HEAL THE OCEAN

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Heal the Ocean Synopsis of:

Water Supply Planning Study
Prepared for the City of Santa Barbara
August 2009

This report to the City was made by Carollo Engineers, P.C. The information in the Report is to be used to update the General Plan and the Long Term Water Supply Plan (LTWSP).

SECTION 2: State Water Project (SWP) Supply Reliability Assessment:

INTRODUCTION:
From 2002-2008, the City received 13,657 acre-feet water/year from the following source:

57% of its total water supply from	the Cachuma Project
21%	Gibraltar Reservoir
10%	Mission Tunnel (the source is never described but a remark about "Mission Tunnel ground-water seepage" in a later section suggests that this is groundwater)
8%	State Water Project
3%	groundwater
<1%	Devil's Canyon
0%	desalination
-4%	groundwater recharge, overlap agreement with Goleta Water District, and blend water
5%	recycled water

The Gibraltar Reservoir is filling with silt. Instead of raising the Gibraltar Dam, the City has agreed to pass water from the Gibraltar Dam to Lake Cachuma.

The downtown groundwater storage unit (Storage Unit 1) and the Foothill unit can store 16,000 af with a perennial yield of 1300 af and a production capacity of 4,500 afy. A third unit southwest of downtown (Storage Unit 3) is of poor quality and quantity. Injection is possible at Alameda Park and San Roque Park, although this has not been done since 1993. Wells at Alameda Park and Santa Barbara High School can also address seawater intrusion. Even excluding the quality of water from Storage Unit 3, groundwater quality *is not as good as* surface water quality, with taste, odor, iron, and manganese exceeding standards. Foothill water is treated at the wellhead, while Storage Unit 1 water

is treated at the Ortega Groundwater Treatment Plant. Improvements there are expected to allow full use of that water supply.

Devil's Canyon Creek is used only when Gibraltar water is highly turbid following a storm.

A desalination plant exists, but is expensive to operate, so is not currently in use. Should its capacity be needed, it is anticipated that about a year will be needed to recommission the facility.

State Water moves from Lake Oroville to the Feather River to the Sacramento River through the Sacramento-San Joaquin River Delta (the Delta) from which it is pumped by the Banks Pumping Plant at the Clifton Court Forebay to the Bethany Reservoir to the California Aqueduct. Santa Barbara's water is diverted near Kettleman City, treated at the Polonio Pass Water Treatment Plant and passed through the Mission Hills/Santa Ynez Extension into Lake Cachuma.

The City has a Table A amount of 3300 afy.

SWP SUPPLY RELIABILITY:
Climate change is expected to make our water supply less reliable.

Effects on State Water (i.e., the Delta watershed) are expected to be:

- Heat waves will increase in frequency, magnitude, and duration;
- Average annual temperatures will increase 5.5 – 10.4^{o}F by the end of the century;
- Irrigation demands will, therefore, increase;
- Surface flows and groundwater supplies will decrease;
- A 70-90% loss of the Sierra snowpack is expected by the end of the century;
- It will be more difficult to fill reservoirs in dry and even average years;
- A 30% decrease in hydroelectric generation is also expected;
- Longer, drier, and more frequent droughts are expected;
- Up to 2.5x the number of critically dry years are anticipated by the end of the century;
- Increased drought will increase groundwater pumping which will cause groundwater levels to decline;
- More severe and warmer winter storms will increase runoff and flooding;
- Levees, dams, and flood bypasses will be impacted;
- More releases will be made, reducing available supplies and increasing flooding downstream;
- Sea level will rise 20-55 inches by the end of the century (it has already risen 8 inches in the past century);
- Levees are more likely to fail;
- Seawater intrusion will reduce groundwater supplies and/or require more fresh water to repel the intrusion;
- The mean highest tide will increase causing more flooding and storm damage;
- Water quality will be degraded by:
  - Increasing temperature causing increased growth of algae and microbes;
  - Accelerated biological processes causing depletion of dissolved oxygen;
  - Minimizing dilution because flows are reduced;
  - Increased winter flows causing greater non-point pollution;
  - Increased flooding causing greater contamination;
- Many forms of water pollution (sediment, nutrients, dissolved organic carbon, pathogens, pesticides, and salt) will increase;
- A 55% increase in large wildfires is anticipated;
- The fires will cause changes in vegetation, which will reduce water supply;

The fires will also cause increased flooding, which will degrade water quality.

