City of Morro Bay 2005 Urban Water Management Plan

City of Morro Bay

Client Representative Bill Boucher

Boyle Engineering Corporation

Project Manager Michael K. Nunley, PE

Project Engineer C. Kirk Gonzalez

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BOYLE 1194 Pacific Street, Suite 204 San Luis Obispo, CA 93401

City of Morro Bay
2005 Urban Water Management Plan

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2005 Urban Water Management Plan
Executive Summary

The City of Morro Bay currently provides water service to over 5,000 connections, including over 10,000 residents, businesses, industrial facilities, and public facilities. A severe water shortage during the 1987-1992 drought demonstrated that the City needed a new supplemental source of water. Limitations on using the City's groundwater resources during the last few years due to water quality and regulatory issues, as well as regular State Water Project maintenance shutdowns, have reinforced the need to plan for the City's future water supply.

It is the City's goal to maintain a safe and adequate water supply, now and in the future, under normal, dry and peak demand and emergency conditions. A report entitled *Analysis and Recommendations for a Water Management Plan (Water Management Plan)* was prepared in 1995 to assist the City in making important decisions on its future water supplies. This Urban Water Management Plan was prepared to meet regulatory requirements that the City update its urban water management plan every five years.

Future Population and Water Demand Projections

Future population and water demand projections developed in this Water Management Plan are summarized below and depicted in **Figure ES 3-1**.

TABLE ES 4-3
Projected Water Demands in Morro Bay

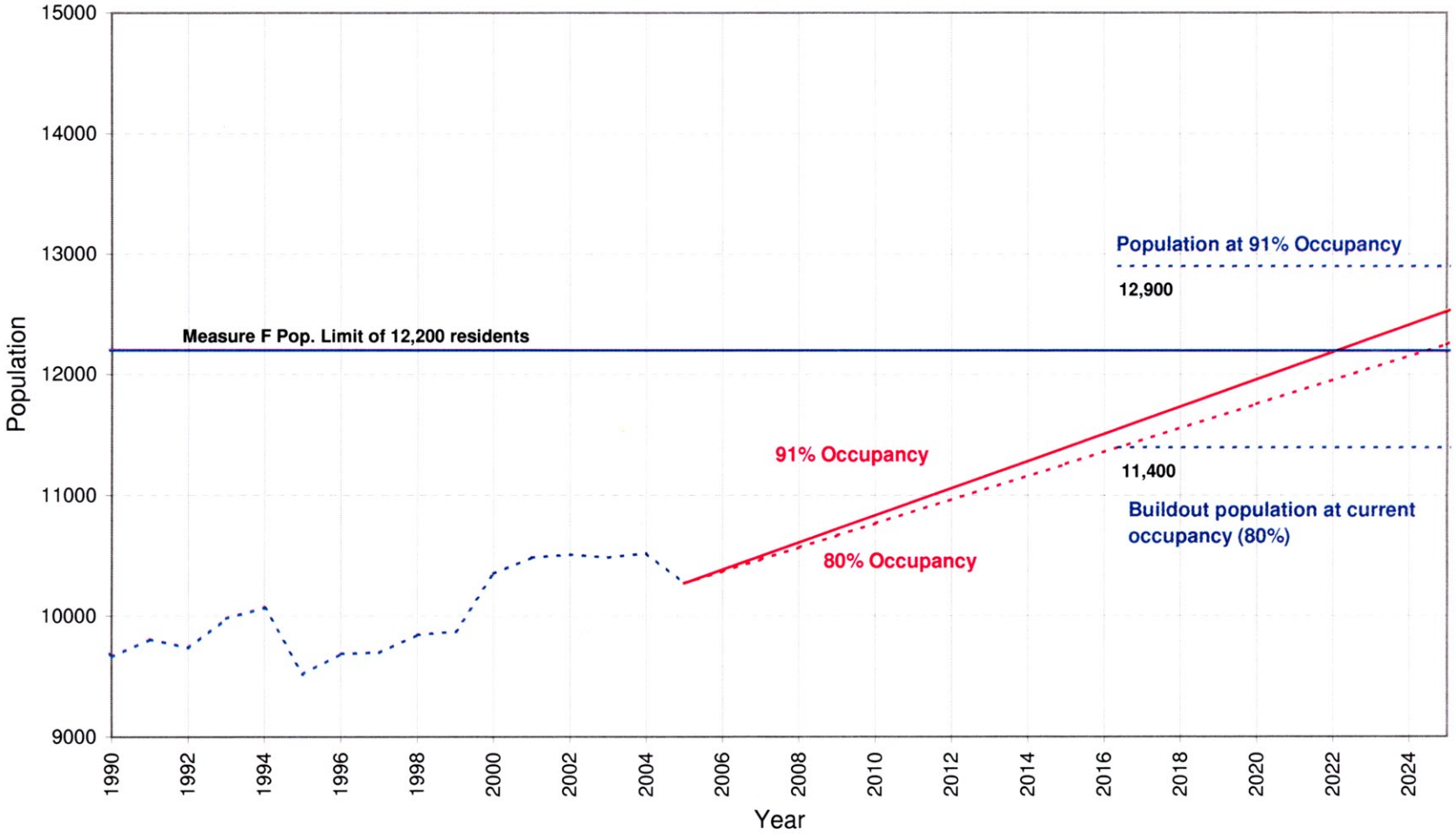
Year	Projected Population[1]	Normal Year[2]		Dry Year[2]	
		Use per capita (gpcd)	Annual demand (AFY)	Use per capita (gpcd)	Annual demand (AFY)
2010	10,800	129	1,600	141	1,700
2015	11,400	129	1,600	141	1,800
2020	12,000	129	1,700	141	1,900
2025	12,500	129	1,800	141	2,000

[1]Assumes growth of 61equivalent dwelling units/ year, occupancy rate of 91% and 2.04 residents per occupied dwelling.

[2]Annual demands rounded to the nearest 100 AFY.

The City's existing water conservation program has proven effective at reducing water demands as discussed in Section 9. It is recommended that voluntary water conservation levels be continued in normal years, in conformance with Best Management Practices (BMP) for urban water conservation. In drought years, stricter conservation levels could be required to further reduce water demands. However, with new water supplies, it should not be necessary to return to the critical or emergency water supply conditions declared in 1990-1992.

FIGURE ES 3-1
City of Morro Bay
Population Projections Used to Estimate Water Needs



Existing Water Supplies

The City's existing water supplies are currently provided almost entirely by water from the State Water Project. The City of Morro Bay is contractually entitled to 1313 AFY of State Water from the County of San Luis Obispo plus an additional 174 percent drought buffer to ensure reliability when the State Water Project has to reduce overall deliveries during dry years. Other existing sources of water include groundwater and a 400 gpm Desalination Plant. Section 5 provides a summary of the existing water supplies. **Figure ES 5-1** shows the Morro Bay and San Luis Obispo County area and the general locations of key water supply facilities for the City.

Prior to the delivery of State Water, the City relied on groundwater for its primary source of supply. The City's groundwater supply in the Morro basin was previously limited due to potential contamination by MTBE. A minimum flow of 1.4 cfs must be available in Chorro Creek downstream of the City's Chorro wells before the City can pump these wells. The Chorro Basin wells became available again only recently when a temporary instream flow monitoring station became operational. However, one Chorro well was taken out of service and another abandoned because the DHS found that the water from those two wells is under the influence of surface water and will require full treatment before it can be used as dictated by the surface water treatment rule.

In accordance with water right permits, the City can pump up to 1,723.5 acre-feet per year (AFY) of groundwater in normal years, but only 1150 AFY in severe drought years.

The Desalination Plant was constructed as a secondary supply during a drought. The existing desalination plant is capable of producing 645 AFY, but is not currently in regular operation. The plant operated for several months after completion in 1993, but due to high operating costs, plant use was discontinued. In 1995, the California Coastal Commission approved a Local Coastal Plan amendment that allows the City to use the plant as a regular non-emergency water source. The plant was used briefly as a supplemental source of water in 1995; however, raw water quality problems caused the plant to shut down. An iron filtration process has been added as a pretreatment measure and the plant is currently capable of operating continuously for short periods (1-2 months).

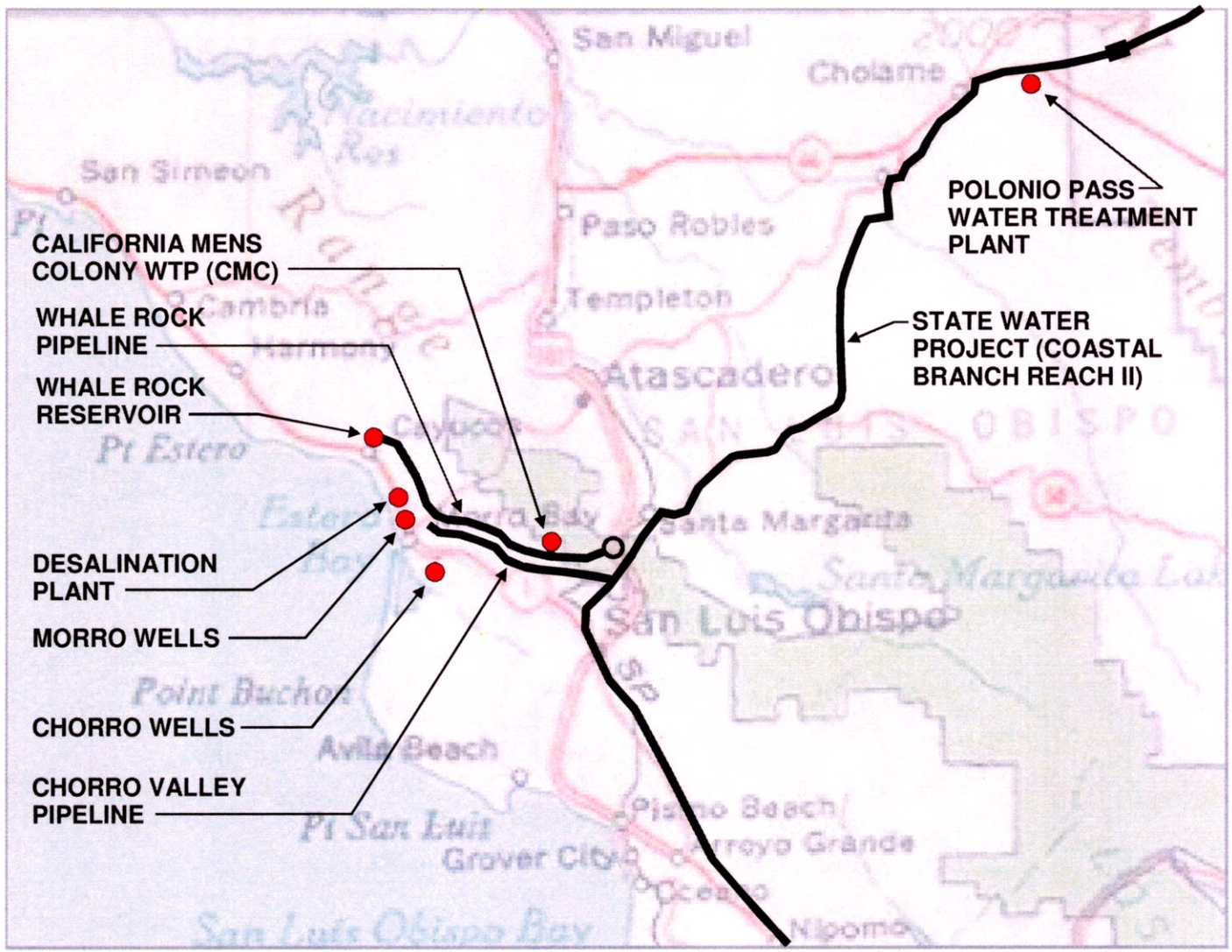


Figure ES 5-1 Existing and Proposed Potential Water Supplies Schematic

Potential Future Water Supplies

Although the total yield from the City's existing water sources (Table ES 8-1) indicates that projected demands through 2025 can be met without expansion or acquisition of additional supplies, potential water sources are examined to ensure adequate supply will be available in the future. Section 6 provides a summary of the City's potential water supplies. Among potential additional water sources studied were the following:

- State Water (including acquisition of existing entitlements in San Luis Obispo and Santa Barbara Counties)
- Expansion of the existing desalination plant
- Replacement well(s)
- Groundwater treatment
- Whale Rock Mutual Aid Agreement for Water Exchange
- Water reclamation
- Additional water conservation

Yields from existing and potential water supplies is summarized in **Table ES 8-1.**

TABLE ES 8-1
Yield of Potential Water Sources

Water Supply Source	Water Supply Yields					
	Nominal Yield (AFY)	Average Yield (AFY)	Average Yield During Critical Drought (AFY)	Yield During Worst Year (AFY)	Yield During Worst Year (%)	Peak Flow (gpm)
Existing Desalination Plant	645	645	645	645	100%	400
Expanded Desalination Plant (800 gpm)	1,290	1,290	1,290	1,290	100%	800
State Water Project with 174% drought buffer	1,313	1,300	1,313	745 / 1,313[g]	57 / 100%[g]	814
CMC/Whale Rock Water Exchange	--	--	--	--		1,180
Morro Wells	581	581	581	581	100%	539
Chorro Wells	1,143	745	456	456	61.2%	1,146
Chorro Wells (with expanded capacity)	1,143	925	566	566	61.2%	1,423
Groundwater Subtotal	**1,724**	**1,326**	**1,037**	**--**	**--**	**1,685**
Groundwater Subtotal (with expanded capacity)	**1,724**	**1,506**	**1,147**	**--**	**--**	**1,962**

Notes:

a) Nominal yield is the potential maximum water production based on production facilities, water rights and a wet year. Average yield is the long-term average over many years, including droughts. The yield during critical drought and yield during the worst year are based on CCWA estimated reliablity for multi year drought and single worst dry year respectively. The peak flow is the design flow capacity in gpm, without downtime.

b) Annual supply capacities of desalination sources are unaffected by drought.

c) Annual yields of the State Water Project based on existing State Water Supply Reports. Peak flow is based on recent data for City's State Water Supply Reports.

d) Nominal capacity of Morro Wells is based on water right permit pumping capacity for Morro Wells.

e) Nominal capacity of Chorro Wells is based on water right permit and is limited by Chorro Creek flow and pumping capacity.

f) A ground water analysis by Cleath & Associates concluded that replacement wells for two abandoned wells should be drilled; new wells would be comparable in yield yet not under the influence of surface water.

g) Single dry year SWP reliability estimated at 4% of contract amount. Future dry year yields (for 2015-2025) based on CCWA projected availability should allow Morro Bay to receive all 1,313 AF on annual entitlement.

Purchasing additional state water entitlement would increase the City's water supply immediately. At this time, however, no entitlements are available for purchase from other communities and local distribution of State Water Project entitlements is at or near the capacity of the existing distribution system.

Expansion of the Desalination Plant would require additional seawater production and adding additional RO trains to the plant. The planned expansion would double the production capacity of the plant.

It may be necessary to provide further blending and/or treatment for the Chorro Basin and possibly Morro Bay well water to meet regulatory requirements for iron, manganese and nitrate concentrations.

Production capacity of the Chorro Basin could be increased by providing full filtration treatment for water from abandoned Well #12 to comply with the Surface Water Treatment Rule (SWTR). Alternatively, replacements wells can be established further from the creek.

An expanded water exchange agreement with the California Men's Colony could enable the City to receive treated water from the CMC water treatment plant during peak demand periods and water shortages. In exchange the City would repay with State Water or other surplus City water during times of low demand. Consequently, there would be no net increase in the City's water supply.

Other options considered include increased conservation, use of recycled water, and constructing a dual irrigation water distribution system.

Water Quality

The treatment and quality of the water available from potential sources that meet the Department of Health Services drinking water standards is a key factor affecting which sources will be the most cost effective and reliable. Section 7 summarizes an evaluation of water quality standards and the blending and water treatment requirements for each existing and potential water supply.

Reliability of Water Supply Alternatives

It is not practical or cost effective for the City to utilize a single water supply source to meet future demands. Each water supply is reliable under certain conditions and unavailable under other conditions. By using the City's varied water sources conjunctively, the City can increase the overall reliability of its water supply and cost effectively ensure that sufficient water will be available during normal, peak demand, and drought conditions. Section 8 provides an assessment of the maximum, average and drought year water yield and reliability for each existing and potential water supply alternative. A series of monthly operational plans for 2010, 2015, 2020 and 2025 suggest how the various water supplies could be used conjunctively to increase the City's overall water supply. The order of use is typically to first use SWP water followed by the Chorro Wells and then the Morro Wells. The desalination plant would be used as needed during peak demand periods and droughts. The final existing water source is the CMC water exchange, although supply from this source is considered a temporary water loan that must be repaid. Typical monthly operating plans for normal rainfall and dry years in 2025 are shown in **Figures ES 8-7** and **ES 8-8**. These show graphically how the water sources conjunctively meet the City's demands.

Figure ES 8-7
Monthly Water Operational Plan - Normal Year - 2025

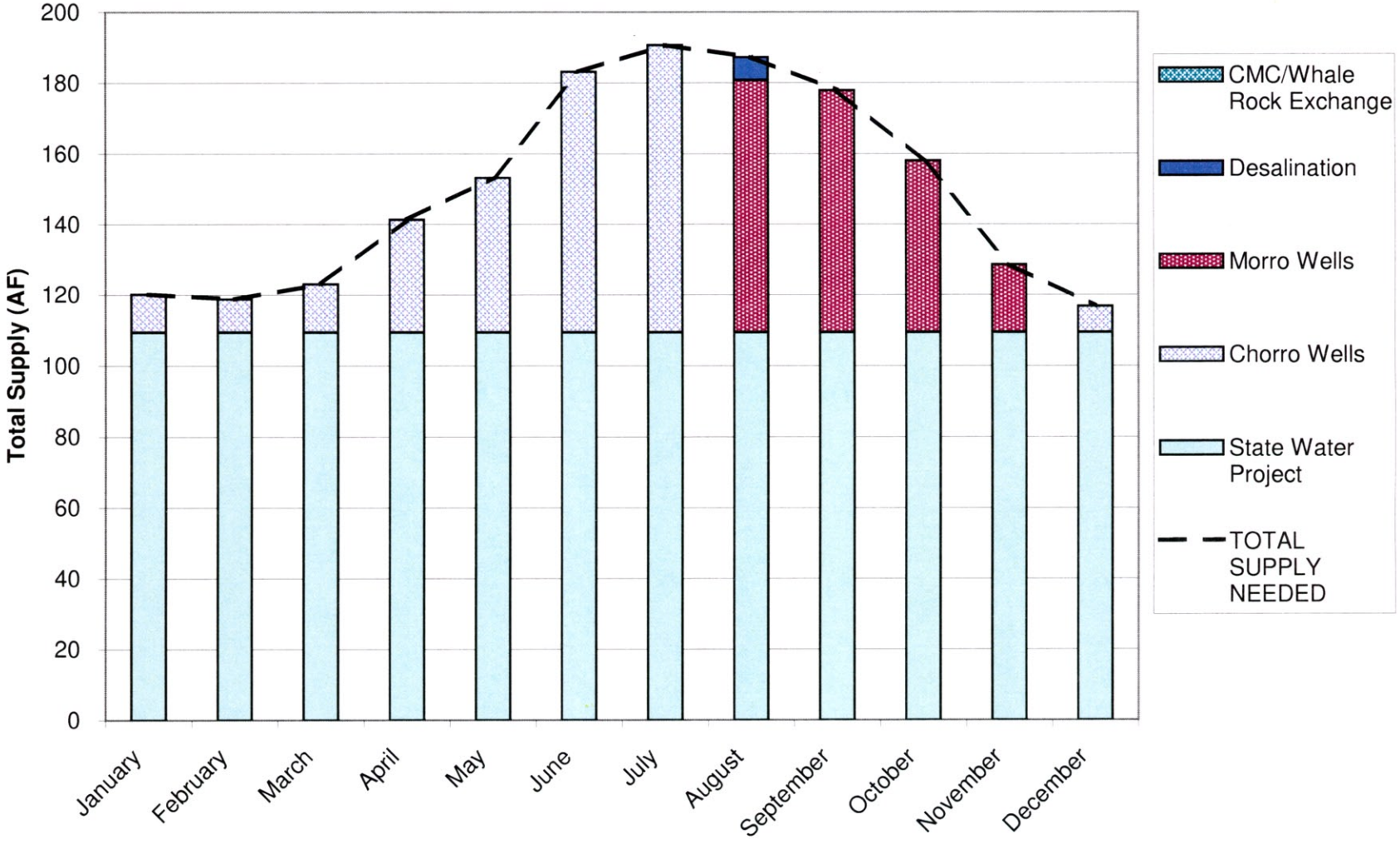
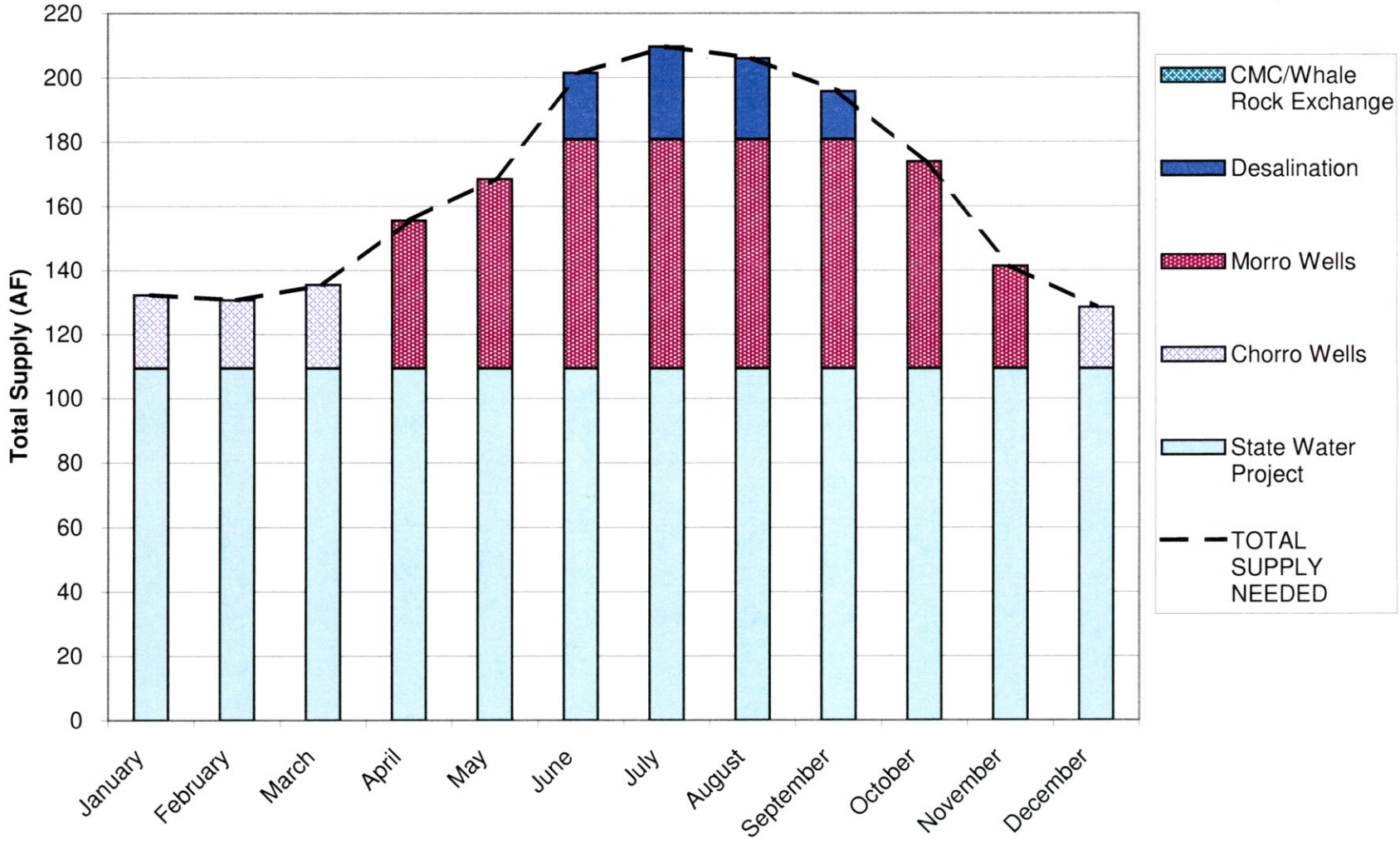


Figure ES 8-8
Monthly Water Operational Plan - Dry Year - 2025



Water Conservation Program Evaluation

The City of Morro Bay currently has in place an effective water conservation program. The result of the program is a per capita water usage that is lower than most of the surrounding communities. Section 9 provides an evaluation and a few suggestions for the City's existing water conservation program.

Water Shortage Contingency Plan

Section 10 provides a summary of the City's water supply contingency plan to meet a water shortage.

Table ES 10-1				
Three-Year Estimated Minimum Water Supply AFY				
Water Supply Sources	**2006**	**2007**	**2008**	**2009**
Morro Wells[1]	581	581	581	581
Chorro Wells[2]	566	566	566	566
State Water Project[3]	1313	1313	1313	1313
Desalination Plant[4]	106	106	106	106
CMC/Whale Rock Exchange[5]	0	0	0	0
Total Available Supply	**2566**	**2566**	**2566**	**2566**
Total Supply Needed[6]	**1641**	**1657**	**1673**	**1689**
Supply Surplus (Shortage)	**925**	**909**	**893**	**877**

1. Assumes that full water right supply from Morro Basin will be available during normal years and that DHS water quality standards will be met. For 3-year minimum supply assumes 581 AFY for drought periods, as described in Section 5.

2. Current wells have nominal capacity of 1148 gpm or 1.65 MGD. Assumes that Chorro Creek in stream minimum flow requirement of 1.4 cfs will be met from Dec 16 to July 15 during a normal year and Dec 16 to March 15 during a drought years. Assume SWP maintenance shutdown will occur during fall when Chorro wells are not available.

3. Assumes that with the City's 174% drought buffer and the County's unallocated entitlement, the City will be able to receive its full entitlement 100% of the time at least through 2009.

4. Assumes that without additional pretreatment facilities, the seawater desalination plant will only operate during a short, 1-2 month, severe water shortage emergency. Permanent desalination plant improvements could be in place by 2008 to provide enhanced pretreatment and possibly reduce plant operating costs.

5. Assumes that up to 1.7 MGD CMC/Whale Rock Exchange water will be available through Mutual Aide agreement. Limited to 1.4 MGD until pumping capacity is increased. This water is on loan, so it must be repaid with SWP or other Morro Bay water in exchange. No additional net water supply is provided. Assumes CMC water is unavailable during critical drought period.

6. Dry year demand projections for 2006 through 2009.

1.0 Introduction

1.1 Purpose

The primary purpose of the 2005 Urban Water Management Plan is to provide the City of Morro Bay with the information and recommendations necessary to develop a long-term plan for developing a reliable, environmentally sensitive, and economical water supply. This report serves as the Urban Water Management Plan which is to be submitted to the Department of Water Resources every five (5) years. As required by SB 672 and AB 901 additional UWMP requirements, the report addresses using local water resources in conjunction with imported State Water Project (SWP) water as well as the water quality and treatment requirements for each water source.

Available water supply alternatives have been compared using various criteria. A recommended implementation plan is presented along with a conjunctive use plan to cost effectively provide a high-quality water supply which is reliable during normal and drought conditions, and when the SWP or other water sources are unavailable.

The City of Morro Bay has enjoyed the benefits and security associated with the use of multiple water sources. Between 1989 and 2002, the Morro Bay water supply was significantly hampered due to the impacts of an extended drought, MTBE contamination of groundwater supplies (Morro Wells), increasing environmental restrictions (Chorro Wells), and the ever-tightening water quality regulations as enforced by the Department of Health Services. Those manifestations forced the City to completely rely upon the State Water Project (SWP) and the integrity of the Chorro Valley pipeline as the sole means to provide water to the City of Morro Bay for several years.

In 2001 and 2002, the City developed additional water sources to supplement their SWP entitlement. For the October/November 2001 scheduled 30-day outage of the State Water Project, the City was able to arrange for several emergency water supplies. They are:

1) SWP water made available by the Central Coast Water Authority (CCWA) to only Morro Bay during the SWP shutdown;

2) Chorro Basin well water that became available again when a temporary Chorro Creek flow monitoring station became operable;

3) Groundwater from the non-potable Flippo's irrigation well in the Morro Basin; and

4) Water obtained through a mutual aide agreement with the California Men's Colony (CMC) such that treated water from the CMC water treatment plant would be available through a new interdistrict connection while the SWP was out of service.

In 2002, treatment of the Morro Wells for MTBE contamination and a November outage of the State Water pipeline resulted in a short-term need for water. This demand was partially met by the renovated desalination plant and temporary pretreatment facilities.

This same mix of water supplies may or may not be available during a future water shortage. Additional water supplies may be needed to serve the City during peak demand periods, during droughts and as the community builds out.

1.2 Background

Several reports pertaining to water management were prepared for the City before the start of the 1987-1992 drought. The February 1981 *Preliminary Water Management Plan* for the City of Morro Bay concluded that groundwater would be adequate to meet projected demands through the year 2000. A September 1982 *Morro Bay Area Water Management Plan* by the California Department of Water Resources (DWR) also found that projected groundwater use in 2000 would not exceed the amount that the local groundwater basins can yield. DWR recommended that a proper placement and number of wells could correct the City's water supply problems.

Until that time, the City had used groundwater to meet all of its municipal and industrial water needs. However, a drought became evident in 1989. As the drought continued into 1990, groundwater levels declined and groundwater quality deteriorated. A voluntary water conservation program was implemented in 1990, followed in that same year by mandatory water conservation measures. In 1990, the City rented a reverse osmosis (RO) treatment unit for treatment of brackish water wells to remove salts and allow blending with the other wells. As groundwater supplies dwindled, conservation levels were increased. In 1991 the City Council declared a "Level 5" emergency water supply condition and began construction of an emergency seawater desalination plant. Various permits were obtained for the construction and operation of the plant; however, the original permits authorized the facility to be used only during a declared emergency.

By 1992, several of the City's wells had been shut down because of declining water levels and deteriorating water quality. In 1992 all of the Morro Basin wells were shut down in order to "relax" the aquifer and prevent further seawater intrusion. Construction of the 400-gpm seawater desalination plant was completed for testing in September 1992 and total completion was in June 1993. Fortunately, heavy rains in the winter of 1992-93 raised water levels in the groundwater basins, ending the declared emergency. The desalination plant was then taken out of service after having produced only 11 acre-feet (AF) of water from brackish wells. No seawater was desalinated. An Environmental Impact Report (EIR) for the plant was certified in April 1993 and in 1994 the California Coastal Commission adopted the 94-1 amendment to the City of Morro Bay's Local Coastal Plan. Amendment LCP 94-1 permits the discretional use of the desalination facilities by the City such that the "City can utilize all of its water supply options without declaring a water emergency." The desalination plant can now be used "as needed to ensure that the City's minimum water quality standards are met, as routine replacement, and to offset drought conditions."

Since 1995, the desalination plant was not operated because high iron concentrations in the raw water caused rapid fouling of the pretreatment system. The plant was returned to active service (on a temporary basis) to operate during November 2002 and is currently used to offset season peak demands and for replacement of supply water, as needed.

