How We Measure Water

Fact Sheet #1
Slides: All

An acre-foot (AF) is a unit of measurement commonly used to quantify large-scale volumes of water, including the amount delivered to households and the amount available in bodies of water. One acre-foot is the amount of water necessary to cover one acre (e.g., almost one football field) to a depth of one foot. An acre foot is equal to 325,851 gallons or 43,560 cubic feet (1,233 cubic meters) of water.

A related measurement is an acre-foot per year (AFY). This measurement is used in many water-management agreements and water planning reports. One acrefoot per year is generally enough water to serve the needs of two households of five residents per household for one year.

Gallons

The U.S. gallon unit of volume is used primarily in measuring daily water operations. The water flow over time is calculated in units of million-gallons per day (MGD). One million gallons per day (MGD) is approximately 1,121 acre-feet per year (AFY). The District operates three water treatment plants with a design maximum water production of 42 MGD (Penitencia), 100 MGD (Santa Teresa Water) and 80 MGD (Rinconada). The San Jose/Santa Clara Water Pollution Control Plant is designed to treat up to 161 MGD.

Volume	Acre-Foot (AF)	To gallons (gal)	**325,851**
		To Hundred Cubic Feet (CCF or HCF)	**435.6**
		To cubic meters (m^3)	**1,233.5**
		To liters (l)	**1,233,500**
Flow	Million Gallons Per Day (MGD)		**1,121**
	Gallons Per Min. (GPM)	Acre-Foot per Year (AFY)	**1.614**
	Cubic Feet Per Second (CFS)		**724.5**
	Liters (l)		**0.4264**

Water Retailers Measure – CCF or HCF

One Hundred Cubic Feet (either CCF or HCF) is the volume unit most commonly used by water retailers to meter a home's monthly water usage. A home water bill generally is shown in CCF or HCF units.

In 2007, residents and businesses in Santa Clara County used approximately 400,000 acre-feet (357 MGD) of potable water. The average monthly water usage per household in San José was 15 CCF (11,220 gallons or .3 AF) and the current average cost was $43 per month.

Water flow rates through streams are typically measured in cubic feet per second (CFS). Cubic feet per second represent the speed (fluid velocity) at which the water flows (approx. 7.48 gallons per second). Excessive water speeds can lead to pipe failures, stream bank erosion, and flooding. Typical District pipelines are operated at flow speeds of approximately 5 CFS, while stream flows are more variable. Real time local stream flow measurements are available on-line via the ALERT program, which is linked to 70 stream flow meters on the various streams throughout the county.

Water Supply Reliability

Fact Sheet #2
Slides 8-18

As the water management agency and principal water wholesaler for Santa Clara County, the District is responsible for planning to meet current and future demand for water for the county. The District does its water supply planning in collaboration with San Francisco Public Utilities Commission and water retail agencies in the county.

Water supply reliability includes the availability of water as well as the integrity of the infrastructure and systems that retrieve, store, transport, treat and distribute it. The District strives to meet water demand under all hydrologic conditions, including satisfying its treated water contracts for deliveries to the retail agencies and managing the groundwater basins so that water can be pumped from wells.

Water supply conditions change from year to year because of natural variations in hydrology. In addition, the District operates in an environment of uncertainty and must respond to institutional, regulatory and political risk factors that affect its ability to meet water demand. 2007 was a particularly challenging year with dry year conditions, legal challenges, and regulatory constraints on imported water supplies.

In May 2007, a federal court decision invalidated the Biological Opinion issued by the U.S. Fish and Wildlife Service for operation of the State Water Project (SWP) and Central Valley Project (CVP) with regard to an endangered species, the Delta Smelt. The court ruling, which imposes restrictions on pumping in the Delta, will be in effect until a new Biological Opinion is issued to guide the operations of the two water projects.

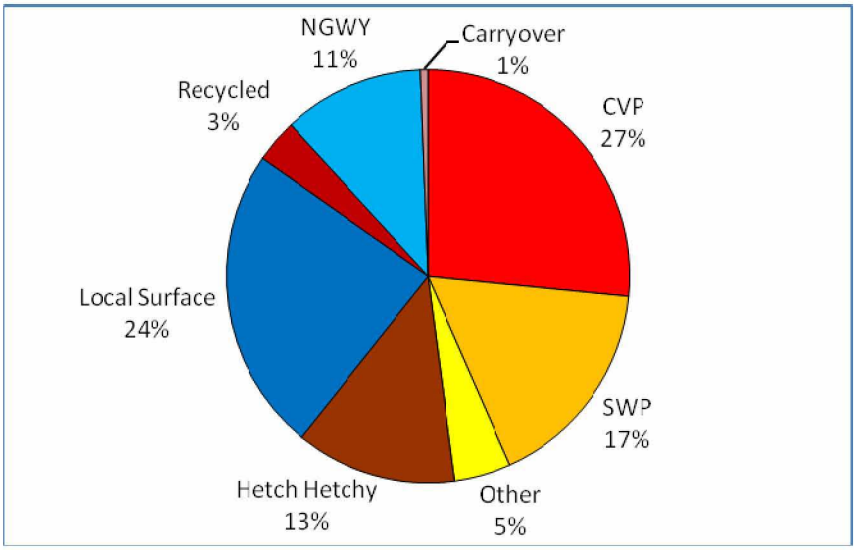


Figure 1: 2006 Water Sources for Santa Clara County

The court order has the potential to impact District water supply and operations in three key ways. It is estimated that overall deliveries will be cut by 10% to 25%, depending on the location of the Delta Smelt and river flow conditions. Secondly, because specific pumping reductions cannot be predicted, the two water projects can not finalize their annual allocations until later in the year, extending the period of supply and operational uncertainty. And finally, limits on Delta pumping will increase the draw on water in San Luis Reservoir,

which could exceed the allowable reservoir withdrawal rate. The District may be unable to meet immediate surface water demands under such circumstances.