It is feared that current water management practices will be unable to mitigate the effects of climate change on water supply reliability, flood risk, aquatic ecosystems, and other areas of impact.

(HTO Note: It appears these changes are not only anticipated if we don't reduce our greenhouse emissions, they are anticipated *even if we do*. Nevertheless, there is a concerted effort from the governor's office to reduce greenhouse emissions. It appears incontrovertible that greenhouse gasses degrade freshwater quality, and that poor freshwater quality results in poor seawater quality, so it seems that embracing reduction in greenhouse gasses is an important objective.)

The Governor's office has developed ten strategies toward the goal of reducing greenhouse emissions:

Provide sustainable funding for water management;
Develop integrated regional water management;
Increase water use efficiency;
Practice integrated flood management;
Sustain ecosystems;
Expand water storage;
Fix Delta water conditions;
Increase monitoring;
Adapt to sea level rise;
Fund climate change impacts/adaptations research

The Governor's office has also established a committee to develop a plan for the Delta. (HTO Note: this looks to be an elaboration on the 7th strategy, above. The plan consists of 7 goals. Of these, one is of particular relevance to our work: promote statewide water conservation, efficiency, and sustainable use.

OTHER SWP VULNERABILITIES:

The levee system protects land behind it from flooding and the Delta from saltwater intrusion. Levee failure, therefore, is of huge concern. Very old design, rising sea level, waves driven by high winds, high storm runoff, and earthquakes are all anticipated to cause failure resulting in interruption of water export from the Delta for 2 – 24 months.

In addition, the status of several fish species in the Delta has necessitated reduction of export pumping.

SWP DELIVERIES EVALUATION:

The authors develop a table predicting SWP delivery reliability under various conditions for the current year (2007) and for 2027. Although climate change was accounted for in the models used to predict delivery reliability, sea level rise and levee failure were not included, so the projections may not be conservative enough. Even so, Table A deliveries are expected to be lower in times of drought.

The authors observe that at the time of writing, the DWR 2009 Report had not been released and recommended that the 2009 Report be consulted upon its publication. That report is available now. A summary says,

> The 2007 report shows current SWP annual Table A deliveries averaging 63% (2595 taf) of the maximum contract amount of 4,133 thousand acre-feet (taf) per year. The 2009 report

shows a corresponding value of 60% (2485 taf). The 2007 report projects an annual average of 66% to 69% (2725-2850 taf) for the future condition, whereas the updated report has 60%. http://www.water.ca.gov/news/newsreleases/2010/01262010reliabilitysummary.pdf

Therefore, deliveries are anticipated to be down in all conditions. Santa Barbara's maximum contract amount is 3300 afy. Sixty percent of that would be 1980 afy. That is still more than the average delivery from 2002-2008 of 1069 afy. The authors observe that the City is fortunate to have an SWP contract for Table A supplies which can be used and augmented with Article 21 supplies when available.

The Corollo Report continues with the improvements being considered for SWP. Of particular importance to the City is better management of surface and groundwater storage as well as groundwater conveyance. The authors note that the $11-33 billion cost of SWP improvements will be paid by water charges and operation and maintenance fees, thereby affecting the City.

GROUNDWATER BANKING:
Because the City is an SWP contractor, because of the nature of the Coastal Branch, and because the City is not drawing its maximum Table A amount, the authors state that the City is in a position to bank groundwater. This is the "ability to use available aquifer space to store water during wet years, pump the stored water, and use it during dry years." "In-lieu storage" is the storage of groundwater by supplying surface water in-lieu of pumping groundwater, thus retaining groundwater in storage.