The counties of Santa Barbara and San Luis Obispo have entitlements to 45,486 and 25,000 AFY of water from the SWP, respectively. The Coastal Branch II Aqueduct, a pipeline that passes through the City of San Luis Obispo, was completed in 1996 and transmits State Water to San Luis Obispo and Santa Barbara Counties. In 1991, due to continuing water supply problems, residents of the City voted to receive 1,313 AFY of State Water with a 100 percent drought buffer. This drought buffer was increased to 174 percent in 2002. The acquired State Water is conveyed from the Coastal Branch II Aqueduct to the City through the Chorro Valley Pipeline, which is routed along the Chorro Valley to Morro Bay.

In 1995 the State Water Resources Control Board (SWRCB) approved water right permits for the City's Morro Basin and Chorro Basin well fields. In the past the City has had to stop using its groundwater resources in both well fields. As a condition of the Chorro Basin water right, the City must install permanent stream inflow monitoring equipment to ensure a minimum stream flow of 1.4 cfs. In the fall of 2000 the new monitoring station was washed out in a storm. Since then, a temporary replacement monitoring station was installed so the City could make use of the Chorro Wells. A permanent flow monitoring station will be located and installed in the near future in coordination with the SWRCB and the California Fish and Game Department.

The Department of Health Services (DHS) identified two of the Chorro Basin wells as being under the influence of Chorro Creek surface water (Wells No. 8 and 12). Subsequently DHS issued a compliance order to the City, requiring filtration to meet the Surface Water Treatment Rule (SWTR) requirements. The City has taken both of wells cited by DHS out-of-service. Well No. 8 was abandoned when the City terminated its lease on the well.

The Morro wells were taken out of service in 2000 after the SWRCB issued an order forbidding the City to use the wells because an underground fuel storage tank leaked and had contaminated the Morro groundwater basin in the vicinity of the Morro Wells with MTBE. The responsible service station owner, Shell Oil, is nearly finished cleaning up the MTBE contamination.

This Urban Water Management Plan summarizes and evaluates existing water supplies and supply alternatives the City of Morro Bay is pursing to develop the water sources necessary for a reliable and high quality future water supply.

1.3 Scope of the Study

The Scope of Work for preparation of this Water Management Plan includes the following major tasks:

Project Future Population Growth

- Review land uses changes to the General Plan/Local Coastal Plan. Adjust future population forecasts based on the 2000 Census population estimates, growth limitations established by Measure F, and 2000 – 2005 data.

Project Future Water Demand

- Project average year and drought year per capita water demands.
- Forecast City's future water demand for 2010, 2015, 2020, and 2025.
- Summarize and evaluate trends in unaccounted for water uses and water losses during the last ten years.

Evaluate Current and Future Water Supplies

- For each of the City's existing water supplies, describe the water source characteristics, production facilities, historical production and reliability.
- Project the short-term (three years) and long-term quantity and reliability of water that will be available from each source.
- Provide overview of the future water supply alternatives.
- For future water sources, project the expected yield during wet, normal and dry years and during a critical drought.

Compare Future Water Supply and Demand

- Compare future water demand forecast and existing available water supplies and identify water supply needed to increase total annual supply, provide monthly peaking water production capacity and supplement existing water supplies during drought periods and other emergencies.
- Define the conjunctive use operating criteria for using the potential City water supplies.

Evaluate Water Treatment Requirements

- Summarize how applicable State and federal water quality and water treatment requirements may affect City water sources.

Evaluate City Water Conservation Program

- Summarize City's evaluation of the 14 Water Conservation Best Management Practices defined in the Memorandum to Understanding Regarding Urban Water Conservation in California (MOU) that is signed by the State Water Contractors.

Recommend Water Storage Contingency Plan

- Recommend a Water Shortage Contingency Plan to meet water demand during the next three years using a combination of available and potential water supplies and water conservation measures.
- Summarize information provided by the City on the potential impact that a water shortage could have on the water enterprise fund and the City's financial strategy to offset those impacts.

Water Quality Standards

This Water Management Plan recognizes that more stringent and costly water quality standards for public health are affecting the continued reliability and cost of the State's water supplies. Morro Bay experienced this with the

listing of Wells #8 and #12 (Well #8 has since been abandoned) as being under the influence of surface waters. Morro Bay, as with other purveyors throughout the State, will need to respond to changing quality standards as they are adopted by the DHS. The impacts may result in a reprioritization of water supply options for the City and an increase in the cost to treat and deliver potable water.

Water Conservation

Regarding demand management, this Urban Water Management Plan calls for the water conservation measures, known as BMP's, to reduce annual urban water demand. Morro Bay, as a State Water Subcontractor, has adopted the implementation of water conservation measures as part of the City's Urban Water Management Plan. An evaluation of the effectiveness of the implemented measures is included in the body of the text.

Water Supply Alternatives

This report identifies several alternatives for supply augmentation. These alternatives include:

- Continued water conservation
- Water recycling
- Groundwater blending, treatment and/or filtration
- Potential use of non-potable groundwater for irrigation
- Purchase of additional State Water entitlement from San Luis Obispo or Santa Barbara County purveyors
- Upgrade of desalination facility to provide increased system reliability and/or additional supply
- Water exchanges with adjacent purveyors
- Utilization of multiple sources to increase overall system reliability

Each of the above alternatives is discussed and analyzed within the body of this report.

2.0 Study Area Characteristics and Land Use

2.1 Extent of Study Area

The City's water supplies are affected by water use and wastewater discharges within the drainage areas of Morro Creek and Chorro Creek. The combined watershed covers approximately 44,000 acres, and defines the study area considered in this report. Although the watershed is mostly outside the City limits, water demands, precipitation, creek flows, and wastewater discharges in that area affect the amount of groundwater available to the City. The watershed area also roughly corresponds to the "sphere of influence" adopted by the Local Agency Formation Commission (LAFCO). The study area is shown in detail on **Figure 2-1** which also shows the various planning boundaries including the City limits, the Coastal Plan boundary, and the LAFCO sphere of influence and service.

2.2 Physical Environment

Topography and Geography

The topography of the study area is generally hilly to mountainous, with development and agriculture concentrated on the coastal plain and valleys. Slopes are steeper than 20 percent and up to 50 percent for much of the area, with the estuarine and valley areas being less than 20 percent.

The northeast and southeast boundaries of the study area are defined by the Santa Lucia Mountain Range. A series of ancient volcanic peaks named Park Ridge forms the southwest boundary. Elevations range from sea level to 2,624 feet at Cerro Alto peak. The lower areas are mainly grasslands while the higher terrain is covered with chaparral.

The topography of the region serves to limit development to the coastal plain and valleys. Surrounding mountains and the ocean will ultimately restrict the expansion of the City.

Geology

The coastal range in the area of Morro Bay is dominated by the Franciscan Formation, formed primarily of metamorphic rock. The southern side of the area is composed of the Islay Hill - Morro Rock complex, which is an 18-mile long series of Oligocene volcanic rocks that have pierced through the Franciscan Formation. Overlaying the bedrock within much of Morro Bay are the bay muds and alluvia of Morro Creek and Estero Bay which are comprised of unconsolidated sedimentary deposits and fine grain sediments.

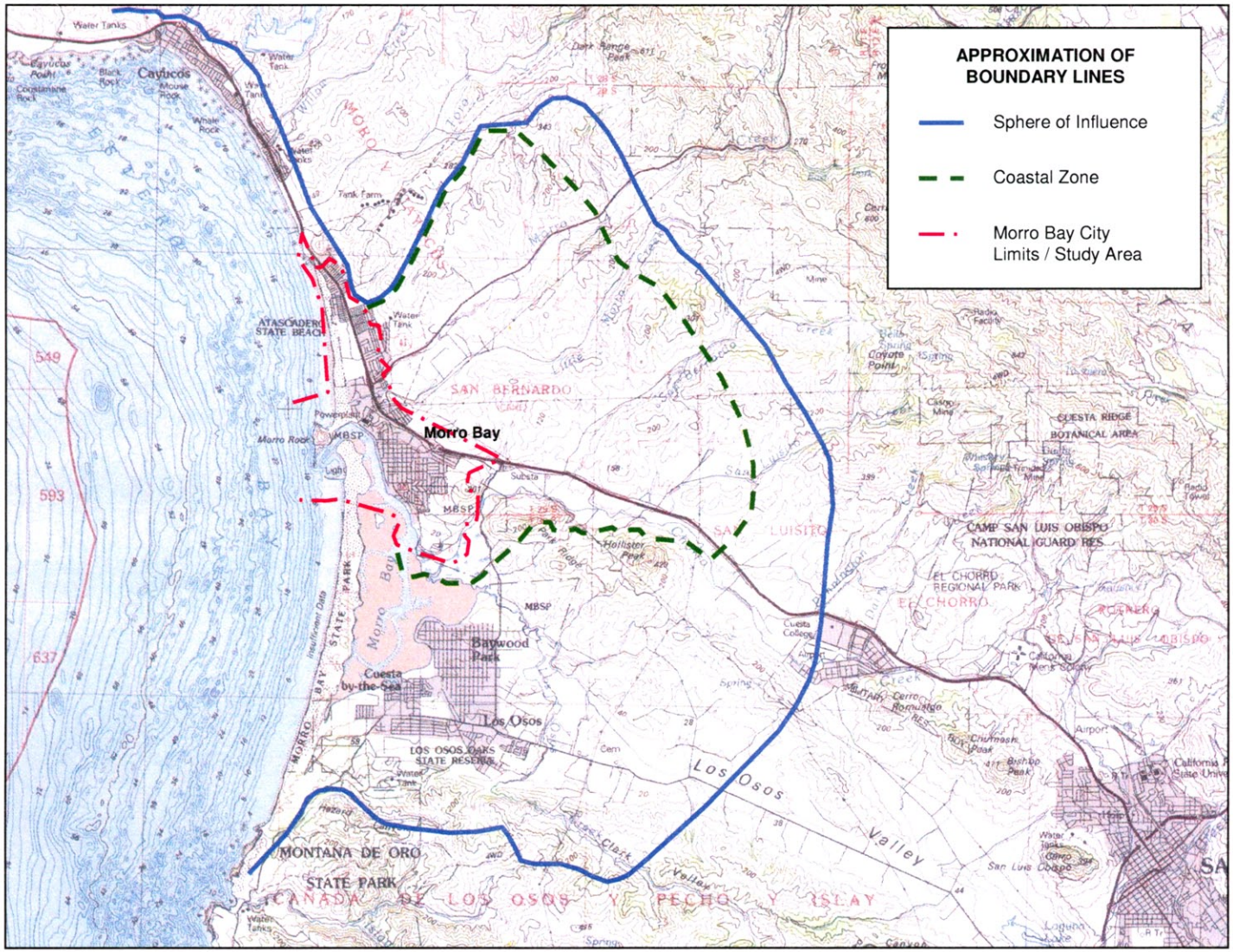


Figure 2-1 Morro Bay Urban Water Management Plan Vicinity Map

The alluvium in the Morro and Chorro Valleys contains sand and gravel, which provide groundwater storage in the aquifers.

Soils

Soils in the area consist of loamy sands, sandy loam, clays, clay loam, and silty clay loam. The alluvial water bearing deposits are generally capped by 20 to 50 feet of clay. The soils in the valleys are suitable for agriculture, affecting the demands for groundwater.

Climate

The City of Morro Bay has a mild Mediterranean type of climate, influenced by its proximity to the ocean. Cool breezes from the ocean keep peak summer temperatures below levels typically seen in inland communities. As a result, irrigation water demands in Morro Bay exhibit less seasonal fluctuations than occur inland. Reduced seasonal fluctuations in water demands benefits the City's water planning. Average evapotranspiration, precipitation and temperature data are listed in Table 2-1.

Table 2-1
Climate Data

Month	Standard Average Eto (in)	Average Precipitation (in)	Average Temperature (F)
Jan	1.97	3.1	50.5
Feb	2.31	3.6	51.9
Mar	3.76	1.8	53.9
Apr	4.52	0.6	52.7
May	5.86	0.6	56.5
Jun	5.97	0.0	58.1
Jul	6.00	0.0	59.9
Aug	5.41	0.0	59.9
Sep	4.60	0.0	60.2
Oct	3.52	1.1	57.9
Nov	2.44	1.5	54.4
Dec	2.00	2.5	51.8

Source: California Irrigation Management Information System 2000-2005 data.

Morro Bay Estuary

In 1994, the Governor established Morro Bay as California's first State Estuary. The Morro Bay National Estuary Program (MBNEP) is one of 28 national programs that combine governmental and private efforts to protect this important coastal area. The Comprehensive Conservation and Management Plan (CCMP) calls for actions in several areas including water quality, habitat protection, and public education.

2.3 Area Economy

General Economic Conditions

The economy of Morro Bay is primarily oriented toward tourism and recreational activities. In addition, it is a desirable place to retire. Census 2000 data shows that 35 percent of the population is over the age of 55 and that there are 2.04 people per household. In accordance with the City's reliance on tourism, about 20 percent of the City's residences are vacant or used as seasonal second residences. Agriculture also plays a significant role in the local economy.

Recreation

Morro Bay has a wide array of recreational opportunities, which include fishing, surfing, hiking, bird and sea life watching, sightseeing, boating, golf, and beach activities. There are facilities for boating and camping. The City has several parks within its boundaries including a portion of the 2102-acre Morro Bay State Park with camping facilities for 135 units, an 18-hole golf course, a museum and a marina. Morro Strand State Beach provides 104 campsites within the 75-acre public beach area. Tidelands Park provides boat-launching facilities for fishing and sailing. Morro Rock and Coleman Park provide sightseeing and beach access for sunbathing and surfing. The City has two smaller parks which include picnic areas, lawns and courts for sports activities, and playgrounds. The Embarcadero provides visitors with many shops, restaurants, and fish markets. Sport fishing, whale watching, and sightseeing trips are also available on charter boats.

Harbor Resources

A number of coastal dependent industries such as commercial and recreational fishing and boating related services are present in the City. Coastal dependent industries have been decreasing over a number of years. However, the City has been taking active steps to ensure that a viable industrial base is maintained. Such steps are outlined in the *Waterfront Master Plan*, and the *Seafood Processing Industry Study and Economic Development Planning Report.* The City recognizes that coastal dependent industries are important to its character and to the tourism industry.

Agriculture

Part of the study area is utilized for agriculture. This area consists of irrigated and dry land farm crops, predominantly in the valleys where slopes are flatter. Steeper farmland is used for grazing of cattle. In recent years, steeper lands have increasingly been planted as orchards and vineyards.

Dry land farming crops include grains, field corn, hay, and garbanzo beans. Irrigated farmland is used for both rotational and permanent crops. Rotational crops include peas, cauliflower, lettuce, and celery. Permanent crops include orchards of citrus and avocados, and vineyards, although some exotic fruits are also grown.

Transportation

The City of Morro Bay lies along Highway 1, a major north-south coastal roadway. There is no railroad passing through the City. Neither are there significant port facilities for transportation or trade, except for marine terminals for petroleum products. To enhance Morro Bay as a tourist destination, the City operates a trolley service, completed a bikeway plan, and had Highway 1 through the City designated as a scenic highway.

3.0 Population Within the City of Morro Bay

3.1 Historic Population

The population and water demand projections in this study consider 2005 as the base year, as water demands and land uses in 2005 are available. The 2005 population of the City is estimated to be 10,270 people, as provided by the City of Morro Bay. The historic population of the City is provided in Table 3-1. Population estimates for the years prior to and after the 2000 census were provided by the City.

"Occupancy" in Morro Bay includes two categories of population: permanent residents and seasonal occupants. Permanent residents include homeowners or renters who have their primary residence in the City. Seasonal occupants include vacationers and owners of vacation or secondary homes in the City.

Due to the importance of tourism and retirement lifestyles to Morro Bay, average annual occupancy rates for dwellings have been historically low, around 80 percent. There is also a seasonal component to population in the City, with a higher population in the summer.

TABLE 3-1
Historic Population and Water Demands in the City of Morro Bay

Year	City Population	Total Production (acre-ft)	Average Annual Per Capita Demand (gpcd)
1960	5,599	894	143
1961	---	842	---
1962	---	999	---
1963	---	840	---
1964	---	881	---
1965	6,400	1,000	139
1966	6,500	1,188	163
1967	6,600	1,194	161
1968	6,750	1,298	172
1969	6,900	1,255	162
1970	7,109	1,534	193
1971	7,450	1,533	184
1972	7,514	1,547	184
1973	7,725	1,424	165
1974	7,942	1,482	167
1975	8,165	1,510	165
1976	8,394	1,574	167
1977	8,525	1,249	131
1978	8,625	1,430	148
1979	9,150	1,614	157
1980	9,064	1,651	163
1981	9,206	1,727	167
1982	9,277	1,586	153
1983	9,436	1,534	145
1984	9,599	1,669	155
1985	9,747	1,691	155
1986	9,881	1,614	146
1987	9,825	1,655	150
1988	9,975	1,648	147
1989	10,133	1,559	137
1990	9,664	1,527	141
1991	9,806	1,256	114
1992	9,736	1,319	121
1993	9,979	1,391	124
1994	10,071	1,414	125
1995	9,518	1,418	133
1996	9,687	1,501	138
1997	9,696	1,535	141
1998	9,845	1,326	120
1999	9,871	1,393	126
2000	10,350	1,400	121
2001	10,486	1,410	120
2002	10,510	1,454	123
2003	10,485	1,421	113
2004	10,522	1,477	125
2005	10,270	1,361	118

Production from the City's water system; does not include private wells.

3.2 Population Projections by Others

A number of population projections for Morro Bay have been provided in previous studies, as shown in Table 3-2. Therefore, population projections were developed for this study as discussed herein and were only developed for the purposes of estimating future water demands. Although the year 2025 now represents a reasonable planning horizon, few studies have projected population as far head as 2010.

TABLE 3-2
Morro Bay Population Projections from Previous Studies

Source and Date	2000	Build-out	2010
Census 2000	10,350	- -	- -
Morro Bay General Plan (1994)	12,195	13,500	- -
Water Management Plan - Boyle (1994)	12,200	- -	14,700
City of Morro Bay, 1992 Annual Water Report			
Based on Measure F	12,196	- -	- -
Based on existing vacancy rates	10,970	- -	- -
1993 Desalination Plant EIR	12,195	13,940	- -
SLO County Land Use Element and Local Coastal Plan - Estero Planning Area (1988)	13,047	- -	- -
SLO County General Plan (1989)	12,518	12,200	14,350
Brown & Caldwell (1981)	12,200	- -	- -
John Carollo Engineers (1978)	16,500	- -	- -

3.3 Measure F

While some or all conditions of Measure F may have lapsed, the requirements are included herein for reference. Measure F, a resource management initiative, was approved by the voters in Morro Bay in 1984 to limit new construction. As a result, City Ordinance No. 266 (see Appendix A) was adopted by the City Council to implement the measure, including provisions to administer and monitor the allocation system for all new development and construction. The major features of the ordinance are summarized below:

- The ordinance provides for a population growth from 9,600 up to 12,200 by the year 2000. As of 2000 the Morro Bay population reached 10,350 residents.
- Development is subject to availability of water resources both in quantity and quality, through the adoption of a Water Management Plan.
- If water and wastewater treatment capacities become available, the measure allows for population increases beyond 12,200. Changes to the growth management procedures require a majority vote.
- Residential building permits are limited to 70 units/year. This may be increased or decreased by 10 percent to achieve the annual growth target.
- Commercial and industrial building permits issued shall not require more than 130 percent of the water allocated for residential units that year.
- Residential building permit approvals will follow priorities set by the Coastal Act.
- Only development proposals which meet the definition of infill will be approved (infill areas have streets, utilities etc. currently adjacent to the property).
- Existing open space and agricultural land within the City can only be rezoned by majority vote and approval of Coastal Commission.
- Public facilities are exempt.

There is a minor inconsistency within Measure F. At the historical number of people per inhabited dwelling unit (2.1), and at the historic occupancy rate of 80 percent, the maximum 77 new dwelling units per year resulted in a population of fewer than 12,200 people in 2000.

According to the last census the 2000 population for the City of Morro Bay was 10,350 people. Census 2000 also reported a density of 2.04 people per inhabited dwelling unit and an occupancy rate of 79.8 percent. The 2000 population was lower than the Measure F limit because the average household size has dropped and the occupancy rate continues to be low. The population also reflects development at less than the 77 units/year allowed by Measure F. If the 2000 occupancy rate were 94 percent, the Measure F population limit would have been reached according to the number of housing units and the persons per inhabited unit reported with the

Census 2000 data. Since the City can directly control development of new housing units but not the number of people living in them, the provisions of Measure F are well suited to its purpose.

3.4 Population Projections for Water Demand Projections

For population projections, 2000 Census data were used to determine both the residential occupancy rate for Morro Bay (the fraction of occupied dwellings to total dwellings) and the average number of persons per *inhabited* dwelling. Using these values and the average number of dwelling units allocated each year by the city of Morro Bay for residential development, population increase was projected over the next twenty years. This population forecast is based on assumptions regarding future conformance with the General Plan, household size, the economy and numerous other short-term and long-term factors that can influence a community's rate of growth.

Similarly, population projections were made assuming increase residential occupancy rates to San Luis Obispo County's average residential occupancy rate (91% based on 2000 Census data) and a maximum residential occupancy rate (100%) for the next twenty years. As developable areas within the City diminish, occupancy rates, especially for newly developed residences, are likely to increase from Morro Bay's relatively low residential occupancy rate. Projections with these increased occupancy rates allow forecasting of a range of future populations dependent on possible future growth trends (Figure 3-1).

Population limits were projected based on general planning limits and the conditions of Measure F, which limit residential building permits to 70 permits per year, and set a population limit of 12,200. If the occupancy rate for new homes is the same as the present rate, the "build-out" population, in keeping with the General Plan and Measure F limitations, will be only 12,200. However, if occupancy rates increase in the future, due to demographic or economic trends, population limits could be as high as 14,200 with 100 percent occupancy in all dwellings (Table 3-3). These estimates of population limitations included in this report are considered likely if present development patterns and demographic trends continue.

TABLE 3-3
Estimated Population Range in Morro Bay

Present Population (2000 Census)	10,350
In Group Quarters	198
In Households	10,152
Total Housing Units (2000 Census)	6,251
Occupied Housing Units (2000 Census)	4,986
Average Number of Persons per Occupied Dwelling (2000 Census)	2.04
Additional Residences at Build-out	622
Potential Population Limits (Measure F)	
Present Occupancy Rates (80%)	11,400
SLO County Occupancy Rate (91%)	12,900
100% Occupancy of All Dwellings	14,200

As shown in Table 3-3, a large range in population could occur within current city planning limits, depending on occupancy rates and other factors. For the purposes of this study, it is assumed that population would continue to grow at an average rate of 61 residential units per year (based on the average number of Equivalent Development Units (EDUs) allocated each year between 2000 and 2004). At that rate of residential development allocation and the current occupancy rate, a population of 12,900 would occur in 2031. However, if the occupancy rate increases to match the current average occupancy rate of San Luis Obispo County (91 percent), the population would reach 12,900 in 2028.

The population projections used as a basis for estimating future water demand in this report assume an increased occupancy rate equal to that of San Luis Obispo County. It is also assumed that "buildout" (in terms of this report) would occur when the City population reaches 12,900 people (91 percent occupancy of the 6873 developed/developable lots in the City, as listed in Table 3-3). Population growth rates are expected to plateau as developable area within the City diminishes. Therefore, "buildout" would occur after the end of the 20-year planning horizon. These results are summarized below in Table 3-4.

TABLE 3-4
Projected Population in Morro Bay for Estimation of Water Needs

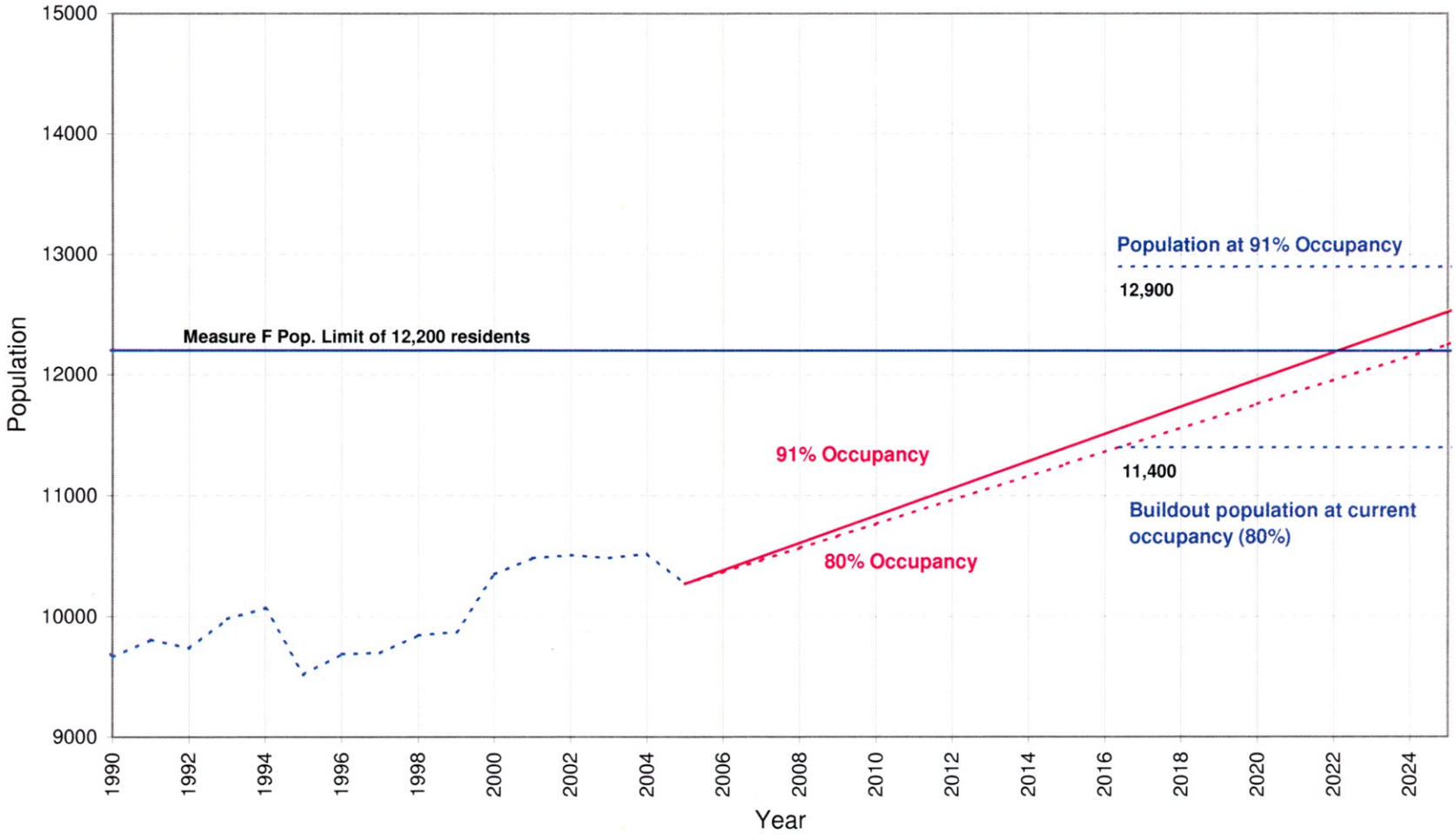
Year	At current Morro bay occupancy rate (80%)	At current SLO County occupancy rate (91%)
2010	10,800	10,800
2015	11,300	11,400
2020	11,800	12,000
2025	12,300	12,500

Assuming continued housing allocations at average allocation rate of 61.2 EDUs per year.

The projected population is shown relative to historic population in Figure 3-1.

In some respects, the population projections in Table 3-4 may be greater than growth that will occur. Using an occupancy rate of 91 percent results in conservative estimates of future water demand, because the historical occupancy rate has been much lower. Considering the 50-year or greater design life of water supply projects such as the SWP, it is appropriate to be conservative for planning purposes.

FIGURE 3-1
City of Morro Bay
Population Projections Used to Estimate Water Needs



4.0 Water Demands in Morro Bay

4.1 Historical Water Use

Historical water production and per-capita water production within the City of Morro Bay are summarized in Table 3-1. The water production (or *use*) includes losses in the City's system and unaccounted for water use.

4.2 Estimated Future Per Capita Water Use and Water Conservation

To develop per capita water demands for forecasting future water demand, an evaluation was made of the City's historic water use, the effect of year-to-year weather variations and likely water conservation levels that will be sustained and possibly improved in the future.

During the severe drought of the early 1990s, the City implemented a mandatory water conservation program. Low per capita water demand in 1990 (Table 3-1) demonstrates the effectiveness of the mandatory water conservation program. After the drought, the mandatory severe drought-level water conservation requirements were replaced by ongoing water conservation programs as described in Section 9.

Before the City's water conservation program was initiated, water demand ranged between 139 and 193 gallons per capita per day (gpcd). The average per capita demand during the 10-year period preceding the drought (1978-1987) was 154 gpcd. Based on levels of water conservation since the drought in the early 1990's and consistent with water conservation Best Management Practices (BMPs), the per capita water use factors shown in Table 4-1 were selected as being most representative of future water demands for planning purposes.

Shown in Table 3-1, per capita water demand declines in wet years such as 1998 with high rainfall totals and increases in dry years such as 1997 when higher irrigation rates are required to sustain crops and gardens. During the 1992 to 2005 period, after the City's water conservation program was implemented, the maximum water demand was 141 gallons per capita per day (gpcd). Since the major drought of the early 1990s ended, the maximum seven-year average water demand has been 129 gpcd. As summarized in Table 4-1, these two historic water demands are used in this report as the per capita water demands for future water demand forecasts: 129 gpcd for "normal" rainfall years and 141 gpcd for "dry" years.