All of these factors were taken into account to develop a probable range of scenarios and contingency plans for 2007 and 2008. The strategy will be continuously updated throughout the year to account for operations to date and real-time conditions.

As the region's population continues to grow, the demand for water will increase. A number of factors have to be considered to ensure that future water supply is reliable, including: climate change, environmental issues locally and in the Delta, more stringent regulations, aging infrastructure and the costs to develop other supplies. In the coming year, the District will update its Integrated Water Resources Plan to account for changing circumstances and new conditions.

The District manages and addresses risks and uncertainties by building a diversified portfolio of water supply alternatives. The portfolio of existing dry-year supplies and new water supply investments is intended to meet at least 95% of future water demands. To secure long term water supply, reliability, and regulatory certainty, the District continues to engage in statewide, regional and local collaboration and partnerships.

Furthermore, the District's long-term water supply planning combines sustainability principles with water resources and watershed stewardship planning. This robust, integrated approach provides a sound planning framework that maximizes protection and efficient use or existing resources while minimizing risks from uncertainties and stranded assets.

Global Warming & Climate Change

Fact Sheet #3
Slides 13, 14, 17

Global Warming is a term used to describe the heating of the Earth's surface from a buildup of specific "greenhouse" gases in the atmosphere. Like a greenhouse window, greenhouse gases allow sunlight to pass through the atmosphere, but then prevent heat from escaping. The greenhouse effect is a natural phenomenon that is essential to keeping the Earth's surface warm. Without it, there would not be life as we know it. It is the increases in specific greenhouse gases, such as carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), halocarbons, and ozone (O3)—mostly from burning fossil fuels—that are trapping excess heat in the atmosphere and are warming Earth's surface faster than at any other time in recorded history. It is a commonly accepted fact among reputable scientific institutions worldwide that the Earth's surface is warming. These institutions include the U.S. Environmental Protection Agency, University of Oxford, United Nations Environment Program (UNEP), World Meteorological Organization (WMO), US Climate Change Science Program, Okanagan University College in Canada, and more. The predicted increases in the Earth's surface temperature will significantly affect climate, public health, agriculture, snow accumulation and storage, water resources, sea levels, forests and landscapes, and glaciers.

The Santa Clara Valley Water District and the City of San José are at the forefront of addressing global warming and climate change issues at the state and national level. The City and District have partnered with Sustainable Silicon Valley's CO2 Initiative--a key strategy to respond to climate change resulting from the accumulation of human-generated greenhouse gases like CO2 in Santa Clara County. Both agencies are taking action right now by changing the way they manage energy usage and optimizing operations to increase are energy efficiency. In addition, joint water conservation programs have resulted in some of the biggest energy savings of any programs in the County.

The terms *global warming* and *climate change* are often used interchangeably. However, there is a distinction. Climate change is a broader term that covers all the anticipated effects of climatic changes beyond just the rising temperatures implied by the term global warming.

Rising global temperatures are melting off the world's glaciers and the polar ice caps at an alarming rate. The resultant rise in sea levels is likely to have global consequences. Of particular concern to Santa Clara County is the potential for a catastrophic failure of the San Francisco-San Joaquin Bay Delta levee

system, through which about half of our annual water supply passes. Failure of these levees would not only decrease the quantity of imported water available to the county, but it would also increase the salinity of Delta water, adversely impacting water quality and Bay-Delta ecosystems. In addition, rising sea levels will also result in coastal flooding and increased saltwater intrusion into our groundwater basins. The effects of climate change extend beyond water supply concerns. Temperature and precipitation changes also affect plant life, potentially changing habitats resulting in further loss of some plant and animal species—some already endangered. In addition, flood protection structures may not be able to handle higher water levels and rising tides could overwhelm levees in the South Bay.

The above scenarios represent the potential impact of climate change over the next several decades. They present significant challenges that will be very difficult and expensive to overcome.

The Water District is addressing the climate change challenge and related uncertainties at two levels. The first, proactive, step is to change practices and increase efficiency so as to not exacerbate the problem. The second level is to specifically assess vulnerabilities and risks due to climate change and incorporate the results of the assessment into all District planning for water supply, flood management, business and strategic plans.

Over the past 15 years, the Water District led water conservation and recycling programs have saved over 1.4 billion kilowatts of energy, and reduced air pollution by an amount equivalent to removing 72,000 cars from the roads. In 2006, the District achieved 96% of energy use from renewable sources.

On Jan 29, 2008, the District Board of Directors passed a resolution that reaffirmed the Board's aspiration to:

1. Continue to exercise leadership in initiatives, programs and policies that address climate change while furthering the District's mission;
2. Apply understanding of climate change and related impacts as appropriate in water supply plans, flood management project plans, asset management and infrastructure plans, California Environmental Quality Act assessments and environmental impact reports, energy management plans, business plans, and strategic plans; and
3. Strive to minimize its greenhouse gas emissions related to utilization and management of water resources; and
4. Enhance community understanding of climate change and how it challenges the District's mission.

In addition, the Board adopted a set of policies directing the integration of change considerations into District planning and operations. It formed a Climate Action Team to facilitate the integration and furtherance of the District's mission and the newly adopted policies. Building on past successes, the District continues to provide a systematic framework for integrating mitigation and adaptation to climate change into all of the District's activities, which will include early or no-regret actions, refinements to existing operations, and identifying services/programs that needed expansion, and capital investments needs. Partnership, collaboration and knowledge-sharing and better decision support tools are keys for responding to climate change.