Several large water banks, which are SWP contractors, exist in the state. The Central Coast Water Authority could be used as an intermediary to develop a water banking program for the City to bank the unused portion of its SWP entitlement. The authors articulate considerations for the evaluation of banking programs.

This section of the Report concludes with the warning that *in the near future* the City will not receive the deliveries from the SWP that it expects. Reliability of the water supply is expected to go down as the system is brought into a sustainable condition, which bodes well for the more distant future. In the meantime, the City is advised to use the most conservative estimates in the Report when planning and to be more flexible in managing its diverse water supplies, especially with respect to banking, recycled water use, and conservation.

SECTION 3: Localized Climate Change Impact Assessment:

CLIMATE CHANGE IMPACT ANALYSIS:
Climate change is not only going to affect the SWP. It will affect us here in the City. Our climate is of the Mediterranean type with warm, dry summers and cool, wet winters. Our proximity to the Pacific moderates that climate such that our average maximum temperature is 70^{o}F, our average minimum is 50^{o}F, and our average overall temperature is 60^{o}F.

Three-quarters of Santa Barbara County is mountainous, and the Santa Ynez Mountains running along the coast produce rain orographically. Average rainfall in the City is 19 inches per year with a historical maximum of 47 inches and minimum of 4.5 inches. Streamflow is due to rainfall only, there being no appreciable snowpack or headwater base flow. Droughts are common. In the last one, which lasted from 1987 to 1992, Gibraltar Reservoir was drained, and Lake Cachuma was almost so. In response to this, the City built desalination facilities.

Although changes in precipitation due to global climate change are already apparent within the US, a slight increase in precipitation in the City and at Gibraltar Reservoir and Lake Cachuma is not significant. What is apparent is that variation has increased.

Modeling is not fine enough to be able to predict changes even for southern California as a whole, let alone the City, but it does seem that there will be an increase in the annual precipitation that falls as rain in the western mountains of the US. Extreme daily precipitation in regions of the US that include the City will increase. This will cause runoff rates to increase resulting in drops in groundwater recharge and surface water quality and an increase in reservoir inflow. Twenty-four hour precipitation events that are considered extreme will increase threefold by the end of the century with a reduction by half of the frequency of what used to be called 10-, 20-, 50-, and 100-year storms. The Report recommends that the City's long-term planning consider an increased frequency of extreme events of 69% and a change in annual distribution of such storms.

Along with projections for increased extreme precipitation are projections for the number of dry days in summer months. This will extend our dry season. As for the Delta, the City can expect 2.5-times more dry years by the end of the century. The Report recommends that the City assume a 20% increase in frequency and duration of future droughts.

The Report comments on how irrigation needs may change as a result of plant responses to increased air temperatures and increased carbon dioxide concentrations, but the science is so uncertain as to make projections almost useless. A small increase in irrigation requirements is possible, but study is advised.

The Report also notes that the State is encouraging the preparation of Integrated Regional Water Management plans by 2011. They are to include:

- Integrated flood management;
- 20% increase in future dry conditions;
- Aggressive conservation and efficiency strategies;
- Land use policies that help restore natural processes to increase infiltration, slow runoff, improve water quality, and augment natural water storage;
- Land use policies that encourages low-impact development that reduces water demand, captures and reuses runoff, and increases the reliability of the water supply.

How much sea level is going to rise is also uncertain. What is clear is that past models failed to anticipate current rates, so the most conservative approach seems reasonable. The Report recommends planning for a 55-inch rise by the end of the century. A report from the National Academy of Sciences particular to sea level change along the California coast is expected by the end of this year. The current authors note that the City's desalination and wastewater treatment facilities, while 12 feet above the current mean sea level, will be impacted by the rise in sea level by the end of the century. In addition, recycled water treatment facilities, various pipelines, and pumping facilities will also be affected by flooding and erosion.

Again, the authors recommend flexibility in the City's approach to water system operations.