Table 4-1
Water Use Factors Used for Demand Projections

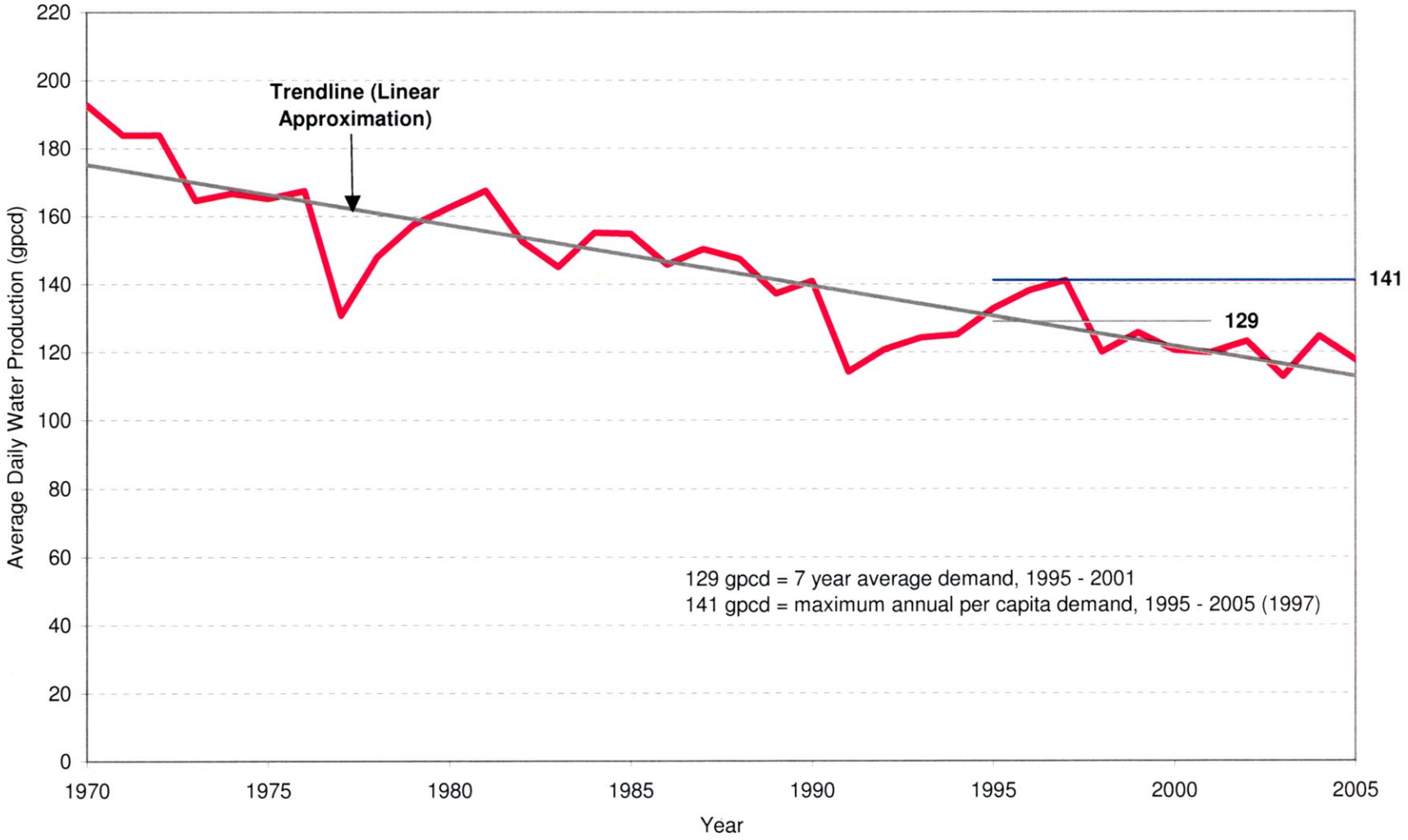
Conditions	Average Annual Gross Per Capita Demand (gpcd)	Description
Dry	141	Dry year demand level resulting from higher irrigation requirements during warmer and/ or dryer years. Assumes voluntary water conservation equivalent to Best Management Practices without mandatory water rationing.
Normal	129	Normal demand level resulting from voluntary water conservation equivalent to Best Management Practices, without mandatory water rationing.

Includes residential, commercial and industrial demand as well as water losses in City's distribution system.

In Figure 4-1, per capita water use factors used for planning are compared to historic use occurring in Morro Bay. Although lower per capita water use during dry periods is feasible, and was achieved during the early 1990's drought, lower use factors are not the basis for long term planning. More stringent conservation measures are available for emergencies and unforeseen events impacting supply.

One of the reasons that Morro Bay has such a low per capita water consumption is that many of the water conservation measures implemented during the drought, such as plumbing retrofits and prohibitions against wasting irrigation water, continue to be of benefit.

FIGURE 4-1
City of Morro Bay
Historic Per Capita Water Production



Another reason that Morro Bay has low water consumption rates is the high cost of water in Morro Bay. Major new water facilities, such as the seawater desalination plant and the State Water connection, have increased the cost of water considerably. Morro Bay has implemented a tiered water rate structure that encourages water customers to limit their water consumption.

For planning purposes, it is assumed that future water conservation practices will be implemented to a level consistent with voluntary compliance with the 14 Water Conservation Best Management Practices (BMPs) set forth in the September 1991 *Memorandum of Understanding Regarding Urban Water Conservation in California* and modified by the state legislature in 2000 with AB 2552. With this level of water conservation, mandatory water rationing would not be imposed during "normal" or "dry" year water supply conditions. However, during severe drought conditions, it may be necessary for the City to impose temporary measures more strict than the voluntary BMP levels. A more complete description of Morro Bay's Water Conservation Program and the temporary mandatory water conservation ordinances that would go into effect during a severe drought are described in Section 9.0.

4.4 Water Losses and Unaccounted For Use

The City of Morro Bay has historically had high water losses resulting from pipeline leakage and unaccounted for use. Historic water losses in the City are summarized in Table 4-2. The City's extensive pipeline replacement program has recently reduced pipeline losses. To further reduce water losses, the City continues the following actions:

- Continue to promptly repair identified water leaks.
- Monitor water consumption versus production by water pressure zone so that the water loss for each zone can be identified.
- Calibrate water meters periodically.
- Require that all water users, including contractors and the fire department, use permanent or temporary water meters for all connections to the water system.

TABLE 4-2
Unaccounted for Water Losses in the City's Water System

Year	Water Lost (percent of production)
1985	12.2%
1986	13.1%
1987	11.4%
1988	11.2%
1989	10.9%
1990	15.2%
1991	16.7%
1992	16.3%
1993	15.3%
1994	13.2%
1995	13.0%
1996	13.2%
1997	15.6%
1998	13.4%
1999	13.7%
2000	11.9%
2001	9.2%
2002	11.1%
2003	9.7%
2004	13.4%
2005	8.8%
Median:	13.1%

Statewide unaccounted for water loss in municipal systems varies between 1 to 20 percent. The median is 10 to 15 percent.

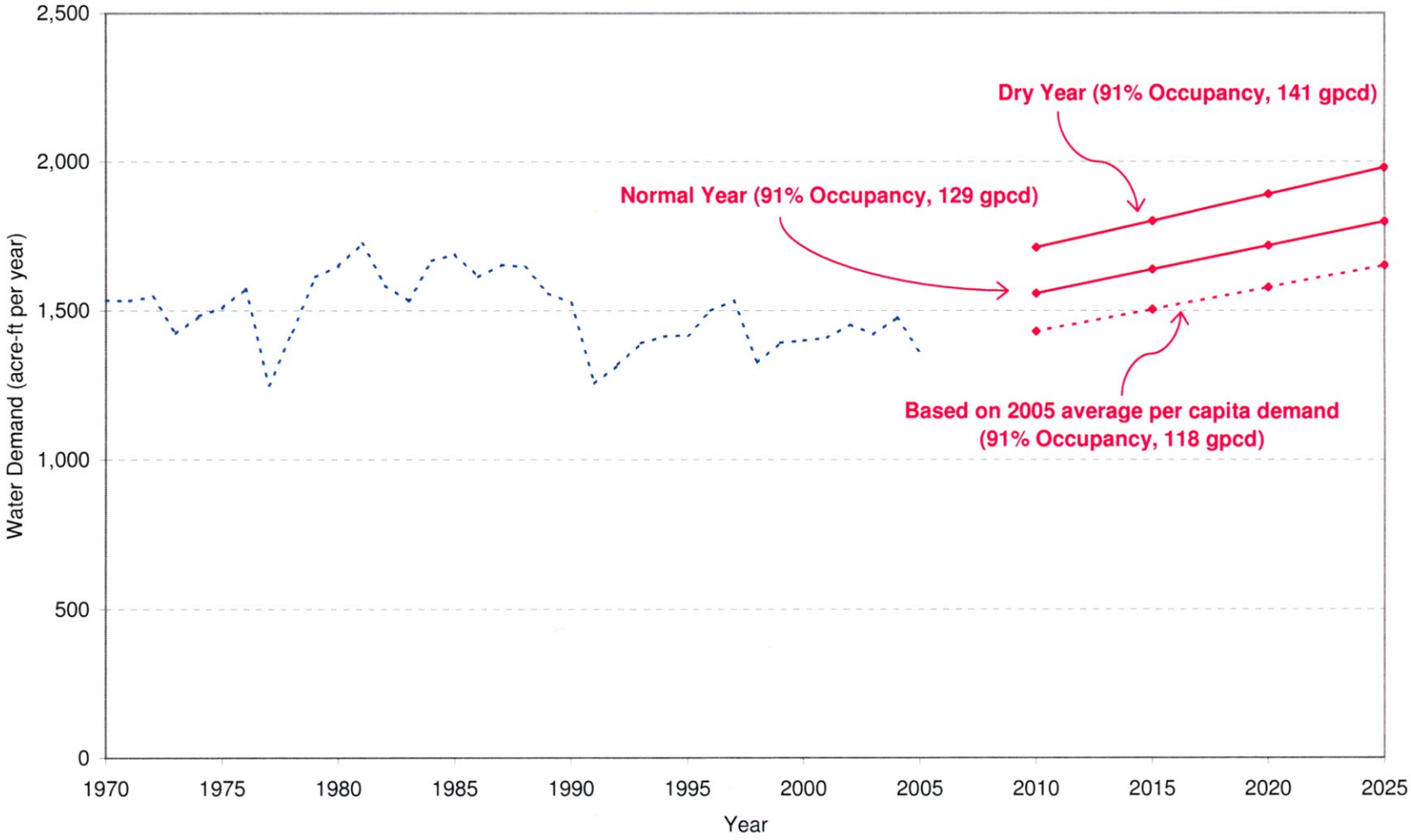
Table 4-1 summarizes gross per capita usage based on production records. Recent reductions in water losses due to pipeline repairs have been accounted for in the per capita water demands and water conservation levels used for planning. Therefore no additional demand due to water losses needs to be considered in making the demand projections.

4.5 Projected Water Demands in Morro Bay

Based on the projected population from **Table 3-3** and the per capita water use factors from **Table 4-1**, the projected water demands were estimated (**Table 4-3**). Demands are projected for both normal and drought years.

The demands include all residential, commercial, and industrial water uses supplied by the City's system. The demands also include water losses. The projected demands are compared to historic water demands in **Figure 4-2**.

FIGURE 4-2
City of Morro Bay
Historic and Projected Water Demands



Many previous studies have projected water demands for the City of Morro Bay. Prior water demand projections have generally been higher than the projections developed in this study. The highest projections were those made before Measure F was passed.

TABLE 4-3
Projected Water Demands in Morro Bay

Year	Projected Population[1]	Normal Year[2]		Dry Year[2]	
		Use per capita (gpcd)	Annual demand (AFY)	Use per capita (gpcd)	Annual demand (AFY)
2010	10,800	129	1,600	141	1,700
2015	11,400	129	1,600	141	1,800
2020	12,000	129	1,700	141	1,900
2025	12,500	129	1,800	141	2,000

[1]Assumes growth of 61 equivalent dwelling units/ year, occupancy rate of 91% and 2.04 residents per occupied dwelling.

[2]Annual demands rounded to the nearest 100 AFY.

4.6 Water Demand by Type of Use

Water demands by type of use are summarized in **Table 4-4**. The relative percentages were based on City water use reports for 1995-2000. Multi-family residential use includes condominiums and tourism includes motels, hotels, and restaurants. Overall, about 68 percent of the water used in Morro Bay is for residential purposes. According to a recent land-use study, about 66 percent of the remaining land to be developed within the City will be residential. The land use planning study suggests that if development occurs in accordance with the general plan, residential uses will continue to be about the same percentage of the overall demand.

TABLE 4-4
Projected Water Demand by Type of Use

	Percentage by Type of Use[1]	Projected Annual Demand (AFY) and Number of Meters[2]							
		2010		2015		2020		2025	
		AFY	Meters	AFY	Meters	AFY	Meters	AFY	Meters
Single Family Residence	54%	861	5,040	861	6,313	914	7,586	968	8,647
Multi-Family Residence	8%	135	376	135	471	144	566	152	646
Mobile Homes	4%	70	27	70	33	74	40	79	46
Rest Homes	2%	30	2	30	3	32	3	34	4
Commercial/ Industrial	12%	188	441	188	553	200	665	212	757
Tourism	8%	130	58	130	73	138	87	146	99
Coastal Dependent	0.5%	8	7	8	9	8	10	9	12
Schools	5%	72	7	72	9	77	10	81	12
Public Facilities	7%	106	149	106	186	112	224	119	255
Totals[3]	**100%**	**1,600**	**6,097**	**1,600**	**7,638**	**1,700**	**9,178**	**1,800**	**10,462**

[1] Based on Average Usage by Land Use (2003-2005)

[2] Projected number of meters based on population growth and historic relationship of meters per capita

[3] Annual demands rounded to the nearest 100 AFY

Therefore, the gross per-capita demand used for projections should be conservative. It is assumed that the current mix of residential and non-residential water use will continue. The residents of Morro Bay have expressed their desire for more competitive places to shop locally. Alleviating such concerns would require commercial development to keep pace with residential development.

Coastal dependent water use has declined from 2 percent to less than 1 percent of the City's water demand during the past several years. A small increase is expected in the coming years with the proposed redevelopment of the

seafood industry and anticipated new U.S. Food and Drug Administration requirements for seafood processing which will require processors to use more potable water.

4.7 Monthly Peaking Factors

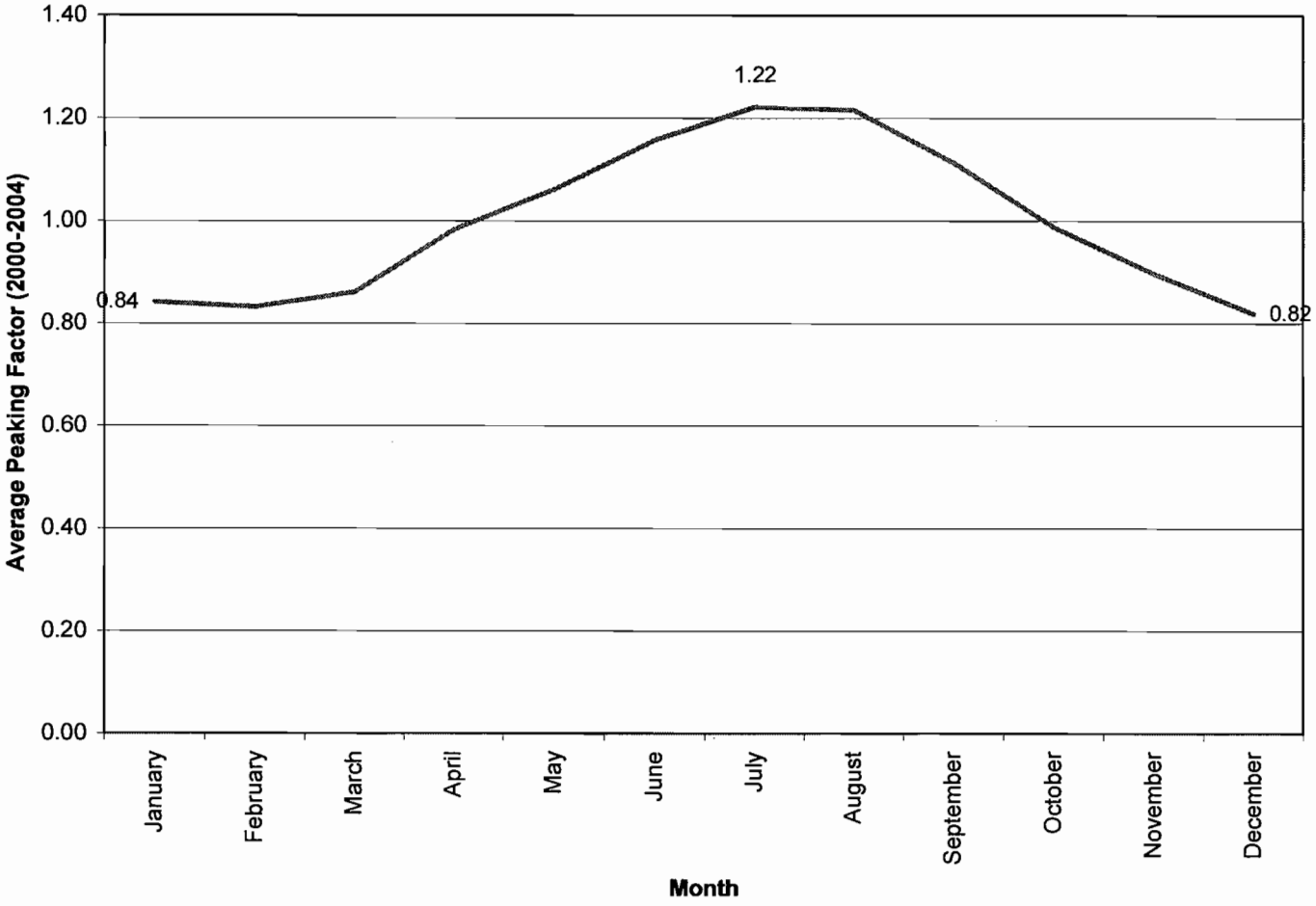
As is typical in California, water use in Morro Bay is higher in the summer than in the winter, due to irrigation of landscaping. In evaluating the potential project alternatives, it is necessary to consider seasonal variations in water use. The monthly peaking factors in the City are summarized in **Table 4-5 and Figure 4-3**. These peaking factors also include the seasonal effects of the tourist industry and part-time residences.

TABLE 4-5
Monthly Peaking Factors for Water Demand in Morro Bay
Monthly Peaking Factors

Month	2000	2001	2002	2003	2004	2000 - 2004 Average	2000 - 2004 Maximum	Values Used for Analysis
January	0.86	0.86	0.83	0.85	0.81	0.84	0.86	0.80
February	0.78	0.83	0.88	0.87	0.79	0.83	0.88	0.79
March	0.85	0.84	0.90	0.85	0.86	0.86	0.90	0.82
April	0.99	0.98	0.99	0.94	1.02	0.98	1.02	0.94
May	1.04	1.06	1.07	1.01	1.12	1.06	1.12	1.02
June	1.12	1.18	1.14	1.13	1.22	1.16	1.22	1.22
July	1.20	1.22	1.18	1.23	1.27	1.22	1.27	1.27
August	1.20	1.22	1.19	1.22	1.25	1.22	1.25	1.25
September	1.11	1.10	1.06	1.12	1.19	1.11	1.19	1.19
October	0.97	1.00	1.02	1.05	0.90	0.99	1.05	1.05
November	0.96	0.90	0.92	0.90	0.81	0.90	0.96	0.86
December	0.92	0.79	0.82	0.81	0.75	0.82	0.92	0.78

2000 - 2004 monthly peaking factors were based on monthly water production records provided by the City of Morro Bay. The values used for the analysis identify the highest peaks occurring during the June - October high demand period.

FIGURE 4-3
Monthly Peaking Factors



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5.0 Existing Water Supplies

5.1 Groundwater

This section describes the City's existing water supplies: groundwater from the Chorro and Morro basins, imported State Water Project water, desalinated seawater, and the emergency supply from the California Men's Colony (CMC) water treatment plant. The location of each water source and related facilities are depicted in **Figure 5-1**.

Prior to construction of the City's State Water Project (SWP) connection, the City received its entire water supply from two local groundwater basins: the Morro and Chorro Basins. These basins are shallow alluvial aquifers located in the Morro and Chorro Valleys. Past experience indicates that the basins have a limited storage capacity, with groundwater flowing to the ocean by gravity. The basins can be drained after a short drought. Annual recharge from rainfall is important to maintain continuous extractions.

The Chorro and Morro Basins are shallow alluvial basins that behave similar to an underground stream. Rainfall in the watershed percolates into the ground and flows underground to the ocean. Use of such water resources are controlled by the SWRCB. The SWRCB in 1972 issued findings that the Chorro and Morro Basins are riparian underflow. The City of Morro Bay applied for appropriative water rights and, in 1995, the SWRCB approved water right permits for up to 1.2 cubic feet per second (cfs) and 581 AFY from the Morro basin and up to 3.171 cfs and 1142.5 AFY annually of Chorro Creek underflow. The Chorro Creek water right includes a condition that the City can only pump its wells when the Chorro Creek flow exceeds 1.4 cfs.

The Morro groundwater basin was previously unavailable to the City due to nearby MTBE contamination in the groundwater basin. However, treatment began in 2002 and initial monitoring results have been positive although potable water has not yet been produced. One of the Chorro Basin wells (Well No. 8) has been abandoned and a second Chorro Basin well (Well No. 12) is out of service due to potential water quality concerns. The remaining Chorro Basin wells cannot be used unless the Chorro Creek flow exceeds the minimum flow requirement for other downstream users. Temporary flow monitoring equipment is used as needed, however, the City is evaluating its options for the permanent flow monitoring station location. Chorro Creek splits into several streams and has changed its flow pattern in recent years, so finding the best permanent flow monitoring location will require some additional study. Morro Bay's historical groundwater production is listed in **Table 5-1**. More detail on both groundwater basins is provided in the sections that follow.

Historic water production is summarized in Table 5-1 below.

TABLE 5-1
Historic Water Production by the City of Morro Bay
(AFY)

Year	Chorro Basin	Morro Basin	Total Groundwater	R/O Plant	State Water	TOTAL
1980	1,079	572	1,651	--	--	1,651
1981	1,143	584	1,727	--	--	1,727
1982 a	1,061	526	1,587	--	--	1,587
1983	995	537	1,532	--	--	1,532
1984	1,097	572	1,669	--	--	1,669
1985	1,108	582	1,690	--	--	1,690
1986	1,059	552	1,611	--	--	1,611
1987	1,124	531	1,655	--	--	1,655
1988	1,120	528	1,648	--	--	1,648
1989	1,047	512	1,559	--	--	1,559
1990 b	963	564	1,527	--	--	1,527
1991 c	808	449	1,256	--	--	1,256
1992 d	1,049	270	1,319	--	--	1,319
1993	994	397	1,391	--	--	1,391
1994	954	460	1,414	--	--	1,414
1995	986	420	1,406	12	--	1,418
1996	1,261	240	1,501	--	--	1,501
1997	985	249	1,234	--	301	1,535
1998	38	0	38	--	1,288	1,326
1999	34	0	34	--	1,359	1,393
2000	4	0	4	--	1,396	1,400
2001	11	0	12	--	1,399 e	1,410
2002	1	32	33	48	1,373	1,454
2003	3	29	32	13	1,384	1,429
2004	49	213	262	10	1,206	1,477
2005	204	150	354	0	1,007	1,361

a The allocation program was instituted near the end of 1982.

b 1,286 AF potable + 241 AF treated by Reverse Osmosis.

c 1,164 AF potable + 92 AF treated by Reverse Osmosis.

d 1,313 AF potable + 11 AF treated by Reverse Osmosis.

e Includes 3 AF treated Whale Rock water via CMC.

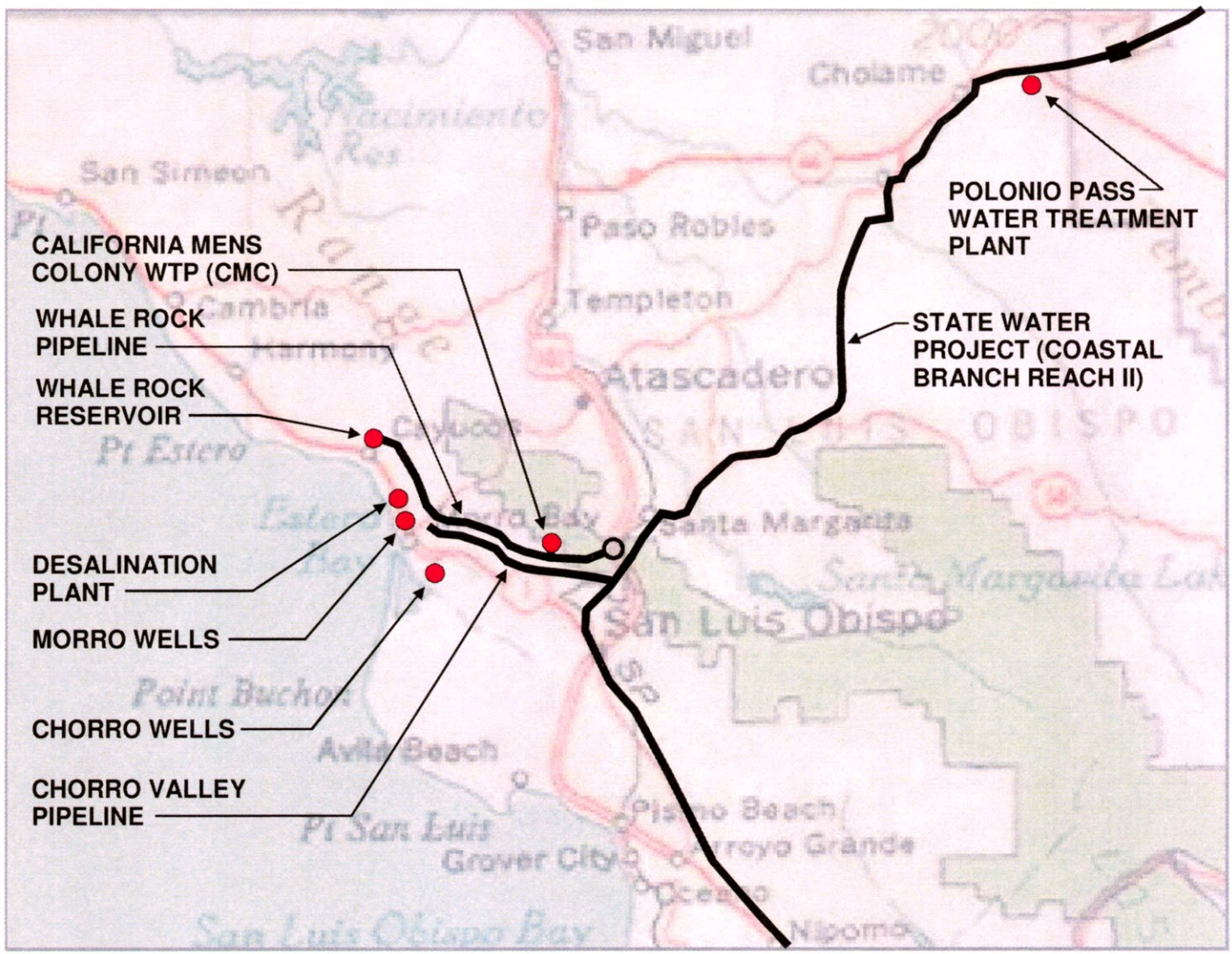


Figure 5-1 Existing and Proposed Potential Water Supplies Schematic

5.1.1 Morro Basin Wells

In 1999 Methyl Tertiary Butyl Ether (MTBE) was discovered in the Morro Basin. The contamination was traced back to a Shell-branded gas station at the intersection of Highway 41 and Main Street. The City's Morro Well No. 3 is located about 600 feet from the gas station and was about 300 feet from the closest portion of the known groundwater plume as of June 2001. Since the State Water Resources Control Board (SWRCB) was concerned that pumping the City's Morro Well could cause the groundwater plume to migrate towards the municipal well field, the SWRCB issued an order in 2000 forbidding the use of the City's Morro Basin wells unless: 1) there is an emergency, or 2) the City adds well head water treatment equipment and establishes testing protocols for the water. The City elected to negotiate a settlement with Shell that requires Equilon/Equiva, as Shell's subsidiary that oversees the company's west coast stations, to clean up the contaminated aquifer and to provide compensatory funding that the City of Morro Bay can use to develop temporary alternative water sources. Beginning in February 2001, Equilon's contractor began working to pump out and treat the contaminated groundwater. The well has not yet been converted back to potable use but recent tests suggest the treatment scheme was successful.

In the past the Morro Basin experienced periods of seawater intrusion during long-term droughts. In their *Groundwater Source Status Report*, Cleath and Associates evaluated the current condition of the Morro Basin. In their opinion, with the City's 581 AFY (189 million gallons/year) annual limit on pumping from the Morro Basin, seawater intrusion is less likely to occur in the future. In addition, the Morro wells should be able to produce year round at the maximum 1.2 cfs rate allowed in the City's water right permit.

5.1.2 Chorro Basin Wells

The City has seven wells in the Chorro Basin. One well is out of service and another well has been abandoned because of water quality concerns. The other five wells can only be used when Chorro Creek minimum flow requirements are met in accordance with the State Water Resources Control Board decision. The City has a flow monitoring system in place and plans to install a permanent stream flow monitoring station to continuously monitor Chorro Creek flow rates.

As a condition of the City's Chorro Basin water right permit, the State Water Resources Control Board (SWRCB) required the City to install stream flow monitoring devices in Chorro Creek upstream from the City's Chorro wells. Under the Chorro basin water right permit conditions, the City can only pump its Chorro wells when the stream flow exceeds 1.4 cfs. Stream flow monitoring equipment has been installed, and calibrated for stream flow rate estimation. With this stream monitoring equipment and calibration program in place, the City can use five of its Chorro wells whenever stream flow exceeds 1.4 cfs.

Generally, water from groundwater basins does not require treatment other than chlorination to provide disinfection. Wells # 8 and #12, however, are located within 100 feet of Chorro Creek. Consequently, the Department of Health Services (DHS) found that these two wells are under the influence of surface water. In accordance with the Surface Water Treatment Rule (SWTR), DHS ordered the City to filter and disinfect water from Wells #8 and #12 to meet the SWTR requirements. Well #8 has been abandoned and the lease terminated. In order to continue using Well #12, the City would need to construct a filtration plant meeting the requirements of the SWTR. For the purpose of this study, it is assumed that future use of Well #12 and a replacement well near the original Well #8 location would require a treatment solution to be developed. Alternatively, replacement

wells for Wells No. 8 and 12 could be constructed in locations not under the influence of surface water. These are considered expansions to the Chorro Basin well system and are not included in supply calculations unless specified.

Water quality levels for the remaining Chorro Wells should be assessed before these wells are used extensively. See Chapter 7 on water quality, water treatment and water blending options.

5.1.3 Groundwater Production Capacity

The historic production from the City's groundwater sources is summarized in **Table 5-1**.
As part of a hydrogeologic study by Cleath and Associates, preliminary estimates were made of the expected groundwater basin yields under various conditions, as summarized in **Table 5-2**. The yield estimates were derived only for the purpose of comparing alternatives. The estimated yields are based on the City's permitted water right groundwater basin usage forecasts prepared by others. If estimated extractions by other basin pumpers were to change, the yields to the City would change. Historic and projected extractions required for normal years, based on monthly peaking factors determined in **Table 4-6** are summarized in **Table 5-3**.

TABLE 5-2
Preliminary Yield Estimate of Potential Groundwater Extractions by Morro Bay (AFY)

Condition	Chorro Basin	Morro Basin	Total
City of Morro Bay Water Right	1143	581	1724
Normal Year[1]	1143	581	1724
Dry Year[1]	566	581	1147
Average Expected Long-Term Yield[2]	925	581	1506
Average Yield During the 1987-1992 Critical Drought	566	581	1147

1. Assumes that Chorro Creek in stream minimum flow requirement will be met from December 16 to March 15 during a drought year and from December 16 to July 15 during a normal year. During a limited number of exceptionally wet years, the Chorro wells might be available year round. Morro wells are expected to provide their full permitted water right year-round during both normal and drought years.

2. This long-term yield assumes that the Chorro Creek 1.4 cfs minimum flow requirement will be met, on average, between December 16 and June 1 of each year. A preliminary frequency analysis by Komex International Ltd. suggests that the minimum flow requirement may be met 84% of the year; however this was a wet period. A long-term yield estimate based on historical periods that include droughts will be lower.