In May of 1995, the San José City Council adopted a resolution to participate in the Cities for Climate Protection Campaign sponsored by the International Council for Local Environmental Initiatives (ICLEI). The array of actions and activities that have followed are described below and have contributed to a reduction in greenhouse gases in addition to the City's energy programs. The emission reductions achieved as a result of the energy efficiencies within City facilities equate to reducing over 89,000 metric tons of carbon dioxide – equivalent to not driving more than 19,000 cars for one year -- or recycling 30,000 tons of solid waste instead landfilling it.

The goals of the 1995 campaign were to:

- Strengthen local commitment to reduce greenhouse gases;
- Utilize management and planning tools developed by ICLEI to determine local energy use and develop strategies for conservation;
- Promote best practices to reduce energy use in buildings and transportation; and
- Enhance national and international ties through a collective voice for municipalities.

Within that adopted resolution, San José pledged to:

- Incorporate the goal of greenhouse gas reduction in the policies and programs being pursued under the Sustainable City Major Strategy and sustainable city energy strategy;
- Review the variety of energy conservation and efficiency measures that the City is currently pursuing and assess the greenhouse gas reduction that will be achieved by each measure;
- Identify for implementation those measures that achieve significant greenhouse gas reductions; and
- Continue to advocate for energy efficiency and climate protection at the regional, state and national levels.

San José has fulfilled this pledge through the Sustainable City Program activities that occur throughout city departments. In particular, the City's adopted Sustainable Energy Policy and Action Plan contribute to that effort. The purpose of that policy is to create a community where energy is generated and used in the most sustainable manner possible. One of the goals within the Sustainable Energy Policy is to "Promote and achieve a cleaner and healthier environment, including improving air quality and reducing greenhouse gas emissions."

The City achieves this goal through policies and programs that:

- Reduce petroleum consumption in municipal fleets through improvements in fleet fuel efficiency, the use of alternative fuel vehicles and alternative fuels.
- Reduce petroleum consumption in the private sector through improvements in fleet fuel efficiency, the use of alternative fuel vehicles and alternative fuels.
- Support and expand the City's Smart Growth policies which lead directly to improved air quality through reduced vehicle miles traveled.
- Reduce the urban heat island effect through the adoption of cool communities' actions.

Conservation

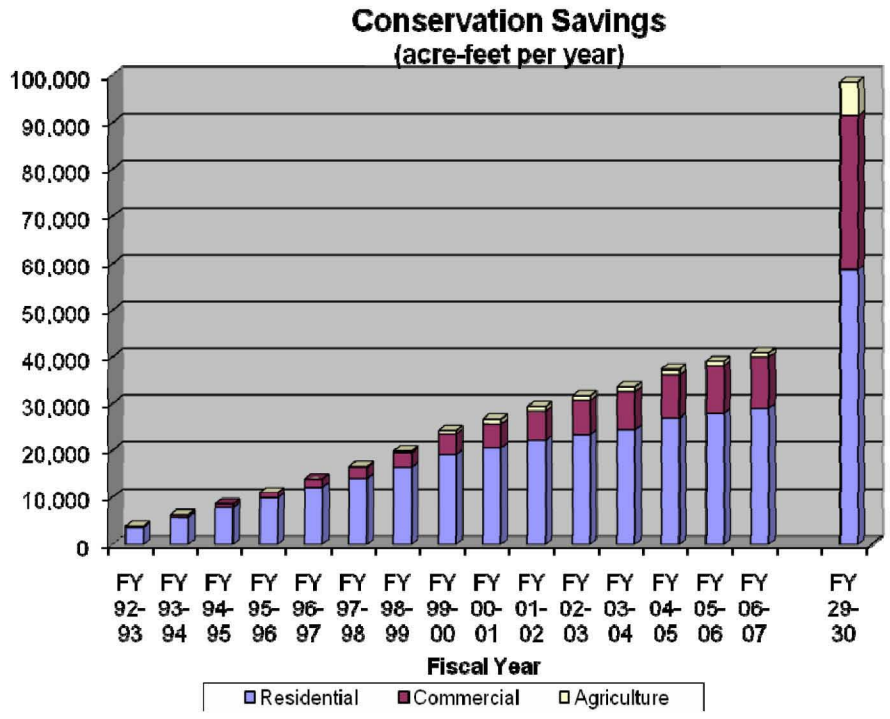
Are each in a

Fact Sheet #4
Slides 20-33

Water conservation, a program widely supported by the public, offers a variety of benefits countywide. Besides meeting long-term water reliability goals, water conservation programs help meet short-term demands placed on the water supply system during critical dry periods. Conservation reduces wastewater flows to Bay Area treatment plants, thus avoiding or deferring facility expansions while protecting the Bay's salt marsh habitat. Water conservation also saves energy, thereby reducing air pollution and greenhouse gas emissions, and helps reduce the frequency of across the board conservation requirements (e.g.; last year's request for 10% conservation) on water retailers and consumers.

Since FY 92-93, City indoor conservation programs, mostly funded in cooperation with the District, resulted in over 9,000 acre feet total of indoor water conservation throughout the Treatment Plant service area. Countywide, the District sponsored programs have achieved approximately 41,000 acre-feet per year of indoor and outdoor water conservation countywide (see chart below). These conservation efforts, as well as the efforts by the other cities and the water retailers, have resulted in a decrease in countywide per capita water use over time. Current per capita water use is below the per capita water use in 1987.

The District's adopted goal for water conservation is 100,000 acre-feet by 2030. By comparison, annual conservation goals for other Bay Area water agencies range from 10,000 acre feet savings by 2050 (Contra Costa Water District) to 45,000 acre feet by 2020 (East Bay Municipal Utility District, which serves Alameda and Contra Costa counties).