SECTION 4: Recycled Water Expansion Assessment:

RECYCLED WATER REGULATIONS:
Recycled water is a great resource for the City because of its reliability. Currently the City provides 850 afy from the El Estero Wastewater Treatment Plant. Although the requirements for unrestricted use of disinfected tertiary recycled water, which is produced by El Estero, are few: average turbidity of 2 NTU (5 NTU maximum) and average total coliform MPN of 2.2/100 mL (23/100 mL maximum in 30 days), the recycled water currently produced by this facility does not meet the criteria. It must, therefore, be blended with drinking water before use, although this is a violation of Title 22. (Turbidity requirements, which are the exceeded parameter with respect to El Estero's product, are supposed to be met before blending).

Various new policies are in development at the State level, among them a mandated increase in State-wide recycled water use to 200,000 afy by 2020 and to 500,000 afy by 2030, *contingent on the availability of sufficient capital funding.* All basins are to have developed salt and nutrient management plans within five years. *And groundwater basins are to be monitored.* An expert panel will recommend which CECs will be monitored in groundwater.

The policy upgrades will affect the City by re-emphasizing recycled water use and providing funding for it. Current City recycled water use requirements and recommendations exceed what is mandated by the State.

EXISTING RECYCLED WATER SYSTEM:
Historically, influent to El Estero has been 9.5 million gallons per day (mgd; 10,650 afy), but this has declined to 7.8 mgd (8744 afy). Even with more conservation efforts, flow is expected to remain above 6 mgd (6726 afy); therefore available recycled water is also expected to be 6 mgd. Of this, 260,000 gallons per day (gpd; 0.26 mgd; 292 afy) are required for plant processes at El Estero. The 83 recycled water users used an average total of 755,811 gpd (0.76mgd; 847 afy) for 2003–2007. So about 5 mgd more recycled water could be used, however, there are constraints within the system.

El Estero includes the treatment plant, a 670,000 gallon-recycled water storage reservoir, and a recycled water pump station. The recycled water distribution system (built in two phases and referred to as Phase I and Phase II) includes piping, pressure blow-off assemblies, check-valve assemblies, a booster pump station, a 1.5 million gallon-reservoir at the golf course, and a recycled water pump station.

There are constraints with respect to capacity for several processes in the overall provision of recycled water. To provide sufficient disinfection contact time, the El Estero chlorine contact basin is operated in tandem with the recycled water reservoir. Alone, the chlorine contact basin provides 2.16 mgd; in tandem with the recycled water reservoir 4.3 mgd of capacity is provided. The former is currently sufficient, but may not be in the future. Because of the tandem use of the reservoir, waters are treated in batches rather than continuously, thereby reducing production rates and reliability of product waters. Using the reservoir for disinfection also reduces its use for storage. It is recommended that plant disinfection capacity be expanded, which would also increase storage.

The capacity of the filters upstream of the chlorine contact basin is 4.4 mgd, which is sufficient. Likewise, distribution pipelines are sufficient currently and into the foreseeable future. Pump station capacity is about twice current demand. Storage, however, is limited to 0.5 mgd. (The level of the 670,000 gallon reservoir cannot be drawn below 170,000 gallons because that volume is required for chlorine contact.) Overnight, the available reservoir at El Estero is depleted for irrigation but is

supplemented with water treated overnight, which produces another 0.5 mgd. This serves the Phase I zone with 1.0 mgd. To increase this amount, the filters can be run continuously, but this requires increased storage volume.

The Phase II zone is supplied only by the Golf Course reservoir (1.5 mgd) which is filled over the course of the day and not supplemented at night. Increasing storage is the only way for Phase II supply to be increased. El Estero plus the golf course capacity sum to give a maximum delivery of 2.5 mgd.

Since recycled water is currently blended with potable water, the amount of blended recycled water is greater than the numbers cited above. Blending increases the recycled water volume by a factor of 1.4, so disinfection capacity is 4.3 mgd x 1.4 = 6 mgd; filtration capacity is 4.4 mgd x 1.4 = 6 mgd. The weak link in the chain is, again, storage. To the 2.0 mgd that can be stored (0.5 mgd at El Estero and 1.5 mgd at the golf course), is added the amount produced overnight. When blended, that portion becomes 0.5 mgd x 1.4 = 0.7 mgd. Added to the 2.0 mgd in storage, this is 2.7 mgd. However, potable water is being used to produce recycled water. The City desires to eliminate blending.