TABLE 5-3
Historical and Projected Groundwater Extractions (AFY)

Basin Name (s)	2000	2001	2002	2003	2004	2005	2010	2015	2020	2025
Chorro Creek Basin	4	11	1	3	49	204	138	175	228	272
Morro Basin Wells	0	0	32	29	213	150	124	156	189	208
Percentage of water demand	0%	1%	2%	2%	18%	26%	17%	20%	24%	27%

Projections based on projected values determined in Tables 4-6 and summarized in Tables 8-3 through 8-10.

Aside from short-term groundwater supply constraints, a potential limitation on additional groundwater pumping is seawater intrusion into the basins. Seawater intrusion occurs intermittently during dry periods and causes elevated levels of sodium and chloride in groundwater from wells near the coast. Seawater intrusion has been detected as far as 1.5 miles inland. Several wells near the coast have been abandoned for potable use due to poor water quality. Once seawater intrusion occurs, it may take many years of reduced pumping for the groundwater basins to recover. A major benefit of additional water supplies has been to reduce groundwater pumping and limit further seawater intrusion.

The usage levels in **Table 5-2 and Table 5-3** are not expected to cause seawater intrusion more severe than acceptable levels during critical droughts.

5.2 State Water Project

The City's primary source of water is the State Water Project (SWP). California's Department of Water Resources (DWR) is responsible for the construction, operation and maintenance of the SWP. The City of Morro Bay has entered two contracts with the San Luis Obispo County Flood Control and Water Conservation District (SLOCFC&WCD) for receipt of State Water. The first contract, the *Water Treatment and Local Facility Agreement,* dated March 1, 1992, covers the Central Coast Water Authority treatment plant and local facilities such as the Chorro Valley Pipeline. The second contract, *Water Supply Agreement between San Luis Obispo County Flood Control and Water Conservation District and the City of Morro Bay,* dated May 11, 1992, covers receipt of State Water and payment for State facilities. Both contracts require Morro Bay to make certain payments whether or not water is received.

The City of Morro Bay has an entitlement to receive 1313 Acre-Feet per year (AFY) of State Water plus an additional 174 percent drought buffer of approximately 2290 AFY. The drought buffer is intended to help insure the full allocation of water is delivered when the Department of Water Resources reduces water deliveries due to drought conditions.

On average, the SWP can deliver only part of the entitlements held by SWP contractors and subcontractors with the SWP facilities currently in service. This is because not all of the water conservation and delivery facilities originally included in the SWP plan have been constructed. Some originally planned facilities may never be constructed. In addition, environmental concerns and the outcome of the California-Federal (CalFed) Water negotiations reduced the actual diversions below original forecasts.

Morro Bay's drought buffer will provide the City with additional SWP reliability during a drought when the SWP deliveries are reduced and if the full allocation for San Luis Obispo County has been claimed by other participants. With the drought buffer, the City will receive 100 percent of its contract entitlement as long as SWP deliveries statewide are approximately 36 percent or more. Deliveries are calculated as if the City has an entitlement of 3,598 AFY (entitlement with drought buffer) instead of only 1313 AFY. Accordingly, when statewide SWP deliveries drop to 5 percent of entitlements during critical drought years, Morro Bay would receive 180 AFY or 14 percent of its 1313 AFY entitlement held with SLOCFC&WCD.

Of the County's 25,000 AFY entitlement from the SWP, 4,830 AFY has been subcontracted by water purveyors in the County. Some of County's State Water subcontractors, including Morro Bay, have purchased additional drought buffer entitlements totaling 2,640 AFY. This leaves a significant fraction of the County's entitlement

still available for purchase. Until all of San Luis Obispo County's State Water entitlement is fully allocated, Morro Bay and other SWP subcontractors in the County will not actually have their State Water deliveries reduced during a drought. As shown in **Table 5-4**, with the county's 25,000 AFY annual entitlement (Table A amount) SWP deliveries would have to be reduced below 7.4 percent before the City of Morro Bay would have SWP deliveries reduced from 1313 AFY. As purveyors acquire more of the County's 25,000 AF entitlement, the individual subcontractors will have to rely increasingly on purchasing their own drought buffers to increase the minimum SWP deliveries during a severe drought.

TABLE 5-4
Benefit of SWP Drought Buffer

Statewide SWP Deliveries	Delivery to Morro Bay without Drought Buffer (AFY)	Delivery to Morro Bay with Drought Buffer (AFY)	Delivery to Morro Bay with Drought Buffer and Uncontracted County SWP Entitlement (AFY)
100%	1313	1313	1313
75%	985	1313	1313
50%	657	1313	1313
36%	479	1313	1313
33%	433	1187	1313
7%	92	252	1303
5%	66	180	931
4%	53	144	745

In this Plan, it is assumed that the County will have sufficient unclaimed allocation and/or the State Water Project will not be reduced below 36 percent in order to provide Morro Bay with 100 percent of its contract entitlement during normal years.

In addition to its drought buffer, Morro Bay or the county could purchase additional SWP water from other SWP contractors or subcontractors or from one of several programs DWR provides for delivering additional water during a drought. This could partially or entirely replace the portion of the City's SWP entitlement that would not be met by regular available deliveries during a drought.

The Coastal Branch Aqueduct conveys State Water from the California Aqueduct to the counties of San Luis Obispo and Santa Barbara. The Coastal Branch Aqueduct has two segments. The Coastal Branch Phase I conveys water from the California State Aqueduct west of Interstate Highway 5 to the Devil's Den Pumping Plant. The Coastal Branch Phase II extends from the Devil's Den Pumping Plant to the Central Coast Water Authority (CCWA) Polonio Pass Water Treatment Plant (WTP) and continues southwest to Highway 101and then south to Santa Barbara County. The Coastal Branch Phase I is sized to convey 25,000 AFY plus Santa Barbara County's allocation. The Coastal Branch Phase II pipeline from Devil's Den Pumping Plant to the Polonio Pass WTP has a capacity of 100 cubic feet per second, which provides for delivery of 4,830 AFY plus Santa Barbara County's allocation and the equivalent of about 19,500 AFY of off-peak pumping capacity[1].

[1] Based on an off-peak pumping schedule of 16 hours per day (plus one hour of ramp-up and ramp-down) to reduce power costs. (10/9/01 Fax from Bill Brennan, Central Coast Water Authority)

Although the County has 17,530 AFY of excess State Water Project entitlement for sale, there is no excess pipeline or treatment capacity for the County in the Coastal Branch Phase II to deliver more than the existing contract allocations of 4,830 AFY.

State Water is conveyed from the Coastal Branch Phase II to the City through the Chorro Valley Pipeline. Although initially sized to convey just the purchased SWP entitlements, the City of Morro Bay paid to have the Chorro Valley pipeline diameter upsized from 10 inches to 16 inches.

5.3 Seawater Desalination Plant

In 1992 the City of Morro Bay constructed a seawater desalination plant during a drought emergency. Permits to construct and operate the plant were expedited with the provision that the plant would be used only during a declared emergency. The City adopted a final EIR for the Morro Bay desalination facilities in April 1993. The EIR covers both emergency and normal use of the plant, and also considers a plant expansion of up to 960 gpm. In 1995 the California Coastal Commission approved Morro Bay Local Coastal Plan (LCP) Amendment LCP 1-94 allowing the desalination plant to operate "as needed to ensure that the City's minimum water quality standards are met, as routine replacement, and to offset drought conditions." The LCP requirement that the City update its Water Management Plan every five years is met by this document.

The desalination plant utilizes a reverse osmosis system (RO) to desalinate seawater produced from five seawater wells located along the Morro Bay harbor. In its current configuration, the City's desalination plant has the ability to supply 400 gpm of treated water to the City's distribution system.

The City completed construction of the RO desalination plant in 1992. After completion, the plant operated for several months and was shut down due to excessive operating costs. The plant remained unused until 1995 when the City again operated the plant as a reliable water source during a drought. Operation of the facility ceased after increasing iron concentrations in the raw water caused rapid fouling of the desalination plant's pretreatment system. Between 1995 and 2002, the desalination plant was not operated. Limited pilot testing was conducted during June/July of 2001 to evaluate potential methods to minimize the impact of the raw water's high iron concentrations, filtration was selected as an option for improving pretreatment, and a filter was installed in 2002 to improve plant performance. The plant was operated for approximately one month during fall 2002. Currently, the desalination plant is operated to offset seasonal peaking and for routine supply replacement, such as 2-week state water outages. In the future, as the community expands, the desalination plant may be utilized more regularly.

Originally, brine discharge was to have been released through an existing outfall from the adjacent Morro Bay - Cayucos Wastewater Treatment Plant, jointly owned with the community of Cayucos. The wastewater plant has a 4,400 foot long outfall with a discharge depth of 50 feet. However, the Cayucos Sanitary District (CSD) did not want Morro Bay to discharge brine from the desalination plant through the outfall. As a result, Morro Bay and Cayucos signed an agreement that Morro Bay would not use the wastewater outfall. Should the City desire to use the CSD outfall line, prior consent of the Cayucos Sanitary District would be required. Brine is now discharged through the Duke Energy power plant outfall, which has a capacity of 720 million gallons per day (MGD). The City has a temporary agreement in place to utilize Duke Energy's outfall.

5.4 Exchanges with Adjacent Purveyors

The City of Morro Bay and the California Men's Colony (CMC) have signed a mutual aid agreement that allows the two water purveyors to provide water to each other during water shortages. CMC has a water filtration plant with a rated capacity of 3 MGD that they operate about 8 hours a day to treat water from the Whale Rock, Chorro and Salinas Reservoirs or other sources. By operating the plant on a 24-hour basis, the CMC plant could provide up to 1.7 MGD (1.4 MGD with current pumping limitations) to the City of Morro Bay.

Any water provided to the City must be repaid to CMC at a later time. The CMC water supply may not always be available during droughts or every water supply shortage. Currently, the City and CMC are investigating long-term options for cooperative use of the CMC water treatment plant.

5.5 The Need for New Water Supplies

Between 1998 and 2003, the City of Morro Bay had difficulty meeting the City's water demand. The City's long time historical water sources, the Chorro and Morro wells, were out of service because of water quality concerns and in stream minimum flow requirements as explained above. Fortunately, the City's SWP connection was in service and the City was able to obtain agreements with CCWA and DWR to provide sufficient SWP water for 2000 and 2001 summer and fall peak demand period requirements. During the planned 30-day maintenance shutdown of the SWP pipeline during late October and early November of 2001, the City was able to make special arrangements with the CCWA to continue purchasing stored SWP water. The City supplemented the water with water pumped from the Chorro Basin and water treated at the CMC water treatment plant.

Beyond these recent water supply shortages, the City needs to identify sufficient water supplies to serve the City under the following conditions:

1. To improve water supply operational reliability during droughts.
2. To plan for short-term supply shortfalls when State Water or other City water supplies are not available.

Yield potential of water supplies is discussed in Chapter 8 and summarized in **Table 8-1**.

6.0 Overview of Potential Water Supply Sources

6.1 Purpose of Potential Water Supplies

As outlined in Chapter 5, the City needs to develop additional water supplies to:

- Provide a long-term water supply to serve the City and support future growth;
- Improve water supply reliability during droughts; and
- To make up for State Water or other City water supplies that are unavailable temporarily or for longer periods.

The City is in the fortunate position of having numerous potential water supply sources to choose from, however, no single water source will be capable of meeting all of the City's demands. Each of the potentially available water sources is described below. The locations of the most likely future water supplies are shown in **Figure 5-1**.

6.2 Water Conservation

City residents currently conserve water at a level greater than in most other municipalities. Water conservation measures have included plumbing retrofit requirements that have been in place for more than a decade. The City's high water rates and tiered rate structure have also encouraged residents to conserve water. **Table 6-1** provides a comparison of Morro Bay water rates with other local communities as of January 2001.

Because residents have adopted most of the possible water conservation practices, there is limited potential for further water conservation without mandatory water rationing. An evaluation of the City's current water conservation program is provided in Section 9.

As a water supply option to be considered in this Plan, conservation has been assigned the following role:

1. During wet, normal and dry periods of rainfall, water conservation will continue at a level equivalent to the BMPs, without mandatory water rationing.
2. During critical drought periods, a water emergency may be declared by the City Council and mandatory water conservation measures (see **Appendix A**) would be reenacted.

TABLE 6-1

***COMPARATIVE CONSUMER WATER COSTS AS OF JANUARY 2001**

$100ft^3$ Used	Morro Bay	Cambria	SLO	Pismo Beach	Templeton	Grover Beach	Atascadero	Arro Grande	Paso Robles
0	$16.43	$9.25	$0.00	$17.14	$10.50	$6.75	$11.00	$13.45	$7.80
5	$27.58	$18.65	$12.55	$22.79	$12.80	$13.40	$12.30	$17.95	$7.80
10	$55.98	$42.40	$28.30	$29.19	$18.55	$20.05	$17.50	$22.45	$7.80
15	$85.13	$66.90	$44.05	$36.34	$24.30	$26.70	$22.70	$26.95	$11.65
20	$115.04	$91.90	$59.80	$43.49	$30.05	$33.35	$27.40	$31.45	$15.50
25	$146.54	$118.90	$75.55	$50.64	$37.55	$40.00	$34.20	$35.95	$19.35
30	$179.93	$146.90	$91.30	$57.79	$45.05	$46.65	$41.00	$40.45	$23.20
35	$214.94	$175.90	$107.05	$64.94	$52.55	$53.30	$47.80	$44.95	$27.05
40	$251.24	$205.90	$122.80	$72.09	$60.05	$59.95	$52.90	$49.95	$30.90
45	$288.78	$236.40	$138.55	$79.24	$69.25	$66.60	$59.70	$53.95	$34.75
50	$327.37	$266.90	$154.30	$86.39	$78.45	$73.25	$66.50	$58.45	$38.60
55	$366.92	$297.40	$170.05	$93.54	$87.65	$79.90	$73.30	$62.95	$42.40
60	$407.35	$327.90	$185.80	$100.69	$96.85	$86.55	$78.40	$67.45	$46.30
65	$448.58	$358.40	$201.55	$107.84	$106.05	$93.20	$85.20	$71.95	$50.10
70	$490.54	$388.90	$217.30	$114.99	$115.25	$99.85	$93.10	$76.45	$54.00
75	$533.21	$419.40	$233.05	$122.14	$124.45	$106.50	$102.10	$80.95	$57.85

* Source: "Water Rate Survey, Central Cost Area San Luis Obispo" - Atascadero Mutual Water Company, Jan. 2001

3. During an unexpected drought emergency, the City may enact water conservation levels similar to or more severe than those of the 1991-92 drought period.

The first conservation level has been incorporated into the water demand projections herein (refer to **Tables 4-1 and 4-4**). The second and third levels are not incorporated into the demand projections, and are considered to provide an emergency reserve, or "safety factor," for circumstances not accounted for in this Urban Water Management Plan.

6.3 Water Recycling and Reuse

The Morro Bay - Cayucos Wastewater Treatment Plant discharges about 1.1 MGD of mixed primary and secondary effluent into the Pacific Ocean through an outfall. According to City staff, TDS measurements have exceeded 1,000 mg/L when wastewater from Morro Bay and Cayucos are blended. With higher levels of treatment and TDS removal, this water could be used for irrigation. The recycled water could represent a valuable resource for use by the City to offset groundwater demands. The feasibility of using recycled water was evaluated in the 1994 City of Morro Bay *Analysis and Recommendations for a Water Management Plan* and in the more recent *Cayucos/Morro Bay Comprehensive Recycled Water Study* prepared for the City of Morro Bay and the Cayucos Sanitary District in 1999.

Some of the potential recycled water projects evaluated included: irrigating public parks, school yards and the Morro Bay Golf Course; agricultural irrigation in Morro Valley; enhancement of the stream flow in Morro Creek, Chorro Creek and/or the Morro Bay National Estuary and groundwater recharge.

In the two earlier recycled water evaluations, irrigating public parks and school grounds was eliminated from further consideration because the total acreage available for irrigation is small compared to the construction costs for the separate distribution system necessary to bring the recycled water to the irrigation sites.

The remaining projects have larger irrigation water requirements. Recycled water project costs could be reduced if the recycled water customers could be served with secondary treated recycled water, thereby limiting the necessary wastewater treatment plant upgrades Surface irrigation with secondary level treated wastewater is permitted for golf courses with restricted access and certain non-food and food crops where the recycled water does not come into contact with the edible portion of the crop. Some orchards can be irrigated with secondary level recycled water; however, avocado trees, which often have fruit bearing branches close to the ground may not be good candidates.

The two Morro Bay recycled water assessments concluded that the Morro Bay Golf Course and most of the potential Morro Valley recycled agricultural irrigation water customers would require tertiary levels of water treatment thereby requiring an upgrade to the existing wastewater treatment plant. Given the higher capital and operations and maintenance costs to upgrade the Morro Bay – Cayucos Wastewater Treatment Plant to tertiary level treatment plus the long pipeline required to bring recycled water to the potential customers, the cost per acre foot for recycled water would be about $2400 per acre foot.[2] Agricultural irrigation water demand also varies seasonally and drops significantly in the wet winter months.

[2] Carollo Engineers, *Cayucos/Morro Bay Comprehensive Recycled Water Study, City of Morro Bay and Cayucos Sanitary District, October 1999, P. 7-23. Cost not updated since study was published.*

Similarly, enhancing streamflows in Morro and Chorro Creek or the Morro Bay National Estuary would potentially require treatment beyond the tertiary level of treatment and significantly increase the cost per acre-foot for streamflow enhancement projects.

Wastewater reclamation has been presented as an approach for increasing the use of Chorro groundwater. In the Phase 2 Community Development Block Grant (CDBG) Wastewater Reclamation Feasibility Study by Boyle Engineering (1999), a concept for construction of a treatment plant at the eastern end of Morro Bay, near Chorro Creek, was presented as an approach for improving wastewater service while also increasing summer stream flows in the creek. The City is considering construction of a new plant to offset demand at the existing jointly-owned Cayucos/Morro Bay facility. The initial projected flows at the new facility (0.6 MGD) is less than the stream flow (1.4 cfs or 0.9 MGD) required for full use of the Chorro wells. Discharge from the treatment plant alone could not sustain the desired flow rate in Chorro Creek. However, potential ultimate flows from future development that could be served by the new treatment plant could reach 1.2 MGD. The treated water from this flow rate (1.8 cfs) would be sufficient to meet the desired flow in the creek.

6.3.1 Groundwater Recharge with Recycled Water

Current DHS regulations allow surface spreading of reclaimed water that is "at all times of a quality that fully protects public health." (Title 22, Article 5.1, Section 603 20 (a)). The State Water Resources Control Board controls groundwater recharge of recycled water into groundwater basins.

To further clarify groundwater recharge requirements, the DHS published for comment draft Groundwater Recharge Reuse regulations on April 23, 2001. The final versions of the draft regulations may or may not closely resemble the draft. The draft recycled water regulations require the following for recharge of tertiary treated recycled water:

- Recycled water must blend with other water supplies so that recycled water makes up less than 50 percent of recharged water.
- The minimum retention time underground must be 6 months for surface spreading and 9 months for subsurface injection.
- The distance from point of recharge to the nearest well must be at least 500 feet for surface spreading and 2000 feet for subsurface injection.
- Control of nitrogen and Total Organic Carbon (TOC) levels in recycled water.
- Water quality must meet Department of Health Services (DHS) drinking water primary and secondary maximum contaminant levels (MCLs).
- Groundwater recharge with secondary treated recycled water would no longer be allowed although current regulations allow surface spreading of secondary treated recycled water.

Due to the small size of the Morro and Chorro basins, and due to their shallow depths and short groundwater retention time, recharge of recycled water into groundwater basins does not presently appear to be feasible from

the regulatory and economic perspectives, and is not considered further in this report. Additional hydrogeologic study would be required to show that recycled water recharge would be possible.

Overall, upgrading the Morro Bay/Cayucos Wastewater Treatment Plant or constructing a new plant will probably be required for a viable recycled water project. Given the other water supply options available, it does not appear that recycled water provides a cost effective project alternative at this time. In the future if the wastewater treatment plant must upgrade to tertiary treatment in order to meet NPDES permit requirements, then recycled water projects should then be reconsidered.

6.4 Groundwater

There are two groundwater basins considered in this study: the Morro and Chorro Basins.

6.4.1 Morro Basin Groundwater

The Morro Groundwater Basin was not utilized in 2001 due to the presence of MTBE in the basin near the City's wells. The owner of the service station (Equilon/Equiva) responsible for the spill has finished cleaning up the contaminant.

The City's expected yields from the basin are projected in **Table 5-3**. Yield potential for normal and drought conditions are summarized in **Table 5-2**. It is assumed that the seawater wells will not interfere with the Morro wells and that the City will be able to pump from the Morro wells with the desalination plant in operation. Existing wells provide a production capacity of 1.71 MGD compared to the permitted production rate of 0.78 MGD. The Morro wells have had periodically high iron and manganese levels. As discussed in Section 7 on water quality, the need to provide treatment to remove iron and manganese from the Morro well water should be evaluated. The desalination plant can be used in this capacity.

6.4.2 Chorro Basin Groundwater

The City of Morro Bay's water right permit with the SWRCB for the Chorro wells requires that Chorro Creek have a minimum flow of 1.4 CFS before the City may operate its Chorro well field.

Until temporary streamflow monitoring equipment was recently installed and calibrated, the Chorro basin wells were out of service. Historically, the annual pumping period for the Chorro wells is December 15 to July 15 for normal years and December 15 to March 15 for drought years.

In addition to the restricted use of the Chorro wells mandated by the SWRCB permit, Chorro wells #8 and #12 have been identified as being under the influence of surface water by the DHS due to their close proximity to Chorro Creek. Wells #8 and #12 have, therefore, been taken out of service and Well #8 has been abandoned.

Water treatment by filtration will be required before these wells (or replacement wells since Well #8 was abandoned) could be put back into service. This reduces the City's current Chorro basin well pumping capacity to 1.65 MGD, which is less than the maximum permitted rate of 2.05 MGD.

For water planning purposes, the following assumptions are made regarding Chorro Basin wells:

1. Streamflow monitoring equipment is installed and calibrated. Permanent streamflow monitoring equipment will be installed in the future.

2. Disinfection facilities will be provided.

3. Chorro well water quality will be evaluated to determine whether well protection and treatment facilities are required to produce water that reliably meets iron, manganese and bacteriological water quality requirements. If treatment is required, separate groundwater treatment facilities will be constructed or, if the raw water quality is compatible, the Chorro water might be treated at an upgraded CMC water treatment plant.

4. In order to provide well pumping capacity that can produce the full amount permitted under the City's water right, either:

    - Replacement well(s) not under the influence of surface water will be drilled to replace Wells #8 and #12, or

    - Treatment of Well #12 water will be provided in compliance with the Surface Water Treatment Rule (SWTR).

6.4.3 Irrigation with Groundwater

One possible strategy for using groundwater, especially from wells that might require some limited or full treatment for use as a domestic water source, would be to create a separate irrigation water distribution system using only groundwater and/or recycled water. For this to be cost effective, the irrigation sites must be large enough and close enough to the wells so that the cost of constructing a dual water distribution system is not too high. Since this analysis must be performed on a site by site basis, this alternative will not be evaluated further in this report. An irrigation/recycled water master plan could be developed at a later time if the City wishes to pursue this option.

6.5 State Water Project

San Luis Obispo County has additional State Water entitlements and other agencies may make portions of their allocations available in the future.

6.5.1 Additional Drought Buffer

As discussed in Section 5.2, the City has an additional 174 percent drought buffer to help insure that the full allocation of water is delivered when the Department of Water Resources (DWR) declares reduced water deliveries are required due to drought conditions. The City's 1313 AFY entitlement with 2290 additional drought buffer will allow the City to take the full allotment of water when the DWR declares the supplies to be reduced to 36 percent of normal delivery. Since the County has an excess of unallocated State Water entitlement, State Water subcontractors in San Luis Obispo County can effectively receive their State Water

allocations 99 percent of the time. Even during severe droughts, State Water deliveries are only unavailable when the State Water transmission facilities are out of service for maintenance or during a disaster.

6.5.2 Purchase Additional State Water Project Allocation

As previously discussed, the County has 17,530 AFY of excess capacity in the State Water Project. Other agencies with State Water contracts may also make a portion of their allocation available in the future. However, no additional delivery capacity exists in the Coastal Branch II aqueduct and there is no additional treatment plant capacity in the Polonio Pass Treatment Plant, the plant which treats State Water for San Luis Obispo and Santa Barbara Counties.

This option was not evaluated further for three primary reasons:

1. The high cost of constructing a new aqueduct to transmit the water and upgrades to the Polonio Pass Treatment Plant to treat the water.

2. The reliability of the supply would be increased, but the City would still be subject to the delivery system reliability limitations of the SWP.

3. The City cannot rely on another agency making a portion of their allocation available in the future.

Pursuit of other agencies' allocations is a possible approach in the future, but cannot be relied upon as a definite future source of water. Therefore, it was not included in this analysis but is considered a viable option if an opportunity presents itself.

6.6 Seawater Desalination Plant

As described in Section 5.3, the City's seawater desalination plant is currently used for short periods during water shortages. The desalination plant could be used for longer periods provided it is renovated and permanent pretreatment support facilities (such as settling tanks for treating backwash water) are added. The desalination plant could also be expanded.

Plant upgrades could improve energy efficiency and increase the percentage of product water to raw water from 40 percent to perhaps 65 percent.

The seawater desalination plant currently produces about 400 gpm of product water from 600 gpm of raw water. Adequate space is available at the desalination plant site to expand the production capacity from 400 to 800 gpm of treated water. One new seawater production well would be needed to increase raw seawater production to 1200 gpm with an allowance for redundancy.

For planning purposes, the following two options are available for future use of the existing desalination plant:

1. Maintain the plant on standby and use it as needed to ensure that City's minimum water quality standards are met, as routine replacement when insufficient groundwater and State Water are available and to offset drought conditions, and

2. Expand desalination plant capacity.

Both of these options were considered in defining the water supply alternatives. Possible joint desalination projects with the City of San Luis Obispo are also under consideration.

6.8 Options with Adjacent Purveyors

The California Men's Colony has a water filtration plant with a rated capacity of 3 MGD that operates approximately 8 hours per day to treat water from the Whale Rock, Chorro and Salinas Reservoirs and other water sources. By operating the plant on a 24-hour basis, the CMC plant could provide up to 1.7 MGD to the City of Morro Bay. When the State Water pipeline was shut down for 30 days during the fall of 2001, the City supplemented the shortage in State Water delivery by obtaining water from the California Men's Colony (CMC).

The City of Morro Bay and CMC have signed a mutual aid agreement that allows the two water purveyors to provide water to each other during water shortages. The mutual aid agreement calls for each purveyor to repay the borrowed water at a later, mutually agreeable time. Currently the City and CMC are investigating long-term options for cooperative use of the CMC water treatment plant.

6.8.1 Near Term Supply from Whale Rock

A study was recently completed to determine the feasibility of operating the CMC plant (which treats water from Whale Rock Reservoir) 24 hours per day. Recommended facility and operational improvements were completed so the CMC plant could deliver water to Morro Bay when the SWP pipeline shut down for thirty days in October and November, 2001. Morro Bay will replace the Whale Rock water with Morro Bay water delivered to CMC at a later time.

6.8.2 Long Term Supply from Whale Rock

In the long term, there is a possibility for the City to trade its SWP water or water from other City sources (desalination plant or well water) for other water treated in the existing CMC water treatment plant. The existing CMC water treatment plant could be used to treat up to 1.7 MGD for the City. For example, the City might obtain Whale Rock water during water shortages or during the summer and fall peak demand periods. In exchange, in the winter, when Morro Bay has excess SWP water available, the City provide water for CMC in return. Such arrangements would require new agreements with other water purveyors, thus, this alternative is indefinite. For planning purposes, this report assumes that CMC water treatment plant water will only be borrowed temporarily should emergency shortages occur. Repayment of borrowed water would be required soon after any water shortage emergency ended. Additionally, during a drought, when CMC may need to supplement it's own SWP delivery or other supply, the Whale Rock water may not be available.

Extensive upgrades and/or replacement of the existing CMC water treatment plant may be required before the City could rely on Whale Rock water as a reliable backup water supply meeting DHS water quality standards. A consultant evaluation was recently conducted to identify the water treatment plant upgrades that would be required for Morro Bay to regularly take water treated at the CMC plant. It was determined a detailed conjunctive use model of the various water sources and possible cooperative agreements utilizing the CMC water

treatment plant should be developed to evaluate the benefits to each participating water agency's water supply reliability.

7.0 Water Quality and Treatment of Potential Water Sources

7.1 Water Quality of Existing and Potential Water Sources

Based on published information, the water quality of existing and potential water sources is summarized in **Table 7-1**. In general, all water sources meet present DHS primary drinking water standards, or are treatable to meet regional drinking water standards. Any of the available water sources identified could be used by the City. Differences between use of the water sources would be the cost of treatment and/or blending the water sources to meet drinking water standards.

7.2 Blending Water Sources

Blending is best suited for mixing water sources with low levels of constituents such as total dissolved solids (TDS) and/or nitrates (e.g., desalinated water or SWP water) with water supplies such as groundwater having higher TDS and/or nitrate levels. For other water quality issues such as high iron and manganese or coliform counts, additional water treatment, possibly including filtration, may be required to provide water quality meeting both regulatory requirements and customer satisfaction expectations.

Morro Bay's current water supply consists of a varying mix of groundwater, SWP water, desalinated seawater and the Whale Rock emergency water supply. Water quality for these water sources varies considerably between sources; furthermore, groundwater quality varies from well to well, season to season and year to year. One goal of prior City water master planning efforts was to provide water system customers with a more uniform and higher quality water supply. The City has blended all water supplies since completion of the Blending Pipeline in 2002. Disinfection completes the process. The City plans to add more disinfection facilities in the near future (See Section 7.3.2).

The desalination plant product water is piped to the Upper Kings Tanks for blending. If additional groundwater treatment, such as iron and manganese removal or filtration, is required for the Morro Well water, a second groundwater treatment facility could be constructed near the Morro Wells, or the Morro Well water could be piped to a joint groundwater treatment facility with the Chorro Wells near the Upper Kings Tanks. Currently, the Morro Wells are connected to the desalination plant, which could provide treatment. Alternatively, if the water quality is compatible, the groundwater could be treated at the CMC water treatment plant.

TABLE 7-1
Water Quality from Various Sources
(values in mg/l)

	City Groundwater[a]		State			Recommended
	Morro Basin	Chorro Basin	Water Project[a]	RO Plant[b]	Whale Rock Reservoir	State Drinking Water Standards[c]
Sodium	37-49	37-49	40	23		n.s.
Potassium			2.2	<3		
Chloride [e]	55-110	49-120	58-80	29	21	250
Total Dissolved Solids [e]	360-580	470-750	299	160		500
Sulfates [e]	60-76	59-87	32	2	64	250
Lead (90th percentile) j	ND	ND	ND-0.005		0.005	0.015
Copper (90th percentile) j	2.6 [f]	ND			0.022	1.3
Total Hardness	280-470	430-520	98	94	250	n.s.[d]
Nitrates	19-26	17-68			<.44	45
Iron	0.2-2.3	0.08-2.1			0.11	0.3
Manganese (µg/l)	ND-80	ND-60			<5-60	50
Mercury (µg/l)	ND	ND			ND	2.0
Aluminum	ND-0.3	ND-0.06	0.06		.087	1.0
TTHM	ND-27	ND-20	31.2			100
MTBE (µg/l)	ND	ND				5/13[i]
Gross Alpha Particles (pCi/l)	6.5					5/15[g]

ND = None detected.