As signatories to the California Urban Water Conservation Council's Memorandum of Understanding, the District and the City's Municipal Water System are obligated to implement a variety of urban water conservation programs. Additionally, under the Central Valley Project Improvement Act, the District is also required to implement various agricultural water conservation programs. Finally, due to the overall cost-effectiveness of water conservation, both the District's 2005 Urban Water Management Plan (UWMP) and its 2003 Integrated Water Resources Planning document call for significant conservation savings – 100,000 acre-feet by 2030 of which 70,000 acre-feet is expected to come from the current portfolio of programs and an 30,000 acre-feet will come from new initiatives (known in the District as the "No-Regrets" package). Achieving these goals will require considerable collaboration with local cities and state-wide initiatives.

The City funds conservation solely with Fund 513 (Treatment Plant Operating Fund), due to the flow reduction needs of the San Jose/Santa Clara Water Pollution Control Plant. Since the goal is to reduce flow to the Plant, the City only funds indoor water conservation programs throughout the tributary area. It does not fund any outdoor conservation. District conservation funding comes from wholesale water revenue and grants such as Prop 50 and Prop 13 funds and cost-sharing. Annually, the District secures from $1 to $2 million in grant funding and approximately $500,000 to $1 million in cost-sharing for conservation activities countywide. Cost-sharing leverages the amount each agency has to spend on its programs, thus making them more cost-effective.

The tremendous volume of water savings cited above is due to our joint successes in securing grant funding and cost sharing. The two agencies have engaged in a cost-sharing agreement since FY 1998. For instance, in FY 07-08, the City is helping to finance District programs with $547,000 in cost sharing and the District is helping to finance the City with $280,000 in cost sharing. The District portion is larger because it takes a bigger role in program administration at this point.

Equipment retrofits and replacements in residential and business settings are the primary means of achieving water conservation. Equipment replacements can include replacing pre-1992 toilets with High Efficiency Toilets that flush with just one gallon of water, replacing washing machines with high efficiency machines, replacing "pre-rinse sprayers" used in food service settings with water-conserving sprayers, and changes to cooling tower equipment. Considerable conservation potential lies in outdoor conservation as well (landscape irrigation, etc.).

The District and City currently implement over 20 different water conservation programs that use a mix of incentives and rebates, free device installation, one-on-one home visits, site surveys, and educational outreach to reduce water consumption in homes, businesses and agriculture. Further opportunities exist

in the development of ordinances that require the use of the most water and energy efficient fixtures.

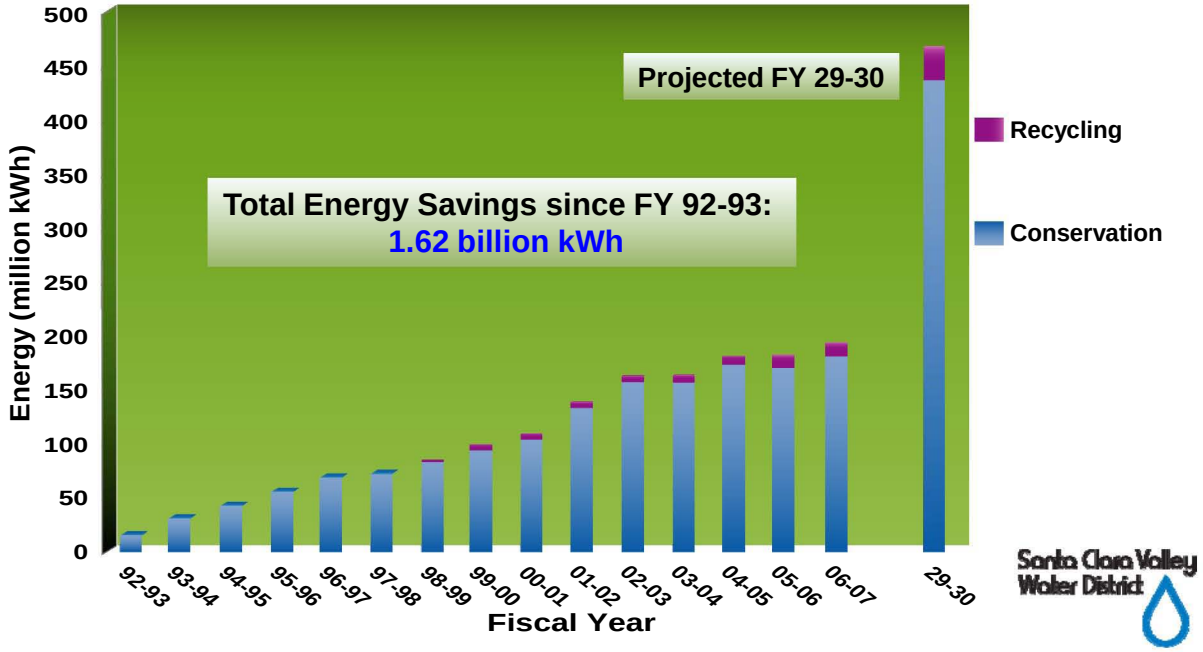
While the City has several ordinances prohibiting wasting water, there are further opportunities to save water with ordinances that apply to new development, improve landscape standards for new and existing development, and retrofit toilets upon resale. Morgan Hill, for example, has recently enacted such ordinances (e.g.; Ordinance 18.73 was added to the Municipal Code to require water conserving landscapes).

The amount of conservation achieved by each technology and program strategy varies. It also varies by the setting in which it occurs. For instance, a toilet replacement in a restaurant (~48 gallons per day, or gpd) achieves more conservation than a toilet replacement in a hotel (~16 gpd) because the restaurant toilet is used much more frequently. A pre-rinse sprayer valve replacement in a restaurant may achieve 150 gpd in conservation. Other factors influence the cost-effectiveness of conservation activities. For instance, the types of programs used to install a water-conserving fixture vary in cost. A toilet rebate may cost $100 while a full-service toilet retrofit program may cost $250 per fixture. Grant funding and cost sharing may make the difference between a cost-effective program and one that is not. To make a program cost-effective, the recipient of the technology (for instance, a private residence) may have to help fund a conservation strategy, such as a toilet retrofit. All these factors are considered in conservation program development to ensure that the most cost-effective and equitable conservation strategies are employed.

