City, which is located in Glenn County and not included in Butte County's population projection. Cal Water's service area also includes unincorporated parts of Butte County outside Chico's city limits. As a result Cal Water's total population figures are greater, but the rate of increase is similar.

Similarly, the housing count was estimated by comparing the US Census 2000 data and the service counts for the Chico District, Figure 2.2-3. The service count for the year 2000 is lower than the US Census 2000 housing units estimate. This is most likely the result of district service connections including one meter that serves several housing units, such as duplexes or apartments, whereas the US Census data totals all of the housing units (single and multifamily residences). The US Census 2000 housing unit figure was established by summarizing the individual census blocks enclosed within the service area of the district.

Figure 2.2-3: Estimated Housing Comparison



2.3 Climate

The climate for the Chico District is moderate with warm dry summers and cool winters. The majority of precipitation falls during late autumn, winter, and early spring.

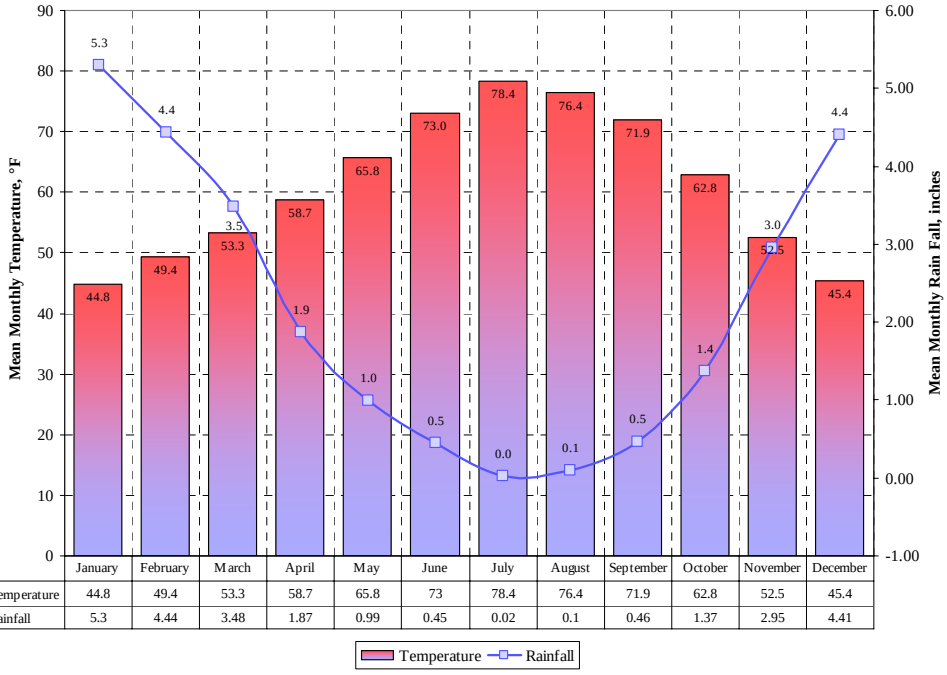
The following table, Table 2.3-1, lists the average annual conditions for the closest weather station to the Chico District. The average rainfall for the district is 48% of the annual total evapotranspiration value.

Table 2.3-1: Average Annual Climate (Table 3)

Average Temperature	Average Rainfall	Annual Total Evapo-transpiration
61.0°F	25.84 inches	53.37 inches

Figure 2.3-1 displays the average monthly temperature and rainfall[2].

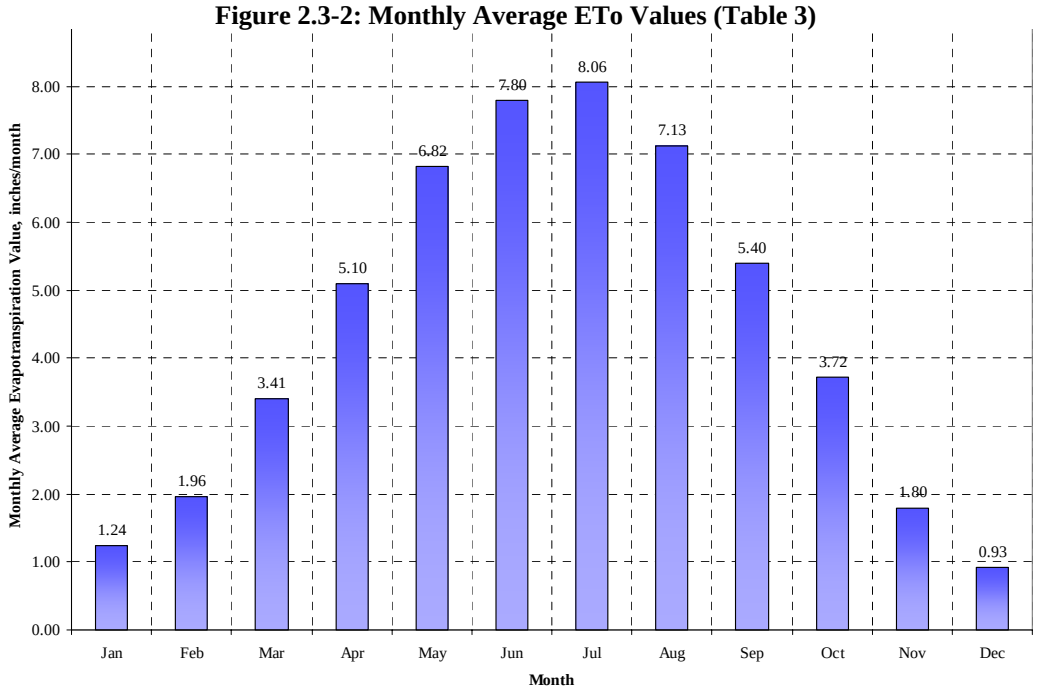
Figure 2.3-1: Average Monthly Temperature and Rainfall (Table 3)



	January	February	March	April	May	June	July	August	September	October	November	December
Temperature	44.8	49.4	53.3	58.7	65.8	73	78.4	76.4	71.9	62.8	52.5	45.4
Rainfall	5.3	4.44	3.48	1.87	0.99	0.45	0.02	0.1	0.46	1.37	2.95	4.41

Figure 2.3-2 displays the monthly average evapotranspiration values for the area of the district[3]. Evapotranspiration values estimate the amount of water loss by the combination of two separate processes: evaporation from soil surface and transpiration by plants.

Figure 2.3-2: Monthly Average ETo Values (Table 3)



Additional climate data is provided in the Appendix C, worksheet 18.

3 Water Sources

3.1 Introduction

The sole source of water supply for the customers of the Chico District is groundwater. The projected water supply sources and volumes based on average consumption are summarized in Table 3.1-1.

Table 3.1-1: Current and Planned Water Supplies (Table 4) (AFY)

Water Supply Sources	2005	2010	2015	2020	2025	2030
Cal Water Groundwater Wells	29,897	34,909	39,242	43,875	49,059	54,938
Transfers in or out	-	-	-	-	-	-
Exchanges In or out	-	-	-	-	-	-
Recycled Water (projected use)	-	-	-	-	-	-
Desalination	-	-	-	-	-	-
Total	29,897	34,909	39,242	43,875	49,059	54,938

3.2 Purchased Water

Cal Water does not purchase imported water to meet supply requirements in its Chico District. However, Butte County has entitlement to approximately 27,000 AFY of State Water Project (SWP) water. Historically, Butte County has not made full use of the majority of this entitlement. The Butte County Department of Water and Resource Conservation is currently developing a feasibility study to determine the most appropriate way to make full use of this entitlement. At this time it is not clear whether SWP water will be available for purchase by Cal Water, used for groundwater recharge, or sold to outside interests.

3.3 Surface Water

The Chico District does not impound or divert surface water as a means to meet supply requirements.

3.4 Groundwater

The groundwater used by the Chico - Hamilton City District is extracted from the aquifers of the Sacramento River Valley that underlie the district. The district has 69 wells in total located throughout the district's service area; 66 in Chico (including one leased well) and three in Hamilton City.

Current design capacity for the operational wells (including standby wells) is 63,305 GPM, equivalent to 91.2 MGD. The design production capacity represents 188 percent of the ten-year average maximum day demand and 363 percent of the ten-year average, average day. Currently there are eight surface storage structures, enabling the groundwater wells to pump to storage during non-peak demand periods. The measured

average day demand and maximum day demand in 2006 were 26.7 MGD and 51.3 MGD, respectively. The district has sufficient groundwater production capacity to supply all of the current annual average day and maximum day demand.

Average static groundwater elevations in the Chico District have remained relatively constant over the past thirty-seven years. Over the fifty-seven years that water levels in Company wells have been recorded, the level has declined about forty feet. Short periods of groundwater elevation decline and recovery have occurred during this period. The most recent extended multi-year drought that reduced the availability of replenishment water, coupled with the high growth rate, caused a 20-foot decline in static groundwater elevation. Drought recovery began to become apparent in 1995, with a ten-foot increase in the average static groundwater elevation, as shown in Figure 3.4-1.

Figure 3.4-1: Chico District Well Level Average (Static)

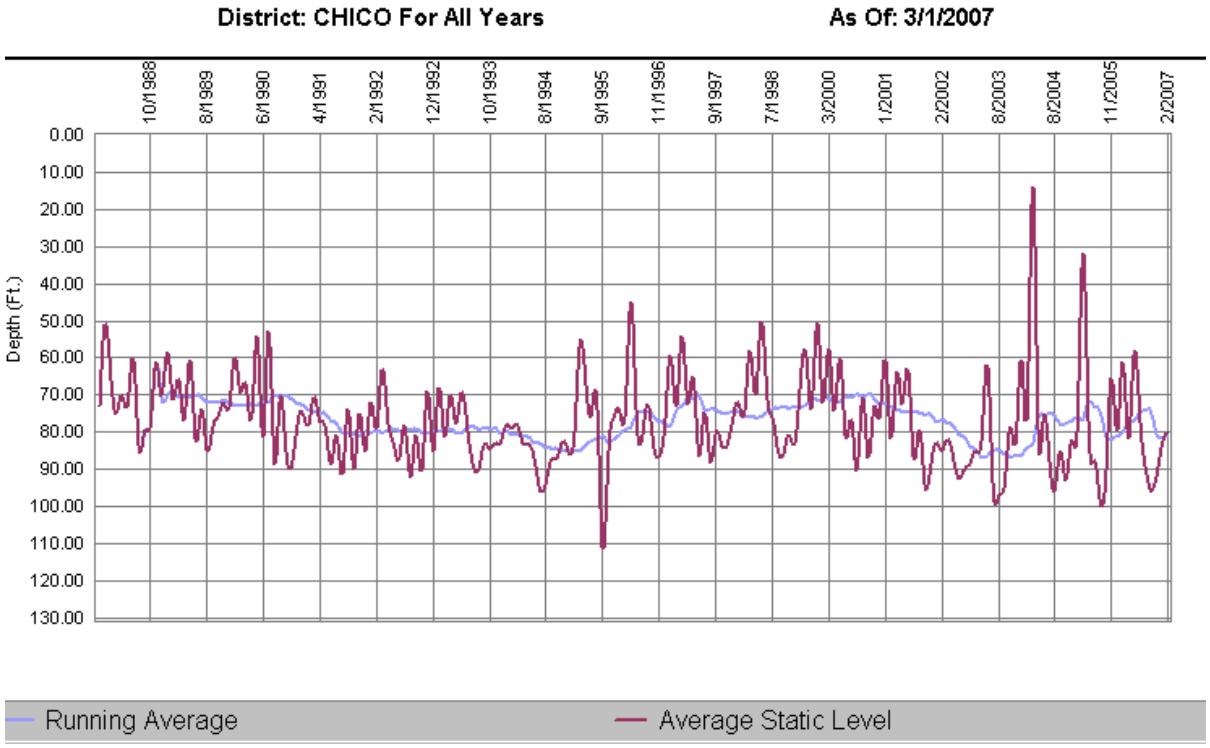
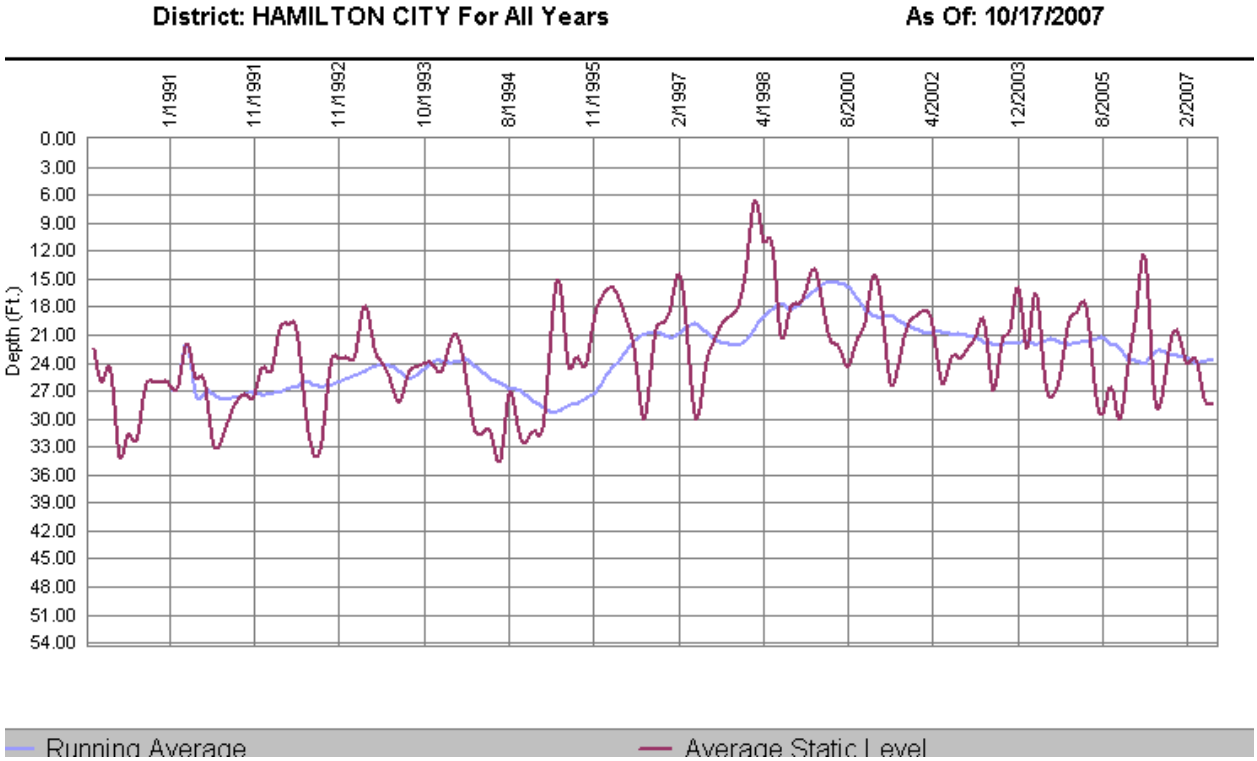


Figure 3.4-2 displays the groundwater level for Hamilton City District from 1990 to 2007. Water level had remained constant during the draught condition from 1987 to 1992 with a sharp increase during recovery period after the draught ended. Since this period, water levels have remained relatively constant.