[a] City of Morro Bay, Department of Public Works 1998 and 1999 samples.

[b] Title 22 Chemical Analyses of Product Water, City of Morro Bay 1992.

[c] Department of Water Resources 1991.

[d] n.s. - no standards.

e. Secondary standard.

f. Combined well supply – 1993 test.

g. Trigger level for additional testing requirement/primary MCL.

h. City of Morro Bay 2000 Consumer Confidence Report.

i. Recommended MCL/primary MCL.

j. Distribution system samples.

k. Whale Rock Reservoir Watershed Sanitary Survey, 1997-2000 Average, Boyle Engineering Corporation, 2001.

The City's various water supplies are blended to improve the overall water quality. The percentage of SWP water or desalinated water mixed with the City's groundwater supplies could vary between a 50:50 groundwater to SWP water mix and a 10:90 mix, respectively. TDS levels provide a good indication of general water quality and are used in this study for blending calculations. TDS levels of the various water sources, used for blending calculations, are provided in **Table 7-2**.

As can be seen, blending SWP water or desalination water, with the groundwater supply improves the TDS concentrations of the general water supply.

TABLE 7-2
Water Quality of Potential Water Sources
Used in Blending Calculations

Source	Total Dissolved Solids (mg/l) Normal Year	Drought Year
Average Groundwater Supply	750	1,200
State Water	300	300
Desalinated Sea Water	284	284

1. TDS levels for groundwater represent upper limits rather than long-term averages.
2. TDS estimates from 1994 Water Management Plan and City water quality test data.

7.3 Water Treatment Requirements

7.3.1 Water Treatment Requirement Summary

Water treatment requirements of the potential water sources are summarized in **Table 7-3** below:

TABLE 7-3
Treatment Requirements for Potential Water Sources

Water Source	Treatment Required
Groundwater from wells (other than #12)	No treatment normally required if wells can be kept free of bacterial contamination. Cause of periodic high bacterial counts should be further evaluated. Treatment may also be required for occasional high nitrates, iron and manganese if improved well maintenance, blending or discontinuing of pumping are not sufficient or feasible.
Groundwater from Well #12 and Replacement Well for Well #8 near old site	Treatment, including filtration, meeting the requirements of the Surface Water Treatment Rule.
State Water	Conventional water treatment at CCWA's Polonio Pass Water Treatment Plant.
Whale Rock Reservoir Water	Full conventional treatment or membrane filtration of surface water at upgraded CMC water treatment plant
Seawater	Desalination by reverse osmosis.
All Water Sources	Disinfection by chloramines to be compatible with SWP water.

7.3.2 Chloramination for Disinfection

SWP water in the CCWA is disinfected by chloramination. Chlorinated and chloraminated water are not normally commingled in a water system since the risk of creating undesirable disinfection byproducts increases. In order to avoid potential water quality problems such as THM formation or loss of measured disinfection residual that could occur if SWP water and the City's other water supplies are mixed, it is advisable to convert all of the City's water supplies from chlorination to chloramination. This could be accomplished by adding ammonia after the various water supplies are blended and chlorinated. In 1996 a preliminary chloramination project design was completed. Current plans call for this project to move into final design and construction soon after the City identifies what combination of water sources will comprise the City's future water supply.

8.0 Capacity, Yield and Reliability of Water Supply Alternatives

8.1 Overview

To evaluate and compare the water source alternatives potentially available to the City of Morro Bay, it is important to identify for each water source: the likely annual yield, the maximum production capacity and the reliability. These three characteristics may or may not vary for each water source from season to season and year to year. Combining water from multiple sources using a conjunctive use operating plan allows the City to increase the overall yield and reliability of the City's water supply.

This section discusses capacity, yield, and the reliability of each potential source. Next, a reliability matrix compares the water source and delivery system reliability of the various water sources. In the final subsection, a recommended conjunctive use plan is presented for 2010, 2015, 2020 and 2025.

8.2 Definition of Critical Drought Cycle

The yield of some existing and potential water sources would be reduced during periods of drought. For the purpose of this study, a "normal year" is defined to correspond to long-term average hydrologic conditions. The "critical drought" is defined to be the 1987-1992 six-year drought. The term "worst year" refers to the single year with the lowest yield. For some alternatives, there is no single "worst year," since all drought years are similar in terms of water supply and demand.

Statewide, the last recent multiple year drought began in 1987. Due to the quick recharge of the Chorro and Morro basins, the beginning of the drought in Morro Bay is more difficult to define. The impacts of the drought were most strongly felt when groundwater levels did not recover in the winter of 1989-1990. However, the drier years beginning in 1987 probably caused an overdraft of the basins that resulted in problems later on. Therefore the drought in Morro Bay is assumed to have started in 1987.

Before the recent drought, the critical drought for the SWP was considered to be the 1928-1934 period, a seven-year drought cycle. The critical drought for the Chorro and Morro Basins is assumed to be the recent 1987-1992 drought, a six-year drought. For the SWP, the 1987-1992 drought was similar in severity to the 1928-1934 critical drought, although 1928-1934 is still considered worse because it lasted 7 years instead of six. Therefore, for this study, the 1987-1992 drought provides a good basis of comparing the water supply alternatives.

8.3 Yields From Existing and Potential Water Sources

The expected yields from each of the potential water sources are shown in **Table 8-1**. Nominal yields represent the plant capacity, well capacity, water permit maximum yield or water purchase contract limits. The average yield is the average over a long period that includes both wet and dry years. The yield during the critical drought is also provided in **Table 8-1**, along with the single worst year.

The capacities of the desalination plant alternatives depend on the plant size, and are unaffected by drought. The State Water capacities are based on **Table 5-4**.

The Morro Basin capacity is based on the water right permit from the SWRCB.

TABLE 8-1
Yield of Potential Water Sources

Water Supply Source	Water Supply Yields: Nominal Yield (AFY)	Average Yield (AFY)	Average Yield During Critical Drought (AFY)	Yield During Worst Year (AFY)	Yield During Worst Year (%)	Peak Flow (gpm)
Existing Desalination Plant	645	645	645	645	100%	400
Expanded Desalination Plant (800 gpm)	1,290	1,290	1,290	1,290	100%	800
State Water Project with 174% drought buffer	1,313	1,300	1,313	745 / 1,313[g]	57 / 100%[g]	814
CMC/Whale Rock Water Exchange	--	--	--	--		1,180
Morro Wells	581	581	581	581	100%	539
Chorro Wells	1,143	745	456	456	61%	1,146
Chorro Wells (with expanded capacity)	1,143	925	566	566	61%	1,423
Groundwater Subtotal	**1,724**	**1,326**	**1,037**	**--**	**--**	**1,685**
Groundwater Subtotal (with expanded capacity)	**1,724**	**1,506**	**1,147**	**--**	**--**	**1,962**

Notes:

a) Nominal yield is the potential maximum water production based on production facilities, water rights and a wet year. Average yield is the long-term average over many years, including droughts. The yield during critical drought and yield during the worst year are based on CCWA estimated reliablity for multi year drought and single worst dry year respectively. The peak flow is the design flow capacity in gpm, without downtime.

b) Annual supply capacities of desalination sources are unaffected by drought.

c) Annual yields of the State Water Project based on existing State Water Supply Reports. Peak flow is based on recent data for City's State Water Supply Reports.

d) Nominal capacity of Morro Wells is based on water right permit pumping capacity for Morro Wells.

e) Nominal capacity of Chorro Wells is based on water right permit and is limited by Chorro Creek flow and pumping capacity.

f) A ground water analysis by Cleath & Associates concluded that replacement wells for two abandoned wells should be drilled; new wells would be comparable in yield yet not under the influence of surface water.

g) Single dry year SWP reliability estimated at 4% of contract amount. Future dry year yields (for 2015-2025) based on CCWA projected availability should allow Morro Bay to receive all 1,313 AF on annual entitlement.

The existing Chorro Basin capacity is based on the nominal pumping capacity of the wells other than Well #12. A surface water treatment plant would be required to continue operating Wells #12 (and, if a new lease were signed, a replacement well near the abandoned Well #8). The alternative of an expanded Chorro Basin well field assumes that either a surface water plant would be built to treat the water from Wells #12 or replacement well(s) for Wells #8 and #12 would be drilled that are not subject to surface water influence. Treatment of the groundwater at an upgraded or replacement CMC water treatment plant should also be considered. For the expanded Chorro Basin alternative, the nominal yield is based on the permitted water right. The drought yield is based on the Cleath and Associates estimate of the number of annual pumping days expected during a drought (ibid.). The subtotal for groundwater in **Table 8-1** includes the output of all wells including replacement wells for Wells #8 and #12. However, the extractions cannot exceed the permitted water right for the Chorro and Morro Basins.

The Whale Rock Water Exchange assumes that CMC will provide Morro Bay with up to 1.4 MGD as a water loan. With additional pumping capacity, CMC could deliver up to 1.7 MGD to the City. This water must be repaid with SWP water or other potable water from the City's supplies at a later time when surplus water is available. The total potential water available to Morro Bay from the CMC water treatment plant will be limited by the water supplies available. CMC has access to water supplies from the Whale Rock Reservoir, the Chorro Reservoir, the State Water Project and, possibly other sources. Additional water treated at the CMC plant might be available from other purveyors such as the City of San Luis Obispo or California Polytechnic State University, San Luis Obispo, but only if separate agreements could be reached.

8.4 Evaluating Reliability

Reliability of a given water source is associated with a variety of factors. For the purposes of this report, reliability will be evaluated from two perspectives: reliability of the supply and reliability of the delivery system.

Reliability of the water supply depends upon factors that would render a water supply unusable. These factors could include: water source contamination, increased environmental restrictions, adjudication, droughts and additional upstream water supply diversions by others.

Reliability of the delivery system depends upon factors that would render the water source production, treatment or transmission facilities unusable and therefore water delivery to the community of Morro Bay. Within this category, there is a general distinction between facilities controlled by the City of Morro Bay and facilities controlled by other entities that sell the water to Morro Bay. The facilities that Morro Bay controls (local wells, desalination plant, etc.) will generally be more reliable since Morro Bay will be able to quickly implement its own emergency response plan to the local emergency. In contrast, Morro Bay has no control over the response time associated with a State Water supply system failure.

The reliability of each of the City's potential water sources is considered Sections 8.5 through 8.12.

8.5 Reliability of State Water

State Water reliability depends upon a variety of factors over which the City of Morro Bay has little or no control. Therefore, State Water should not be relied upon as the sole source of water for the community. Key factors influencing the reliability of State Water include:

- Periodic cessation of State Water deliveries for facility maintenance.

- Reduced deliveries during drought conditions. State Water deliveries are directly correlated to drought conditions. For instance, the poor snow pack in the winter months may result in an overall reduction of State Water deliveries to all State Water contractors. In 2001, State Water contractors received only 39 percent of their contracted entitlement. At the beginning of the year, DWR informed State Water Contractors that 2001 water deliveries could be as low as 20 percent. DWR gradually increased the delivery forecast to 39 percent by mid-August, 2001. This was long after farmers and water districts had already reduced their irrigated acreage or made alternative water supply arrangements for the year. Recently DWR updated projections of minimum estimated delivery (single dry year) from 19-20% published in SWP Delivery Reliability Report (2003) to 4-5% or 1000-1250 AFY (2005 SWP Delivery Reliability Report Public Review Draft).

- Morro Bay's 174 percent drought buffer entitles the City to approximately 74% of supply available to SLOCFC&WCD, based on the fraction of water entitled to Morro Bay with the 174% buffer (3,594 AFY) to the contracted amount of 4,830 AFY (Table A amount) by SLOCFC&WCD from CCWA. It is assumed that the combined effect of the drought buffer and the unallocated County entitlement will allow the City to claim 1313 AFY through 2020 during normal years and multiple dry years (2005 CCWA UWMP). During single worst dry year conditions when CCWA estimates 1,000 AFY will be available to SLOCFC&WCD (2005 CCWA UWMP), approximately 745 AFY will be available to Morro Bay under these conditions and with the City's drought buffer. In later years, CCWA predicts approximately 4,000 AFY will be available to SLOCFC&WCD resulting from projects such as groundwater banking. Table 5-4 summarizes SWP supply availability to CCWA and The City of Morro Bay.

- Susceptibility of State Water supply to contamination due to the numerous public access points from the Delta to the Polonio Pass Water Treatment Plant.

- Potential impact of disasters such as earthquakes and floods that could interrupt State Water deliveries.

- Potential power failures could shut down DWR pumping facilities necessary to deliver water to Morro Bay.

The reliability of State Water could be increased in several ways:

- The City of Morro Bay could pursue a water banking agreement with another State Water contractor or subcontractor. Such a groundwater banking arrangement would be based upon the delivery of excess State Water to the banking partner when the City has surplus State Water available. It may also be possible to bank drought buffer water, but contractual and delivery systems should be evaluated. Typically, a fraction of the water banked would be made available to the City of Morro Bay in the event that drought conditions severely impact the Morro Bay water supply. If, for instance, the City negotiated a 2 to 1 water banking agreement, the City would be able to draw 1 acre-foot of water for every 2 acre-feet banked. If the total banked water plus SWP water delivered to the City did not exceed the City's normal SWP deliveries, then additional pipeline and water treatment capacity would not be required.

- If the groundwater banking location were within San Luis Obispo County, the City might may be able to make groundwater-banking arrangements directly. If the groundwater banking location were outside the

County, then the County of San Luis Obispo would probably need to enter into the groundwater banking agreement on behalf of Morro Bay.

8.6 Reliability of Water from Exchanges with Other State Water Customers

The additional water available through state water exchanges will have a reliability equal to a San Luis Obispo County State Water subcontractor without a drought buffer. As with the current drought buffer, the City could choose to acquire an additional drought buffer or set up banking agreements.

8.7 Reliability of Morro Groundwater Basin

The reliability of groundwater supplies is limited by hydrogeologic conditions and the amounts of recharge available. The Morro groundwater basin is comprised of a small shallow aquifer with limited storage capability. Due to the size of the Morro aquifer, historical operations indicate that the Morro aquifer can be drained in the event the Morro well field is continuously operated during a 2 to 7 year drought cycle.

In the opinion of Cleath and Associates, the risk of overdrafting during a drought has been reduced since the 1987-1992 drought. This is due, in part, to the hydrogeologic investigations that preceded the SWRCB approval of the City's Morro basin water permit. The permitted pumping rate is normally set within the groundwater basin's long-term average yield. In addition, State Water importation has reduced reliance on the groundwater basin.

Another factor affecting the Morro aquifer is its susceptibility to localized groundwater contamination as occurred with recent MTBE contamination.

8.8 Reliability of Chorro Groundwater Basin

The reliability of the Chorro groundwater basin is similar to the Morro Basin groundwater reliability; however, there are several additional issues affecting the Chorro Basin reliability. One major consideration is that Wells #8 and #12 were found to be under the influence of surface water. By order of DHS, these wells cannot be used without full filtration in accordance with the Surface Water Treatment Rule. This is particularly important because the baseline flow of Chorro Creek, the focal point of the Chorro Basin, is provided during part of the year by the treated wastewater discharge from the California Men's Colony located in the upper reaches of the Basin. The CMC wastewater facility has on numerous occasions exceeded their water quality requirements as stipulated in their wastewater discharge permit. Such a violation could have serious implications relative to the reliability of the Chorro Basin. Because of these water quality issues, the City terminated its lease for Well No. 8 and abandoned the well.

The overall reliability of the Chorro Basin, however, would increase if the City constructs a water treatment facility. The water treatment facility could also reduce the iron and manganese levels occasionally present in the Chorro well water. To use Well #8 would require that the City enter into a new lease or drill a new replacement well.

Another potential issue in the Chorro Basin outside of the City's control is the potential for additional upstream diversions for agricultural irrigation. Upstream agricultural activity also increases the Chorro aquifer's susceptibility to contamination common with the application of fertilizers, pesticides, and herbicides.

Chorro Creek flows into the Morro Bay Natural Estuary area. Consequently, environmental groups have focused on the instream flow requirements for Chorro Creek. The City's water permit requires the City to install a permanent instream flow monitoring station. According to the permit, the City can only pump its Chorro wells when the downstream flow is 1.4 cfs or more. During a drought year, this could limit Chorro well field use to three months of the year. The wells would be available from about December 16 to July 15 in a normal year and possibly all year during a wet year. This wide range of annual production rates requires the City to use the Chorro wells when they are available and have other water sources ready when the Chorro Basin pumping must stop.

As stated earlier in this study, the City is considering using recycled water for stream augmentation which would increase the reliability of Chorro basin as a water source. This approach is being actively investigated by the City at this time.

8.9 Reliability of Desalination Plant

As a water supply, seawater desalination is independent of the weather conditions that cause droughts. Experience with other plants has shown desalination to be a reliable process with only minimal disruptions due to maintenance. A seawater desalination plant can deliver nearly all of its capacity in any year.

The major factor that could affect the desalination plant's long-term reliability is the reliability of the energy supplies required to run the plant. Energy sources are subject to periodic short- and long-term power outages due to a variety of causes. Furthermore, continued regional power demand increases could exceed the power industry's capability to add new power generation sources. A state-wide energy crisis made it less economical to run a desalination plant, or any other energy intensive component of the City's water system.

For the purpose of this study, it is assumed that a desalination plant can deliver most of its nominal capacity in any year. Adding a temporary pretreatment system to remove iron from the raw water has improved the operating cost and reliability of the seawater desalination facility but permanent facilities are required for handling the effluent from the pretreatment system and further improving reliability.

8.10 Reliability of Whale Rock Supply

The mutual aide agreement signed by the City of Morro Bay and the California Men's Colony allows the two agencies to provide water to each other during periods of water shortages. During the October/November 2001 SWP shutdown, several difficulties with plant operation and the interconnection occurred that limited the water that CMC could provide to the City. Conversion of the plant from a part-time operating schedule to a 24-hour, seven day a week schedule was a significant change. Expectations are that future CMC water reliability would be contingent upon: 1) the availability of water from the Whale Rock, Chorro or Salinas Reservoirs or other water sources, 2) the ability of the CMC water treatment plant to reliably and adequately treat water in quantities that exceed current CMC demand, 3) automating more of the plant's water quality monitoring and control systems, and 4) improving the interdistrict water connection.

8.11 Reliability Matrix

The reliability of each of the identified water supply alternative is presented in a matrix format in **Table 8-2** such that the comparative reliability can be determined. The reliability matrix lists each of the identified water supply alternatives in the first column. Each alternative is evaluated for the water source reliability factors listed along the top of the matrix. For each water supply alternative the water source reliability factors are ranked from 1 to 5. A ranking of 1 indicates no impact while a ranking of 5 indicates a severe impact.

In general, less vulnerability was assumed for facilities where local entities manage the resources and decision-making as well as the response to emergencies.

The reliability differences between the alternatives provide insight into the different attributes of each water source. Combining the water sources that offset each other's weaknesses in a conjunctive use will increase the overall water system reliability.

Discussion of the reliability considerations for each supply alternative is the result of a consistent evaluation conducted by the authors of this report. Obviously, each reviewer might weight the factors differently. However, we expect that if each reader performs a consistent evaluation, the same reliability ranking will result. This reliability evaluation does not address costs associated with each supply alternative, a factor that is expected to contribute to the City's final decision along with considerations of relative reliability.

TABLE 8-2
Reliability Matrix

	Reliability Factors											
	Reliability of Delivery			Reliability of Supply								
Alternative Source of Supply	Short Term Power Outage	Long Term Energy Crisis	Delivery Facility Failure	Drought of 1-2 years	Additional Upstream Diversions	Contamination of Source/ Supply	Increased Environmental Restrictions	Long Term Changes in Climate	Loss of water rights due to adjudication	Total	Average	Ranking
Renovated Desalination Plant	2	4	3	1	1	2	2	1	1	17	1.9	1
Expanded Desalination Plant	2	4	3	1	1	2	3	1	1	18	2.0	2
State Water with Drought Buffer	2	2	3	2	2	2	2	3	1	19	2.1	3
CMC Agreement	2	2	3	3	1	3	3	3	2	22	2.4	4
Morro Ground Water Basin	2	2	2	3	2	5	4	3	2	25	2.8	5
Chorro Basin with Treatment and Expanded Capacity	2	2	2	4	3	2	4	3	3	25	2.8	5
Chorro Ground Water Basin	2	2	2	4	3	4	4	3	2	26	2.9	6

Ranking
1 not impacted
2 minor impacts
3 moderate impacts
4 substantial impacts
5 severe impacts

8.12 Increased Reliability through Conjunctive Use

From a practical and cost standpoint no single water source will be able to meet all of the City's water needs (with the exception of the SWP through increased entitlement). The City's total supply will consist of a combination of water sources. These water sources will be used conjunctively to meet the City's demands in normal and drought years and during SWP maintenance periods.

It may be acceptable for one component of the City's future water supply to have a reduced reliability. The important issue is for the total water supply, consisting of two or more water sources, to have an adequate reliability during critical droughts. In that way, one water source can make up for deficiencies in another water source in critical periods when water supply is impacted.

8.12.1 Conjunctive Use Operating Criteria

To define how the various water sources would be used together, the following operating criteria are established:

- **State Water.** The City's baseline water supply (and currently primary active supply) will be State Water. This is because State Water has high water quality and is relatively reliable during non-drought years (except during maintenance shutdowns or disasters). State Water is currently available except during the scheduled shutdowns for maintenance. It is assumed that State Water could be sufficient to supply the City during a "normal" year.

- **Chorro Wells.** The next water supply source that the City will use is the Chorro Wells. By using the Chorro Wells first during the wet season, the Morro Wells can be reserved for peaking capacity during the summer and fall months.

  The Chorro well field water will be blended with the SWP water to provide an increased quantity and more uniform quality water source to the community than the Chorro wells can provide without blending.

  Because of the Chorro Creek minimum flow requirement, this source should be used when it is available. The Chorro Wells will normally be available about December 15 of each year after the winter rains have started. When the monitored stream flow drops below 1.4 cfs later in the year, the Chorro Wells can no longer be used. Availability will typically continue until about March 15 in drought years, July 15 in normal years and possibly all year in wet years. Using the Chorro wells before the Morro Wells will help the City maintain a balance between the two groundwater basins and stay within the maximum production rates and total annual production permitted for each basin.

  To put the Chorro Wells back in service will require completing installation of the permanent flow monitoring station and taking steps to assure that water quality requirements are met consistently. This may require blending and/or additional water treatment facilities.

- **Morro Wells.** The next water supply source to be used is the Morro Wells. The new blending pipeline will allow blending of the Morro well field water with the SWP water to provide a higher quality and more uniform water source to the community.

  By using the Chorro wells first during the wet season, the Morro wells can be reserved for peaking capacity during the summer and fall months. The Morro wells will probably be the City's second lowest cost source.

  The City may need to take steps to assure that water quality requirements are met consistently. This may require blending and/or additional water treatment facilities.

- **Desalinated Seawater.** During peak demand periods or droughts when the total water supply available from the SWP and the Chorro and Morro groundwater basins is insufficient to meet peak water demands over an extended period (tentatively five days or longer,) the desalination plant will be operated to provide an additional water supply. This will occur more often as the City builds out and water demand increases.

  The desalination plant should operate at a regular rate during the water shortage period, and the groundwater wells used to respond to daily peak demand. Because the desalination plant is the City's most expensive water source, it will not be operated longer than necessary.

  To prepare the desalination plant for regular service, prefiltration support facilities (such as settling tanks for backwash) should be upgraded for permanent use. The plant will also require regular maintenance and test operations so that it is ready when the peak demand periods begin. The City has obtained an operations and maintenance contract with an operations company to maintain this level of readiness at least cost to the City.

  Given the issues with the City's groundwater quality, this resource could be elevated in priority and could make other sources available regardless of quality.

- **Water Exchange with Adjacent Purveyors.** When SWP water, the available Chorro and Morro well water and the available desalination water are insufficient to meet the City's water demand, the City can activate its Mutual Aide Agreement with the California Men's Colony to obtain treated Whale Rock Reservoir Water.

  Considering the present condition of the Morro Well and the absence of permanent pretreatment facilities (such as backwash settling tanks) at the desalination plant, the CMC Water may be an important backup water source when SWP water is unavailable. Chorro well water is typically only available during the winter and possibly spring months. While the CMC has agreed to provide Morro Bay with up to 1.7 MGD on an exchange basis once additional pumping capacity is provided, the daily and annual limits to long-term availability of this water supply need to be established.

  Payment for the CMC/Whale Rock water is made in-kind when the City provides replacement water to the CMC from the City's SWP water or other available water supplies. Low demand periods when the City has surplus water available to repay the water loan need to be identified.

8.12.2 Use of Groundwater Basins During Droughts

In the past the City managed its groundwater basins by peaking off groundwater supplies above the safe yield for one year during a single worst year of a drought. This required reducing groundwater extractions in subsequent years to compensate.

Now that the City has approved water right permits for the Morro and Chorro Basins, the City has a maximum permitted pumping rate that cannot be exceeded at any time.

8.12.3 Water Operational Plan

The conjunctive use operating criteria described in Section 8.3.1 were used to develop a series of Monthly Water Operational Plans that appear in **Tables 8-3 through 8-10**. Graphic depictions are provided in **Figures 8-1 to 8-8**. Operational plans are provided for normal and drought years in 2010, 2015, 2020 and 2025. Dry year operational plans reflect reduced SWP supply water available to SLOCFC&WCD, as described in the 2005 CCWA UWMP, Table 20 for single driest year estimated supplies, and Chorro well operation only during the wet months. CCWA anticipates increased reliability through groundwater banking or similar projects by 2015.

As shown, the City can operate their various water sources (as detailed in the notes on the Tables 8-3 through 8-10) to meet the planned dry and normal year demands.

TABLE 8-3

Monthly Water Operational Plan[5] - Normal Year - 2010

AF

Water Source	January	February	March	April	May	June	July	August	September	October	November	December	Total
Chorro Wells[1]	0	0	0	12	23	48	55	0	0	0	0	0	138
Morro Wells[2]	0	0	0	0	0	0	0	52	44	27	1	0	124
State Water Project[3]	104	102	106	109	109	109	109	109	109	109	109	101	1288
Desalination Plant[4]	0	0	0	0	0	0	0	0	0	0	0	0	0
CMC/Whale Rock Ex.[6]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Supply	104	102	106	122	132	158	164	161	153	136	111	101	1549
Total Supply Needed	104	102	106	122	132	158	164	161	153	136	111	101	1549
Supply Shortage	0	0	0	0	0	0	0	0	0	0	0	0	0

Assumptions:

1. Assume that during a normal year, Chorro Wells can be pumped from December 16 to July 15. During a wet year, the Chorro Wells can be pumped year round. During a dry year, the Chorro Wells can only be pumped from December 16 to March 15, so they would not be available during the peak demand periods when SWP is insufficient to meet demand. Maximum pumping rate by water right permit is 3.171 cfs and 1142.5 AFY. Operation over seven months per year equates to 163 AF/ mo. or 2.74 cfs.

2. Assume that the Morro Wells will be pumped as needed for peaking from March 15 to December 15. During a drought year when SWP deliveries will be less than 50 percent, Morro Bay will be unaffected until the County has sold its unallocated SWP entitlement. When this occurs, Morro Wells will be pumped at a minimum of 50 percent of capacity during a drought year in order to reserve full SWP deliveries for peak demand periods. Maximum pumping rate by water right permit is 1.2 cfs and 581 AFY. Operation over approximately 8 months per year equates to 71 AF/ mo. or 1.19 cfs.

3. See Sections 5.2 & 8.5 for discussion of State Water Project deliveries during normal and dry years. During drought years when DWR announces SWP cutbacks on December 1, City will stop SWP deliveries until March 15. Chorro well water will be available during this time (with Morro wells and Desalination as backup). This will reserve SWP water for later months with higher demands when Chorro wells are unavailable.

4. Desalination plant will operate when other water supplies, including SWP and Chorro and Morro wells, are insufficient or do not meet City and/or DHS water quality standards.

5. Assume that water sources will be added to match demand in the following order: SWP, Chorro Wells (when available), Morro Wells, Desalination, CMC.

6. Assume that CMC/Whale Rock Water Exchange agreement will allow ongoing use of CMC/Whale Rock water for peak demand days. Water "loaned" from CMC Water Treatment Plant will be repaid with other Morro Bay water supplies during the same year. Assume CMC water may not be available during a critical drought.

7. Order of use is: 1) SWP, 2) Chorro Wells (when available), 3) Morro Wells, 4) Desalination, and 5) CMC backup water supply.

TABLE 8-4

Monthly Water Operational Plan[5] - Dry Year - 2010

AF

Water Source	January	February	March	April	May	June	July	August	September	October	November	December	Total
Chorro Wells[1]	52	51	55	0	0	0	0	0	0	0	0	49	207
Morro Wells[2]	0	0	0	71	71	71	71	71	71	71	60	0	560
State Water Project[3]	62	62	62	62	62	62	62	62	62	62	62	62	745
Desalination Plant[4]	0	0	0	1	12	40	48	44	35	17	0	0	198
CMC/Whale Rock Ex.[6]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Supply	114	113	117	134	146	174	181	178	169	150	122	111	1709
Total Supply Needed	114	113	117	134	146	174	181	178	169	150	122	111	1709
Supply Shortage	0	0	0	0	0	0	0	0	0	0	0	0	0

Assumptions:

1. Assume that during a normal year, Chorro Wells can be pumped from December 16 to July 15. During a wet year, the Chorro Wells can be pumped year round. During a dry year, the Chorro Wells can only be pumped from December 16 to March 15, so they would not be available during the peak demand periods when SWP is insufficient to meet demand. Maximum pumping rate by water right permit is 3.171 cfs and 1142.5 AFY. Operation over four months per year equates to 189 AF/ mo. or 3.17 cfs.

2. Assume that the Morro Wells will be pumped as needed for peaking from March 15 to December 15. During a drought year when SWP deliveries will be less than 50 percent, Morro Bay will be unaffected until the County has sold its unallocated SWP entitlement. When this occurs, Morro Wells will be pumped at a minimum of 50 percent of capacity during a drought year in order to reserve full SWP deliveries for peak demand periods. Maximum pumping rate by water right permit is 1.2 cfs and 581 AFY. Operation over approximately 8 months per year equates to 71 AF/ mo. or 1.19 cfs.

3. See Sections 5.2 & 8.5 for discussion of State Water Project deliveries during normal and dry years. During drought years when DWR announces SWP cutbacks on December 1, City will stop SWP deliveries until March 15. Chorro well water will be available during this time (with Morro wells and Desalination as backup). This will reserve SWP water for later months with higher demands when Chorro wells are unavailable.

4. Desalination plant will operate when other water supplies, including SWP and Chorro and Morro wells, are insufficient or do not meet City and/or DHS water quality standards.