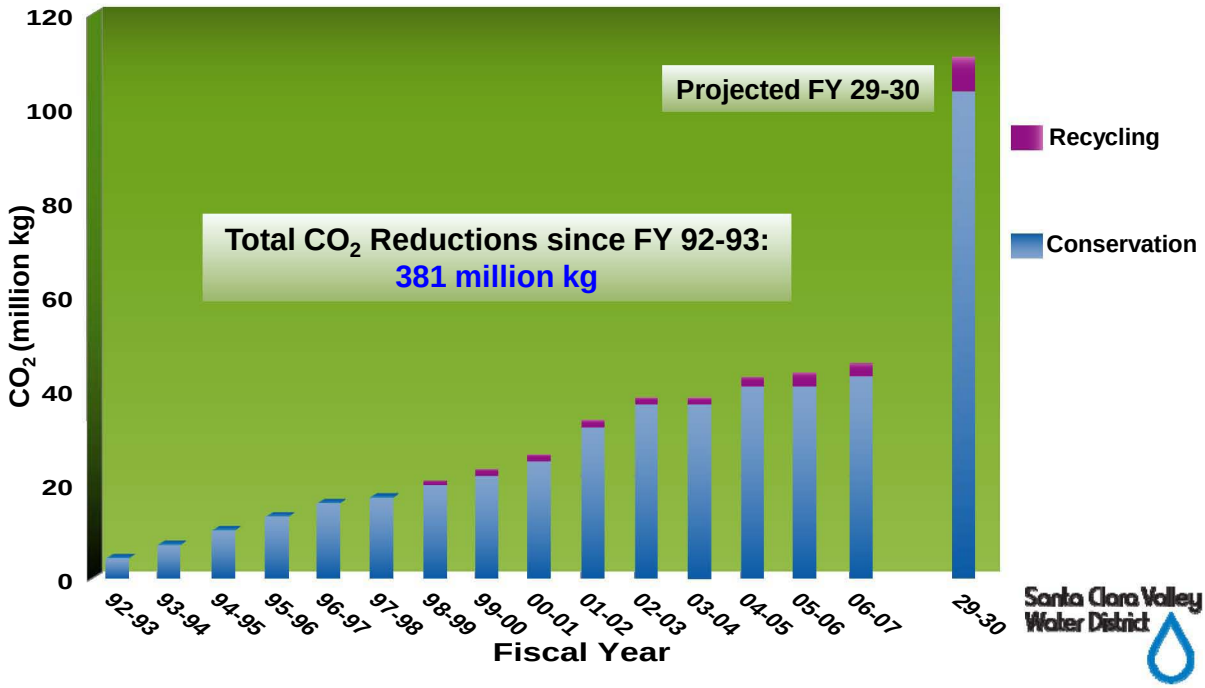
The water supply and treatment system (pumping water from its source, conveyance, water treatment, distribution, end use, and wastewater treatment) is the single largest user of energy in California. Therefore, water conservation (and water recycling) saves energy and thereby reduces air pollutant emissions, including emissions of carbon dioxide, a greenhouse gas. Using the Water to Air Model developed by the Pacific Institute, the District estimates that, from FY 92-93 through FY 06-07 , local water use efficiency programs (conservation and water recycling) have saved approximately 1.62 billion kilowatt-hours (kWh) of energy (see chart below). This represents a financial savings of approximately $208 million and is equivalent to the annual electricity required for 236,000 households. Through saving energy, the programs also eliminated approximately 381 million kg of carbon dioxide, the equivalent of removing 82,000 passenger cars from the road for one year.

Climate change will affect water availability through changes in hydrology, precipitation patterns, and drought cycles, offering further imperatives for conservation and recycling.

Energy Savings from Water Use Efficiency Programs



Carbon Dioxide Reductions from Water Use Efficiency Programs



Santa Clara Valley Water District

CITY OF SAN JOSE CAPITAL OF SILICON VALLEY

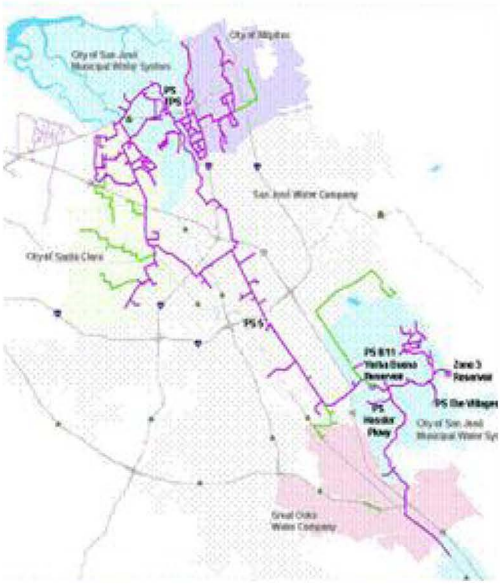
A Shared Vision for Recycled Water Use

Fact Sheet #5
Slides 34-54

- **Green Vision Goal #6**: Recycle or beneficially reuse 100% of our wastewater by 2022.
  - Increase SBWR nonpotable reuse by 100% to 20 MGD (City lead).
  - Pilot and implement a 10 MGD streamflow augmentation project (District lead).
  - Pilot and implement a 10 MGD groundwater recharge reuse project (District lead).
  - Confirm benefit of 60 MGD discharge to maintain South Bay ecosystem (City lead).
- **District Ends Policy:** Use recycled water to fulfill 10% of the water demand county-wide by 2020
  - Reuse 45,000 acre-foot per year (AFY) out of projected 450,000 AFY demand (approximately 40 MGD).

NOTE: The bullets below are not part of the UWMP or District policy.