Figure 3.4-2: Hamilton City District Well Level Average (Static)



The Butte Basin Water Users Association (BBWUA) has prepared a groundwater model of the basin and is developing a plan to manage the quantity of water stored in the groundwater aquifers. This regional management will help perpetuate the availability of this resource. However, with increasing demand will come greater production and reliance on groundwater resources. In January 1997, Hydrologic Consultants Inc. (HCI) completed a run of the model to consider the impacts of projected growth in the City of Chico on groundwater availability. HCI's conclusions from this model were that, "Groundwater resources within Butte Basin are entirely sufficient to support the growth in water consumption expected in the Chico Urban Area (Chico) to the year 2012. Chico will experience a decline in groundwater levels of approximately 8 feet by the year 2012. Corresponding to this decline, there will be a reduction of approximately 10,450 AF of groundwater stored in the aquifer beneath Chico. The average saturated thickness of the aquifer beneath Chico is approximately 1,200 feet."[4] Currently, Butte County has taken the lead role in regional management; as well as, maintaining the groundwater model.

3.4.1 Basin Boundaries and Hydrology

The following description and additional details of the basin are given in the DWR's Groundwater Bulletin 118, see Appendix D[5]:

Table 3.4-1: Characteristics of Groundwater Sub-basins Underlying the Chico-Hamilton City District

Groundwater Basin Name	Sub-basin Name	Portion of Chico-Hamilton City District Served	DWR Basin
Sacramento Valley	Vina	City of Chico	5-21.57
	West Butte	City of Chico	5-21.58
	East Butte	City of Chico	5-21.59
	Corning	Hamilton City	5-21.51

Source: DWR Bulletin 118, Groundwater Basin Descriptions, updated February 27, 2004.

The Vina Subbasin is bounded on the west by the Sacramento River, on the north by Deer Creek, on the east by the Chico Monocline and on the south by Big Chico Creek. Deer Creek and Big Chico Creek serve as hydrologic boundaries in the near surface.

The West Butte Subbasin is bounded on the west and south by the Sacramento River, on the north by Big Chico Creek, on the northeast by the Chico Monocline, and on the east by Butte Creek. The subbasin is hydrologically contiguous with the Vina and East Butte subbasins at depth. The Chico Monocline forms a geographic boundary; however, a component of recharge to the subbasin appears east of the fault structure. Groundwater flow is southwesterly toward the Sacramento River north to the city of Princeton. South of Princeton groundwater flows away from the Sacramento River to recharge the groundwater system.

The East Butte Subbasin is bounded on the west and northwest by Butte Creek, on the northeast by the Cascade Ranges, on the southeast by the Feather River and the south by the Sutter Buttes. The northeast boundary along the Cascade Ranges is primarily a geographic boundary with some groundwater recharge occurring beyond that boundary.

Hamilton City is located within the Corning Subbasin which comprises the portion of the Sacramento Valley Groundwater Basin bounded on the west by the Coast Ranges, on the north by Thomes Creek, on the east by the Sacramento River, and on the south by Stony Creek.

3.4.2 Groundwater Management Plan

The groundwater basin that Cal Water pumps from is an un-adjudicated basin. In Glenn County, where Hamilton City is located, there has been ongoing discussion as to how to actively manage the groundwater basin. However, conflicts between surface water and groundwater interests have prevented a legislated adjudication of the basin. Instead, the Glenn County Water Advisory Committee was formed and the Basin Management

Objective (BMO) concept was instituted as local ordinance. The BMO became the groundwater management plan for the County.

The Butte County Department of Water and Resource Conservation has developed a groundwater management plan[6]. Again, no safe yield has been established but policy decisions were made in an attempt to maintain groundwater levels and water quality. A copy of the management plan is attached in Appendix I.

3.5 Recycled Water

The recycling of wastewater offers several potential benefits to Cal Water and its customers. Perhaps the greatest of these benefits is to help maintain a sustainable groundwater supply either through direct recharge, or by reducing potable supply needs by utilizing recycled water for appropriate uses (e.g., landscape, irrigation) now being served by potable water. Currently, no wastewater is recycled for direct reuse in the Chico District. The potential amount of recycled water that can be produced is proportional to the amount of wastewater that is generated by District, and is discussed in the following sections.

3.5.1 Wastewater Collection

The Chico Water Pollution Control Plant is owned by the City of Chico and provides the wastewater treatment for Cal Water's Chico service area. The wastewater at the treatment plant undergoes secondary treatment followed by chlorination and dechlorination prior to disposal into the Sacramento River. Oxidation ponds are also available for backup. The Chico treatment plant has a capacity to treat 9 MGD but currently receives 6.4 MGD from Cal Water's Chico service area. Treated wastewater from the Chico Wastewater Treatment Plant is not recycled at this point.

Hamilton City Community Services District provides treatment for Cal Water's Hamilton City's service area. The facility is location a quarter of a mile from the city. The system is operating at approximately one-half of its design capacity. This facility can serve an additional 2,500 residences before expansion will be necessary.[7] The facility has a 0.5 MGD capacity with an influent rate of 0.222 to 0.230 MGD during summer and approximation facility capacity during winter months. Hamilton City has approximately 8.5 mile on collection mains. The wastewater at the treatment plant undergoes a primary treatment before being discharged to settling ponds, where the liquid is allowed to infiltrate and or evaporate.

3.5.2 Estimated Wastewater Generated

Estimates for the district wastewater quantity since 1980 are shown in Figure 3.5-1 and were calculated by annualizing 90 percent of January water use in Cal Water's service area. The future quantity of waste generation is based on a linear equation of the historical estimates. The estimated volume of wastewater generated for the district in five-year increments to the year 2030 is presented in Table 3.5-1

Figure 3.5-1: Estimated District Annual Wastewater Generated

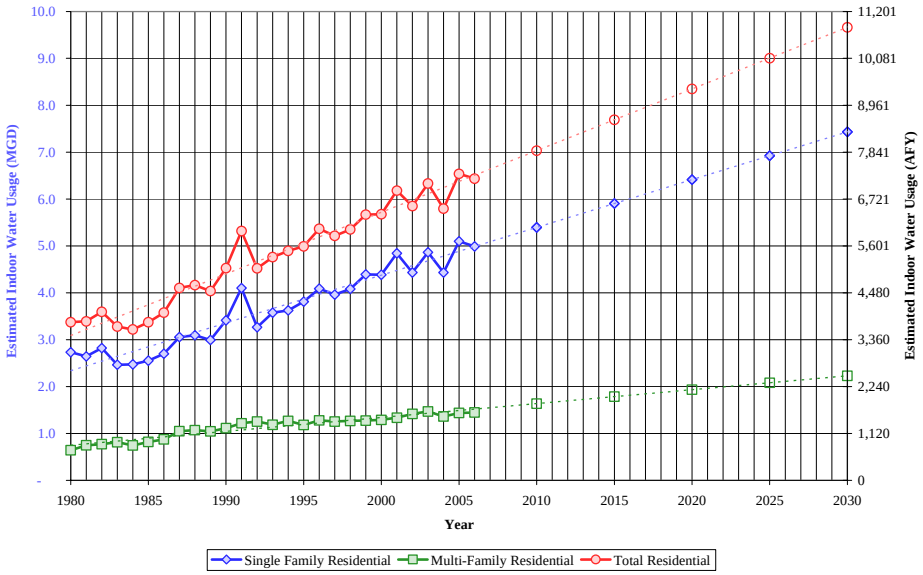


Table 3.5-1: Disposal of wastewater (non-recycled) AF Year (Table 34)							
Method of disposal	**Treatment Level**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Discharged to Sacramento River	Secondary	7,322	7,877	8,614	9,350	10,086	10,823
	Total	7,322	7,877	8,614	9,350	10,086	10,823

3.5.3 Potential Water Recycling

It is not anticipated that any customers will be serviced with reclaimed water from the Chico Water Pollution Control Plant in the near future. The treatment plant would require an upgrade to include filtration as one of the treatment processes in order to provide suitable quality for unrestricted reuse. Although there are 8,600 acres of farmland near the treatment plant, the nearest potential customer is more than a mile away. Serving this and other potential customers would entail large costs for construction of transmission lines. Using recycled water for any other purpose (e.g., commercial/residential irrigation and toilet flushing) is not considered economically viable during the next 20 years because the City of Chico is five miles east of the treatment plant. The cost of production, transmission, and distribution of recycled water could not be justified based on current and anticipated costs of water and of wastewater disposal. Therefore, the projected recycled water supply for Cal Water's Chico service area through the year 2020 is 0 acre-feet per year. Cal Water has not implemented any incentive programs to encourage recycled water use because they do not own and operate the wastewater system.

3.6 Desalinated Water

There are no opportunities for the development of desalinated water in the District.

3.7 Transfer or Exchange Opportunities

Cal Water is not currently pursuing transfer or exchange opportunities in its Chico District.

3.8 Water Supply Reliability

A chart comparing annual rainfall since 1980 to the average annual rainfall (25.8 inches) is shown in Figure 3.8-1. The most recent driest year occurred in 1999 when the rainfall was 49.7% below average (13.9 inches). This is taken as the Single Dry Year shown in Table 3.8-1. The three Multiple Dry-Water Years used are based on the most recent and consecutive lowest annual rainfall totals which occurred in 2002, 2003, and 2004.

Figure 3.8-1: Comparison of Annual Rainfall to Historical Average

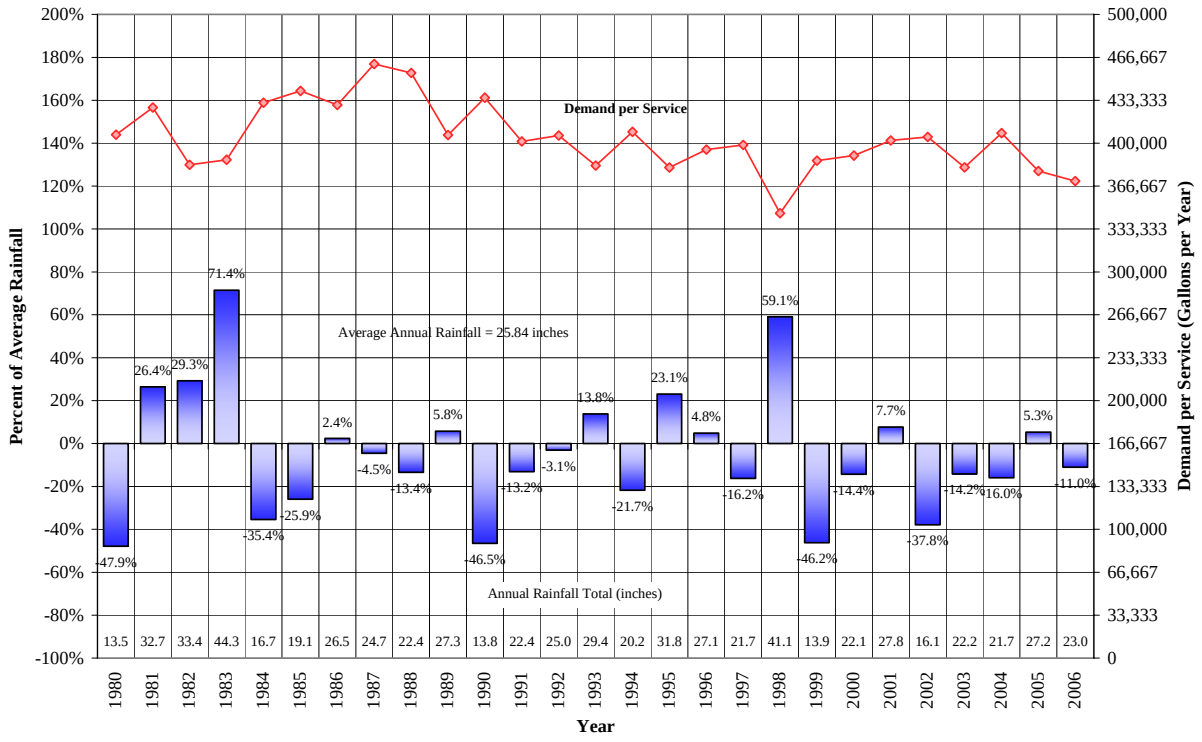


Table 3.8-1: Basis of Water Year Data (Table 9)	
Water Year Type	**Base Year (s)**
Average Water Year	1997
Single-Dry Water Year	1999
Multiple-Dry Water Years	2002, 2003, 2004

The Chico District is located in an unadjudicated groundwater basin. Since no safe yield has been established Cal Water works under the assumption that an adequate supply will be available to its customers. According to well level records, the groundwater level has been consistent over time. The theoretical supply for the Chico District is the total design capacity of all the active wells, which is 99,200 AFY. A ten percent safety factor was applied to account for the possibility of wells being taken out of service. The current design capacity of all the active wells is three times the annual demand. The supply reliability is shown in Table 3.8-2.

Table 3.8-2: Supply Reliability - AF Year (Table 8)

Average / Normal Water Year (2006)	Single Dry Water Year (2007)	Multiple Dry Water Years		
		Year 1 (2008)	Year 2 (2009)	Year 3 (2010)
89,280	89,280	89,280	89,280	89,280
% of Normal	100%	100%	100%	100%

Cal Water is not a regional water wholesaler and does not store water seasonally in reservoirs. Therefore total runoff figures can not be used to determine supply reliability. Total supply amounts have been used instead.

Although the historical climatic record shows that the demand can be met by the supply, other factors which may threaten the reliability of supply are listed in Table 3.8-3.

Table 3.8-3: Factors Resulting In Inconsistency of Supply (Table 10)

Name of supply	Legal	Environmental	Water Quality	Climatic
Groundwater			✓	✓

Cal Water has and will meet all state and federal water quality regulations. Chemicals of concern in the Chico District include Arsenic and the volatile organic compounds tetrachloroethylene (PCE) and trichloroethylene (TCE). For Hamilton City, total petroleum hydrocarbons (TPH), methyl tertiary-butyl ether (MTBE), and Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) are a concern. None of these chemicals are expected to cause significant problems with the quality of water delivered to Cal Water's customers. Wells testing above MCLs for any contaminant are either taken out of service or are treated with wellhead remediation technologies to ensure compliance with all water quality regulations. Furthermore, any areas that have been found to be contaminated are currently being regulated by either the California Department of Toxic Substances Control (DTSC) or State Water Resources Control Board (SWRCB). Cal Water will avoid these contaminated areas when sighting any future groundwater wells.

As noted earlier, short-term drought events should not pose a serious threat to the reliability of supply in the Chico District. An extended drought could reduce the groundwater table significantly enough to limit groundwater supplies.

3.8.1 Water Quality

The drinking water delivered to customers in the Chico-Hamilton City District meets or surpasses all federal and state regulations. The U.S. Environmental Protection Agency as authorized by the Federal Safe Drinking Water Act of 1974 sets drinking water standards. A state can either adopt the USEPA standard or set state standards that are more stringent than those set by the federal government.