5. Assume that water sources will be added to match demand in the following order: SWP, Chorro Wells (when available), Morro Wells, Desalination, CMC.

6. Assume that CMC/Whale Rock Water Exchange agreement will allow ongoing use of CMC/Whale Rock water for peak demand days. Water "loaned" from CMC Water Treatment Plant will be repaid with other Morro Bay water supplies during the same year. Assume CMC water may not be available during a critical drought.

7. Order of use is: 1) SWP, 2) Chorro Wells (when available), 3) Morro Wells, 4) Desalination, and 5) CMC backup water supply.

TABLE 8-5

Monthly Water Operational Plan[5] - Normal Year - 2015

AF

Water Source	January	February	March	April	May	June	July	August	September	October	November	December	Total
Chorro Wells[1]	0	0	3	20	30	58	64	0	0	0	0	0	175
Morro Wells[2]	0	0	0	0	0	0	0	61	53	35	8	0	156
State Water Project[3]	109	108	109	109	109	109	109	109	109	109	109	106	1309
Desalination Plant[4]	0	0	0	0	0	0	0	0	0	0	0	0	0
CMC/Whale Rock Ex.[5]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Supply	110	108	112	129	140	167	174	171	162	144	117	106	1639
Total Supply Needed	110	108	112	129	140	167	174	171	162	144	117	106	1639
Supply Shortage	0	0	0	0	0	0	0	0	0	0	0	0	0

Assumptions:

1. Assume that during a normal year, Chorro Wells can be pumped from December 16 to July 15. During a wet year, the Chorro Wells can be pumped year round. During a dry year, the Chorro Wells can only be pumped from December 16 to March 15, so they would not be available during the peak demand periods when SWP is insufficient to meet demand. Maximum pumping rate by water right permit is 3.171 cfs and 1142.5 AFY. Operation over seven months per year equates to 163 AF/ mo. or 2.74 cfs.

2. Assume that the Morro Wells will be pumped as needed for peaking from March 15 to December 15. During a drought year when SWP deliveries will be less than 50 percent, Morro Bay will be unaffected until the County has sold its unallocated SWP entitlement. When this occurs, Morro Wells will be pumped at a minimum of 50 percent of capacity during a drought year in order to reserve full SWP deliveries for peak demand periods. Maximum pumping rate by water right permit is 1.2 cfs and 581 AFY. Operation over approximately 8 months per year equates to 71 AF/ mo. or 1.19 cfs.

3. See Sections 5.2 & 8.5 for discussion of State Water Project deliveries during normal and dry years. During drought years when DWR announces SWP cutbacks on December 1, City will stop SWP deliveries until March 15. Chorro well water will be available during this time (with Morro wells and Desalination as backup). This will reserve SWP water for later months with higher demands when Chorro wells are unavailable.

4. Desalination plant will operate when other water supplies, including SWP and Chorro and Morro wells, are insufficient or do not meet City and/or DHS water quality standards.

5. Assume that water sources will be added to match demand in the following order: SWP, Chorro Wells (when available), Morro Wells, Desalination, CMC.

6. Assume that CMC/Whale Rock Water Exchange agreement will allow ongoing use of CMC/Whale Rock water for peak demand days. Water "loaned" from CMC Water Treatment Plant will be repaid with other Morro Bay water supplies during the same year. Assume CMC water may not be available during a critical drought.

7. Order of use is: 1) SWP, 2) Chorro Wells (when available), 3) Morro Wells, 4) Desalination, and 5) CMC backup water supply.

TABLE 8-6

Monthly Water Operational Plan[5] - Dry Year - 2015

AF

Water Source	January	February	March	April	May	June	July	August	September	October	November	December	Total
Chorro Wells[1]	11	9	14	0	0	0	0	0	0	0	0	7	41
Morro Wells[2]	0	0	0	32	44	71	71	71	69	49	19	0	426
State Water Project[3]	109	109	109	109	109	109	109	109	109	109	109	109	1313
Desalination Plant[4]	0	0	0	0	0	2	10	6	0	0	0	0	19
CMC/Whale Rock Ex.[6]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Supply	120	119	123	141	153	183	191	187	178	158	129	117	1799
Total Supply Needed	120	119	123	141	153	183	191	187	178	158	129	117	1799
Supply Shortage	0	0	0	0	0	0	0	0	0	0	0	0	0

Assumptions:

1. Assume that during a normal year, Chorro Wells can be pumped from December 16 to July 15. During a wet year, the Chorro Wells can be pumped year round. During a dry year, the Chorro Wells can only be pumped from December 16 to March 15, so they would not be available during the peak demand periods when SWP is insufficient to meet demand. Maximum pumping rate by water right permit is 3.171 cfs and 1142.5 AFY. Operation over four months per year equates to 189 AF/ mo. or 3.17 cfs.

2. Assume that the Morro Wells will be pumped as needed for peaking from March 15 to December 15. During a drought year when SWP deliveries will be less than 50 percent, Morro Bay will be unaffected until the County has sold its unallocated SWP entitlement. When this occurs, Morro Wells will be pumped at a minimum of 50 percent of capacity during a drought year in order to reserve full SWP deliveries for peak demand periods. Maximum pumping rate by water right permit is 1.2 cfs and 581 AFY. Operation over approximately 8 months per year equates to 71 AF/ mo. or 1.19 cfs.

3. See Sections 5.2 & 8.5 for discussion of State Water Project deliveries during normal and dry years. During drought years when DWR announces SWP cutbacks on December 1, City will stop SWP deliveries until March 15. Chorro well water will be available during this time (with Morro wells and Desalination as backup). This will reserve SWP water for later months with higher demands when Chorro wells are unavailable.

4. Desalination plant will operate when other water supplies, including SWP and Chorro and Morro wells, are insufficient or do not meet City and/or DHS water quality standards.

5. Assume that water sources will be added to match demand in the following order: SWP, Chorro Wells (when available), Morro Wells, Desalination, CMC.

6. Assume that CMC/Whale Rock Water Exchange agreement will allow ongoing use of CMC/Whale Rock water for peak demand days. Water "loaned" from CMC Water Treatment Plant will be repaid with other Morro Bay water supplies during the same year. Assume CMC water may not be available during a critical drought.

7. Order of use is: 1) SWP, 2) Chorro Wells (when available), 3) Morro Wells, 4) Desalination, and 5) CMC backup water supply.

TABLE 8-7

Monthly Water Operational Plan[5] - Normal Year - 2020

AF

Water Source	January	February	March	April	May	June	July	August	September	October	November	December	Total
Chorro Wells[1]	6	5	9	27	38	67	74	0	0	0	0	3	228
Morro Wells[2]	0	0	0	0	0	0	0	71	62	43	14	0	189
State Water Project[3]	109	109	109	109	109	109	109	109	109	109	109	109	1313
Desalination Plant[4]	0	0	0	0	0	0	0	0	0	0	0	0	0
CMC/Whale Rock Ex.[6]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Supply	116	114	118	136	147	176	183	180	171	152	124	112	1730
Total Supply Needed	116	114	118	136	147	176	183	180	171	152	124	112	1730
Supply Shortage	0	0	0	0	0	0	0	0	0	0	0	0	0

Assumptions:

1. Assume that during a normal year, Chorro Wells can be pumped from December 16 to July 15. During a wet year, the Chorro Wells can be pumped year round. During a dry year, the Chorro Wells can only be pumped from December 16 to March 15, so they would not be available during the peak demand periods when SWP is insufficient to meet demand. Maximum pumping rate by water right permit is 3.171 cfs and 1142.5 AFY. Operation over seven months per year equates to 163 AF/ mo. or 2.74 cfs.

2. Assume that the Morro Wells will be pumped as needed for peaking from March 15 to December 15. During a drought year when SWP deliveries will be less than 50 percent, Morro Bay will be unaffected until the County has sold its unallocated SWP entitlement. When this occurs, Morro Wells will be pumped at a minimum of 50 percent of capacity during a drought year in order to reserve full SWP deliveries for peak demand periods. Maximum pumping rate by water right permit is 1.2 cfs and 581 AFY. Operation over approximately 8 months per year equates to 71 AF/ mo. or 1.19 cfs.

3. See Sections 5.2 & 8.5 for discussion of State Water Project deliveries during normal and dry years. During drought years when DWR announces SWP cutbacks on December 1, City will stop SWP deliveries until March 15. Chorro well water will be available during this time (with Morro wells and Desalination as backup). This will reserve SWP water for later months with higher demands when Chorro wells are unavailable.

4. Desalination plant will operate when other water supplies, including SWP and Chorro and Morro wells, are insufficient or do not meet City and/or DHS water quality standards.

5. Assume that water sources will be added to match demand in the following order: SWP, Chorro Wells (when available), Morro Wells, Desalination, CMC.

6. Assume that CMC/Whale Rock Water Exchange agreement will allow ongoing use of CMC/Whale Rock water for peak demand days. Water "loaned" from CMC Water Treatment Plant will be repaid with other Morro Bay water supplies during the same year. Assume CMC water may not be available during a critical drought.

7. Order of use is: 1) SWP, 2) Chorro Wells (when available), 3) Morro Wells, 4) Desalination, and 5) CMC backup water supply.

TABLE 8-8

Monthly Water Operational Plan[5] - Dry Year - 2020

AF

Water Source	January	February	March	April	May	June	July	August	September	October	November	December	Total
Chorro Wells[1]	18	16	21	0	0	0	0	0	0	0	0	14	68
Morro Wells[2]	0	0	0	40	52	71	71	71	71	58	26	0	462
State Water Project[3]	109	109	109	109	109	109	109	109	109	109	109	109	1313
Desalination Plant[4]	0	0	0	0	0	12	20	17	7	0	0	0	57
CMC/Whale Rock Ex.[5]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Supply	127	125	130	149	162	193	201	198	188	167	136	123	1899
Total Supply Needed	127	125	130	149	162	193	201	198	188	167	136	123	1899
Supply Shortage	0	0	0	0	0	0	0	0	0	0	0	0	0

Assumptions:

1. Assume that during a normal year, Chorro Wells can be pumped from December 16 to July 15. During a wet year, the Chorro Wells can be pumped year round. During a dry year, the Chorro Wells can only be pumped from December 16 to March 15, so they would not be available during the peak demand periods when SWP is insufficient to meet demand. Maximum pumping rate by water right permit is 3.171 cfs and 1142.5 AFY. Operation over four months per year equates to 189 AF/ mo. or 3.17 cfs.

2. Assume that the Morro Wells will be pumped as needed for peaking from March 15 to December 15. During a drought year when SWP deliveries will be less than 50 percent, Morro Bay will be unaffected until the County has sold its unallocated SWP entitlement. When this occurs, Morro Wells will be pumped at a minimum of 50 percent of capacity during a drought year in order to reserve full SWP deliveries for peak demand periods. Maximum pumping rate by water right permit is 1.2 cfs and 581 AFY. Operation over approximately 8 months per year equates to 71 AF/ mo. or 1.19 cfs.

3. See Sections 5.2 & 8.5 for discussion of State Water Project deliveries during normal and dry years. During drought years when DWR announces SWP cutbacks on December 1, City will stop SWP deliveries until March 15. Chorro well water will be available during this time (with Morro wells and Desalination as backup). This will reserve SWP water for later months with higher demands when Chorro wells are unavailable.

4. Desalination plant will operate when other water supplies, including SWP and Chorro and Morro wells, are insufficient or do not meet City and/or DHS water quality standards.

5. Assume that water sources will be added to match demand in the following order: SWP, Chorro Wells (when available), Morro Wells, Desalination, CMC.

6. Assume that CMC/Whale Rock Water Exchange agreement will allow ongoing use of CMC/Whale Rock water for peak demand days. Water "loaned" from CMC Water Treatment Plant will be repaid with other Morro Bay water supplies during the same year. Assume CMC water may not be available during a critical drought.

7. Order of use is: 1) SWP, 2) Chorro Wells (when available), 3) Morro Wells, 4) Desalination, and 5) CMC backup water supply.

TABLE 8-9

Monthly Water Operational Plan[5] - Normal Year - 2025

AF

Water Source	January	February	March	April	May	June	July	August	September	October	November	December	Total
Chorro Wells[1]	11	9	14	32	44	74	81	0	0	0	0	7	272
Morro Wells[2]	0	0	0	0	0	0	0	71	69	49	19	0	208
State Water Project[3]	109	109	109	109	109	109	109	109	109	109	109	109	1313
Desalination Plant[4]	0	0	0	0	0	0	0	6	0	0	0	0	6
CMC/Whale Rock Ex.[5]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Supply	120	119	123	141	153	183	191	187	178	158	129	117	1799
Total Supply Needed	120	119	123	141	153	183	191	187	178	158	129	117	1799
Supply Shortage	0	0	0	0	0	0	0	0	0	0	0	0	0

Assumptions:

1. Assume that during a normal year, Chorro Wells can be pumped from December 16 to July 15. During a wet year, the Chorro Wells can be pumped year round. During a dry year, the Chorro Wells can only be pumped from December 16 to March 15, so they would not be available during the peak demand periods when SWP is insufficient to meet demand. Maximum pumping rate by water right permit is 3.171 cfs and 1142.5 AFY. Operation over seven months per year equates to 163 AF/ mo. or 2.74 cfs.

2. Assume that the Morro Wells will be pumped as needed for peaking from March 15 to December 15. During a drought year when SWP deliveries will be less than 50 percent, Morro Bay will be unaffected until the County has sold its unallocated SWP entitlement. When this occurs, Morro Wells will be pumped at a minimum of 50 percent of capacity during a drought year in order to reserve full SWP deliveries for peak demand periods. Maximum pumping rate by water right permit is 1.2 cfs and 581 AFY. Operation over approximately 8 months per year equates to 71 AF/ mo. or 1.19 cfs.

3. See Sections 5.2 & 8.5 for discussion of State Water Project deliveries during normal and dry years. During drought years when DWR announces SWP cutbacks on December 1, City will stop SWP deliveries until March 15. Chorro well water will be available during this time (with Morro wells and Desalination as backup). This will reserve SWP water for later months with higher demands when Chorro wells are unavailable.

4. Desalination plant will operate when other water supplies, including SWP and Chorro and Morro wells, are insufficient or do not meet City and/or DHS water quality standards.

5. Assume that water sources will be added to match demand in the following order: SWP, Chorro Wells (when available), Morro Wells, Desalination, CMC.

6. Assume that CMC/Whale Rock Water Exchange agreement will allow ongoing use of CMC/Whale Rock water for peak demand days. Water "loaned" from CMC Water Treatment Plant will be repaid with other Morro Bay water supplies during the same year. Assume CMC water may not be available during a critical drought.

7. Order of use is: 1) SWP, 2) Chorro Wells (when available), 3) Morro Wells, 4) Desalination, and 5) CMC backup water supply.

TABLE 8-10

Monthly Water Operational Plan[5] - Dry Year - 2025

AF

Water Source	January	February	March	April	May	June	July	August	September	October	November	December	Total
Chorro Wells[1]	23	21	26	0	0	0	0	0	0	0	0	19	89
Morro Wells[2]	0	0	0	46	59	71	71	71	71	65	32	0	487
State Water Project[3]	109	109	109	109	109	109	109	109	109	109	109	109	1313
Desalination Plant[4]	0	0	0	0	0	21	29	25	15	0	0	0	90
CMC/Whale Rock Ex.[6]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Supply	132	131	136	156	169	202	210	206	196	174	141	129	1979
Total Supply Needed	132	131	136	156	169	202	210	206	196	174	141	129	1979
Supply Shortage	0	0	0	0	0	0	0	0	0	0	0	0	0

Assumptions:

1. Assume that during a normal year, Chorro Wells can be pumped from December 16 to July 15. During a wet year, the Chorro Wells can be pumped year round. During a dry year, the Chorro Wells can only be pumped from December 16 to March 15, so they would not be available during the peak demand periods when SWP is insufficient to meet demand. Maximum pumping rate by water right permit is 3.171 cfs and 1142.5 AFY. Operation over four months per year equates to 189 AF/ mo. or 3.17 cfs.

2. Assume that the Morro Wells will be pumped as needed for peaking from March 15 to December 15. During a drought year when SWP deliveries will be less than 50 percent, Morro Bay will be unaffected until the County has sold its unallocated SWP entitlement. When this occurs, Morro Wells will be pumped at a minimum of 50 percent of capacity during a drought year in order to reserve full SWP deliveries for peak demand periods. Maximum pumping rate by water right permit is 1.2 cfs and 581 AFY. Operation over approximately 8 months per year equates to 71 AF/ mo. or 1.19 cfs.

3. See Sections 5.2 & 8.5 for discussion of State Water Project deliveries during normal and dry years. During drought years when DWR announces SWP cutbacks on December 1, City will stop SWP deliveries until March 15. Chorro well water will be available during this time (with Morro wells and Desalination as backup). This will reserve SWP water for later months with higher demands when Chorro wells are unavailable.

4. Desalination plant will operate when other water supplies, including SWP and Chorro and Morro wells, are insufficient or do not meet City and/or DHS water quality standards.

5. Assume that water sources will be added to match demand in the following order: SWP, Chorro Wells (when available), Morro Wells, Desalination, CMC.

6. Assume that CMC/Whale Rock Water Exchange agreement will allow ongoing use of CMC/Whale Rock water for peak demand days. Water "loaned" from CMC Water Treatment Plant will be repaid with other Morro Bay water supplies during the same year. Assume CMC water may not be available during a critical drought.

7. Order of use is: 1) SWP, 2) Chorro Wells (when available), 3) Morro Wells, 4) Desalination, and 5) CMC backup water supply.