Storage can be increased to the point where it is no longer the limiting factor, at which point the current booster pumping system capacity of 3.3 mgd would become limiting.

The cost of producing recycled water, including personnel, chemicals, and power for tertiary treatment and disinfection is $130,615/year or $115/acre-foot/year. The cost to distribute recycled water within Phase I is $31,900/year or $43/acre-foot/year, while that of distributing recycled water within Phase II is $52,400/year or $132/acre-foot/year.

WATER QUALITY:
Currently, the City produces recycled water that must be blended with potable water so that turbidity is 2.0 NTU or less, Total Dissolved Solids (TDS) is less than 1500 mg/L, and chloride is less than 300 mg/L during the irrigation season.

To eliminate blending, the recycled water produced would have to meet the three parameters listed above. Three limiting issues are identified:

1. Secondary effluent is not properly “conditioned” for filtration;
2. The filtration system is old and in poor condition;
3. TDS and chloride levels can only be brought down to acceptable levels by desalting.

To address these issues, the Report recommends:

1. Modification of aeration distribution, control, and dissolution;
2. Increased solids retention time;
3. Upgrading the tertiary chemical feed system;
4. Upgrading the tertiary filters;
5. Running the filters at a constant rate.

EXPANDED RECYCLED WATER USAGE OPPORTUNITIES:
Opportunities to increase recycled water use are as follows:

1. Stop blending potable water with recycled water;
2. Increase connections to current distribution system;
3. Extend existing distribution system;
4. Development adjacent to distribution system.

Relative to #2, above, a number of potential recycled water customers adjacent to the existing system are identified using historical potable water usage billing classifications. The uses include industrial and commercial process water as well as irrigation water. Demand is estimated to be 0.36 mgd (403 afy). In addition to potential customers, a number of current recycled water customers who supplement their recycled water use with potable water are also identified, although some customers who currently use potable water for irrigation do so because of concerns about recycled water quality, particularly high mineral content. Demand is estimated to be 0.085 mgd (96.3 afy).

It is recommended that the City continue to retrofit City restrooms so that City toilets can use recycled water for flushing.

Relative to #3, above, a number of potential recycled water customers along potential extensions to the existing system are identified. They are classified by project (#3-9), have demands of 0.1-0.002 mgd (71-2 afy), and costs of $526-$3752/acre-foot.

ISSUES RELATED TO EXPANDED USE:
Expanded uses of recycled water appropriate for the City are toilet flushing, car washing, commercial laundering, and irrigation. According to the California Water Code Section 13553"…(U)se of potable domestic water for toilet and urinal flushing in structures is a waste or an unreasonable use of water…if recycled water, for these uses, is available to the user and meets the requirements set forth in Section 13550…" Therefore, recycled water can be used to flush toilets if the requirements of dual plumbing are met.

Use of recycled water in car washes requires that TDS be below 30 mg/L for the final rinse, which level even potable water does not currently meet. The Report suggests, therefore, that car washes in the City are currently using reverse osmosis or some other treatment to lower TDS. If that is the case, recycled water could be treated at car washes to meet their needs and eliminate the use of potable water. We also now know why getting your car washed in Santa Barbara is so expensive.

Water at laundry facilities must be non-staining and, therefore, low in iron, manganese and color. Testing for these constituents would need to be done.

The mineral content of recycled water is critical for use in irrigation. Potable water has TDS of 573 mg/L, tertiary effluent is calculated to have TDS of 1350 mg/L, and blended recycled water has TDS of 1127 mg/L. To accomplish this level of TDS in recycled water used for irrigation, 367 afy of potable water are used. This represents 30% of the blend volume. The EPA recommends TDS of 1000 mg/L in water reused for irrigation, but the City has tested the salinity of soil in irrigated areas and not found an increase in salinity.