There are two general types of drinking water standards, Primary and Secondary. Primary Standards are designed to protect public health by establishing Maximum Contamination Levels (MCL) for substances in water that may be harmful to humans. MCLs are established very conservatively for each contaminant and are generally based on health effects which may occur if a person were to drink three liters of the water per day for 70 years. Secondary Standards are based on the aesthetic qualities of the water such as taste, odor, color, and certain mineral content. These standards, established by the State of California, specify limits for substances that may affect consumer acceptance of the water.

The quality of the groundwater produced by the district's active wells can vary depending on location. Water produced from several wells has been tested to contain concentrations that exceed the MCL for Trichloroethylene (TCE) and Tetrachloroethylene (PCE). However, in all cases, these wells were either taken out of service or treatment facilities were installed to remove the contaminant.

The presence of these volatile organic chemical contaminants in district wells raises a concern regarding the future availability of other wells not currently impacted. Contaminant migration of these solvents with groundwater movement could force the closure or treatment of other wells.

3.9 Water Supply Projects

Future water supply projects are summarized in Table 3.9-1.

Table 3.9-1: Future Water Supply Projects (Table 17)

Project Name	Projected Start Date	Projected Completion Date
Water Supply and Facilities Master Plan	2006	2007
Well 76	2006	2007
Well 79	2007	2008
Well 80	2008	2009

4 Water Shortage Contingency Plan

4.1 Worst Case Water Supply Availability

This section describes measures the company may take in times of supply shortages. During periods of water shortages, the company's conservation programs can be expanded and may include more restrictive measures such as mandatory reductions, rationing, and penalties.

4.2 Stages of Action

California Water Service Company has developed a four-stage rationing plan. The plan includes voluntary and mandatory stages. Approval from the CPUC must be obtained prior to implementation of mandatory restrictions.

Table 4.2-1: Consumption Reduction Methods (Table 27)

Shortage	Stage	Demand Reduction Goal	Type Of Program
Minimum 5 - 10%	Stage 1	10% reduction	Voluntary
Moderate 10 - 20%	Stage 2	20% reduction	Voluntary or Mandatory*
Severe 20 - 35%	Stage 3	35% reduction	Mandatory*
Critical 35 - 50%	Stage 4	50% reduction	Mandatory*

* Mandatory = Allocations

4.2.1 Actions to Be Undertaken By California Water Service Company

The following outline lists the actions to be taken during periods when a reduction in consumption is required:

Stage 1

- California Water Service Company maintains an ongoing public information campaign consisting of distribution of literature, speaking engagements, monthly bill inserts, and conservation messages printed in local newspapers.
- Educational programs in area schools are also ongoing.

Stage 2

- California Water Service Company will aggressively continue its public information and education programs.
- Ask consumers for 10 to 20 percent voluntary or mandatory water use reductions.
- Prior to implementation of mandatory reductions, obtain approval from CPUC.
- Lobby for passage of drought ordinances by appropriate governmental agencies.

Stage 3

- Implement mandatory reductions after receiving approval from CPUC.
- Maintain rigorous public information campaign explaining water shortage conditions.
- Water use restrictions go into effect; prohibited uses can include watering resulting in gutter flooding, using a hose without shutoff device, filling of pools or fountains, etc.
- Limiting landscape irrigation by restricting the hours of the day and or days of the week during which water for irrigation can be used.
- Monitor production weekly for compliance with necessary reductions.
- Installation of a flow restrictor on the service line of customers who consistently violate water use restrictions.

Stage 4

- All of steps taken in prior stages intensified.
- Discontinuance of water service for customers consistently violating water use restrictions.
- Monitor production daily for compliance with necessary reductions.
- More restrictive conditions for, or a prohibition, of landscape irrigation

4.2.2 Mandatory Prohibitions

Due to Cal Water's investor-owned status, it is not authorized to pass any ordinances. Should conditions warrant mandatory reductions, Cal Water will request authority to add Tariff Rule 14.1, Mandatory Water Conservation Plan (see Appendix E), to existing tariffs for a district. Included in Rule 14.1 is Section A. Conservation - Nonessential or Unauthorized Water Use which prohibits use of water for filling or refilling of swimming pools, use of water which results in flooding or runoff in gutters, etc.

4.2.3 Consumption Limits

California Water Service Company maintains extensive water use records on individual metered customer accounts. These records are reviewed in the districts on a daily basis to identify potential water loss problems.

In order to protect itself against serious and unnecessary waste or misuse of water, Cal Water may meter any flat rate service and apply the regularly established meter rates where the customer continues to misuse or waste water beyond five days after Cal Water has given the customer written notice to remedy such practices.

4.2.4 Monitoring Procedure during Periods of Water Shortages

During all stages of water shortages, daily production figures are reported to and monitored by the district manager on a daily basis. Consumption will be monitored through these daily production figures in the district for compliance with necessary reductions.

4.2.5 Penalties or Charges for Excessive Use

Cal Water, after one written warning, shall install a flow-restricting device on the service line of any customer observed by Cal Water personnel to be using water for any non-essential or unauthorized use defined in Section A. of Tariff Rule 14.1 (see Appendix E). Repeated violations of unauthorized water use will result in discontinuance of water service.

4.2.6 Analysis of Revenue and Expenditure Impacts

California Water Service Company is an investor-owned water utility and, as such, is regulated by the CPUC. On March 8, 1989, the Commission instituted an investigation to determine what actions should be taken to mitigate the effects of water shortages on the State's regulated utilities and their customers. In decision D. 90-07-067, effective July 18, 1990, the Commission authorized all utilities to establish memorandum accounts to track expenses and revenue shortfalls caused both by mandatory rationing and by voluntary conservation efforts. Subsequently, D. 90-08-55 required each class A utility (more than 10,000 connections) seeking to recover revenues from a drought memorandum account to submit; for Commission approval, a water management program that addresses long-term strategies for reducing water consumption. Utilities with approved water management programs were authorized to implement a surcharge to recover revenue shortfalls recorded in their drought memorandum accounts.

However, the Commission's Decision 94-02-043 dated February 16, 1994, states:

> *10. Now that the drought is over, there is no need to track losses in sales due to residual conservation.*
> *11. The procedures governing voluntary conservation memorandum accounts (see D.92-09-084) developed in this Drought Investigation will no longer be available to water companies as of the date of this order.*
> *12. Procedures and remedies developed in the Drought Investigation that are not specifically authorized for use in the event of future drought in these Ordering Paragraphs will no longer be available to water companies as of the date of this order except upon filing and approval of a formal application.*
> *(CPUC Decision 94-02-043, Findings of Fact, paragraphs 10-12)*

It was at this time that Cal Water significantly curtailed conservation activities in its districts. At the time that triggers for voluntary or mandatory reductions should occur in the future, Cal Water will determine if a filing to the CPUC is necessary to enforce the reductions and to begin tracking lost sales from the required reductions.

4.3 Implementing the Plan

Section 357 of the Water Code requires that suppliers that are subject to regulation by the CPUC shall secure its approval before imposing water consumption regulations and restrictions required by water shortage emergencies.

4.4 Supply Shortage Triggers

Although California Water Service Company's Chico District is not currently experiencing a supply shortage, Cal Water intends to manage its supply prudently. If a supply deficiency should occur, Cal Water will implement the appropriate "Stage of Action" unless the Public Utilities Commission adopts findings to implement a less restrictive stage.

Table 4.4-1: Water Supply Triggering Levels	
Stage	% Shortage
Stage 1	Up to 10% supply reduction
Stage 2	10 to 20% supply reduction
Stage 3	20 to 35% supply reduction
Stage 4	35 to 50% supply reduction

4.5 Three-Year Minimum Water Supply

Table 4.5-1 lists the minimum water supply for the next three years based on current capacity of the groundwater supply with additional capacity being added in the near future from new wells that are being planned.

Table 4.5-1: Three-Year Estimated Minimum Water Supply (Table 24) (AFY)				
Source	**Normal**	**Year 1**	**Year 2**	**Year 3**
Cal Water groundwater well	99,200	102,426	105,652	108,878
Total	99,200	102,426	105,652	108,878

4.6 Catastrophic Water Supply Interruption

Cal Water has an Emergency Response Plan in place that coordinates overall company response to a disaster in any or all of its districts. In addition, the Emergency Response Plan requires each district to have a local disaster plan that coordinates emergency responses with other agencies in the area. Cal Water can rely on it's own generator powered facilities during an emergency.

Cal Water also inspects its facilities annually for earthquake safety. To prevent loss of these facilities during an earthquake, auxiliary generators and improvements to the water storage facilities have been installed as part of our annual budgeting and improvement process.

5 Water Use Provisions

5.1 Distribution of Services

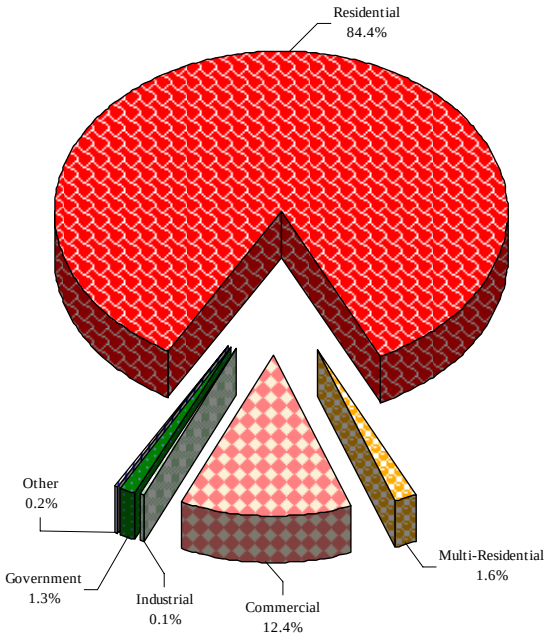
California Water Service Company classifies customer service connection categories as follows:

- Single Family Residential
- Multi Family Residential
- Commercial
- Industrial
- Government
- Other

The residential sector of CWS customers includes permanent single and multifamily residents and does not include service for seasonal customers.

Land use in the Chico District is dominated by residential and commercial activities, as seen in the service count of the District, Figure 5.1-1. Single-family residential services account for 84.4 percent of all services; multifamily residential services represent 1.6 percent, and commercial services 12.4 percent. Thus, 98.4 percent of all services are for residential and commercial facilities. The remaining 1.6 percent includes industrial, governmental uses, and other functions such as temporary construction meters.

Figure 5.1-1: Distribution of Services (2006)



5.2 Historical and Current Water Demand

Demand per service was established as a function of historical sales and service data. Projected demand is the mathematical product of total projected services and demand per service. Historical sales values are illustrated in Figure 5.2-1. Historical service counts are illustrated in Figure 5.2-2.

Figure 5.2-1: Historical Sales

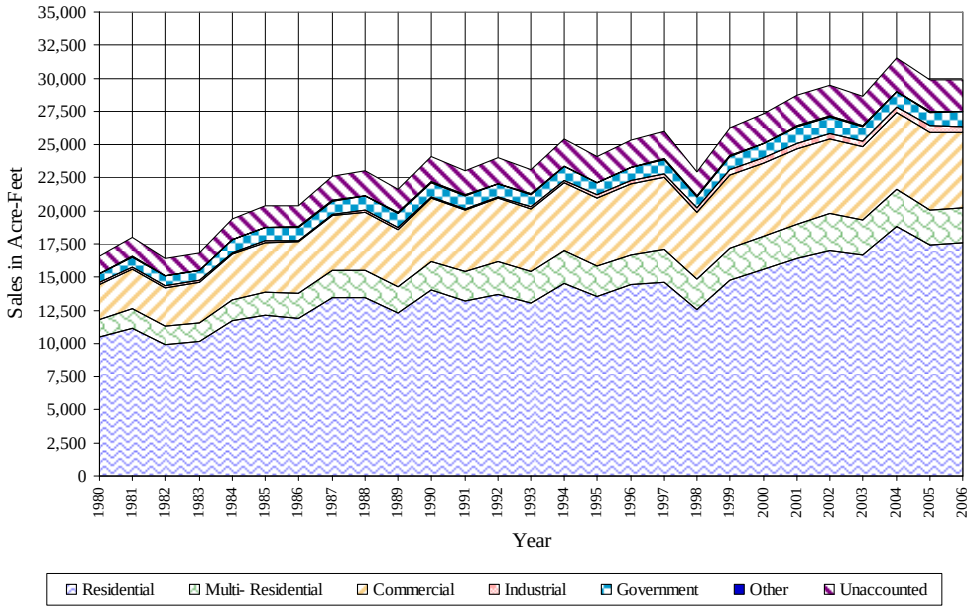
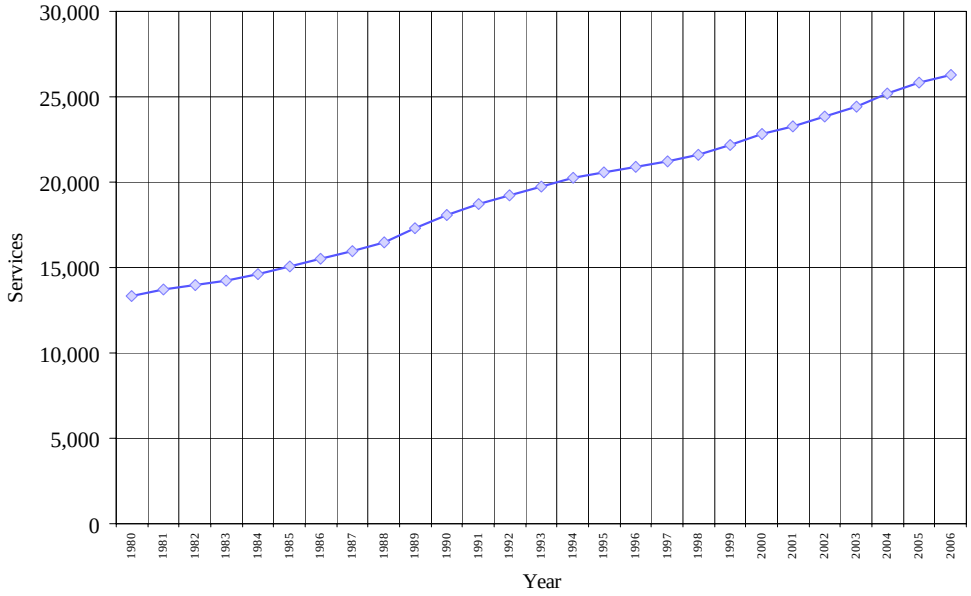
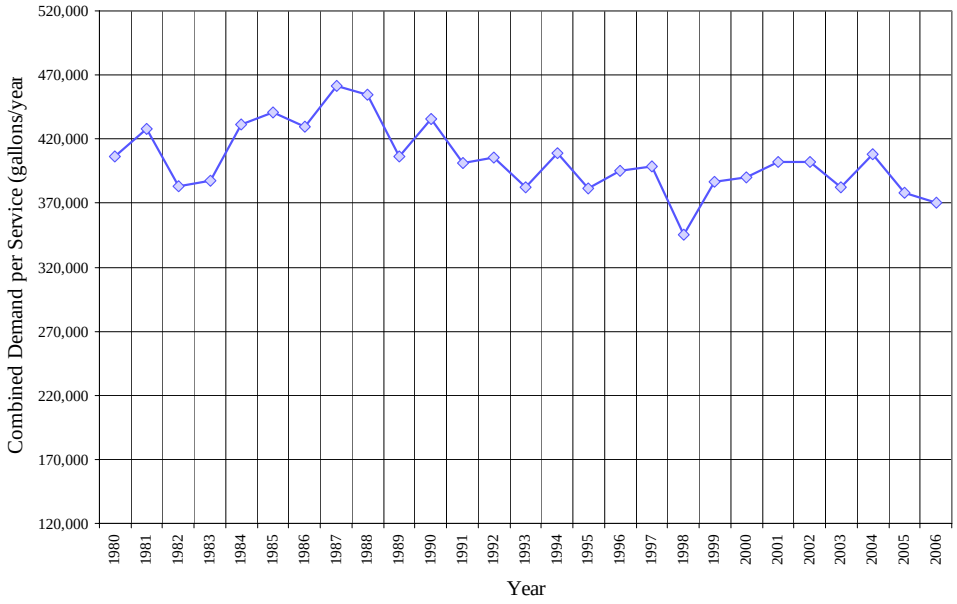


Figure 5.2-2: Historical Service Counts



The combined demand for all services has decreased slightly over time but generally fluctuates between 370,000 to 400,000 gallons per service per year, as shown in Figure 5.2-3.