Figure 8-1
Monthly Water Operational Plan - Normal Year - 2010

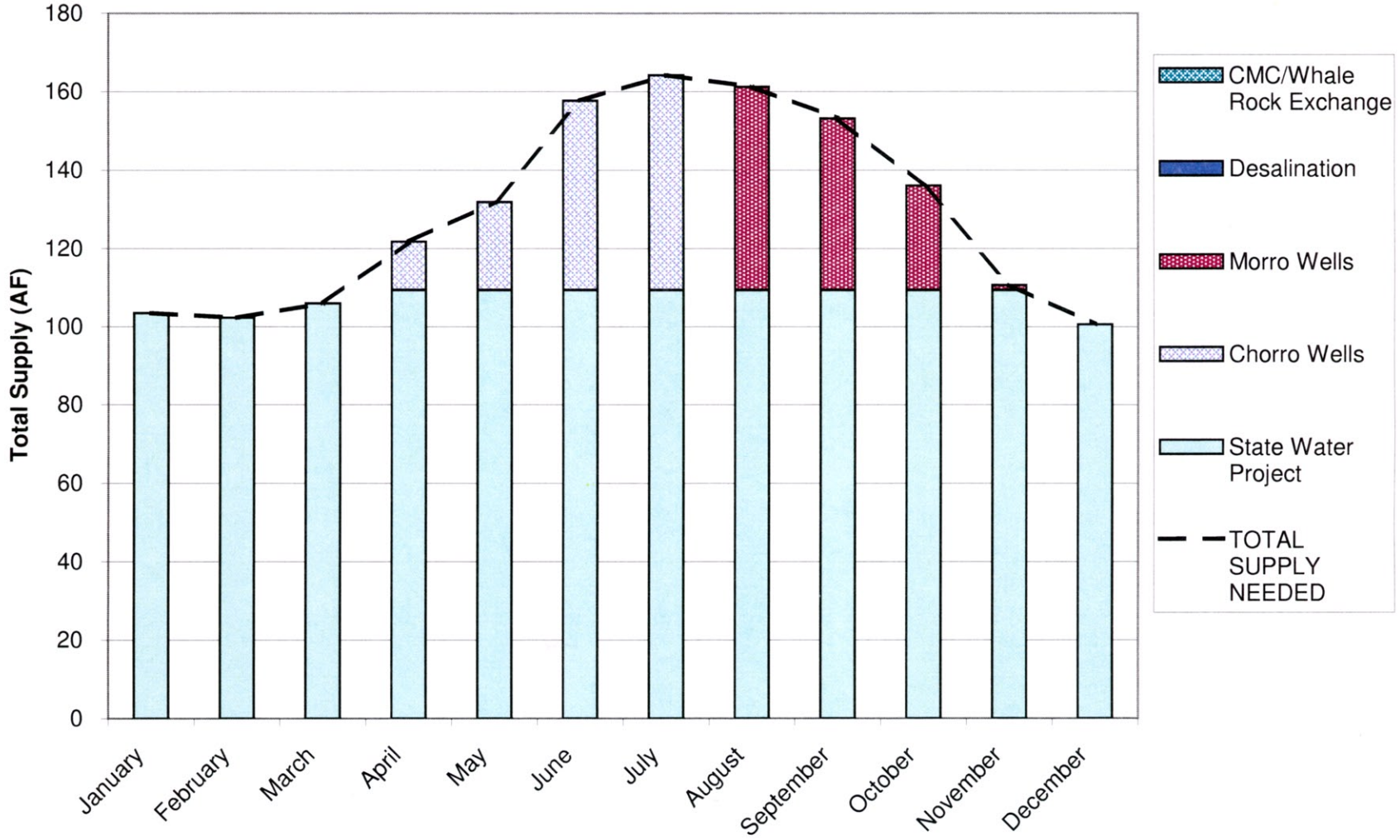


Figure 8-2
Monthly Water Operational Plan - Dry Year - 2010

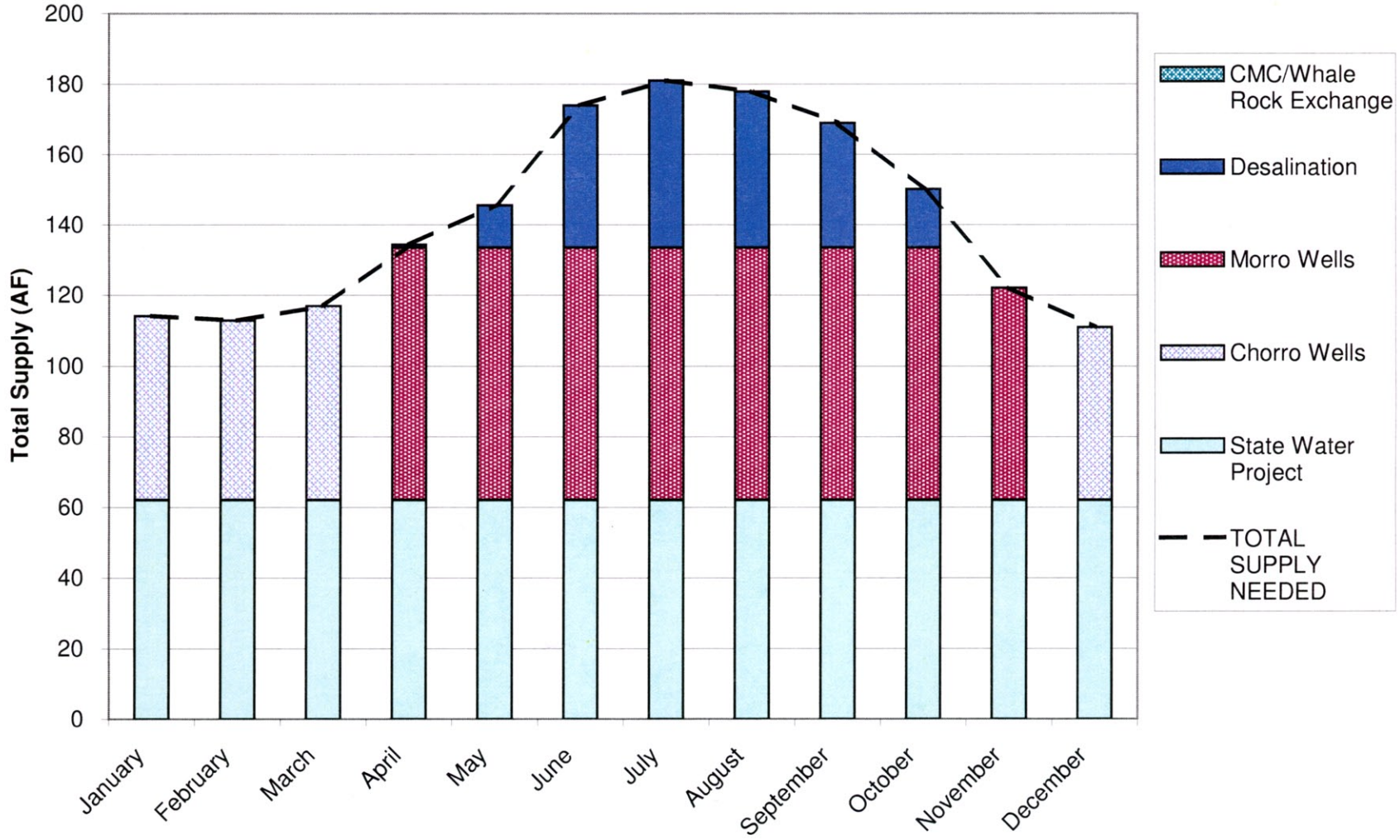


Figure 8-3
Monthly Water Operational Plan - Normal Year - 2015

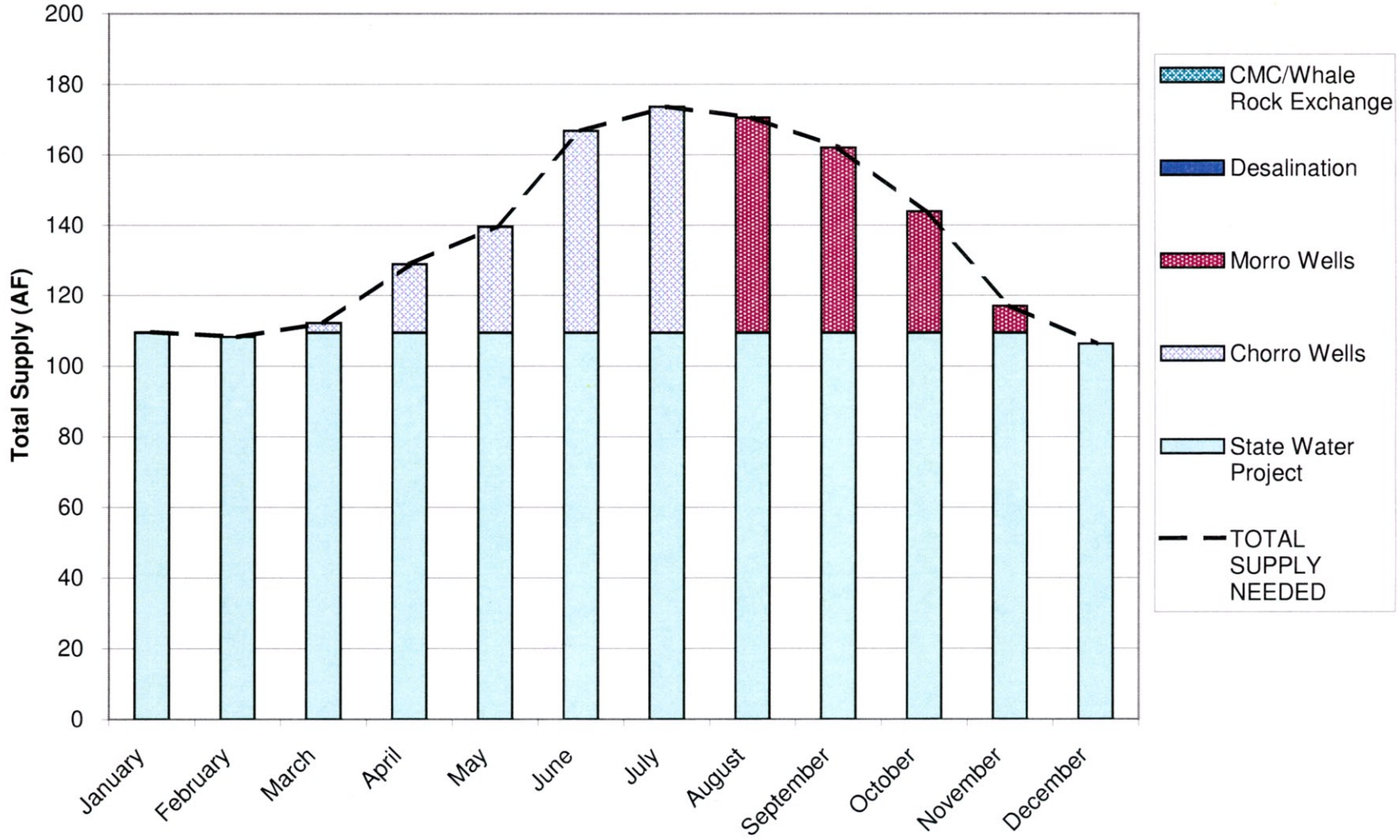


Figure 8-4
Monthly Water Operational Plan - Dry Year - 2015

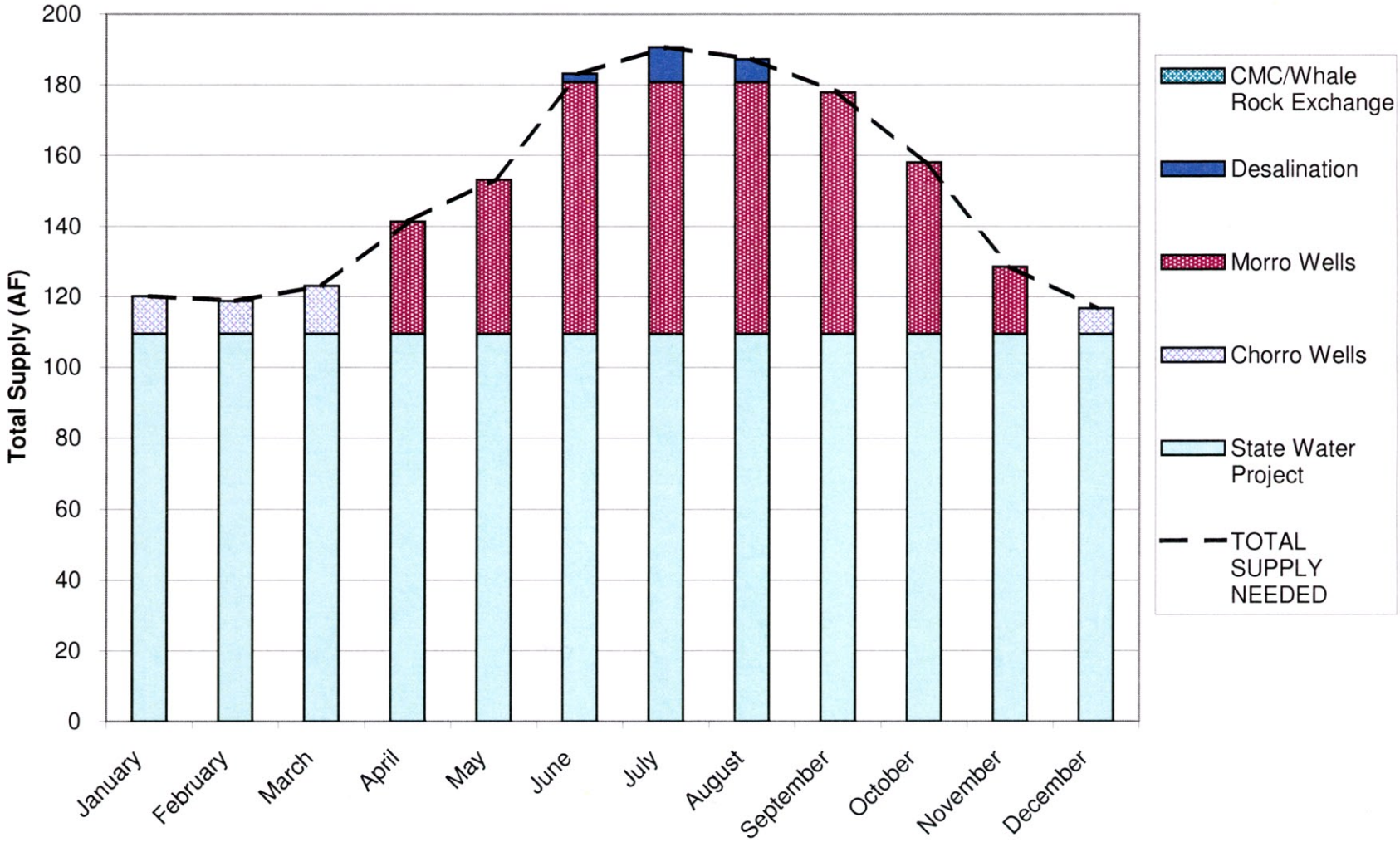


Figure 8-5
Monthly Water Operational Plan - Normal Year - 2020

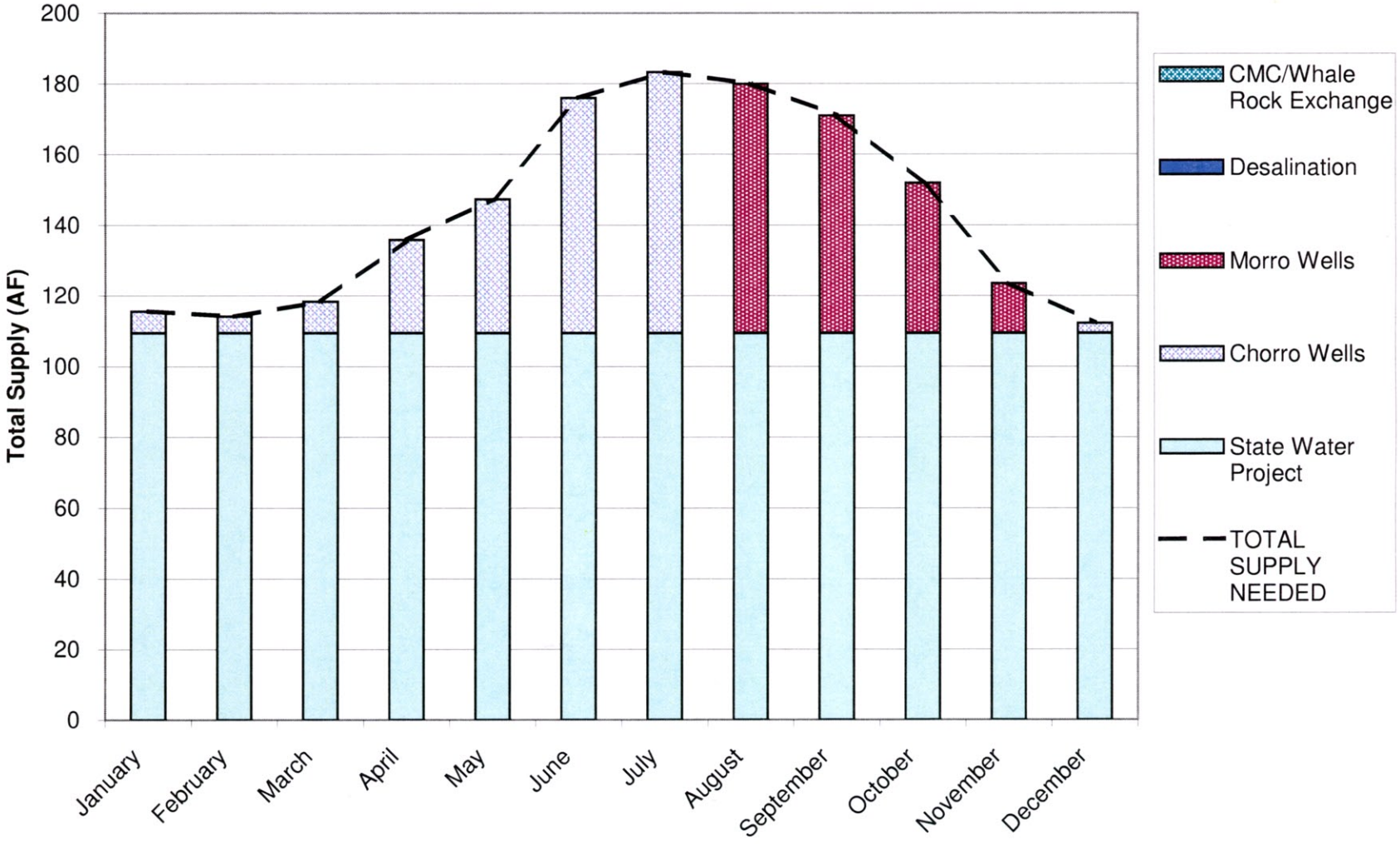


Figure 8-6
Monthly Water Operational Plan - Dry Year - 2020

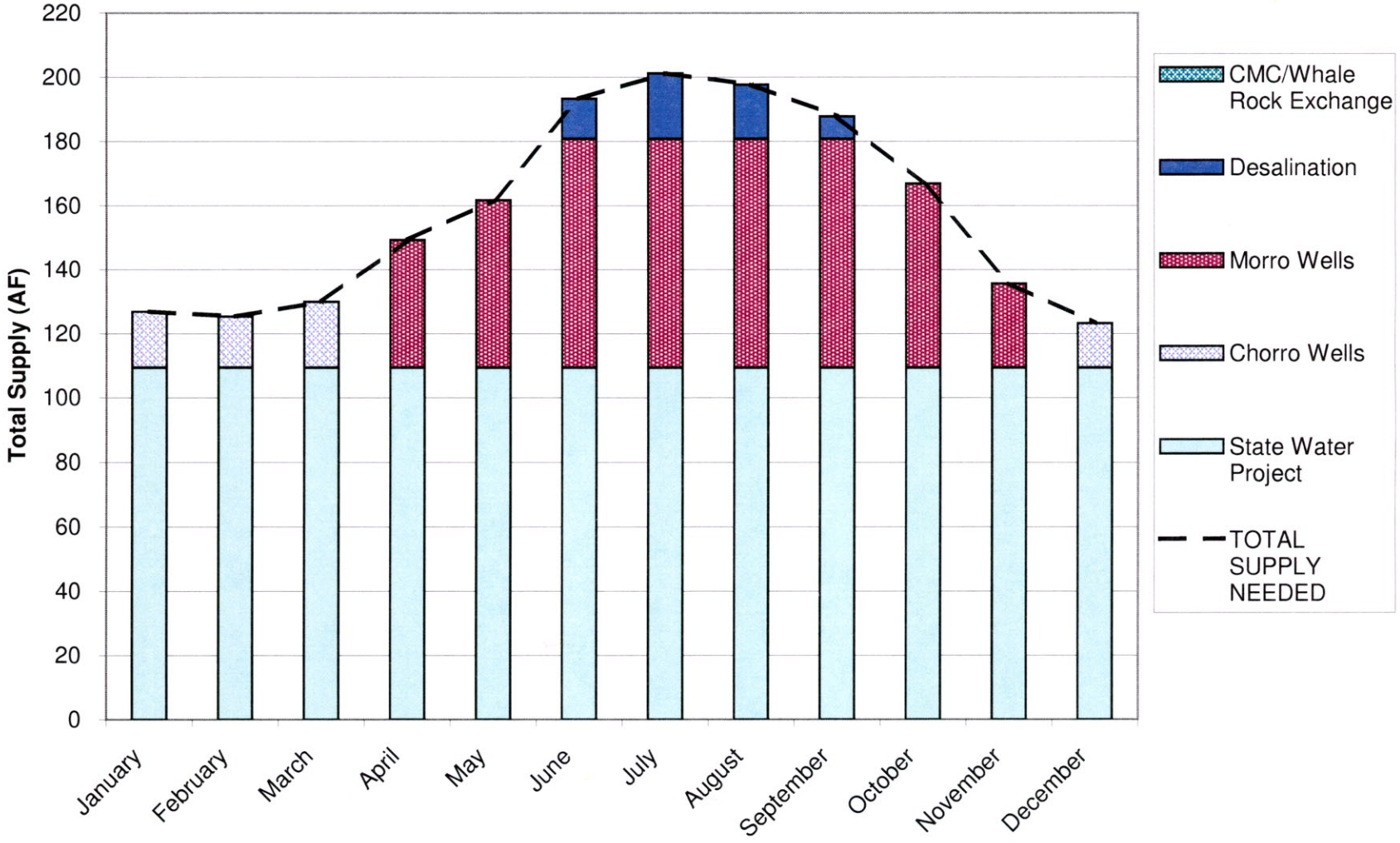


Figure 8-7
Monthly Water Operational Plan - Normal Year - 2025

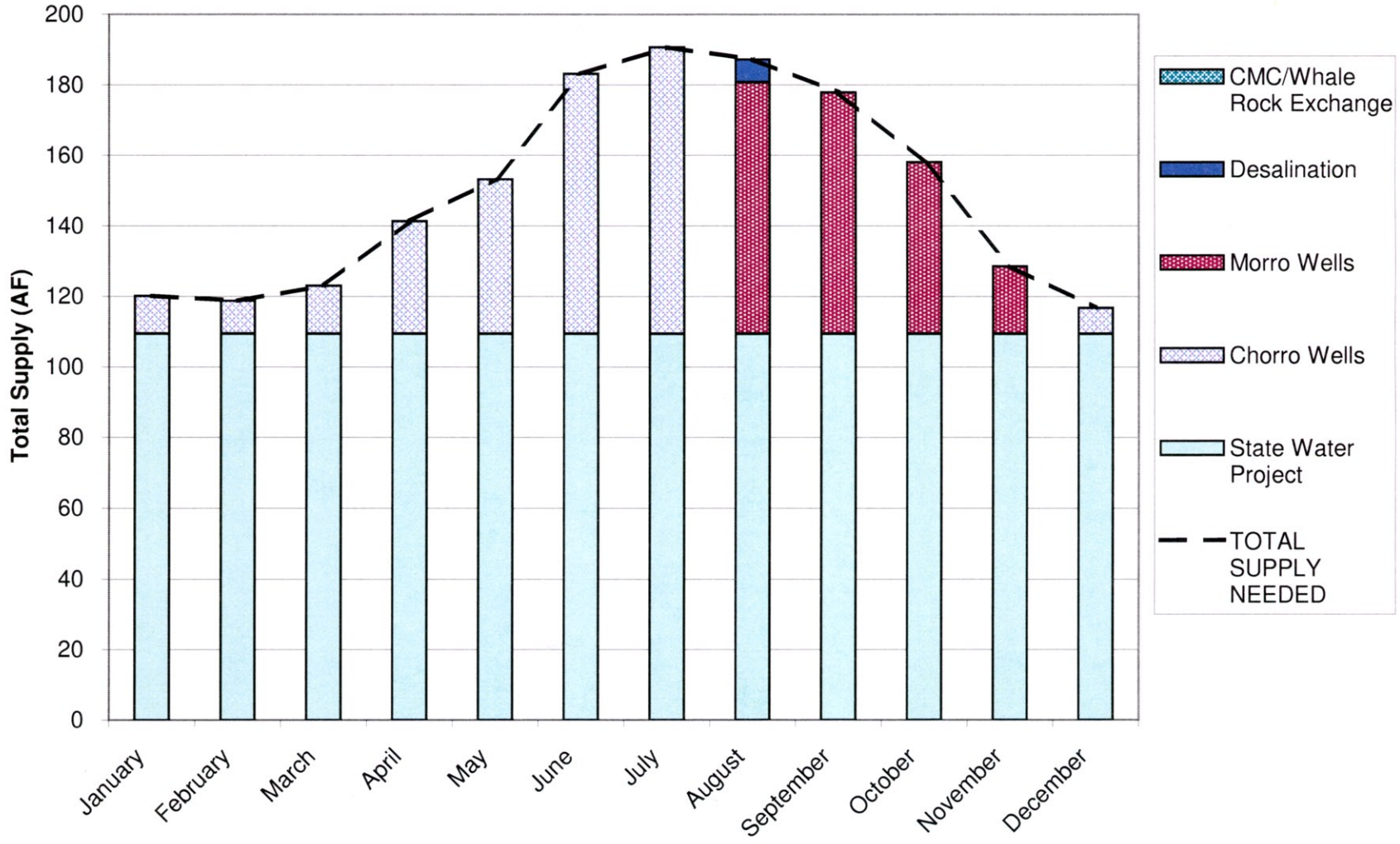
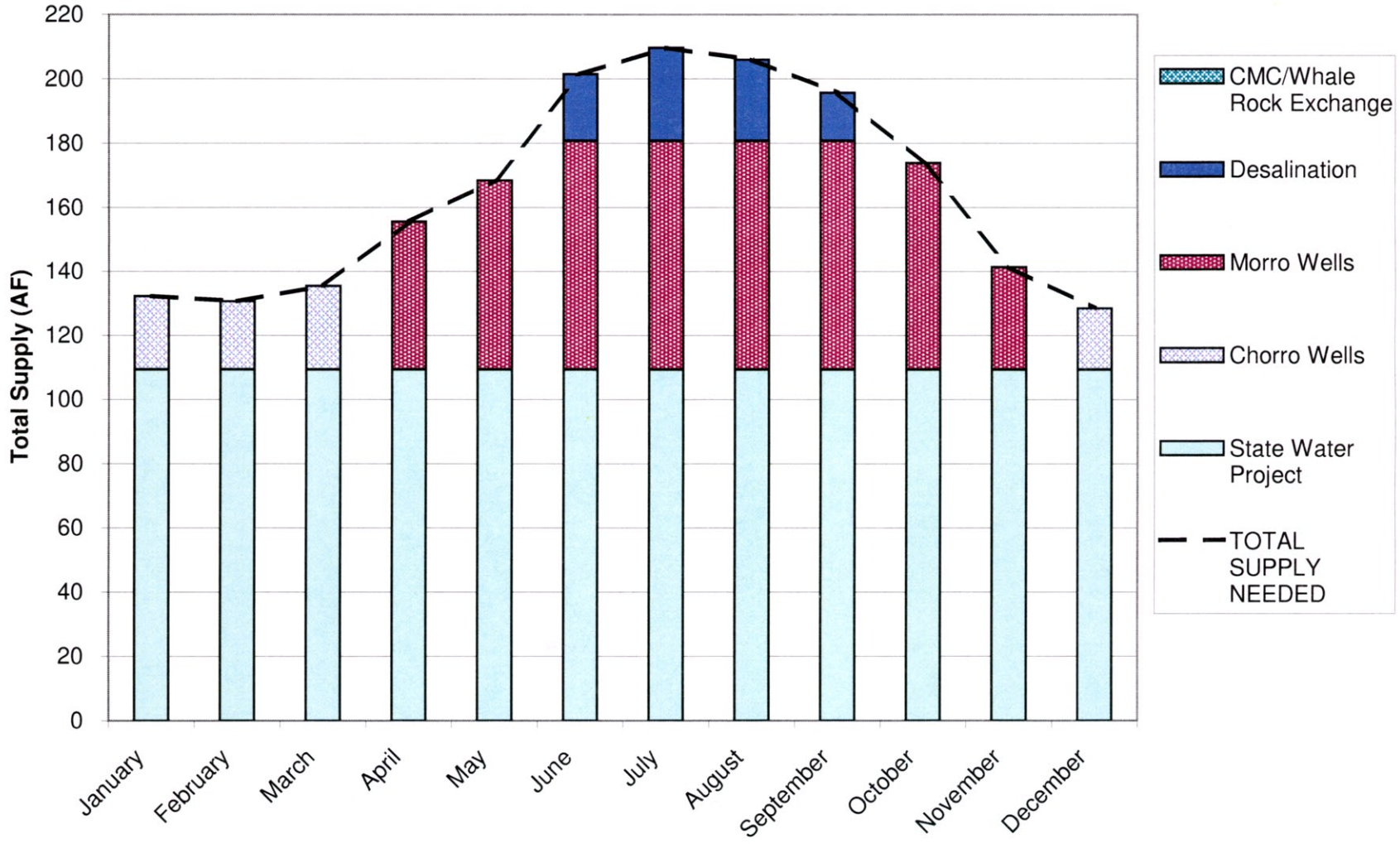


Figure 8-8
Monthly Water Operational Plan - Dry Year - 2025



9.0 Water Conservation Program Evaluation

9.1 Adopted Water Conservation Program

The City of Morro Bay in the face of an ever-tightening water supply has successfully implemented a rigorous and effective water conservation program. A series of water conservation measures were adopted during the height of the drought in the early 90's, when the City's water supplies were taxed to their limit. The water conservation program, as implemented by the City of Morro Bay, is intended to protect the public health and safety as well as minimize adverse impacts to commerce, industry and recreation associated with drought conditions.

The City's water conservation policies promote the more efficient use of the existing water resources. Since the City adopted its water conservation program in the late 1980's, water demand in the City has declined substantially such that Morro Bay per capita water demand is currently one of the lowest in the state.

Since its inception, the City's water conservation program mandated that developers provide water for new construction by funding retrofits of existing facilities to offset two times the developer's estimated water demand. The City developed a water equivalency program to quantify proposed water conservation measures and ensure that reduced water demands will offset water needed for new construction. In practice, retrofitting has generally been limited to toilet replacement. Typically developers were required to fund 14 toilet retrofits for each proposed new residential service. The developer mandated toilet retrofit program ceased in 2001 since the City believes all willing toilet retrofit candidates have been funded and that the remaining candidates would not provide adequate water savings for the additional expense. A new voluntary Ultra Low Flow Toilet (ULFT) rebate program has begun.

In addition to the developer-funded retrofitting program, the City adopted mandatory water conservation measures intended to reduce overall water consumption by existing customers. These mandatory water conservation measures are described in the Morro Bay Municipal Code Sections 13.04.320 to 13.04.345, which are provided in **Appendix B**. Section 13.04.320 grants the City Council authority to declare when a low water level condition exists. Section 13.04.330 identifies the water conservation powers of the City Council when it is deemed necessary to conserve water during low water level periods. Section 13.04.340 identifies the powers of the public works director to enforce water conservation measures if the City Council adopts a resolution declaring a low water level or water system emergency.

Section 13.04.345 identifies the mandatory water conservation requirements for the five increasing levels of conservation as the City's water supplies are reduced during drought conditions. The five classifications for mandatory water restrictions are as noted in the following table and are enforceable through financial penalties and/or loss of service:

Level	Description
1	Normal Water Supply Conditions
2	Moderately Restricted Water Supply Conditions
3	Severely Restricted Water Supply Conditions
4	Critical Water Supply Conditions
5	Emergency Water Supply Conditions

The water conservation measures as triggered by each water supply condition per Section 13.04.345 are as provided:

Level 1: Normal Water Supply Conditions

- Spring-loaded shut-off nozzles are required for outdoor water use.
- Outdoor irrigation resulting in excessive runoff is prohibited.
- Water may be used as needed for washing and cleaning paved surfaces.
- Water is supplied to customers at restaurants only upon request.

Level 2: Moderately Restricted Water Supply Conditions

- Any use that results in excessive gutter runoff is prohibited.
- Water may be used for washing vehicles, boats and buildings with spring-loaded shut-off nozzles, but spraying paved areas is prohibited except for public health or safety.
- Outdoor irrigation is restricted between 10:00 a.m. and 4:00 p.m. and is to be performed only on designated days, except for newly planted landscaping that requires additional water to survive. Excessive gutter runoff is prohibited.
- Water is supplied to customers at restaurants only upon request

Level 3: Severely Restricted Water Supply Conditions

- Washing boats, marinas, buildings and outdoor paved areas is prohibited except for public health or safety reasons.
- Washing cars may be performed only with the use of a bucket and sponge.
- Emptying and refilling swimming pools and commercial spas is prohibited.

- The use of potable water for compaction, dust control and construction purposes is prohibited.
- Dysfunctional or leaking water fixtures in public or commercial facilities are required to be repaired within three days.
- All visitor-serving facilities shall prominently display water conservation educational materials and provide handouts, which outline the mandatory conservation measures being taken.

Level 4: Critical Water Supply Conditions

- Any water use that results in gutter runoff is prohibited.
- Any water cleanup for public health and safety shall be performed with a bucket and brush. No use of hoses, even if equipped with a shut-off nozzle is permitted.
- Irrigation is to be performed only once per week, and is not allowed between 9:00 a.m. and 5:00 p.m.
- Use of fresh water to wash down boats or docks or for other incidental activities is prohibited. All hoses shall have spring-loaded shut-offs or similar devices and may be used only to fill water tanks of boats or to flush outboard engines.
- Restaurants shall serve water only in response to specific requests by a customer.
- Emptying and refilling all pools and spas is prohibited.
- Use of potable water for compaction or dust control purposes in construction activities is prohibited
- Dysfunctional or leaking water fixtures shall be repaired immediately.
- All visitor-serving facilities in the city shall prominently display these mandatory water conservation requirements for the benefit and education of visitors to the community

Level 5: Emergency Water Supply Conditions

- The City Council may impose water-rationing requirements as it deems appropriate.

In addition to the mandatory water conservation program detailed above, the City has implemented a leakage detection and repair program and is planning to further reduce water losses by calibrating production meters, replacing water meters, and coordinating billing information. An extensive pipe replacement program has also been undertaken such that aged pipe is no longer considered to be a major contributor to the unaccounted for water losses.

9.2 Best Management Practices (BMPs) for Water Conservation

As part of the Bay-Delta Proceedings held to decide the future management of the Sacramento Delta, the DWR, in conjunction with water purveyors and environmental groups developed a list of BMPs for urban water conservation. The BMPs represent levels of water conservation that can be reasonably achieved without

mandatory water rationing. The BMPs include proven water conservation measures for which quantifiable water savings can be determined. The BMPS also include potential measures for future adoption when information on their effectiveness becomes known. The BMPs were formalized in a September 1991 *Memorandum of Understanding Regarding Urban Water Conservation in California.* In support of the Bay-Delta process, it is expected that all State Water contractors and subcontractors will sign the Memorandum of Understanding; most have already done so. Signing the Memorandum of Understanding commits the water agencies to diligently pursue the listed water conservation measures.

SB 553, which was signed into law on September 28, 2000, revised the BMP list from 16 to 14 slightly different BMPs. The updated list of BMPs is as follows:

BMP 1: Water Survey Programs for Single Family Residential and Multi-Family Residential Customers

BMP 2: Residential Plumbing Retrofit

BMP 3: System Water Audits, Leak Detection and Repair

BMP 4: Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

BMP 5: Large Landscape Conservation Programs and Incentives

BMP 6: High-Efficiency Washing Machine Rebate Programs

BMP 7: Public Information Programs

BMP 8: School Education Programs

BMP 9: Conservation Programs for Commercial, Industrial, and Institutional Accounts

BMP 10: Wholesale Agency Assistance Programs

BMP 11: Conservation Pricing

BMP 12: Conservation Coordinator

BMP 13: Water Waste Prohibition

BMP 14: Residential Ultra Low Flow Toilet (ULFT) Replacement

In addition to the BMPs listed above, the Memorandum of Understanding also includes potential BMPs that are to be investigated and may be adopted when their effectiveness becomes known. The potential BMPs to be implemented are noted below:

- Rate structures and economic incentives
- Efficiency standards for appliances and irrigation devices

- Replacement of appliances and irrigation devices
- Retrofit of existing car washes
- Graywater use
- Distribution system pressure regulation
- Billing records broken down by customer class
- Swimming pool and spa conservation including covers
- Restrictions on evaporative coolers
- Point of use water heaters and recirculating systems
- Efficiency standards for new industrial and commercial processes

9.3 Status of BMP Implementation by the City of Morro Bay

The City of Morro Bay has implemented many of the BMPs listed in the preceding section. The status of each of the 14 BMPs is described below:

BMP 1: Water Use Survey Programs for Single Family Residential and Multi-Family Residential Customers

No water survey program has been implemented at this time.

BMP 2: Residential Plumbing Retrofit

In the past the City of Morro Bay mandated that developers must fund retrofitting of existing facilities to offset two times the development's estimated water demand. This retrofitting has typically been limited to the installation of ultra low flow toilets (ULFTs). This developer-funded program ceased in 2001 since the City believes all willing toilet retrofit candidates have been funded and that the remaining candidates would not provide adequate water savings for the additional expense. However, the City has provided an ULFT rebate program to replace the developer-funded program and this program is on-going.

BMP 3: System Water Audits, Leak Detection and Repair

System water audits, leak detection and repair are an ongoing component of the water system maintenance program. Over the last 5 years the City has replaced a large number of leaking water pipes and has reduced system water losses as shown in **Table 4-3**.

BMP 4: Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

The City of Morro Bay is 100 percent metered. City continues to require meters for all temporary water connections.

BMP 5: Large Landscape Conservation Programs and Incentives

No large landscape conservation program exists at this time. However, the City is pursuing a conversion to non-potable water sources for irrigation.

BMP 6: High-Efficiency Washing Machine Rebate Programs

The City has recently adopted an Energy Star washing machine rebate program that was added to the existing rebate program for ULFTs. Note that high efficiency washing machines typically require at least 20 psi to operate properly.

BMP 7: Public Information Programs

The City of Morro Bay has prepared brochures which address drought resistant landscaping. These brochures are available upon request.

BMP 8: School Education Programs

Given the water history of Morro Bay, the Morro Bay public schools have developed their own water conservation program and it has been determined that an additional City-sponsored program is not needed.

BMP 9: Conservation Programs for Commercial, Industrial, and Institutional Accounts

No program at this time.

BMP 10: Wholesale Agency Assistance Programs

No program is available through the Central Coast Water Authority or the County of San Luis Obispo.

BMP 11: Conservation Pricing

The City of Morro Bay has some of the highest water rates within the Central Coast, so this encourages water conservation by all water customers. In addition to high water rates, the City has implemented a tiered rate schedule which encourages water conservation since large water users are penalized with higher water rates.

BMP 12-: Conservation Coordinator

The City of Morro Bay Director of Public Services is designated as the City's Conservation Coordinator as defined in the City of Morro Bay's Municipal Ordinances.

BMP 13: Water Waste Prohibition

The prohibition of water waste has been incorporated in the City ordinances since the 1980's.

BMP 14: Residential Ultra Low Flow Toilet (ULFT) Replacement

See BMP 2 above.

To further the water conservation effort it is recommended that the City continue to implement the 14 BMPs taking special consideration of the BMPs noted below for immediate implementation.

- Continue the program of calibrating production meters to ensure an accurate metering of water produced. This will continue to reduce the City's recurring problem of unaccounted for water.
- Calibrate selected water service meters and enact a replacement program if warranted.

9.4 Evaluation and Estimate of Existing Water Savings

The City of Morro Bay has experienced an extremely positive community response to appeals to conserve water. Although the City has not formally developed a program to evaluate the effectiveness of each BMP implemented, the City has monitored the trending of the average per capita water consumption of the community. It is estimated that compared to the pre-drought ten-year (1978-1987) average per capita water demand of 154 gallons per capita per day (gpcd), the current per capita water demand ranges from about 129 gpcd during normal years to 141 gpcd during dry years. This demonstrates that the City's water conservation program has reduced per capita water consumption by 8 to 16 percent.

The 1994 Water Management Plan adopted by the City states "The City should continue with voluntary water conservation unless average personal water usage exceeds 130 gallons per capita day (gpcd), at which time an extensive consumer education program shall be implemented and if unsuccessful, more stringent measures shall be adopted." For the period since the City's Water Conservation Program was adopted, the average per capita water demand has been 126 gpcd. Because the average per capita water demand has not exceeded 130 gpcd, the City has not needed to adopt more stringent water conservation measures or to more closely monitor the effectiveness of the implemented BMPs.

The City's water usage is considerably lower than the average state water demand and indicates the success in water conservation that has been achieved by the City. According to the California Water Plan by DWR (1998), the average urban per capita water demand for the state was 229 gpcd in 1995. DWR had projected demands of 243 gpcd without conservation and 215 gpcd with conservation.

9.5 Coordination with Appropriate Agencies

The City of Morro Bay has not coordinated with any other agencies in preparation of this UWMP.

10.0 Water Shortage Contingency Plan

10.1 Overview - Water Shortage Emergency Response

The City of Morro Bay has recently dealt with water shortages. During the 1987 to 1992 drought, Morro Bay was one of the first California communities to declare a Water Shortage Emergency. The Morro Bay seawater desalination plant was constructed on an emergency basis when the City's two groundwater basins, the Chorro and Morro basins, were both experiencing declining water production. Well water quality also declined during this period due to increasing iron and manganese in the water and, for some wells, seawater intrusion associated with overpumping and the lack of adequate aquifer recharge.

During the decade since then, the City has invested much time and funding to provide a more reliable water supply to the Morro Bay community. Recent events, which include the discovery of MTBE contamination in the Morro basin, past difficulties complying with the SWRCB's minimum flow restrictions on using the Chorro basin, and the 30-day maintenance shutdown of the SWP pipeline, again created a water shortage for the City. The City took action to quickly identify and develop alternative water sources to serve the community.

The City's current water shortage contingency planning is summarized below. Details on the City's comprehensive water planning effort appear throughout this Urban Water Management Plan.

10.2 Water Supply Options

Morro Bay's long-term water supply includes a variety of sources (surface water, groundwater, desalinated seawater and emergency interconnections with other water supply entities). By having a variety of water resources, the City has endeavored to improve the overall reliability and quality of its water supply. One goal of the City's water planning effort is to have water supply sources that will have sufficient water available during water shortages created by seasonal water cycles, droughts and disasters such as power outages and groundwater contamination incidents. This is accomplished, in part, by implementing a conjunctive use operating plan. Recommendations for a conjunctive use operating plan are provided in Section 8 of this report.

The City has also secured several water supplies designed to be available during a water shortage. They are described below.

10.2.1 Desalination Plant

In the early 1990's, Morro Bay completed construction of the seawater desalination plant. Their intention was to provide a reliable, although expensive, emergency water supply. The plant operated for a few months in 1991-1992 and again in 1995. Between 1995 and 2002, the desalination plant was out of service. In 1995 Local Coastal Plan Amendment LCP 1-94 was adopted thereby allowing for the operation of the desalination plant "as needed to ensure that City's minimum water quality standards are met, as routine replacement, and to offset drought conditions."

Iron removal from seawater, via filtration, is necessary for proper operation of the plant. The interim prefiltration system is capable of operating for short periods. Construction of a permanent pretreatment facility, if required, can be completed by 2010. As projected for dry years in monthly operational plan tables (**Tables 8-3 through 8-10**), supplemental supply water from the desalination plant is likely to be required from June through September

to offset peak demand during the summer months. For 2025, projected dry-year demand would require a maximum of 29 AF per month of supplemental supply from the desalination plant which could be provided by round-the-clock operation at 230 gpm (58% of current 400 gpm production capacity).