- Use recycled water instead of drinking water for industrial cooling.
  - Convert public facilities to recycled water use for cooling and market recycled water to adjacent industries.
  - Require recycled water for cooling in new industrial facilities near pipeline.
- Connect customers near SBWR pipeline.
- Extend SBWR pipeline to new developments and existing large customers.
  - Extend SBWR pipeline to serve recycled water to customers along N. First Street.
  - Require recycled water use and extend SBWR pipeline to serve future developments.



- Use recycled water to augment flow to enhance or restore county streams where appropriate.

- ❖ Design and build Advanced Recycled Water Treatment (ARWT) at San Jose/Santa Clara Water Pollution Control Plant.
  - 8 MGD microfiltration/reverse osmosis.
  - $53 million total project cost; $8.5 million available in state and federal grants.
  - Operating cost $3-4 million/year.
  - See attached Fact Sheet #7.
- ❖ Design and build future satellite groundwater recharge reuse facilities
  - Advantages:
    - More cost effective compared to expanding non potable recycled water uses.
    - Water can be used for all purposes (after groundwater recharge).
  - Challenges
    - Requires significant public education and outreach.
    - Product water and recharge procedures are highly regulated.

Streamflow Augmentation With Recycled Water

Fact Sheet #6
Slide 42

Since late 2003, the District has been evaluating streamflow augmentation on Upper Silver Creek, a tributary to Coyote Creek. The project began with a multi-year sampling effort to determine baseline conditions and moved through the environmental and permit processes. Prior to that, the City had conducted streamflow evaluations on Coyote Creek in the 1990s. The goal of the District's project was to determine whether it is feasible, within economic, environmental and county-wide policy objectives for water supply management, to augment flows in the Coyote Creek watershed with tertiary-treated recycled water. The District coordinated with the City of San José to utilize South Bay Water Recycling (SBWR) Program's recycled water for the project.

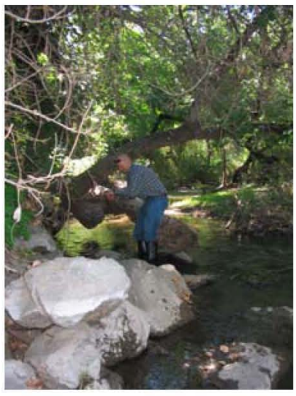
Streamflow augmentation could have direct water supply and environmental stewardship benefits for the District, the City, and the communities they serve. If successful, recycled water can be used to keep live streams flowing, and reservoir water that is currently used for streamflow augmentation can be saved and used for other purposes. Moreover, an additional benefit in augmenting creeks with recycled water is that it can be done even in times of drought since recycled water is immune from droughts or Delta issues. Recycled water could be used to enhance streams in many areas of the County.

The District is partnering on this study with researchers at Stanford University. The District proposed to augment stream flows on Upper Silver Creek with recycled water during an approximate five-month research period from July through October 2008. Water quality (surface water and upper aquifer groundwater) and water temperature impacts from the release of tertiary-treated recycled water to augment stream flows were the primary issues studied. In accordance with the California Environmental Quality Act (CEQA), a Final Initial Study and Mitigated Negative Declaration (IS/MND) was prepared. The District coordinated with various regulatory and permitting entities to perform this release and study. Three years of baseline stream water quality data and push well groundwater data were monitored and analyzed. Recycled water quality analyses were also performed for almost three hundred chemical constituents. Based on previous Stanford University investigations on the Santa Ana River in Southern California, many chemicals of concern are adequately filtered or degraded by natural stream processes, and recycled water could be a suitable candidate for streamflow augmentation. However, these evaluations are very site specific and natural hydrogeology and other factors play into these analyses.

Current Findings & Decision. Recently, the Stanford researchers brought forth newly published investigations (from other researchers) on perfluorochemicals (PFCs), a group of compounds that can have adverse health effects. PFCs are emerging (newly discovered) contaminants; they are man-made and can come from packaging materials, lubricants, paints, etc. High doses can lead to mortality while lower doses result in blood and liver impacts, immunological problems, carcinogenic potential and behavioral effects. Stanford researchers reviewed the PFC baseline data on the concentrations of perfluorochemicals found in Upper Silver Creek, in Coyote Creek, in the push wells, and in the recycled water. In interpreting and explaining the significance of their results, the Stanford researchers noted that another researcher had recently determined that a concentration of 50 ng/L (described as a threshold level) of a particular PFC, known as PFOS, should not be exceeded in a water body in order to protect the health of birds. Published research at these low concentrations identified avian impacts but not human health impacts. PFOS is not a chemical that is regulated nor does it have established action levels or maximum contaminant levels (MCLs). There are no current federal or state regulatory requirements regarding PFCs or PFOS because these are emerging chemicals of concern. Based on the local data collected, background concentrations of PFOS in Upper Silver Creek and Coyote Creek are currently around 50 ng/L (the published threshold level). No point source has been identified as a contributor. Concentrations of PFOS coming from San Jose's recycled water range from 190 ng/L to 340 ng/L. Therefore, if the stream is augmented with recycled water this summer, concentrations of PFOS will likely be in the 80 to 200 ng/L range, significantly above the level that could affect the water birds in the creek.

In light of these new findings, staff recommended discontinuing the current release of recycled water into Upper Silver Creek and the District has halted this summer's study.

Future. The District is working with the City of San José on the design of an advanced treatment recycled water facility using microfiltration and reverse osmosis membranes and ultraviolet disinfection. When constructed, this facility would enhance the quality of the recycled water so that it is suitable for more uses. Future streamflow augmentation projects with advanced treated SBWR recycled water (advanced treatment is said to remove almost all contaminants) or future streamflow augmentation projects in different stream locations in the county where stream baseline PFC concentrations are lower may still be feasible.