Figure 5.2-3: Historical Demand per Service



Demand began declining in 1988 in response to the last drought. Since 1991 demand has remained relatively constant. A notable exception is 1998, where demand was reduced significantly. This coincided with an unusually high rainfall year. Curbing future demand will require the implementation of conservation activities. The Company's goal is a 10% reduction in demand (based on pre-drought levels). Implementation of Best Management Practices will assist in achieving this goal.

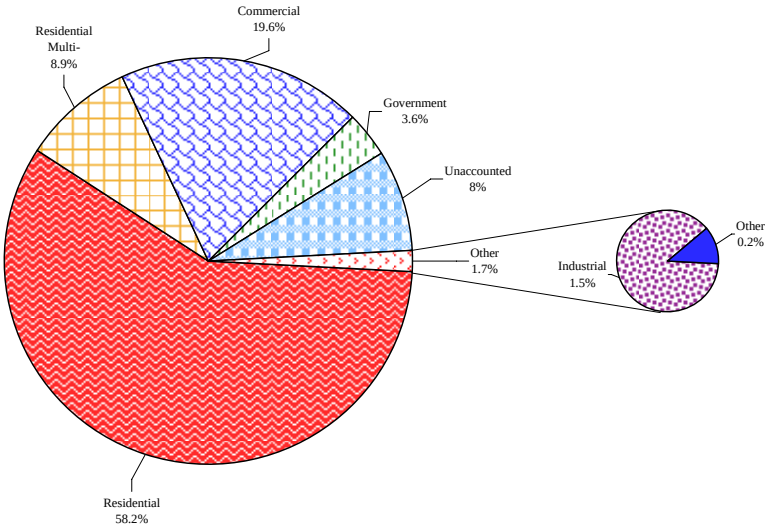
5.3 Per Capita Water Demand

Per-capita water use in the district is summarized in Table 5.3-1, and was based on the end of 2006 total demand. With a total demand of 9,737 million gallons and Chico District's estimated population of 96,890, water use in 2006 was 276 gallons per capita per day. In comparison, the statewide value is 190 gallons per capita per day.

Table 5.3-1: Per Capita Water Demand (2006)

All Users			Residential Only		
Usage (AFY)	Usage (MGY)	Gallons Per Capita Per Day	Usage (AFY)	Usage (MGY)	Gallons Per Capita Per Day
29,930	9,753	275.8	20,242	6,596	186.5

Figure 5.3-1: Percent of Total Demand by Type of Use (2006)



For the purpose of projecting total system demand, the projected number of services for each customer class was multiplied by the demand per service for that classification. This process was employed because of the significant difference between the demand per service associated with certain uses and the combined or average demand per service.

Single family residential water use represents the one of the smallest demand per service segments in the district with a 5 year average of 270,854 gallons per service per year, yet this category uses 58.2 percent of the total demand. The multifamily residential use was 8.9 percent of the total demand with a demand per service that has a 5 year average of 2,054,338 gallons per service per year. The combined residential sector component of demand is equal to 67.2 percent of total demand.

5.4 Historical and Projected Water Demand

Total system demand was projected by multiplying the number of services for each customer class by the demand per service for that class. This process incorporates the significant differences between the demand per service associated with each customer class and the different growth rates for each class. The service projection is shown in Figure 5.4-1.

Projected service connections based on past service counts are labeled 5-Year Average and 10-Year Average. The 5-Year Average is the short-term growth rate, calculated from 2002 to 2006 period, which has an overall annual average growth rate of 2.49%. The 10 Year Average, the long-term growth rate calculated from 1997 to 2006 period, exhibits an overall annual average growth rate of 2.32%.

In addition to historical trend, Cal Water has investigated major development projects that can increase the demand on the District. At the time of development of this Urban

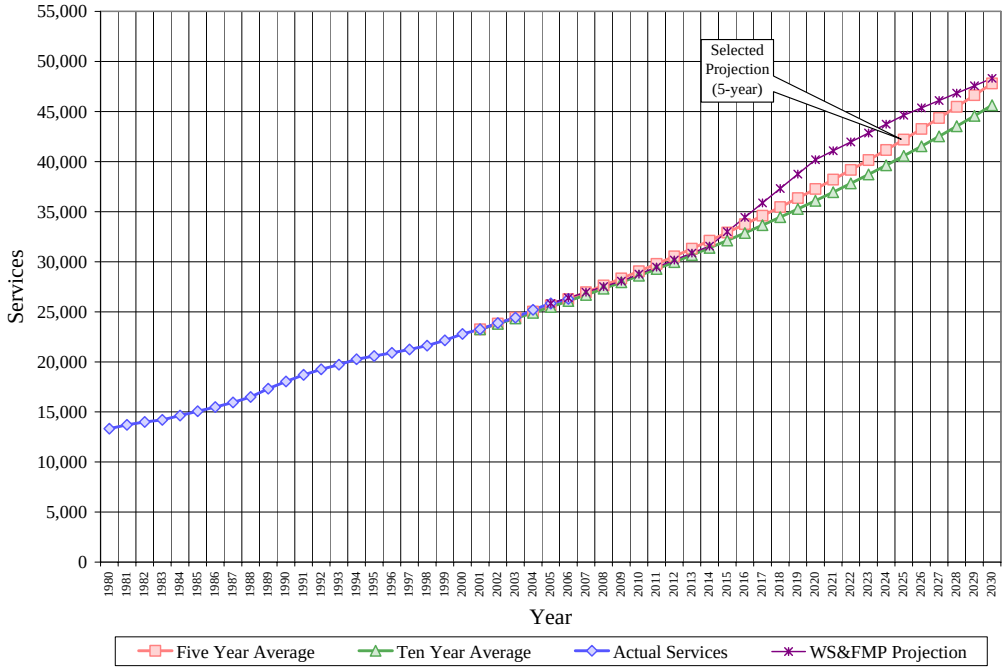
Water Management Plan, the only major residential growth within the District was found to be Meriam Park. Following is a summary of the proposed range of development levels:

- Residential:
  - Detached units (Single Family Units): 600 – 900
  - Attached units: (Multi Family Units - Apartments)1,500 – 2,300
  - Total units: 2,100 – 3,200
- Retail space (square feet): 166,000 – 287,000
- Office/Commercial (square feet): 395,000 – 900,000
- A professional (minor league) baseball stadium with maximum seating capacity for 4,000 people
- Open space/conservation preserve (non irrigated): 37.8 acres
- Creekside Greenway (non irrigated): 19.9 acres

As shown in Figure 5.4-1, the 5-year growth rate has the strongest correlation with the historical trend. This selected trend also includes the Meriam Park development for the single family homes, retail, and office/commercial demand. The projection for the Multi Family Units was modified to include the additional units that will be constructed with this development.

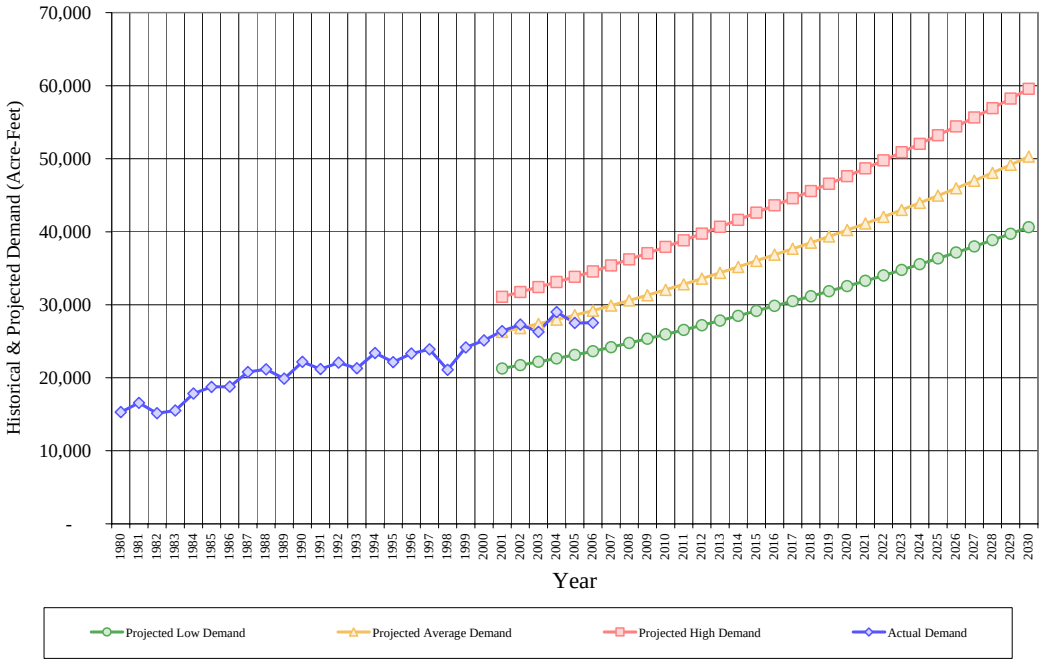
Figure 5.4-1 also shows the projected services that were estimated based on the Water Supply and Facilities Master Plan. The Master Plan shows the projected services to be more inline with the selected 5-year average projections until 2015. The Master Plan assumed a more aggressive schedule from 2015 to 2020, afterwards the two projections become more in-line.

Figure 5.4-1: Historical & Projected Services



Three projection scenarios were used to develop a range of projected demand for the Chico District. The previously discussed service connection growth pattern was applied to three different sets of demand per service data. Data generated through each scenario is compiled and located separately in Appendix C (Worksheets 10, 11, and 12). Comparative demand data for the three scenarios is presented in Figure 5.4-2. The starting point for each projection was the actual annual average number of services in 2001. This provides a comparison of projected values to actual values over a several-year period.

Figure 5.4-2: Historical & Projected Demand (without system losses)



5.4.1 Scenario 1

The District's five-year average growth pattern was applied to the lowest recorded demand per service values from each customer class. Scenario #1 forecasts total demand for the Year 2030 at 40,627 AF (without system losses). This scenario provides a bottom end for the projected demand range. This scenario represents the level of demand Cal Water customers could achieve if an emergency existed. Projected low system demands in 5-year increments, starting in 2010, are shown in Table 5.4-1.

5.4.2 Scenario 2

The District's five-year average growth pattern was combined with the ten-year average demand per service for each customer class to project the most probable demand values through the Year 2030. This scenario forecasts total demand for the Year 2030 at 50,288 AF (without system losses). Scenario #2 represents the normal position of the demand range that should most likely occur provided the 10% conservation goal established by the Company is achieved and maintained. To accomplish this level of demand it will be essential to effectively promote and implement appropriate conservation programs. Projected average system demands in 5-year increments, starting in 2010, are shown in Table 5.4-2.

5.4.3 Scenario 3

The District's five-year average growth pattern was combined with the highest recorded demand per service value for each customer class. Scenario #3 forecasts demand for the Year 2030 at 59,559 AF (without system losses). This scenario provides a top end for the projected demand range. Projected high system demands in 5-year increments, starting in 2010, are shown in Table 5.4-3.

Table 5.4-1: Past, Current, and Projected Water Deliveries for Scenario 1 (Table 12a)

		Water Use Sectors	Single family	Multifamily	Commercial	Industrial	Institutional/Gov.	Landscape/ Agriculture	Recycled	Other	Total
2000	metered	# of accounts	7,603	419	2,974	37	294	-	-	33	11,360
		Deliveries AFY	4,996	2,439	5,577	391	1,061	-	-	41	14,505
	unmetered	# of accounts	11,431	-	-	-	-	-	-	-	11,431
		Deliveries AFY	10,612	-	-	-	-	-	-	-	10,612
2005	metered	# of accounts	10,579	426	3,217	35	342	-	-	50	14,649
		Deliveries AFY	7,186	2,667	5,858	450	1,064	-	-	61	17,286
	unmetered	# of accounts	11,182	-	-	-	-	-	-	-	11,182
		Deliveries AFY	10,219	-	-	-	-	-	-	-	10,219
2010	metered	# of accounts	24,639	466	3,522	37	339	-	-	45	29,047
		Deliveries AFY	17,255	2,482	5,081	117	991	-	-	21	25,948
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2015	metered	# of accounts	28,095	518	3,879	38	336	-	-	51	32,916
		Deliveries AFY	19,676	2,761	5,597	120	982	-	-	24	29,160
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2020	metered	# of accounts	32,036	531	4,272	39	333	-	-	57	37,268
		Deliveries AFY	22,436	2,828	6,164	124	974	-	-	27	32,552
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2025	metered	# of accounts	36,529	533	4,705	40	330	-	-	65	42,203
		Deliveries AFY	25,582	2,842	6,789	128	965	-	-	31	36,337
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2030	metered	# of accounts	41,653	536	5,182	41	327	-	-	73	47,813
		Deliveries AFY	29,171	2,855	7,477	132	957	-	-	35	40,627
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-

Table 5.4-2: Past, Current, and Projected Water Deliveries for Scenario 2 (Table 12b)