10.2.2 Mutual Aide Agreement

The City of Morro Bay has secured a Mutual Aide Agreement with California Men's Colony (CMC) enabling each water purveyor to provide the other with water during a water shortage emergency. During the scheduled fall 2001 30-day shutdown of the SWP pipeline, CMC agreed to provide up to 1.7 MGD of treated Whale Rock water. Only 1.4 MGD was available due to the district interconnection pumping system limitations. The City will repay the water loan with water from the SWP or other City water sources at a later time when surplus water is available.

To facilitate this arrangement, a water connection between the two water systems has been constructed. Limited CMC water treatment plant improvements have also been made to improve operational reliability. A consultant is currently studying what additional water treatment plant improvements would be required to make the plant more reliable and support more permanent water exchange arrangements.

If the CMC/Whale Rock Water exchange arrangement is to become a long-term water supply alternative, hydrogeological assessments should be conducted to determine the quantity of water treated at the CMC water treatment plant that could be made available to Morro Bay on an annual and long-term basis. A water loan repayment plan should also be defined.

10.2.3 Long-Term Water Supply Options

Morro Bay is currently pursuing multiple options to restore the City's water supplies to service. As described in previous sections, it may take several years for the Morro and Chorro basins wells and the City's historical water supply to come back into service at full capacity following an extended high-demand period. With state permit restrictions on pumping, the Chorro wells will only be available for peak demand periods during the wettest years. The desalination plant could be improved to provide a regular water supply during water shortages and peak demand periods.

As shown in **Table 5-4**, sufficient water is available to meet normal year and drought year water demands. With additional desalination plant improvements, and when the Chorro Wells are again available, the City's water supply will be expanded further.

In the long run, the combination of water supplies identified could provide sufficient water to serve the City past 2025.

This Urban Water Management Plan suggests several options for improving the reliability and quantity of source water including acquiring additional SWP entitlements, instituting a State Water banking program, and upgrading and expanding the desalination plant. These options are described in more detail in previous sections.

10.3 Water Shortage Contingency Ordinance

In the event, that the City is unable to identify, develop and provide sufficient water supplies to serve the community during a water shortage emergency, the City has adopted a water shortage contingency ordinance. Sections 13.04.320 through 13.04.345 of the Morro Bay Municipal Code, which are provided in **Appendix B**, define the City's program to conserve water during water shortage emergencies. Specific issues addressed include:

- City Council authority to declare the water level low and the basis for this determination.
- Water conservation actions that the City Council can take once it declares a water emergency.
- Actions that the Public Services Director, as the City's Water Conservation Coordinator, can take once the Council has declared the water level low or in an emergency.
- Mandatory water conservation requirements that are increasingly restrictive as the water shortage becomes more severe. The categories of water conservation requirements are:

    A. Normal Water Supply Conditions

    B. Moderately Restricted Water Supply Conditions

    C. Severely Restricted Water Supply Conditions

    D. Critical Water Supply Conditions

    E. Emergency Water Supply Conditions

Detail on the overall City water conservation program is provided in Chapter 9.

10.4 Worst Case Three-Year Water Supply

The three-year minimum water supply analysis summarized in **Table 10-1** considers the City's projected dry year demand with the water supplies that will be available over the next three years based on values of minimum supply available during the recent 1987-1992 six-year drought.

The water production requirements for 2009 could most likely be met by the City purchasing "daily SWP water" from CCWA to meet the City's peak demand periods at those times the demand exceeded the 1.17 MGD of SWP available from the City's entitlement. However, both desalination and groundwater are available as supplemental sources and are included in the list of available supplies.

Table 10-1

Three-Year Estimated Minimum Water Supply
AFY

Water Supply Sources	2006	2007	2008	2009
Morro Wells[1]	581	581	581	581
Chorro Wells[2]	566	566	566	566
State Water Project[3]	1313	1313	1313	1313
Desalination Plant[4]	106	106	106	106
CMC/Whale Rock Exchange[5]	0	0	0	0
Total Available Supply	**2566**	**2566**	**2566**	**2566**
Total Supply Needed[6]	**1641**	**1657**	**1673**	**1689**
Supply Surplus (Shortage)	**925**	**909**	**893**	**877**

1. Assumes that full water right supply from Morro Basin will be available during normal years and that DHS water quality standards will be met. For 3-year minimum supply assumes 581 AFY for drought periods, as described in Section 5.

2. Current wells have nominal capacity of 1148 gpm or 1.65 MGD. Assumes that Chorro Creek in stream minimum flow requirement of 1.4 cfs will be met from Dec 16 to July 15 during a normal year and Dec 16 to March 15 during a drought years. Assume SWP maintenance shutdown will occur during fall when Chorro wells are not available.

3. Assumes that with the City's 174% drought buffer and the County's unallocated entitlement, the City will be able to receive its full entitlement 100% of the time at least through 2009.

4. Assumes that without additional pretreatment facilities, the seawater desalination plant will only operate during a short, 1-2 month, severe water shortage emergency. Permanent desalination plant improvements could be in place by 2008 to provide enhanced pretreatment and possibly reduce plant operating costs.

5. Assumes that up to 1.7 MGD CMC/Whale Rock Exchange water will be available through Mutual Aide agreement. Limited to 1.4 MGD until pumping capacity is increased. This water is on loan, so it must be repaid with SWP or other Morro Bay water in exchange. No additional net water supply is provided. Assumes CMC water is unavailable during critical drought period.

6. Dry year demand projections for 2006 through 2009.

During 2005, the City continues to have its SWP entitlement as its primary and most reliable water supply. The worst case for the Chorro wells is that they would be available under a drought year scenario from December 15 to March 15 without replacement wells. Based on this analysis, the City should have sufficient resources to address the three-year minimum water supply with existing sources.

If needed (particularly for short-term emergency water), the City's planned additional water sources are:

- Continue working with CCWA to purchase additional SWP water on a daily basis as needed to meet peak demand. Excess pipeline and Polonio Pass WTP capacity must be available in order to increase SWP deliveries to Morro Bay.

- When available, obtain up to 1.7 MGD from CMC's water treatment plant. This water source is limited since the "borrowed" CMC water must be replaced in the future when the City has surplus water available. Other potential raw water supplies, including the Salinas and Chorro Reservoirs, also have limited capacities that might be obtainable by the City on a short-term basis.

- Work with California Department of Fish and Game to install permanent Chorro Creek instream flow monitoring stationing in the near future. Evaluate Chorro well water quality to determine water treatment, if any, will be required for the Chorro basin supply water.

Each year before the summer through fall peak water demand period begins, the City will compare the water sources anticipated to be available against the City's expected water demand based on weather forecasts. If the expected water sources are not sufficient to meet demand, then the City will consider declaring a water shortage emergency and institute the appropriate level of water conservation as described in City's water shortage contingency ordinance (**Appendix B**).

10.5 Financial Impact of Water Shortage

The City has taken measures to provide the financial ability to respond to a water shortage emergency. A water shortage reserve fund will cover potential impacts of a water shortage such as:

- Offsetting decreases in water sales income if water consumption declines due to mandated water conservation measures.

- Paying for higher cost emergency water supplies.

Appendix A

City Ordinance Measure No. 266 (Implementing Measure F)

RESOLUTION NO. 78-00

RESOLUTION OF THE CITY COUNCIL
OF THE CITY OF MORRO BAY, CALIFORNIA
EXTENDING ORDINANCE NO. 266 ESTABLISHING
A GROWTH MANAGEMENT PROCEDURE WHICH WILL
ALLOW FAIR DISTRIBUTION OF THE CITY'S SCARCE
WATER RESOURCES AND PROTECT THE SMALL TOWN
CHARACTER AND SURROUNDING OPEN SPACE OF THE CITY

THE CITY COUNCIL
City of Morro Bay, California

WHEREAS, Ordinance No. 266, also know as Measure "F", was adopted by the voters in 1984 to establish a growth management procedure; and

WHEREAS, Ordinance No. 266 was established as a growth management procedure to allow fair distribution of our scarce water resources and protect the small town character and surrounding open space of the City; and

WHEREAS, the growth management procedures set forth in Ordinance No. 266 have assured that the yearly amount of new residential development is commensurate with the availablity of public services and infrastructure; and

WHEREAS, the growth management procedures set forth in Ordinance No. 266 have assured even and balanced growth and not resulted in a deterioration of the quality of service to existing or new residents; and

WHEREAS, Ordinance No. 266 requires the City Council to set an annual limit on new residential units and to prescribe the mix of multi-family and single family residences allowed.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Morro Bay, California, will continue to set an annual limit on new residential units and to prescribe the mix of multi-family and single family as set forth in Ordinance No. 266.

PASSED AND ADOPTED by the City Council of the City of Morro Bay at a regular meeting thereof held on the 11th day of December, 2000 on the following vote:

AYES: Anderson, Crotzer, Elliott, Peters
NOES: Peirce
ABSENT: None

RODGER ANDERSON, Mayor

ATTEST:

BRIDGETT BAUER, City Clerk

ORDINANCE NO. 266

AN ORDINANCE ESTABLISHING A GROWTH MANAGEMENT PROCEDURE WHICH WILL ALLOW FAIR DISTRIBUTION OF OUR SCARCE WATER RESOURCES AND PROTECT THE SMALL TOWN CHARACTER AND SURROUNDING OPEN SPACE OF THE CITY

Be it ordained by the people of the City of Morro Bay as follows:

SECTION 1. Both the Coastal Commission certified Land Use Plan and the Morro Bay city council-adopted Water Management Plan allow for a city residential population to grow from present 9600 to 12,200 by the year 2000 IF ADDITIONAL WATER RESOURCES OF ADEQUATE QUALITY AND QUANTITY ARE MADE AVAILABLE THROUGH IMPLEMENTATION OF THE WATER MANAGEMENT PLAN. In order to insure even and balanced growth during the 16 year period from January 1, 1985 through December 31, 2000, building permits will be limited to a number permitting an annual increase in population which would achieve the 12,200 person goal by the year 2000. No further residential building will be permitted after a population of 12,200 has been reached unless an increase has been approved by a majority vote at a regular or special election.

SECTION 2. If water and wastewater treatment capacities become available allowing for a population increase beyond 12,200, the growth management procedures of this ordinance may be altered ONLY BY A MAJORITY VOTE OF THE PEOPLE AT A REGULAR OR SPECIAL ELECTION.

SECTION 3. Residential building permits in 1985 will be limited to 70 residential units. The city council, with advice of the planning commission, will determine by January 15 of each calendar year thereafter the mix of multi-unit and single family residential units for that calendar year. The 70 unit ceiling may be increased or decreased by a factor not exceeding 10 percent if necessary to achieve the alloted annual population growth target. The determination of the mix will be based on a study of the historical building permit pattern for the decade prior to 1977 and the years since 1982, plus an estimate of population increase of the previous year. Final adjustment of the building permit limit in each year will be made by the city council after a public hearing.

SECTION 4. In any calendar year the commercial and industrial building permits issued shall not require more than 130% of the water allocated to residential units that year.

SECTION 5. Residential building permit approval will follow Coastal Act priorities for water allocation required by Coastal Development Permit 4-81-309A or as revised after the Coastal Commission review scheduled for December 1984. These priorities shall be reviewed again when the pipe replacement program is completed and necessary amendments submitted to the Coastal Commission.

SECTION 6. For purposes of awarding building permits, only those development proposals which meet the definition of infill now in use for water allocations may be approved. This definition was approved by city council resolution No. 26-84 on March 12, 1984.

SECTION 7. Land Use Plan policies 6.01 through 6.08 have been designed to preserve open space and agricultural land within the city limits. These policies and the zoning ordinances which now implement them may be amended or repealed ONLY BY A MAJORITY VOTE OF THE PEOPLE AT A REGULAR OR SPECIAL ELECTION held after final approval of an amendment or repeal by the city council and prior to submission to the Coastal Commission.

SECTION 8. Nonprofit public facilities (e.g. public buildings, libraries, senior centers, etc.) supported in whole or in part by public funds are exempted from the permit limitations in sections 3 and 4.

SECTION 9. Severance. If any portion of this ordinance is held invalid for any reason by a decision of a court of competent jurisdiction, such portion shall be deemed a separate, distinct and severable portion thereof and such decision shall not affect the validity of the remaining portions.

SECTION 10. This ordinance shall supersede all other ordinances in conflict herewith.

I, GARY A. NAPPER, City Clerk of the City of Morro Bay, do hereby certify that the foregoing is a true and correct copy of an ordinance adopted by a majority vote of the electors voting in the geneal municipal election held in the City of Morro bay on the 6th day of November, 1984.

Dated: November 30, 1984

GARY A. NAPPER, City Clerk
City of Morro Bay, California

F 90

PETITION TO CITY COUNCIL
CITY OF MORRO BAY SUBMITTING PROPOSED ORDINANCE

To: City Council of the City of Morro Bay, State of California

Pursuant to Section 4001, California Elections Code, and the attached published notice of intention, we, the undersigned, more than ten per cent of the registered qualified voters of said city, hereby present this petition and request that the following proposed ordinance be passed without alteration by you, or be submitted to a vote of the people at the next regular election.

The proposed ordinance reads as follows:

AN INITIATIVE ORDINANCE OF THE PEOPLE OF THE CITY OF MORRO BAY ESTABLISHING A GROWTH MANAGEMENT PROCEDURE WHICH WILL ALLOW FAIR DISTRIBUTION OF OUR SCARCE WATER RESOURCES AND PROTECT THE SMALL TOWN CHARACTER AND SURROUNDING OPEN SPACE OF THE CITY.

BE IT ORDAINED BY THE PEOPLE OF THE CITY OF MORRO BAY AS FOLLOWS:

SECTION 1. BOTH THE COASTAL COMMISSION CERTIFIED LAND USE PLAN AND THE MORRO BAY CITY COUNCIL-ADOPTED WATER MANAGEMENT PLAN ALLOW FOR A CITY RESIDENTIAL POPULATION TO GROW FROM PRESENT 9600 TO 12,200 BY THE YEAR 2000 IF ADDITIONAL WATER RESOURCES OF ADEQUATE QUALITY AND QUANTITY ARE MADE AVAILABLE THROUGH IMPLEMENTATION OF THE WATER MANAGEMENT PLAN. IN ORDER TO INSURE EVEN AND BALANCED GROWTH DURING THE 16 YEAR PERIOD FROM JANUARY 1, 1985 THROUGH DECEMBER 31, 2000, BUILDING PERMITS WILL BE LIMITED TO A NUMBER PERMITTING AN ANNUAL INCREASE IN POPULATION WHICH WOULD ACHIEVE THE 12,200 PERSON GOAL BY THE YEAR 2000. NO FURTHER RESIDENTIAL BUILDING WILL BE PERMITTED AFTER A POPULATION OF 12,200 HAS BEEN REACHED UNLESS AN INCREASE HAS BEEN APPROVED BY A MAJORITY VOTE AT A REGULAR OR SPECIAL ELECTION.

SECTION 2. IF WATER AND WASTEWATER TREATMENT CAPACITIES BECOME AVAILABLE ALLOWING FOR A POPULATION INCREASE BEYOND 12,200, THE GROWTH MANAGEMENT PROCEDURES OF THIS ORDINANCE MAY BE ALTERED ONLY BY A MAJORITY VOTE OF THE PEOPLE AT A REGULAR OR SPECIAL ELECTION.

SECTION 3. RESIDENTIAL BUILDING PERMITS IN 1985 WILL BE LIMITED TO 70 RESIDENTIAL UNITS. THE CITY COUNCIL, WITH ADVICE OF THE PLANNING COMMISSION, WILL DETERMINE BY JANUARY 15 OF EACH CALENDAR YEAR THEREAFTER THE MIX OF MULTI-UNIT AND SINGLE FAMILY RESIDENTIAL UNITS FOR THAT CALENDAR YEAR. THE 70 UNIT CEILING MAY BE INCREASED OR DECREASED BY A FACTOR NOT EXCEEDING 10 PERCENT IF NECESSARY TO ACHIEVE THE ALLOTED ANNUAL POPULATION GROWTH TARGET. THE DETERMINATION OF THE MIX WILL BE BASED ON A STUDY OF THE HISTORICAL BUILDING PERMIT PATTERN FOR THE DECADE PRIOR TO 1977 AND THE YEARS SINCE 1982, PLUS AN ESTIMATE OF POPULATION INCREASE FOR THE PREVIOUS YEAR. FINAL ADJUSTMENT OF THE BUILDING PERMIT LIMIT IN EACH YEAR WILL BE MADE BY THE CITY COUNCIL AFTER A PUBLIC HEARING.

SECTION 4. IN ANY CALENDAR YEAR THE COMMERCIAL AND INDUSTRIAL BUILDING PERMITS ISSUED SHALL NOT REQUIRE MORE THAN 130% OF THE WATER ALLOCATED TO RESIDENTIAL UNITS THAT YEAR.

SECTION 5. RESIDENTIAL BUILDING PERMIT APPROVALS WILL FOLLOW COASTAL ACT PRIORITIES FOR WATER ALLOCATION REQUIRED BY COASTAL DEVELOPMENT PERMIT 4-81-309A OR AS REVISED AFTER THE COASTAL COMMISSION REVIEW SCHEDULED FOR DECEMBER 1984. THESE PRIORITIES SHALL BE REVIEWED AGAIN WHEN THE PIPE REPLACEMENT PROGRAM IS COMPLETED AND NECESSARY AMENDMENTS SUBMITTED TO THE COASTAL COMMISSION.

SECTION 6. FOR PURPOSES OF AWARDING BUILDING PERMITS, ONLY THOSE DEVELOPMENT PROPOSALS WHICH MEET THE DEFINITION OF INFILL NOW IN USE FOR WATER ALLOCATIONS MAY BE APPROVED. THIS DEFINITION WAS APPROVED BY CITY COUNCIL RESOLUTION NO. 26-84 ON MARCH 12, 1984.

SECTION 7. LAND USE PLAN POLICIES 6.01 THROUGH 6.08 HAVE BEEN DESIGNED TO PRESERVE OPEN SPACE AND AGRICULTURAL LAND WITHIN THE CITY LIMITS. THESE POLICIES AND THE ZONING ORDINANCES WHICH NOW IMPLEMENT THEM MAY BE AMENDED OR REPEALED ONLY BY A MAJORITY VOTE OF THE PEOPLE AT A REGULAR OR SPECIAL ELECTION HELD AFTER FINAL APPROVAL OF AN AMENDMENT OR REPEAL BY THE CITY COUNCIL AND PRIOR TO SUBMISSION TO THE COASTAL COMMISSION.

SECTION 8. NONPROFIT PUBLIC FACILITIES (E.G. PUBLIC BUILDINGS, LIBRARIES, SENIOR CENTERS, ETC.) SUPPORTED IN WHOLE OR IN PART BY PUBLIC FUNDS ARE EXEMPTED FROM THE PERMIT LIMITATIONS IN SECTIONS 3 AND 4.

SECTION 9. SEVERANCE. IF ANY PORTION OF THIS ORDINANCE IS HELD INVALID FOR ANY REASON BY A DECISION OF A COURT OF COMPETENT JURISDICTION, SUCH PORTION SHALL BE DEEMED A SEPARATE, DISTINCT AND SEVERABLE PORTION THEREOF AND SUCH DECISION SHALL NOT AFFECT THE VALIDITY OF THE REMAINING PORTIONS.

SECTION 10. THIS ORDINANCE SHALL SUPERSEDE ALL OTHER ORDINANCES IN CONFLICT HEREWITH.

THE FOLLOWING IS A TRUE AND CORRECT COPY OF THE PRINTED NOTICE OF INTENTION AND ACCOMPANYING STATEMENT:

NOTICE OF INTENT TO CIRCULATE PETITION

Appendix B

Excerpts from Morro Bay Municipal Code Section 13.04

Concerning Water Conservation

13.04.280 Fraud and abuse.

The water department shall have the right to refuse or to discontinue water service to any premises to protect itself against fraud or abuse. (Ord. 13 § 1 (part), 1965: prior code § 9112D)

13.04.290 Noncompliance.

The water department may, unless otherwise provided, discontinue water service to a customer for noncompliance with any of these regulations if the customer fails to comply with them within five days after receiving written notice of the water department's intention to discontinue service. If such noncompliance affects matters of health and safety, and conditions warrant, the water department may discontinue water service immediately. (Ord. 13 § 1 (part), 1965: prior code § 9112E)

13.04.300 Customer's request for discontinuance.

A customer may have his water service discontinued by notifying the water department reasonably well in advance of the desired date of discontinuance. He will be required to pay all water charges until the date of such discontinuance. (Ord. 13 § 1 (part), 1965: prior code § 9112F)

13.04.310 Restoration—Reconnection charges.

The water department shall charge for restoring water service discontinued for noncompliance with these regulations. The city council shall, by resolution, establish the amount of the charge. (Ord. 213 § 1, 1981: Ord. 13 § 1 (part), 1965: prior code § 9112G)

VII. Emergencies

13.04.320 Determination of low water level.

The city council shall have the power and authority to declare the water level low within the city water system whenever in its judgment sufficient facts exist. Said facts may consist of, but are not limited to, any of the following: failure of pumps or motors; broken water mains; failure or shortage of water supply; increase beyond allowable limits (under State Board of Public Health rules) of mineral content of water; failure of major storage facilities. (Ord. 13 § 1 (part), 1965: prior code § 9126A (part))

13.04.330 Council water conservation powers.

When deemed necessary in the judgment of the city council to conserve water during low water level months, or during flood water conditions, which may contaminate city wells, the city council may by resolution declare an emergency condition and do any or all of the following which in its judgment is deemed advisable after publication of notice thereof is given by the city to users:

A. Limit irrigation within the city water service area to specified hours, or prohibit irrigation entirely within the service area;

B. Hold all customers inside the water service area of the city to specified maximum usages of water for each category of users;

C. Provide adequate water to customers for all purposes except drinking and cooking, and require users to supply their own drinking and cooking water;

D. Take any other action which the city council deems necessary to protect the public health or safety, prevent contamination of city wells or other sources of city water, or ensure an adequate city water supply;

E. The council may provide for exemptions to any conservation measure or other adopted pursuant to this section.

It is unlawful for any person to violate any conservation or other measure imposed by the city council pursuant to this section. Violation of any such conservation or other measure, shall constitute a violation of this section. Failure to comply with any conservation or other measure adopted pursuant to this section may result in termination of water service. No water service shall be terminated until the public works director has notified in writing the customer the reasons for the proposed termination,

and given the customer an opportunity to respond, either orally or in writing. (Ord. 336 § 2, 1988: Ord. 13 § 1 (part), 1965: prior code § 9126A (part))

13.04.340 Public works director powers.

If the city council adopts a resolution declaring the water level low or any emergency in the water system as set out in Sections 13.04.320 and 13.04.330, the public works director is authorized and directed to take any or all of the following actions which in his judgment will best conserve water during the duration of the emergency:

A. Specify the days and/or hours during which water users may irrigate, to take effect after publication of notice thereof in a newspaper of general circulation distributed in the city or after written notice thereof is given by the city to users;

B. If there is failure to comply with the limitation on irrigation, the public works department shall turn off the water of any such violator; provided, the public works director shall not terminate any water service until the director gives notice in writing to the customer of the reasons for the proposed termination, and gives the customer an opporunity to respond either orally or in writing;

C. If in the judgment of the Public works director, there is flagrant waste of water (such as but not limited to water running down gutters), the public works deparment shall turn off the water of said user; provided, the public works director shall not terminate any water service until the director gives notice in writing to the customer of the reasons for the proposed termination, and gives the customer an opportunity to respond either orally or in writing;

D. If an owner of property is notified in writing by the public works director of leaks in the water line on the owner's property and has not repaired such leaks within three days after the notification, the public works department shall turn off the water on the property until the leak is repaired;

E. If specified maximum usages of water are set by the city council during low water months or other emergency conditions in the water system, and if any customer uses more than the specified maximum usage for his category, then such a violation shall result in the penalty applied to the customer in the amount of three dollars per one hundred cubic feet of water used over the specified maximum usage for his category during the period of emergency conditions;

F. Prohibit the filling or refilling of swimming pools, hot tubs or spas, to take effect upon written notification thereof by the city to users. (Ord. 336 § 3, 1988: Ord. 13 § 1 (part), 1965: prior code § 9126B)

13.04.345 Mandatory water conservation requirements.

A. Normal Water Supply Conditions.

1. Outdoor water use for washing vehicles, boats, paved surfaces, buildings or other similar uses shall be attended and have hand-controlled water devices, typically including spring-loaded shutoff nozzles.

2. Outdoor irrigation resulting in excessive gutter runoff is prohibited.

3. Marinas and waterfront installations: all hoses shall have spring-loaded shutoff nozzles or similar controlling devices.

4. Restaurants shall serve drinking water only in response to a specific request by the customer.

5. Newly planted landscaping or newly seeded lawns installed prior to the date these mandatory conservation requirements are imposed may be temporarily exempted from the provisions of subsection A2 of this section; provided, the owner/tenant establishes documentation satisfactory to the city conclusively proving the planting date. Any temporary exemption shall expire when the planting is sufficiently established to survive without excessive gutter runoff. All other conservation measures remain applicable during the temporary exemption.

B. Moderately Restricted Water Supply Conditions.

1. Use of water which results in excessive gutter runoff is prohibited.

2. Outdoor water use for washing vehicles, boats, buildings or other similar uses shall be attended and have hand-controlled water devices, typically including spring-loaded shutoff nozzles.

3. No water shall be used for cleaning driveways, patios parking lots, sidewalks, streets, or other such uses except where necessary to protect the public health or safety.

4. Outdoor Irrigation.

a. Outdoor irrigation is prohibited between the hours of ten a.m. and four p.m.

b. All consumers are directed to use no more water than necessary to maintain landscaping.

5. Marinas and WaterfrontInstallations.

a. Use of fresh water to wash down boats, docks, or other incidental activities shall be attended and have hand-controlled devices, typically including spring-loaded shutoff nozzles.

b. All hoses shall have spring-loaded shutoff nozzles or similar controlling devices.

6. Restaurants shall serve drinking water only in response to a specific request by a customer.

7. Newly planted landscaping or newly seeded lawns installed prior to the date these mandatory conservation requirements are imposed may be temporarily exempted from the provisions of subsection B1 of this section; provided, the owner/tenant establishes documentation satisfactory to the city conclusively proving the planting date. Any temporary exemption shall expire when the planting is sufficiently established to survive without excessive gutter runoff. All other conservation measures remain applicable during the temporary exemption.

C. Severely Restricted Water Supply Conditions.

1. Outdoor Water Use (Except Irrigation).

a. Use of water which results in excessive gutter runoff is prohibited.

b. No water shall be used for cleaning driveways, patios, parking lots, sidewalks, streets, or other such uses except where necessary to protect the public health or safety.

c. Washing cars by use of a hose is prohibited. Use of a bucket is permitted subject to nonwasteful applications.

2. Outdoor Irrigation.

a. Outdoor irrigation is prohibited between the hours of ten a.m. and four p.m.

b. Irrigation of private and public landscaping, turf areas, and gardens is permitted at even-numbered addresses only on Wednesdays and Sundays, and at odd-numbered addresses only on Tuesdays and Saturdays. All consumers are directed to use no more water than necessary to maintain landscaping.

c. Newly planted landscaping or newly seeded lawns installed prior to the date these mandatory conservation requirements are imposed may be temporarily exempted from the provisions of subsection (C)(2)(b) of this section; provided, the owner/tenant establishes documentation satisfactory to the city conclusively proving the planting date. Any temporary exemption shall expire when the planting is sufficiently established to survive with twice per week watering. All other conservation measures remain applicable during the temporary exemption.

3. Marinas and Waterfront Installations.

a. Use of fresh water to wash down boats, docks, or other incidental activities is prohibited.

b. All hoses shall have spring-loaded shutoff nozzles or similar controlling devices.

4. Restaurants shall serve water only in response to a specific request by a customer.

5. Emptying and refilling of swimming pools and commercial spas is prohibited except to prevent structural damage and/or to comply with public health regulations.

6. Use of potable water for compaction or dust control purposes in construction activities is prohibited.

7. Any dysfunctional water fixtures in public or commercial facilities shall be repaired within three days of receipt of notification by the city.

8. All visitor-serving facilities in the city shall prominently display these mandatory water conservation requirements for the benefit and education of visitors to the community. Such display shall be done in a permanent vandal-resistant manner. Visitor-serving facilities shall include, but not be limited to, all motels, restaurants, campgrounds, recreational vehicle parks, mobilehome parks, service stations, public restrooms, etc. The owners or managers of such facilities shall distribute to all customers a printed handout or flyer describing these mandatory water conservation requirements. Such handouts or flyers shall be provided to the owners or managers of such facilities by the city free of charge.

D. Critical Water Supply Conditions.

1. Outdoor Water Use (Except Irrigation).

a. Use of water which results in gutter runoff is prohibited.

b. No water shall be used for cleaning driveways, patios, parking lots, sidewalks, streets or other such uses, except where necessary to protect the public health or safety, and then only by use of a bucket of water and brush.

c. Washing cars or other mobile vehicles and equipment, including trailers and boats on trailers, is permitted only by the use of a bucket of water. No use of hoses, even if equipped with a shut-off nozzle, is permitted. Commercial car washes are exempt from these provisions.

d. Use of potable water to wash buildings, houses or mobilehomes is prohibited.

2. Outdoor Irrigation.

a. Outdoor irrigation is prohibited between the hours of nine a.m. and five p.m.

b. Irrigation of landscaping and gardens is permitted at even-numbered addresses only on Wednesdays, and at odd-numbered addresses only on Tuesdays. Noncommercial food-crop gardens are exempt from these restrictions.

3. Marinas and Waterfront Installations.

a. Use of fresh water to wash down boats or docks, or for other incidental activities, is prohibited.

b. All hoses shall have spring-loaded shutoffs or similar devices, and may be used only to fill water tanks of boats or to flush outboard engines.

4. Restaurants shall serve water only in response to a specific request by a customer.

5. Emptying and refilling swimming pools and spas is prohibited except to prevent structural damage and/or to comply with public health regulations.

6. Use of potable water for compaction or dust-control purposes in construction activities is prohibited.

7. Any dysfunctional water fixtures in public commercial facilities shall be repaired immediately.

8. All visitor-serving facilities in the city shall prominently display these mandatory water conservation requirements for the benefit and education of visitors to the community. Such display shall be done in a permanent, vandal-resistant manner. Visitor-serving facilities shall include, but not be limited to, all motels, restaurants, campgrounds, recreational vehicle parks, mobilehome parks, service stations, public restrooms, etc. The owners or managers of such facilities shall distribute to all customers a printed handout or flyer describing these mandatory water conservation requirements. Such handouts or flyers shall be provided to the owners or managers of such facilities by the city free of charge.

E. Emergency Water Supply Conditions. The city council may impose water rationing requirements as it deems appropriate in accordance with Sections 13.04.330 and 13.04.340. (Ord. 417 § 2, 1992; Ord. 381, 1990; Ord. 374 §§ 2 — 4, 1990; Ord. 347 § 3, 1989)

VIII. Fire Hydrants

13.04.350 Damaging and tampering with hydrants.

No person, other than those designated and authorized by the proper authority, or by the water department, shall open any fire hydrant, attempt to draw water from it or in any manner damage or tamper with it. Any violation of this section will be prosecuted according to law. (Ord. 13 § 1 (part), 1965: prior code § 9117A)

— END —

of transmittal