Staff is proposing continued evaluation of the technical and economic feasibility of doing streamflow augmentation with recycled water. For example, during last year's dry spell, there were requests for augmenting certain creeks with recycled water, when there were no other sources of water to maintain habitat for aquatic species. The District is planning on evaluating other feasible creek locations where recycled water can be used successfully for streamflow augmentation. Should future sites be located, hydrological and geographically specific data pertinent to the new site will be required as well as new CEQA documents. Future use of recycled water for long-term stream augmentation will also require additional environmental review.

Pharmaceuticals In Water Supplies

Fact Sheet # 7
Slides 42, 44-46

The Santa Clara Valley Water District has been closely monitoring recent research on the issue of pharmaceuticals finding their way into the nation's water supply. In 2002 and 2003, the District tested its raw water supply for traces of pharmaceuticals. Additionally, as part of the Advanced Treatment Recycled Water Feasibility Study effort in 2001-2003, the District conducted three rounds of sampling for many of these constituents in recycled water.

According to a new Associated Press (AP) study, which was widely reported in recent national and local media, pharmaceuticals—including antibiotics, anti-convulsants, mood stabilizers, and sex hormones—have been found in over 80% of the country's drinking water supplies. Less emphasized in the reporting is that, with improvement in analytical methods, water professionals are now able to measure pharmaceutical and personal care products in the parts-per-trillion range, which is equivalent to 1/20th of a drop of water in an Olympic-size swimming pool. Research throughout the world has not demonstrated an impact on human health from pharmaceuticals and personal care products in drinking water.

In the Water District's testing of source water, only minute amounts of pharmaceuticals were detected. Analyses of recycled water also showed minute amounts of pharmaceuticals in some samples. However, no recycled water is currently used to augment drinking water supplies or influences drinking water in the county.

The U.S. Environmental Protection Agency, which regulates drinking water, maintains an active program called the Contaminant Candidate List (CCL) to identify contaminants in public drinking water that warrant detailed study. The CCL does not currently include any personal care products or pharmaceuticals. Moreover, recent scientific studies on treatment of some of these pharmaceuticals in water found:

- Granular activated carbon (GAC) or powdered activated carbon (PAC) are very effective to remove these compounds through adsorption;
- Chlorine can remove some of the compounds through oxidation;
- Ozone is capable of removing nearly all of the compounds studied through oxidation; and
- Advanced treatment using a membrane system like reverse osmosis is capable of removing nearly all of the compounds.

Public health is of utmost importance to the Water District and the City. The District uses all these treatment technologies, including the advanced water purification technology known as ozonation, for its drinking water supplies. Although no recycled water is currently used for drinking water purposes, the City and the District are planning to advanced treat a portion of the recycled water. In addition, the District just completed construction of a water quality laboratory to ensure that county residents continue to receive water deemed among the most pure and healthy in the country.

Although testing for pharmaceuticals is still in its early stages, the AP study once again underscores the importance of protecting our precious water resources. The Water District and the City will continue to

encourage policies that protect water from contaminants introduced by pesticides, gasoline or industrial products, and will continue to actively address emerging issues, including pharmaceuticals in water. The best and most cost-effective way to ensure safe water at the tap is to keep our source waters clean. The community can assist by following the Office of National Drug Control Policy, which recommends not flushing prescription drugs down the toilet unless the accompanying patient information specifically instructs that it is safe to do so.

Advanced Recycled Water Treatment Facility

Fact Sheet #8
Slides 45-52

An Advanced Recycled Water Treatment (ARWT) Facility project is endorsed by the Silicon Valley Leadership Group as a way to develop a reliable, sustainable water source for Santa Clara County. Such a project aims to improve the quality of recycled water to aggressively protect groundwater basins while sustaining current baseline users and providing opportunities to expand the user base. The water quality target is to reduce salinity from approximately 730 ppm to 500 ppm. Such treatment would also reduce any other contaminants, including emerging constituents of concern, that might be in the water.

ARWT would facilitate future use of recycled water for landscape irrigation in some sensitive areas and potentially increase industrial applications. It would mitigate the salt impacts due to the proposed increases in industrial cooling towers uses and indoor water reuse in new developments. Finally, AWRT would also enhance options to pursue groundwater recharge and reuse in the future.

Figure 1: Reverse osmosis plant at Alameda County Water District works to remove excess minerals.

The preferred ARWT project involves 10-mgd microfiltration, 8-mgd reverse osmosis, and 10-mgd ultraviolet light disinfection treatment at a facility to be constructed right at the San Jose/Santa Clara Water Pollution Control Plant (Treatment Plant). Staff from the District and City has collaborated on the development of this project and the related Draft Engineers Report, which is near completion. The treatment facility capacity, location, preliminary engineering process, expandability, site layout are included in the report. California Environmental Quality Act (CEQA) compliance documents are also being prepared.

Estimated cost. The current total project cost estimate is $53 million. This includes using land owned by the Treatment Plant (worth $2M); costs for engineering and construction management; and accounts for inflation. The District and City anticipate that a recommendation on cost share proposal will result from the negotiation on long term operation and maintenance for South Bay Water Recycling.

In April 2007, the California Department of Water Resources awarded an approximately $3 million state grant to this project. In late 2007, the Water Resources Development Act was enacted and a $5.5 million federal grant was authorized for this project.

Advanced Treatment generally refers to the treatment process that employs the best available technology. Today's best available treatment technology is the use of reverse osmosis in combination with microfiltration and ultraviolet light disinfection.

Microfiltration (MF)
Microfiltration is a low-pressure membrane filtration process that takes small suspended particles, bacteria and other materials out of the water. Microfiltration provides the most efficient preparation of water for reverse osmosis. It is used in commercial industries to process food, fruit juices and soda beverages; in computer chip manufacturing; and to sterilize medicines that cannot be heated.