		Water Use Sectors	Single family	Multifamily	Commercial	Industrial	Institutional/Gov.	Landscape/ Agriculture	Recycled	Other	Total
2000	metered	# of accounts	7,603	419	2,974	37	294	-	-	33	11,360
		Deliveries AFY	4,996	2,439	5,577	391	1,061	-	-	41	14,505
	unmetered	# of accounts	11,431	-	-	-	-	-	-	-	11,431
		Deliveries AFY	10,612	-	-	-	-	-	-	-	10,612
2005	metered	# of accounts	10,579	426	3,217	35	342	-	-	50	14,649
		Deliveries AFY	7,186	2,667	5,858	450	1,064	-	-	61	17,286
	unmetered	# of accounts	11,182	-	-	-	-	-	-	-	11,182
		Deliveries AFY	10,219	-	-	-	-	-	-	-	10,219
2010	metered	# of accounts	24,639	466	3,522	37	339	-	-	45	29,047
		Deliveries AFY	21,613	2,757	6,070	239	1,289	-	-	81	32,050
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2015	metered	# of accounts	28,095	518	3,879	38	336	-	-	51	32,916
		Deliveries AFY	24,644	3,067	6,686	246	1,278	-	-	92	36,013
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2020	metered	# of accounts	32,036	531	4,272	39	333	-	-	57	37,268
		Deliveries AFY	28,101	3,141	7,364	253	1,267	-	-	104	40,230
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2025	metered	# of accounts	36,529	533	4,705	40	330	-	-	65	42,203
		Deliveries AFY	32,043	3,157	8,110	261	1,256	-	-	117	44,944
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2030	metered	# of accounts	41,653	536	5,182	41	327	-	-	73	47,813
		Deliveries AFY	36,537	3,172	8,932	269	1,246	-	-	132	50,288
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-

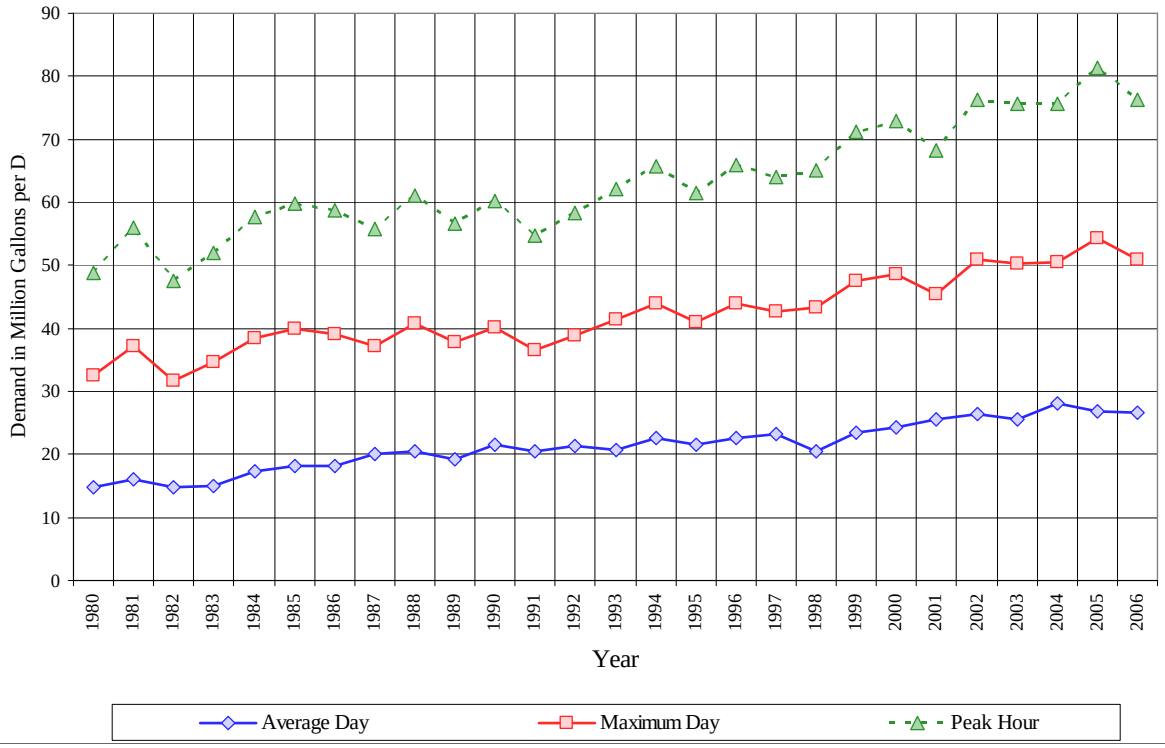
Table 5.4-3: Past, Current, and Projected Water Deliveries for Scenario 3 (Table 12c)

		Water Use Sectors	Single family	Multifamily	Commercial	Industrial	Institutional/Gov.	Landscape/ Agriculture	Recycled	Other	Total
2000	metered	# of accounts	7,603	419	2,974	37	294	-	-	33	11,360
		Deliveries AFY	4,996	2,439	5,577	391	1,061	-	-	41	14,505
	unmetered	# of accounts	11,431	-	-	-	-	-	-	-	11,431
		Deliveries AFY	10,612	-	-	-	-	-	-	-	10,612
2005	metered	# of accounts	10,579	426	3,217	35	342	-	-	50	14,649
		Deliveries AFY	7,186	2,667	5,858	450	1,064	-	-	61	17,286
	unmetered	# of accounts	11,182	-	-	-	-	-	-	-	11,182
		Deliveries AFY	10,219	-	-	-	-	-	-	-	10,219
2010	metered	# of accounts	24,639	466	3,522	37	339	-	-	45	29,047
		Deliveries AFY	25,895	3,042	6,740	461	1,614	-	-	177	3,291
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2015	metered	# of accounts	28,095	518	3,879	38	336	-	-	51	32,916
		Deliveries AFY	29,527	3,384	7,423	475	1,600	-	-	200	42,608
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2020	metered	# of accounts	32,036	531	4,272	39	333	-	-	57	37,268
		Deliveries AFY	33,669	3,466	8,176	489	1,586	-	-	226	47,611
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2025	metered	# of accounts	36,529	533	4,705	40	330	-	-	65	42,203
		Deliveries AFY	38,391	3,482	9,004	503	1,572	-	-	256	53,210
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-
2030	metered	# of accounts	41,653	536	5,182	41	327	-	-	73	47,813
		Deliveries AFY	43,776	3,499	9,917	518	1,559	-	-	290	59,559
	unmetered	# of accounts	-	-	-	-	-	-	-	-	-
		Deliveries AFY	-	-	-	-	-	-	-	-	-

5.5 Average, Maximum, and Peak Demand

The average day demand (ADD) and maximum day demands (MDD) shown in the following graph are based on the historical records for the District. The Peak Hour Demand (PHD) shown in the graph is based on a Peaking Factor of 1.5 times MDD, which is typical of other Cal Water Districts.

Figure 5.5-1: Average Day, Maximum Day, and Peak Hour Demand



The ADD, MDD, and PHD data discussed above were, along with the projected services, used to project the different demands until 2030. These projections are based on comparing supply and demand, and not the capacity of the distribution system. For Cal Water's Water Supply and Facilities Master Plan for Chico, a hydraulic model will be developed to determine the distribution system's ability to deliver the projected ADD, MDD, and PHD. The model results will be described in detail in the Master Plan.

Table 5.5-1 shows the Average Day, Maximum Day, and Peak Hour Demands through 2030 in five year increments. Projected demand and supply is shown in Figures 5.5-2 to 5.5-4 for Average Day, Maximum Day, and Peak Hour Demands, respectively. These values are used to compare the projected demands of the District and determine if the basic facilities are sufficient to meet this demand.

Table 5.5-1: Average Day, Maximum Day, and Peak Hour Demands			
Projected Year	Average Day	Maximum Day	Peak Hour
	(MGD)	(MGD)	(MGD)
2005	26.8	54.2	81.4
2010			
Scenario 1	25.4	49.1	73.7
Scenario 2	31.2	60.4	90.6
Scenario 3	36.8	71.3	106.9
2015			
Scenario 1	28.5	55.2	82.9
Scenario 2	35.1	67.9	101.8
Scenario 3	41.4	80.1	120.2
2020			
Scenario 1	31.9	61.7	92.6
Scenario 2	39.2	75.9	113.9
Scenario 3	46.3	89.6	134.4
2025			
Scenario 1	35.6	69.0	103.5
Scenario 2	43.9	84.9	127.4
Scenario 3	51.8	100.2	150.4
2030			
Scenario 1	39.9	77.2	115.9
Scenario 2	49.1	95.1	142.7
Scenario 3	58.0	112.3	168.5

5.6 Summary

California Water Service Company does not provide water to other agencies and does not supply water for projects such as saline barriers or groundwater recharge and does not plan to supply water for these purposes in the future.

The district system losses based on average demand projections are summarized in Table 5.6-1.

Table 5.6-1: Additional Water Uses and Losses - AF Year (Table 13 and 14)							
Water Use	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Sales to Other Agencies	-	-	-	-	-	-	-
Saline barriers	-	-	-	-	-	-	-
Groundwater recharge	-	-	-	-	-	-	-
Conjunctive use	-	-	-	-	-	-	-
Raw water	-	-	-	-	-	-	-
Recycled	-	-	-	-	-	-	-
Unaccounted-for system losses	2,184	2,392	2,880	3,264	3,695	4,185	4,741
Total	2,184	2,392	2,880	3,264	3,695	4,185	4,741

The past, current, and projected water deliveries based on the average projected consumption rate is presented in Table 5.6-2.

Table 5.6-2: Total Water Use - AF Year (Table 15)							
Water Use	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
Total of Tables 12, 13, 14	27,301	29,897	34,930	39,277	43,925	49,128	55,029

Figure 5.6-1 graphically displays the past, current, and projected water deliveries for all three scenarios including the unaccounted for system losses. Figure 5.6-2 shows the historical and average projected water sources by type of source.

Figure 5.6-1: Historical & Projected Demand (system losses incorporated)

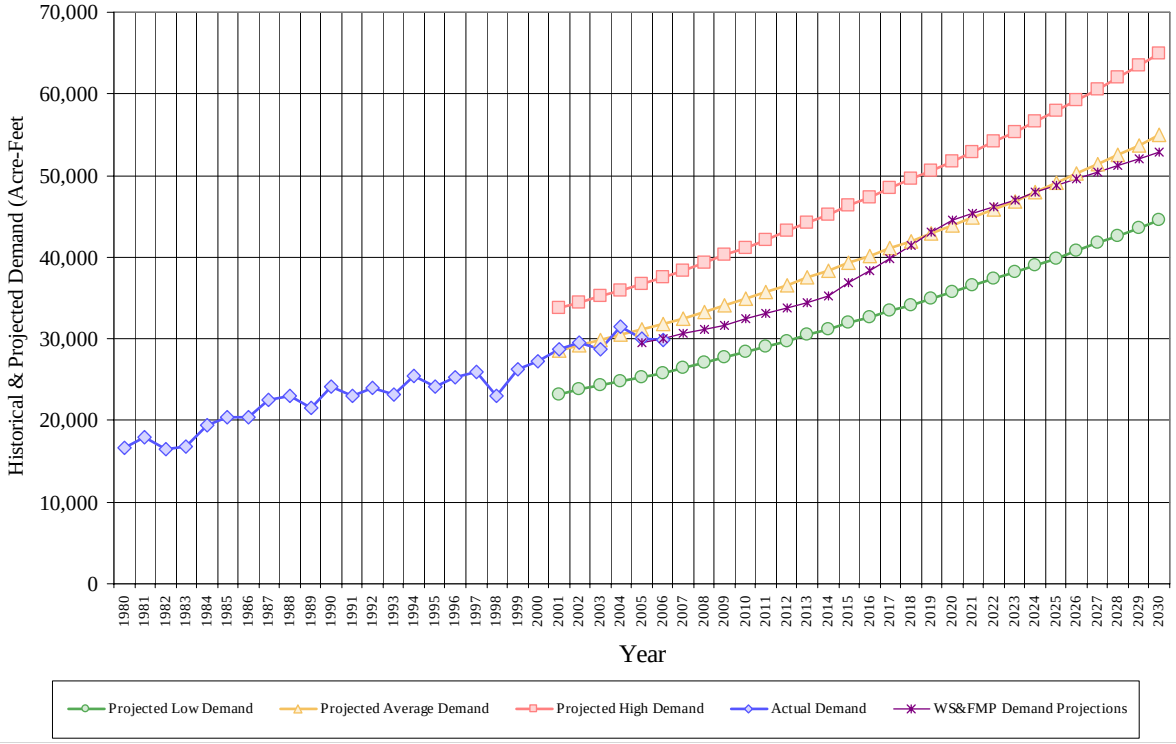
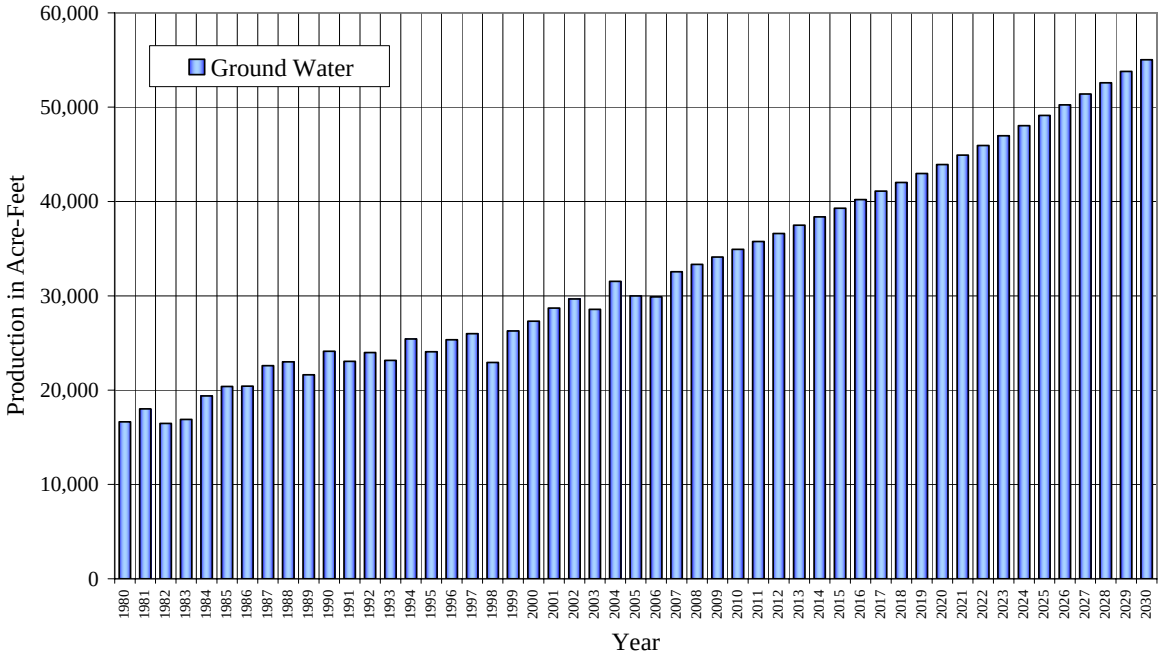


Figure 5.6-2: Historical & Average Projected Sources



6 Supply and Demand Comparison

6.1 Normal-Year Comparison

Tables 6.1-1, 6.1-2, and 6.1-3 compare the current and projected water supply and demand based on average consumption (Scenario 2). The active wells in the Chico District have total current capacity of 99,200 AFY. Planned wells are to be constructed in the near future, which would increase the total capacity to 104,039 AFY. The total supply capacity of the system is further expected to increase slightly over time as new wells are installed. But this increase in supply will be tempered somewhat as aging wells are taken out of service.