A study was done in 2008 to determine what would need to be done to bring the recycled water TDS down to the level recommended by the EPA. The options included blending, which the City is already doing. Obviously to attain a lower TDS, the City would have to blend a greater proportion of potable water with recycled water than it is currently doing. The authors estimate the cost of doing that by assuming 573 afy potable water (30% of total future demand of 1911 afy) @ $250/af. The 1911 afy volume of recycled water apparently comes from a study referred to in the next paragraph. The cost for blending is $143,250 or $75/acre-foot.

The other option is mineral removal. This would be accomplished by rehabilitating the tertiary filters. A study on that has also been done. It shows a cost of $341/acre-foot. The authors point out, however, that this cost should be compared with the cost of a program to reduce discharge of sodium

from water softening (for which no cost was estimated) and the possible reduction in infiltration of saline groundwater due to sewer improvements near the ocean (for which no cost benefit was estimated).

The cost of imported potable water is $575/acre-foot and anticipated to rise. When the cost of potable water reaches $1135/acre-foot, then the cost of blending will be equivalent to the cost of mineral removal.

The authors go on to list customer conversion costs. These include the cost of connections, the cost of backflow prevention, and whatever costs are incurred by individual users to modify their sites. Of course, recycled water rates are lower than potable water rates, so customer costs are offset.

The Report recommends:

1. Adoption of a dual plumbing ordinance requiring installation of dual plumbing in developments adjacent to the recycled water system;
2. Recycled water use at existing sites be maximized;
3. Recycled water use adjacent to the existing system be expanded;
4. Some extension projects (those where demand is likely to be highest/cost per acre-foot lowest).

   If all extensions are implemented, however, the capital cost is anticipated to be an average of $618/acre-foot. Recall that treatment cost is $115/acre-foot and distribution costs are $43 and $132/acre-foot depending on the zone through which recycled water is distributed. (HTO Note: Compared with the $575/acre-foot current cost of imported water and the certainty that imported water cost will increase, $776-865/acre-foot isn't bad.)

5. Demineralization considering the above cost comparisons;
6. Discussion with current and potential users concerning grass species substitution on golf greens to more mineral-tolerant mixes, educational efforts, promotion of recycled water landscape examples;
7. The recommendations above concerning treatment process improvement to improve water quality, which may necessitate system storage and disinfection changes;
8. Such storage and disinfection changes could include:
   a. Adding baffling to the chlorine contact basin to increase efficiency;
   b. Adding an additional chlorine contact basin adjacent to the north wall of the existing basin or on the eastern side of the desalination facility;
   c. Removing the baffles in the reservoir;
   d. Substituting UV radiation or ozone/UV for current hypochlorite disinfection;
9. Developing an inventory of potential recycled water demand from new development.

SECTION 5: Water Conservation Opportunities:

CURRENT WATER USE PATTERNS:
The City has been a member of the California Urban Water Conservation Council (CUWCC) since 1992 and actively carries out 14 of the CUWCC's best management practices (BMPs).

One of the BMPs is having a ratio of water consumption to water production of > 90%. The City's range is 90-94%. Only 6-10% of the City's water is unaccounted for between the sources and the consumers, and this is considered to be very good.

Total average consumption of water in the City in 2006 was 11.3 mgd (12668 afy). Since the City is mostly a residential community, it is not surprising that 69% of water use is by single and multiple-family residences. Single family consumption was about 300 gal/day and increased by about 22% over the ten-year period from 1998-2007. Use at small and large multifamily facilities declined by 12-17%. Industrial use declined by 20%, while irrigation increased by 23%. Commercial and recycled water usage were unchanged over the time period.

In 1977 the State started to modify its plumbing codes. The latest change was mandated in 1992 at the federal level and requires 1.6 gal/flush toilets and low-flow showers and faucets. Of course, most buildings (~70%) in the City are older than both dates, so those provisions don't apply, however, it is estimated that 3-5% of fixtures are replaced annually due to remodeling. The City has sponsored and continues to sponsor rebates for fixtures.