For the purposes of this analysis, Cal Water has limited supply projections to current capacities of the present wells and the planned wells in the near future. Even with this limitation, the projected supply in 2030 is 163% of the projected demand. Furthermore, Chico is located in an un-adjudicated groundwater basin and withdrawals are not limited, thus the normal supply of groundwater is expected to be available in normal years.

Table 6.1-1: Projected Normal Water Supply - AF Year (Table 40)

	2010	2015	2020	2025	2030
Cal Water groundwater well	104,039	104,039	104,039	104,039	104,039
Supply Total	104,039	104,039	104,039	104,039	104,039
% of Normal Year	104.9%	104.9%	104.9%	104.9%	104.9%

Table 6.1-2: Projected Normal Water Demand - AF Year (Table 41)

	2010	2015	2020	2025	2030
Demand	34,930	39,277	43,925	49,128	55,029
% of year 2005	117%	131%	147%	164%	184%

Table 6.1-3: Projected Supply and Demand Comparison - AF Year (Table 42)

	2010	2015	2020	2025	2030
Supply totals	104,039	104,039	104,039	104,039	104,039
Demand totals	34,930	39,277	43,925	49,128	55,029
Difference	69,109	64,762	60,114	54,911	49,010
Difference as % of Supply	66%	62%	58%	53%	47%
Difference as % of Demand	198%	165%	137%	112%	89%

6.2 Single Dry-Year Comparison

According to operational records, the District's demand increases during a single-dry year as compared to normal years. The water demand would increase due to maintenance of landscape and other high water uses that would normally be supplied by precipitation. Tables 6.2-1, 6.2-2, and 6.2-3 compare the current and projected water supply and demand based on high consumption rate (Scenario 3).

As discussed before, Chico is located in an unadjudicated groundwater basin and withdrawals are not limited, the demand is expected to be met by additional pumping from the groundwater wells. As shown in the following tables, the full capacity of the wells will meet the higher demands that are expected during single dry year conditions.

Table 6.2-1: Projected Single Dry-year Water Supply - AF Year (Table 43)

	2010	2015	2020	2025	2030
Cal Water groundwater well	104,039	104,039	104,039	104,039	104,039
Supply total	104,039	104,039	104,039	104,039	104,039
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.2-2: Projected Single Dry-year Water Demand - AF Year (Table 44)

	2010	2015	2020	2025	2030
Demand	41,219	46,338	51,834	57,992	64,977
% of projected normal	118.0%	118.0%	118.0%	118.0%	118.1%

Table 6.2-3: Projected Single Dry-year Supply and Demand Comparison - AF Year (Table 45)

	2010	2015	2020	2025	2030
Supply totals	104,039	104,039	104,039	104,039	104,039
Demand totals	41,219	46,338	51,834	57,992	64,977
Difference	62,820	57,701	52,205	46,047	39,062
Difference as % of Supply	60.4%	55.5%	50.2%	44.3%	37.5%
Difference as % of Demand	152.4%	124.5%	100.7%	79.4%	60.1%

6.3 Multiple Dry-Year Comparison

Tables 6.3-1, 6.3-2, and 6.3-3 compare the projected water supply and demand occurring between 2006 and 2010 during an extended drought lasting the full length of this period. During the first year, the projected average demand (Scenario 2) was used, followed by high demand year (Scenario 3) for the second year. After this time optional or mandatory water use restrictions are expected to be implemented for the third year which will assume to reduce the demand to average conditions (Scenario 2) again. Thereafter, for years 4-5, the low water demand (Scenario 1) was used as stricter water restrictions are expected.

With groundwater being the sole supply for the District, the entire demand will be meet for multiple year droughts with increased pumping from the wells, which will only be limited to the pumping capacity of the wells. However, continued heavy pumping during drought conditions will result in lowering of water levels and lowering the pumping capacity. Conservation methods discussed in Chapter 4 will need to be implemented to reduce demand and the demand on the basin.

Table 6.3-1: Projected Supply During Multiple Dry Year To 2010 (Table 46)
AFY

	2006	2007	2008	2009	2010
Cal Water groundwater well	99,200	102,426	105,652	108,878	112,104
Supply total	99,200	102,426	105,652	108,878	112,104
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.3-2: Projected Demand Multiple Dry Year To 2010 (Table 47)
AFY

	2006	2007	2008	2009	2010
Demand	31,799	38,424	33,328	27,752	28,412
% of projected normal	100.0%	118.0%	100.0%	81.3%	81.3%

Table 6.3-3: Projected Supply And Demand Comparison To 2010 (Table 48)
During Multiple Dry Year Period - AFY

	2006	2007	2008	2009	2010
Supply totals	99,200	102,426	105,652	108,878	112,104
Demand totals	31,799	38,424	33,328	27,752	28,412
Difference	67,401	64,001	72,324	81,126	83,692
Difference as % of Supply	67.9%	62.5%	68.5%	74.5%	74.7%
Difference as % of Demand	212.0%	166.6%	217.0%	292.3%	294.6%

Tables 6.3-4, 6.3-5, and 6.3-6 compare the projected water supply and demand occurring between 2011 and 2015 during an extended drought lasting the full length of this period. The same demand cycle as described for the 2006 to 2010 period is used to compare to the projected supply.

Table 6.3-4: Projected Supply During Multiple Dry Year To 2015 (Table 49)
AFY

	2011	2012	2013	2014	2015
Cal Water groundwater well	112,104	112,104	112,104	112,104	112,104
Supply total	112,104	112,104	112,104	112,104	112,104
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.3-5: Projected Demand Multiple Dry Year To 2015 (Table 50)
AFY

	2011	2012	2013	2014	2015
Demand	35,759	43,195	37,477	31,211	31,953
% of projected normal	100.0%	118.0%	100.0%	81.4%	81.4%

Table 6.3-6: Projected Supply And Demand Comparison To 2015 (Table 51)
During Multiple Dry Year Period - AFY

	2011	2012	2013	2014	2015
Supply totals	112,104	112,104	112,104	112,104	112,104
Demand totals	35,759	43,195	37,477	31,211	31,953
Difference	76,345	68,909	74,627	80,892	80,151
Difference as % of Supply	68.1%	61.5%	66.6%	72.2%	71.5%
Difference as % of Demand	213.5%	159.5%	199.1%	259.2%	250.8%

Tables 6.3-7, 6.3-8, and 6.3-9 compare the projected water supply and demand occurring between 2016 and 2020 during an extended drought lasting the full length of this period. The same demand cycle as described for the 2006 to 2010 period is used to compare to the projected supply.

Table 6.3-7: Projected Supply During Multiple Dry Year To 2020 (Table 52)
AFY

	2016	2017	2018	2019	2020
Cal Water groundwater well	112,104	112,104	112,104	112,104	112,104
Supply total	112,104	112,104	112,104	112,104	112,104
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.3-8: Projected Demand Multiple Dry Year To 2020 (Table 53)
AFY

	2016	2017	2018	2019	2020
Demand	40,209	48,495	42,021	34,935	35,714
% of projected normal	100.0%	118.0%	100.0%	81.3%	81.3%

Table 6.3-9: Projected Supply And Demand Comparison To 2020 (Table 54)
During Multiple Dry Year Period - AFY

	2016	2017	2018	2019	2020
Supply totals	112,104	112,104	112,104	112,104	112,104
Demand totals	40,209	48,495	42,021	34,935	35,714
Difference	71,895	63,609	70,083	77,169	76,390
Difference as % of Supply	64.1%	56.7%	62.5%	68.8%	68.1%
Difference as % of Demand	178.8%	131.2%	166.8%	220.9%	213.9%

Tables 6.3-10, 6.3-11, and 6.3-12 compare the projected water supply and demand occurring between 2021 and 2025 during an extended drought lasting the full length of this period. The same demand cycle as described for the 2006 to 2010 period is used to compare to the projected supply.

Table 6.3-10: Projected Supply During Multiple Dry Year To 2025 (Table 55)
AFY

	2021	2022	2023	2024	2025
Cal Water groundwater well	112,104	112,104	112,104	112,104	112,104
Supply total	112,104	112,104	112,104	112,104	112,104
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.3-11: Projected Demand Multiple Dry Year To 2025 (Table 56)
AFY

	2021	2022	2023	2024	2025
Demand	44,914	53,004	46,968	39,034	39,917
% of projected normal	100.0%	115.4%	100.0%	81.3%	81.3%

Table 6.3-12: Projected Supply And Demand Comparison To 2025 (Table 57)
During Multiple Dry Year Period - AFY

	2021	2022	2023	2024	2025
Supply totals	112,104	112,104	112,104	112,104	112,104
Demand totals	44,914	53,004	46,968	39,034	39,917
Difference	67,190	59,100	65,136	73,070	72,187
Difference as % of Supply	59.9%	52.7%	58.1%	65.2%	64.4%
Difference as % of Demand	149.6%	111.5%	138.7%	187.2%	180.8%

Tables 6.3-13, 6.3-14, and 6.3-15 compare the projected water supply and demand occurring between 2026 and 2030 during an extended drought lasting the full length of this period. The same demand cycle as described for the 2006 to 2010 period is used to compare to the projected supply.

Table 6.3-13: Projected Supply During Multiple Dry Year To 2030 (Table 55)
AFY

	2026	2027	2028	2029	2030
Cal Water groundwater well	112,104	112,104	112,104	112,104	112,104
Supply total	112,104	112,104	112,104	112,104	112,104
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.3-14: Projected Demand Multiple Dry Year To 2030 (Table 56)
AFY

	2026	2027	2028	2029	2030
Demand	44,914	54,204	46,968	39,034	39,917
% of projected normal	100.0%	118.0%	100.0%	81.3%	81.3%

Table 6.3-15: Projected Supply And Demand Comparison To 2030 (Table 57)
During Multiple Dry Year Period - AFY

	2026	2027	2028	2029	2030
Supply totals	112,104	112,104	112,104	112,104	112,104
Demand totals	44,914	54,204	46,968	39,034	39,917
Difference	67,190	57,900	65,136	73,070	72,187
Difference as % of Supply	59.9%	51.6%	58.1%	65.2%	64.4%
Difference as % of Demand	149.6%	106.8%	138.7%	187.2%	180.8%

7 Water Demand Management

7.1 California Urban Water Conservation Council

California Water Service Company is a California Urban Water Conservation Council (CUWCC) member. The CUWCC was created to increase efficient water use statewide through partnerships among urban water agencies, public interest organizations, and private entities. The Council's goal is to integrate urban water conservation Best Management Practices (BMP) into the planning and management of California's water resources. Annual reports filed with the CUWCC are attached in Appendix G. The reports are considered complete according to the CUWCC website.

7.2 Water Conservation Best Management Practices

Implementation of these water conservation BMPs will help limit water demand from customers within the District's service area. This will result in a reduction of water supply requirements for Cal Water's Chico District, while also reducing the impact of water use statewide. This chapter presents an analysis of urban water conservation BMPs and a description of the methods used to conduct the analysis.

The unpredictable water supply and ever increasing demand on California's complex water resources have resulted in a coordinated effort by the Department of Water Resources (DWR), water utilities, environmental organizations, and other interested groups to develop a list of urban BMPs for conserving water. This consensus-building effort resulted in a Memorandum of Understanding Regarding Urban Water Conservation in California (MOU), as amended March 9, 2005, among parties, which formalizes an agreement to implement these BMPs and makes a cooperative effort to reduce the consumption of California's water resources. The MOU is administered by the CUWCC and is its primary tool for encouraging efficient water use throughout the State.

As a signatory of the MOU, Cal Water has agreed to implement the BMPs as defined in Exhibit 1 of the MOU that are cost beneficial, and complete such implementation in accordance with the schedule assigned to each BMP. The MOU requires that a water utility implement only the BMPs that are economically beneficial. If a BMP is not economically feasible, the water utility may request an economic exemption for that BMP. The BMPs as defined in the MOU are generally recognized as standard definitions of water conservation measures. Table 7.2-1 presents the BMPs as defined by the MOU.

Table 7.2-1: Water Conservation Best Management Practices	
No.	**BMP Name**
1	Water survey programs for single-family residential and multi-family residential connections
2	Residential plumbing retrofit
3	System water audits, leak detection and repair
4	Metering with commodity rates for all new connections and retrofit of existing connections
5	Large landscape conservation programs and incentives
6	High-efficiency washing machine rebate programs
7	Public information programs
8	School education programs
9	Conservation programs for commercial, industrial, and institutional accounts
10	Wholesale agency assistance programs
11	Conservation pricing
12	Conservation coordinator
13	Water waste prohibition
14	Residential ULFT replacement programs

7.3 Economic Analysis Methodology

An economic analysis was conducted for seven of the 14 BMPs that are described in the MOU (i.e. BMP nos. 1, 2, 4, 5b, 6, 9, and 14). Economic analyses were not done for BMPs 3, 7, 8, 10, 11, 12, and 13 because they are essentially non-quantifiable, but often critical to the success of those BMPs that are quantifiable. Analysis was also not performed for BMP 5a because Cal Water does not currently distinguish between services with dedicated irrigation meters and those with mixed use meters.

The cost-effectiveness economic analyses were performed using spreadsheet models developed by the CUWCC. In some cases, the models were modified to more closely represent the types of programs that Cal Water would actually be implementing. Each BMP model projects the dollar values of the benefits and costs that would result from implementing a particular BMP. The benefit and cost figures are based on the number of interventions to be completed in accordance with CUWCC coverage requirements, in what is typically a three year implementation schedule. This three year time frame was chosen to coincide both with Cal Water's Urban Water Management Plan submittal schedule for the Chico District, and its PUC rate case filings.

For BMP 5b, large landscape surveys, Cal Water considered a three year implementation schedule unrealistic and planned a longer five year implementation schedule instead. To be consistent with the other BMPs, the economic analysis of only the first three years are included in the tables below. However, the cumulative water savings data represents full implementation. BMP 4, metering with commodity rates, has already begun in the Chico District. The Flat Rate Meter Conversion Program is a capitally funded project that is operating independently of this analysis and will be implemented over a 10 year period.

But, for the purposes of this plan, the metering conversion program has been evaluated according to the same three year implementation schedule used for the remainder of the BMPs, using actual capital budget amounts as inputs to the model, and the planned conversion schedule over this time frame, as seen in Table 7.3-1.

Table 7.3-1: CIP Meter Conversion Summary

Year	Conversions	CIP Budget
2007	1,176	$847,469
2008	1,176	$777,028
2009	1,176	$812,089
Total	3,528	$2,436,586

Because the models do not account for multiple year implementation schedules, each BMP model was run individually for each year from 2007 to 2009, with values adjusted for inflation as appropriate. BMPs with positive benefit to cost ratios are considered economically feasible and should be implemented as described in the MOU. The results of the economic analysis are discussed in the following section.

Important terms and formulas that are common to all the worksheets in the model are defined in Table 7.3-2.

Table 7.3-2: Definition of Terms Used in the Economic Analysis

Term	Definition	Comments
Present Value Benefits:	The total dollar value saved due to conservation resulting from BMP implementation.	Includes both water agency and societal benefits.
Present Value Costs:	The total implementation costs per BMP program.	Includes both water agency and societal costs.
Net Present Value:	Total benefits minus total costs without discounting for time.	A value greater than zero indicates an economically justifiable BMP.
Benefit-Cost Ratio:	The sum of the total benefits divided by the sum of the total costs.	A value greater than one indicates an economically justifiable BMP.
Simple Unit Supply Cost:	The cost per unit (AF) for conserved water.	A value less than CWSC's current marginal cost indicates a less expensive source of supply for conserved water.

7.4 Economic Analysis Results

Table 7.4-1 summarizes the results of the economic analysis.

Table 7.4-1: Benefit-Cost Analysis Summary

BMP 1: Residential Surveys						
	2007		2008		2009	
Perspective	Agency	Society	Agency	Society	Agency	Society
Program Costs	$340,303	$340,303	$351,463	$351,463	$359,785	$359,785
Total Benefits	$87,413	$299,072	$89,939	$308,292	$91,540	$314,626
Net Present Value	($252,890)	($41,231)	($261,524)	($43,171)	($268,245)	($45,159)
Benefit-Cost Ratio	0.26	0.88	0.26	0.88	0.25	0.87
Unit Supply Cost ($/AF)	$1,548	$1,548	$1,599	$1,599	$1,636	$1,636

BMP 2: Residential Plumbing Retrofits						
	2007		2008		2009	
Perspective	Agency	Society	Agency	Society	Agency	Society
Program Costs	$95,614	$95,614	$101,147	$101,147	$104,322	$104,322
Total Benefits	$34,224	$114,629	$35,203	$118,152	$35,844	$120,590
Net Present Value	($61,390)	$19,015	($65,944)	$17,005	($68,478)	$16,268
Benefit-Cost Ratio	0.36	1.20	0.35	1.17	0.34	1.16
Unit Supply Cost ($/AF)	$1,190	$1,190	$1,259	$1,259	$1,299	$1,299

BMP 4: Metering with Commodity Rates						
	2007		2008		2009	
Perspective	Agency	Society	Agency	Society	Agency	Society
Program Costs	$779,173	$779,173	$779,173	$779,173	$779,173	$779,173
Total Benefits	$1,482,622	$10,989,537	$1,482,622	$10,989,537	$1,482,622	$10,989,537
Net Present Value	$703,449	$10,210,364	$703,449	$10,210,364	$703,449	$10,210,364
Benefit-Cost Ratio	1.90	14.10	1.90	14.10	1.90	14.10
Unit Supply Cost ($/AF)	$155	$155	$155	$155	$155	$155

BMP 5b: Large Landscape Surveys						
	2007		2008		2009	
Perspective	Agency	Society	Agency	Society	Agency	Society
Program Costs	$111,709	$465,133	$118,252	$483,331	$121,975	$494,491
Total Benefits	$224,122	$261,321	$230,569	$268,838	$234,603	$273,542
Net Present Value	$112,413	($203,812)	$112,317	($214,493)	$112,628	($220,949)
Benefit-Cost Ratio	2.01	0.56	1.95	0.56	1.92	0.55
Unit Supply Cost ($/AF)	$198	$825	$210	$857	$216	$877

Table 7.4-1 Continued: Benefit-Cost Analysis Summary						
BMP 6: High Efficiency Washing Machine Rebates						
	2007		**2008**		**2009**	
Perspective	**Agency**	**Society**	**Agency**	**Society**	**Agency**	**Society**
Program Costs	$46,309	$300,809	$46,574	$301,074	$46,745	$301,245
Total Benefits	$34,667	$343,620	$35,668	$354,314	$36,302	$362,183
Net Present Value	($11,642)	$42,811	($10,906)	$53,240	($10,443)	$60,938
Benefit-Cost Ratio	0.75	1.14	0.77	1.18	0.78	1.20
Unit Supply Cost ($/AF)	$475	$3,082	$477	$3,084	$479	$3,087
BMP 9: CII Surveys						
	2007		**2008**		**2009**	
Perspective	**Agency**	**Society**	**Agency**	**Society**	**Agency**	**Society**
Program Costs	$162,101	$294,449	$168,236	$305,012	$172,036	$311,518
Total Benefits	$259,232	$521,527	$266,723	$537,393	$271,470	$547,501
Net Present Value	$97,131	$227,078	$98,487	$232,381	$99,434	$235,983
Benefit-Cost Ratio	1.60	1.77	1.59	1.76	1.58	1.76
Unit Supply Cost ($/AF)	$239	$435	$249	$451	$254	$460
BMP 14: ULFT Replacement Program						
	2007		**2008**		**2009**	
Perspective	**Agency**	**Society**	**Agency**	**Society**	**Agency**	**Society**
Program Costs	$277,768	$428,461	$287,057	$442,697	$292,931	$451,751
Total Benefits	$286,080	$520,657	$294,347	$536,619	$299,585	$546,798
Net Present Value	$8,312	$92,196	$7,290	$93,922	$6,654	$95,047
Benefit-Cost Ratio	1.03	1.22	1.03	1.21	1.02	1.21
Unit Supply Cost ($/AF)	$315	$486	$325	$502	$332	$512

According to the analysis, BMPs 4, 9, and 14 have a positive Net Present Value from both the water agency and society perspectives and thus exhibit a benefit/cost ratio over 1.0, as shown in Table 7.4-1. The economic analysis for the Chico District was completed without incorporating potential cost sharing opportunities into the model. To date, Cal Water has not been successful in developing relationships with other local water agencies for this purpose.

Cal Water proposes adding the implementation of BMPs 9 and 14 to the existing programs beginning in 2007. The implementation of BMPs 4, 9, and 14 will result in a total water savings of 50,002 AF over a 30-year period and will cost a total of $3,796,715. Actual budgeted amounts for BMP 4 are included in this total. The potential annual water savings for all BMPs is shown graphically on Figure 7.4-1 and the proposed annual water savings is shown on Figure 7.4-2. The total water savings resulting from this level of coverage is also summarized in Tables 7.4-2 and 7.4-3.

Figure 7.4-1: Potential Water Savings

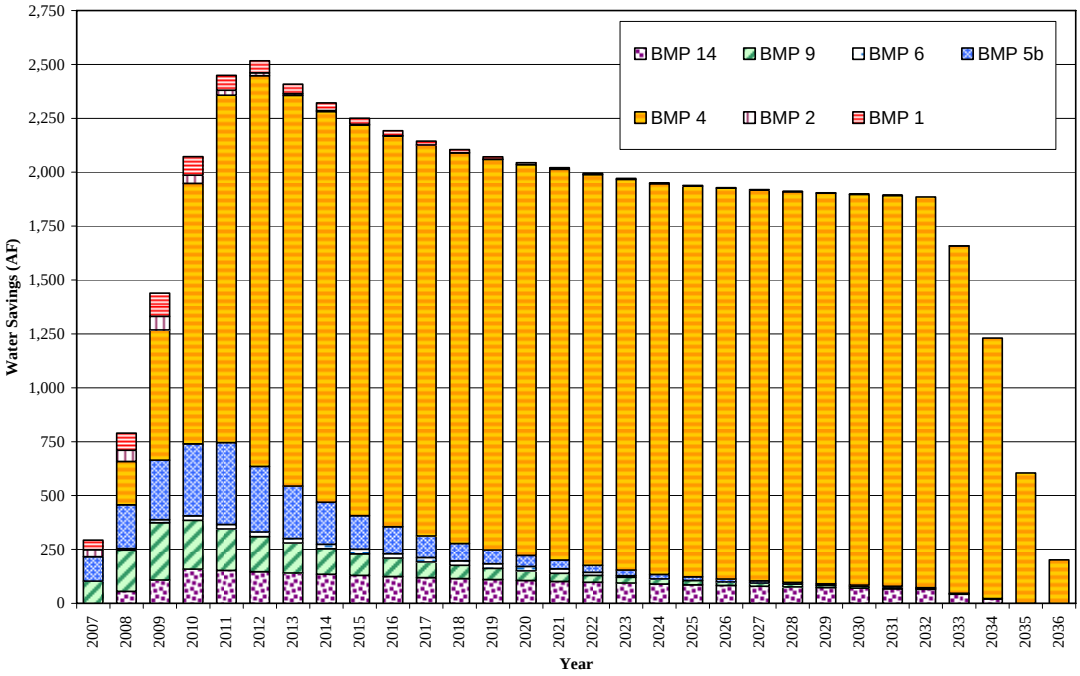


Figure 7.4-2: Proposed Water Savings

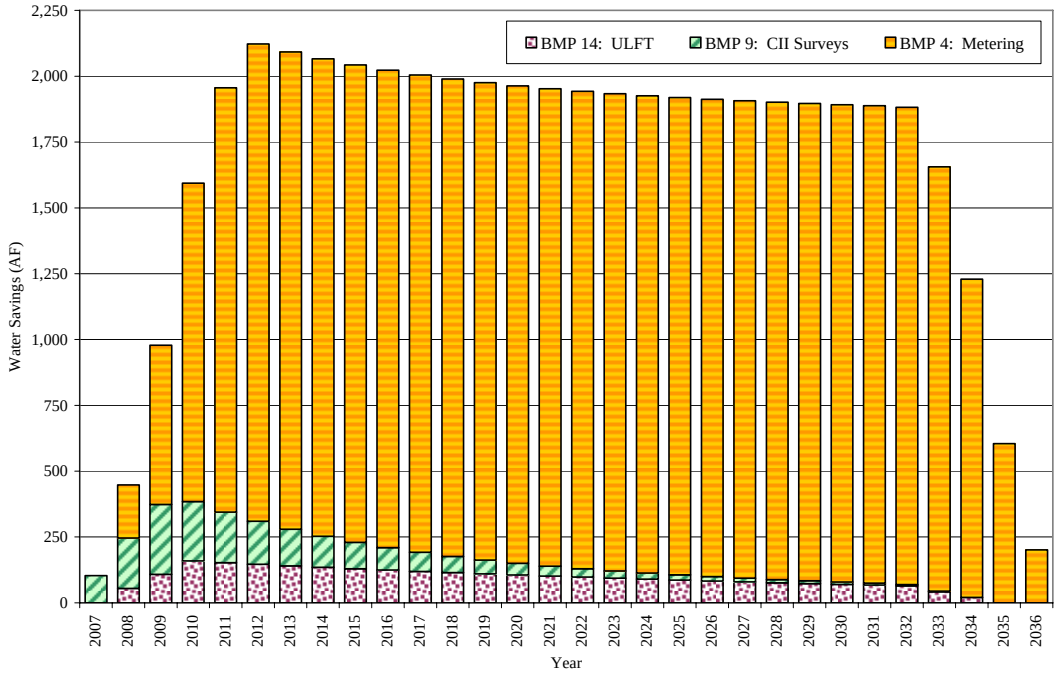


Table 7.4-2: Water Savings and Implementation Costs				
BMP	**Total Interventions**	**Potential Water Savings (AF)**	**Proposed Water Savings (AF)**	**Total Implementation Costs**
BMP 1	4,773	660	0	$0
BMP 2	12,519	241	0	$0
BMP 4	3,528	45,326	45,326	$2,436,586
BMP 5b	554	2,820	0	$0
BMP 6	1,527	293	0	$0
BMP 9	369	2,031	2,031	$502,373
BMP 14	6,810	2,646	2,646	$857,756
Total:	30,080	54,015	50,003	$3,796,715

Figures 7.4-1 and 7.4-2 and Table 7.4-2 do not include the water savings and costs associated with BMPs 3, 7, 8, 10, 11, 12, and 13 since no specific level of effort is defined in the MOU for these BMPs. BMP 13 is covered by CPUC General Order 103, and has no cost unless triggered by a water shortage condition.

Table 7.4-3: Annual Water Savings

Year	BMP 1				BMP 2				BMP 4				BMP 5b					
	Incremental Savings			Annual Savings (AF)	Incremental Savings			Annual Savings (AF)	Incremental Savings			Annual Savings (AF)	Incremental Savings (AF)					Annual Savings (AF)
	2007	2008	2009		2007	2008	2009		2007	2008	2009		2007	2008	2009	2010	2011	
2007	44.1			44.1	32.1			32.1				0.0	113.2					113.2
2008	35.3	44.1		79.4	19.3	32.1		51.4	201.4			201.4	90.6	113.2				203.8
2009	28.2	35.3	44.1	107.7	11.6	19.3	32.1	63.0	402.9	201.4		604.3	72.5	90.6	113.2			276.3
2010	22.6	28.2	35.3	86.2	6.9	11.6	19.3	37.8	604.3	402.9	201.4	1,208.7	58.0	72.5	90.6	113.2		334.2
2011	18.1	22.6	28.2	68.9	4.2	6.9	11.6	22.7	604.3	604.3	402.9	1,611.6	46.4	58.0	72.5	90.6	113.2	380.6
2012	14.5	18.1	22.6	55.1	2.5	4.2	6.9	13.6	604.3	604.3	604.3	1,813.0	37.1	46.4	58.0	72.5	90.6	304.5
2013	11.6	14.5	18.1	44.1	1.5	2.5	4.2	8.2	604.3	604.3	604.3	1,813.0	29.7	37.1	46.4	58.0	72.5	243.6
2014	9.3	11.6	14.5	35.3	0.9	1.5	2.5	4.9	604.3	604.3	604.3	1,813.0	23.7	29.7	37.1	46.4	58.0	194.9
2015	7.4	9.3	11.6	28.2	0.5	0.9	1.5	2.9	604.3	604.3	604.3	1,813.0	19.0	23.7	29.7	37.1	46.4	155.9
2016	5.9	7.4	9.3	22.6	0.3	0.5	0.9	1.8	604.3	604.3	604.3	1,813.0	15.2	19.0	23.7	29.7	37.1	124.7
2017	4.7	5.9	7.4	18.1	0.2	0.3	0.5	1.1	604.3	604.3	604.3	1,813.0	12.2	15.2	19.0	23.7	29.7	99.8
2018	3.8	4.7	5.9	14.5	0.1	0.2	0.3	0.6	604.3	604.3	604.3	1,813.0	9.7	12.2	15.2	19.0	23.7	79.8
2019	3.0	3.8	4.7	11.6	0.1	0.1	0.2	0.4	604.3	604.3	604.3	1,813.0	7.8	9.7	12.2	15.2	19.0	63.9
2020	2.4	3.0	3.8	9.3	0.0	0.1	0.1	0.2	604.3	604.3	604.3	1,813.0	6.2	7.8	9.7	12.2	15.2	51.1
2021	1.9	2.4	3.0	7.4	0.0	0.0	0.1	0.1	604.3	604.3	604.3	1,813.0	5.0	6.2	7.8	9.7	12.2	40.9
2022	1.6	1.9	2.4	5.9	0.0	0.0	0.0	0.1	604.3	604.3	604.3	1,813.0	4.0	5.0	6.2	7.8	9.7	32.7
2023	1.2	1.6	1.9	4.7	0.0	0.0	0.0	0.0	604.3	604.3	604.3	1,813.0	3.2	4.0	5.0	6.2	7.8	26.2
2024	1.0	1.2	1.6	3.8	0.0	0.0	0.0	0.0	604.3	604.3	604.3	1,813.0	2.5	3.2	4.0	5.0	6.2	20.9
2025	0.8	1.0	1.2	3.0	0.0	0.0	0.0	0.0	604.3	604.3	604.3	1,813.0	2.0	2.5	3.2	4.0	5.0	16.7
2026	0.6	0.8	1.0	2.4	0.0	0.0	0.0	0.0	604.3	604.3	604.3	1,813.0	1.6	2.0	2.5	3.2	4.0	13.4
2027	0.5	0.6	0.8	1.9	0.0	0.0	0.0	0.0	604.3	604.3	604.3	1,813.0	1.3	1.6	2.0	2.5	3.2	10.7
2028	0.4	0.5	0.6	1.6	0.0	0.0	0.0	0.0	604.3	604.3	604.3	1,813.0	1.0	1.3	1.6	2.0	2.5	8.6
2029	0.3	0.4	0.5	1.2	0.0	0.0	0.0	0.0	604.3	604.3	604.3	1,813.0	0.8	1.0	1.3	1.6	2.0	6.9
2030	0.3	0.3	0.4	1.0	0.0	0.0	0.0	0.0	604.3	604.3	604.3	1,813.0	0.7	0.8	1.0	1.3	1.6	5.5
2031	0.2	0.3	0.3	0.8	0.0	0.0	0.0	0.0	604.3	604.3	604.3	1,813.0	0.5	0.7	0.8	1.0	1.3	4.4
2032		0.2	0.3	0.5		0.0	0.0	0.0	604.3	604.3	604.3	1,813.0		0.5	0.7	0.8	1.0	3.1
2033			0.2	0.2			0.0	0.0	402.9	604.3	604.3	1,611.6			0.5	0.7	0.8	2.0
2034				0.0				0.0	201.4	402.9	604.3	1,208.7				0.5	0.7	1.2
2035				0.0				0.0		201.4	402.9	604.3					0.5	0.5
2036				0.0				0.0			201.4	201.4						0.0
Tota				659.6				241.0				45,325.5						2,819.8