The Report analyzes use by large consumers. Commercial use by 2370 customers averages 850 gal/day, with the top ten accounts averaging more than 25,000 gal/day. These include the City itself for use in buildings and parks, schools, large motels/hotels, country clubs, the hospital, the zoo, commercial laundries, Caltrans, and retirement homes. The City has been working with the larger customers to accomplish reduction in use, but the Report recommends that it work with all commercial, industrial, and institutional users to reduce water usage.

Per capita water use in the City is 130 gal/person/day (gcd). It was calculated by adding the total potable and recycled water produced (12.16 mgd) and dividing by the population served (93,400). The Central Coast average is 179 gcd, the South Coast average 208, the California average 229, the EPA's Region 9 (California, Arizona, Nevada, Hawai'i, Pacific islands, and tribal nations) average 223, and the national average 160. City conservation is relatively positive, however further conservation will be more difficult.

SB City use is low because of the presence of long-term conservation programs, environmentally-conscious customers, the availability of recycled water, minimal industrial use of water, and our marine climate.

Per capita water use in the City in single family dwellings is 107 gcd, with 61 used indoors, while in multifamily dwellings it is 67 gcd, with 59 used indoors. These are considered to be typical, so further conservation efforts are feasible. Industrial use is considered low when compared to national averages, so further conservation will be more difficult.

Current efforts by the City to conserve water follow the CUWCC BMPs:

1. Residential and commercial water surveys are made;
2. Low-flow shower heads and toilet tank displacement devices are distributed;
3. Water audits will be made if unaccounted for water is >10%, but that is not currently the case in the City;
4. A water main replacement program is underway;
5. All customers are on meters and are billed by volume;
6. Significant large landscape programs are in place such as "Garden Wise Guys" television show, the Green Gardener Program, the California Landscape Budgets Program, the California Irrigation Management Information System, the Smart Irrigation Controller Distribution Program, availability of the Landscape Watering Calculator online, distribution of free rain sensors to shut off sprinklers during and after rain, and promotion of graywater use;
7. Rebates on appliances with high water efficiency rates are given;

8. An extensive public information effort including a conservation hotline, brochures, video loans, a media campaign, water bill messages, website, and demonstration gardens is in place;
9. Presentations are made in schools and camps;
10. Commercial, industrial, and institutional programs are in place to retrofit toilets, provide rebates for installing water efficient bathroom and laundry devices, distribute pre-rinse spray valves to restaurants, and encourage lodging patrons to conserve water;
11. Community programs to heighten water conservation are participated in;
12. Water conservation staff is employed;
13. An ordinance to prohibit water waste has been enacted;
14. An ordinance that requires projects that are subject to design review comply with Landscape Design Standards is in place;
15. City facilities are equipped with water-saving devices and parks with water-wise plants.

The Report continues with an evaluation of water rates. Of the several rate options reviewed (fixed, uniform, declining block, inclining block, seasonal, and water budget), the City uses the inclining block rate structure. This is effective in encouraging conservation, as it charges more per unit as more water is used. There are three tiers for residential users, two for commercial and industrial use as well as residential and commercial irrigation, three for recreation, parks, and school irrigation, three for agricultural irrigation, and single tiers for both recycled water and customers outside of the city limits.

Compared with 12 other municipalities (9 of which have tiered rates), the City has the highest unit charge for the first tier. The City's second tier rate increases by 68% and the third by 5%. The jump to the second tier occurs at a very low volume, while the jump to the third at a high volume. The result is that most residential users must jump to the second tier and most can avoid the third, so little incentive for conservation exists. The authors recommend that more tiers be included in the residential rate structure, so that the rate increases more slowly over a narrower set of tiers.

The authors also recommend a seasonal inclining block rate be implemented for both residential and non-residential users. This would reflect the difference in cost between summer and winter months. Another possibility is that the City implement a water budget-based rate for all customers similar to what it currently uses for irrigation. In this strategy, the rate is calculated on a tiered system starting with a base allotment based on historical use.