Table 7.4-3 Continued: Annual Water Savings

Year	BMP 6				BMP 9				BMP 14				Potential Annual Savings (AF)	Proposed Annual Savings (AF)
	Incremental Savings (AF)			Annual Savings (AF)	Incremental Savings (AF)			Annual Savings (AF)	Incremental Savings (AF)			Annual Savings (AF)		
	2007	2008	2009		2007	2008	2009		2007	2008	2009			
2007				0.0	103.3			103.3				0.0	292.8	103.3
2008	7.0			7.0	87.8	103.3		191.1	55.2			55.2	789.4	447.7
2009	7.0	7.0		13.9	74.6	87.8	103.3	265.8	53.0	55.2		108.1	1,439.1	978.2
2010	7.0	7.0	7.0	20.9	63.5	74.6	87.8	225.9	50.8	53.0	55.2	158.9	2,072.6	1,593.5
2011	7.0	7.0	7.0	20.9	53.9	63.5	74.6	192.0	48.8	50.8	53.0	152.6	2,449.3	1,956.2
2012	7.0	7.0	7.0	20.9	45.8	53.9	63.5	163.2	46.8	48.8	50.8	146.5	2,516.9	2,122.7
2013	7.0	7.0	7.0	20.9	39.0	45.8	53.9	138.7	45.0	46.8	48.8	140.6	2,409.2	2,092.4
2014	7.0	7.0	7.0	20.9	33.1	39.0	45.8	117.9	43.2	45.0	46.8	135.0	2,321.9	2,066.0
2015	7.0	7.0	7.0	20.9	28.2	33.1	39.0	100.2	41.4	43.2	45.0	129.6	2,250.8	2,042.9
2016	7.0	7.0	7.0	20.9	23.9	28.2	33.1	85.2	39.8	41.4	43.2	124.4	2,192.6	2,022.6
2017	7.0	7.0	7.0	20.9	20.3	23.9	28.2	72.4	38.2	39.8	41.4	119.4	2,144.7	2,004.9
2018	7.0	7.0	7.0	20.9	17.3	20.3	23.9	61.6	36.7	38.2	39.8	114.7	2,105.1	1,989.2
2019	7.0	7.0	7.0	20.9	14.7	17.3	20.3	52.3	35.2	36.7	38.2	110.1	2,072.1	1,975.4
2020	7.0	7.0	7.0	20.9	12.5	14.7	17.3	44.5	33.8	35.2	36.7	105.7	2,044.6	1,963.2
2021	7.0	7.0	7.0	20.9	10.6	12.5	14.7	37.8	32.4	33.8	35.2	101.4	2,021.6	1,952.3
2022		7.0	7.0	13.9	9.0	10.6	12.5	32.1	31.1	32.4	33.8	97.4	1,995.2	1,942.5
2023			7.0	7.0	7.7	9.0	10.6	27.3	29.9	31.1	32.4	93.5	1,971.7	1,933.8
2024				0.0	6.5	7.7	9.0	23.2	28.7	29.9	31.1	89.8	1,950.7	1,926.0
2025				0.0	5.5	6.5	7.7	19.7	27.6	28.7	29.9	86.2	1,938.7	1,918.9
2026				0.0	4.7	5.5	6.5	16.8	26.5	27.6	28.7	82.7	1,928.3	1,912.5
2027				0.0	4.0	4.7	5.5	14.3	25.4	26.5	27.6	79.4	1,919.3	1,906.7
2028				0.0	3.4	4.0	4.7	12.1	24.4	25.4	26.5	76.2	1,911.5	1,901.4
2029				0.0	2.9	3.4	4.0	10.3	23.4	24.4	25.4	73.2	1,904.6	1,896.5
2030				0.0	2.5	2.9	3.4	8.8	22.5	23.4	24.4	70.3	1,898.5	1,892.0
2031				0.0	2.1	2.5	2.9	7.4	21.6	22.5	23.4	67.4	1,893.1	1,887.9
2032				0.0		2.1	2.5	4.5	20.7	21.6	22.5	64.7	1,885.9	1,882.3
2033				0.0			2.1	2.1		20.7	21.6	42.3	1,658.2	1,655.9
2034				0.0				0.0			20.7	20.7	1,230.6	1,229.4
2035				0.0				0.0				0.0	604.9	604.3
2036				0.0				0.0				0.0	201.4	201.4
Total:				292.7				2,030.8				2,646.0	54,015.5	50,002.4

7.5 Additional Issues

Non-economic factors including environmental, social, technological, health, and customer impacts, are not thought to be significant in deciding which BMPs to implement in the Chico District. No water supply projects are currently planned that would supply water at a higher unit cost. Cal Water has the legal authority to implement the BMPs. However, the costs of implementing these BMPs are subject to CPUC approval.

7.6 Previous Water Demand Management Program Accomplishments

The Company believes that managing demand is an important element in the overall management of water supply and has made efforts to promote conservation through educational, informational, and customer assistance activities. Cal Water had been conducting conservation programs in the Chico District for several years. However, as a result of the February 1994 CPUC Decision 94-02-1-043 ordering that conservation memorandum accounts be closed, conservation activities have been significantly curtailed in all Cal Water districts.

7.6.1 External Measures to Achieve Public Support

Environmental organizations are seeking expanded water conservation programs and accomplishments by regulated water companies, including more effective and equitable price signals for water consumers and additional cost-effective investments in water efficiency measures by the companies and their customers. Such improvements in water efficiency measures will serve generally to reduce diversions from California's rivers, protect and restore the State's aquatic ecosystems, and reduce energy consumption. Cost-effective efficiency measures will also help mitigate the rising costs of water, wastewater, and energy utility service for consumers and communities.

In 2006 Cal Water participated in a collaborative effort to seek support from the CPUC to increase conservation activities in all districts. Cal Water, California American Water Company, and Golden State Water Company, along with the Mono Lake Committee and the Natural Resources Defense Council provided Joint Recommendations for water conservation to the CPUC. These Recommendations, which are endorsed by eight additional environmental organizations, present a framework for increasing water use efficiency state-wide. Based on these recommendations, Cal Water is proposing an increase in conservation spending to at least 1.5 percent of revenues. A copy of the Joint Water Conservation Recommendations is included in Appendix F.

In addition, Cal Water participates in cooperative conservation activities with the local community. Table 7.6-1 indicates the status of current BMP programs in the Chico service area.

Table 7.6-1: Conservation Measures		
Conservation Measure	Date Implemented	Program End Date
BMP 02 Plumbing Retrofit	1996	N/A at this time
BMP 04 Metering	2007	2017
BMP 06 Washing Machines	2004	2009
BMP 07 Public Information	1994	Ongoing
BMP 08 School Programs	1994	Ongoing
BMP 09 CII Surveys	Proposed	2009
BMP 14 Toilet Rebates	2005	2009

7.6.2 Internal Measures to Achieve Efficient Water Management

Cal Water currently implements internal measures that are intended to achieve efficient water management; these are discussed below:

Distribution System Water Audit and Leak Detection Program

Cal Water implemented an in-house water audit and leak detection program for its distribution systems. The program was administered by a company employee equipped with state-of-the-art leak detection equipment and trained in the methodology described in the American Water Works Association's *Manual of Water Supply Practices: Water Audits and Leak Detection*. It was expected that each district would be audited once every three years. After realizing initial success, this program was suspended as the rate of leak repair outpaced the rate of new leaks being found.

Water Efficient Landscape Guidelines

In 1992, water efficient landscape guidelines were developed (See Appendix F). These guidelines apply to all landscapes designed for Cal Water properties including renovations. For ease of adoption by districts with a multitude of climates and microclimates, the guidelines are generic. They do, however, adhere to water efficient landscape (Xeriscape) principles.

7.7 Overall District Goals

Cal Water recognizes the importance of conservation in managing its own water resources. While economic and regulatory constraints of integrating conservation into supply management have proven challenging, Cal Water is participating in efforts to develop demand management strategies, standards, and criteria by working with the California Urban Water Conservation Council. This Council was formed as part of the MOU primarily to oversee the implementation of the BMPs and to improve water conservation practices and analyses. Cal Water is committed to this process and the development of an integrated resource plan.

Cal Water's conservation programs are intended to assist customers in their efforts to use water efficiently as well as to educate them about their water supply overall. This will lead them to make informed decisions concerning the efficient use of water and enable them to better respond to required reductions in water use should a water shortage or emergency occur. During periods of water shortages, the Company's conservation programs can be expanded and may include more restrictive measures such as mandatory reductions, rationing, and penalties.

7.8 Implementation

For the next three years Cal Water's conservation program is planning to coordinate the implementation of eight BMPs. The current budget amounts are listed in Table 7.8-1 below. For those BMPs for which a cost effectiveness analysis was performed, only BMPs 4, 9, and 14 were deemed cost effective. However, Cal Water has added the implementation of BMPs 2, 5, and 6 to its conservation program in Chico.

Table 7.8-1: Current Annual Conservation Program Budget 2007 – 2009

Program		2007	2008	2009	Total
BMP-2	Plumbing Retrofits	$9,821	$9,821	$9,821	$29,463
BMP-4*	Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections	$847,469	$777,028	$812,089	$2,436,586
BMP-5	Large Landscape Surveys	$30,796	$30,796	$30,796	$92,388
BMP-6	Washing Machine Rebate Program	$7,483	$7,483	$7,483	$22,449
BMP-7	Public Information Campaign	$10,000	$10,000	$10,000	$30,000
BMP-8	School Programs	$20,000	$20,000	$20,000	$60,000
BMP-9	Commercial, Industrial, and Institutional Audits	$25,361	$25,361	$25,361	$76,083
BMP-14	ULFT Replacement Programs	$69,218	$69,218	$69,218	$207,654
Total Per Year		$1,020,148	$949,707	$981,768	$2,954,623

* Currently Funded by Cal Water Capital Improvement Program.

According to the MOU, Cal Water is required to implement only those BMPs that are cost effective. The cost effectiveness analysis found BMPs 2, 5, and 6 to be not economically feasible. However, Cal Water currently has approved money in the budget for these BMPs, and has included them in the conservation program. BMPs 7 and 8 are ongoing and are essential to the success of the entire program but no cost effective analysis has been performed for them. BMP 4 is mandated by Assembly Bill 2572 and is included in Cal Water's capital improvement program. BMPs 9 and 14 were found to be cost effective and the budget amounts listed below represent the estimated funding required to implement these BMPs according to the coverage level and schedule described in the MOU. Before implementing these two and any other conservation program, Cal Water must receive approval from the CPUC.

Table 7.8-2: Proposed Annual Conservation Program Budget 2007 – 2009					
Program		2007	2008	2009	Total
BMP-2	Plumbing Retrofits	$9,821	$9,821	$9,821	$29,463
BMP-4*	Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections	$847,469	$777,028	$812,089	$2,436,586
BMP-5	Large Landscape Surveys	$30,796	$30,796	$30,796	$92,388
BMP-6	Washing Machine Rebate Program	$7,483	$7,483	$7,483	$22,449
BMP-7	Public Information Campaign	$10,000	$10,000	$10,000	$30,000
BMP-8	School Programs	$20,000	$20,000	$20,000	$60,000
BMP-9	Commercial, Industrial, and Institutional Audits	$169,471	$174,029	$176,949	$520,449
BMP-14	ULFT Replacement Programs	$333,644	$344,801	$351,857	$1,030,302
Total Per Year		$1,428,684	$1,373,958	$1,418,995	$4,221,637

* Currently Funded by Cal Water Capital Improvement Program. Actual budget amounts were used.

8 References

[1] LandView 5 and MARPLOT ® software, US Census Bureau/Environmental Protection Agency, downloaded from: http://www.census.gov/geo/landview/lv5/lv5.html, http://www.epa.gov/ceppo/cameo/marplot.htm

[2] Western Regional Climate Center, http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?cachic+nca,

[3] California Irrigation Management Information System (CIMIS), EvapoTranspiration (Eto) Zones Map - Zone 12, http://wwwcimis.water.ca.gov/cimis/welcome.jsp

[4] Hydrologic Consultants, Inc., General Plan Study 1993 – 2012 Groundwater Budget, January 29, 1997.

[5] California's Ground Water Bulletin 118, 2003; Sacramento Valley Hydrologic Region; West Butte Subbasin; Groundwater Basin Number: 5-21.58

[6] Groundwater Management Plan, Butte County Water Commission 2005, downloaded from http://buttecounty.net/waterandresource/groundwater_mgmt_plan.htm

[7] Glenn County, General Plan, 2007 - 2027 downloaded from: http://www.gcplanupdate.net/general_plan/process/issues_opportunities_constraints/sfissues/sf3wastewater.htm