To comply with new CUWCC BMPs, the City needs to:

1. Conduct market research to evaluate the effectiveness of its conservation message;
2. Create a brand/theme for its conservation program;
3. Develop regulations for new development or incentives for compliance with the WaterSense new home program;
4. Implement a commercial/industrial/institutional program that will reduce consumption by these users by 10% in 10 years;
5. Expand incentives for replacing inefficient equipment for the users in #4, above;
6. Assist irrigation users who are > 20% over their budget allotment;
7. Provide irrigation water use surveys for 1.5% of users in #4, above, with mixed-use meters each year.

Other, new conservation efforts could be directed at the single largest use of water in the City, which is residential indoor use. The City is advised to implement a policy to reduce water use in new development such as hospitals and hotels. These should be designed with high-efficiency fixtures, low-water-use landscaping, and dual plumbing. The authors also recommend that status reports on

water use to senior management be provided annually, that a priority list of conservation measures be developed, and that new technologies be evaluated constantly.

The Report continues with a brief analysis of potential savings from *carefully-planned* water conservation programs. This includes data from 10 different water utilities throughout the US and reports anticipated 30-year water savings, per capita savings, and per capita costs (approximate average $5-$5.70/person/year). The authors believe that a 5-10% water savings is possible. However, because the City's per capita use is already below average and its buildings older than average, costs above the above-cited average should be expected. This is already above the $4/person/year cost extrapolated by the City. The Report states that it is not known if the savings in water use would be cost-effective compared with other means of meeting future water needs.

What more can be done will require technical analyses of water savings due to specific conservation measures and examination of the cost of those measures. For existing accounts it is recommended that the City adopt appropriate CUWCC BMPs, replace residential fixtures and washing machines, encourage low-water landscaping, restructure the existing rate tiers, tailor billing for irrigation customers, and offer water surveys and rebates for equipment upgrades to targeted high-volume customers.

Because there is no growth planned, new accounts are anticipated to be few. Nevertheless, the City's new landscape ordinance should be enforced, and it is recommended that the City provide assistance with advanced irrigation systems, encourage the new EPA "Water Sense for New Homes" program, and incentivize upgrades when buildings are sold or the name on the water account changes.

SECTION 6: Water Supply Management Assessment:

CURRENT PLANNING AND MANAGEMENT:
The City's proactive preservation and management of water supplies will be of future benefit. An analysis of historical monthly precipitation patterns is recommended to aid in projection of future impacts, but continued reliance on water from Gibraltar Reservoir, the least expensive source is recommended. Considering local climate change, this may be less available. SWP water, local groundwater, and Mission Tunnel seepage may be as well, so banking imported water may be needed. The option for desalination provides flexibility but at great cost. Recycled water is available but of questionable quality, and the quantity may actually decrease with increased conservation efforts. Planning for wider variations in the availability of each water supply is advised. This can be accomplished by greater surface and groundwater storage.

SUPPLY MANAGEMENT OPPORTUNITIES:
It is recommended that the City not give up sources or do anything that could cause a reduction in current water supplies. Indeed, it is recommended that the City work with regional and state partners to improve the reliability of current sources to be able to adjust to climate change, reduced supplies, and catastrophe.

<u>In the short-term, it is recommended that the City:</u>

1. Work with the Santa Barbara County Integrated Regional Water Management Plan to increase reliability. Grants for banking and desalination may be available;
2. Investigate the local groundwater basins;
3. Improve the quality of recycled water to reduce blending with potable water and expand the recycled water system;

4. Investigate banking its SWP water;
5. Improve conservation by replacing fixtures in old homes and focusing on irrigation and large commercial users;
6. Track anticipated State requirements for stormwater runoff and increase its infiltration to make this source available.

Long-term recommendations include:

1. Investigate operating the desalination plant in lieu of SWP water;
2. Investigate treating local groundwater at the desalination plant;
3. Consider participating in the development of a nearby groundwater bank;
4. Consider silt removal or raising the dam at Gibraltar Reservoir;
5. Investigate exchanging recycled water with neighboring water purveyors;
6. Consider increased water storage in Lake Cachuma.

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