Reverse Osmosis (RO)
Reverse osmosis is a high-pressure membrane filtration process that forces water through the molecular structure of several sheets of thin plastic membranes to filter out minerals and contaminants, including salts, viruses, pesticides, and other materials. The RO membranes are like microscopic strainers - bacteria and viruses, as well as inorganic and most organic molecules cannot pass through the membranes.

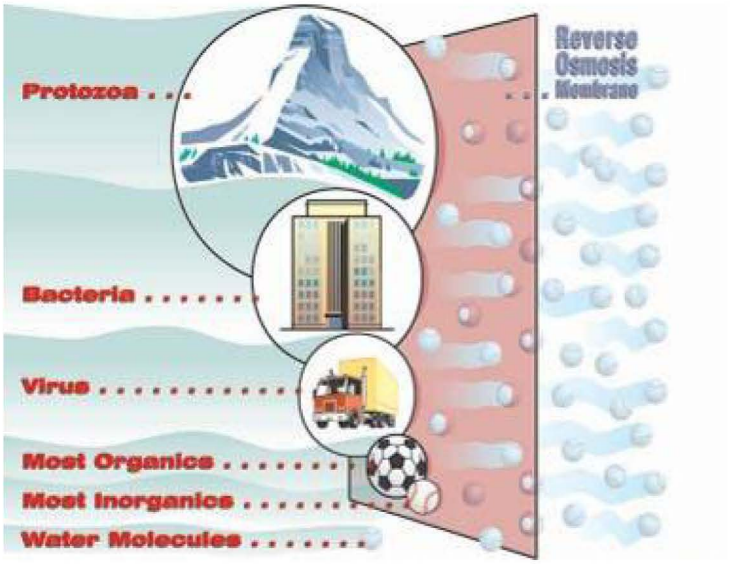


Figure 2: These objects show the relative size of particles that are filtered out by a reverse osmosis membrane compared to a water molecule—shown as the size of a tennis ball. Water molecules are forced under high pressure through the molecular structure of membrane.

Ultraviolet (UV) Light and Hydrogen Peroxide Treatment
During ultraviolet disinfection, water is exposed to ultraviolet (UV) light to provide disinfection. This is the same process used on instruments in medical and dental offices. Additionally, ultraviolet light combined with hydrogen peroxide creates an advanced oxidation reaction that eliminates any remaining contaminants in water by breaking them down in harmless compounds like carbon dioxide and water. This multiple barrier process creates an ultra-pure water.

In July 2002, Singapore announced that it would use microfiltration, reverse osmosis, and ultraviolet light in their NEWater process and as a significant part of its future water plans. Singapore's plan is to use these three processes to treat domestic wastewater before discharging the NEWater into reservoirs to augment drinking water supply. The NEWater plant became its most toured facility, attracting professionals and casual tourists from all over the world. In 2007, the Groundwater Replenishment System in Orange County, CA adopted the same treatment technology in its operations and became the largest groundwater recharge and reuse project in California.

Construction for this project is scheduled to begin in the summer 2009, provided that CEQA clearance is obtained and the District and the City reach a final cost share agreement for the facility. The District and the City are currently joining multiple Bay Area agencies to pursue an additional $8.25 million in federal funding for this project.

Salinity reduction is a key step if the District and the City decide to pursue future groundwater recharge with recycled water. Recycled water use can be expanded to many additional uses by reducing the salinity to 500 ppm but groundwater recharge requires much lower salinity, 30-50 ppm.

The Advanced Treatment Facility would employ the best available technology, similar to that currently being used by the Orange County Water District's Groundwater Replenishment Project which has spent years demonstrating the reliability and safety of advanced treatment, and is already recharging their groundwater basin with recycled water. Operational data from the San Jose Facility would be useful in the future when seeking public acceptance during the application process for securing groundwater recharge permits from the regulatory agencies and seeking public acceptance.

The lead time for implementing a groundwater recharge reuse project is approximately 10 to 15 years. Groundwater recharge reuse projects across the world, including Singapore's NEWater, Orange County's Groundwater Replenishment Project, and Australia's latest reservoir augmentation project, show that gaining public acceptance takes many years and is key to success. Implementing the advanced treatment project in Santa Clara County now would provide tremendous value to gain this public trust and acceptance.

Groundwater Recharge

Fact Sheet #9
Slides 45-46, 51-54

Groundwater recharge occurs when surface water percolates through soil and/or rock to replenish underground aquifers. The land or pond area on the surface, where water infiltrates, is called a recharge zone or recharge area.

Groundwater recharge occurs naturally through:

- Deep percolation of rainfall
- Seepage through streambeds
- Seepage from surrounding hills
- Subsurface flow from adjacent groundwater basins

All the sources listed above contribute to recharge in Santa Clara County. However, natural recharge is not sufficient to replenish the amount of groundwater pumped each year. To ensure a reliable groundwater supply, the District manages an active artificial recharge program.

Artificial recharge is the process where excess surface water is intentionally directed into the ground to increase infiltration and replenish groundwater. The District conducts extensive artificial recharge operations along approximately 70 miles of stream channels and 300 acres of recharge ponds (percolation basins). The District uses local reservoir water and imported water from the Delta, releasing it into streams and percolation ponds, to replenish deep drinking water aquifers. The average annual recharge capacity of these systems is approximately 138,000 acre-feet.

The District's artificial recharge program is critical to ensuring a reliable water supply both now and in the future by:

- Storing water for use during droughts and shortages; and
- Preventing saltwater intrusion and land surface subsidence, both of which are very costly to the community.

In-lieu recharge occurs when surface water is provided for use in areas that would otherwise use groundwater. The District sends the imported water through three water treatment plants to provide drinking water, thus reducing demands on the groundwater basin, and leaving more groundwater in storage for later use. This "conjunctive" use of groundwater and surface water supplies and integrated water supply management approach improves overall water supply reliability and flexibility to meet future water supply conditions.

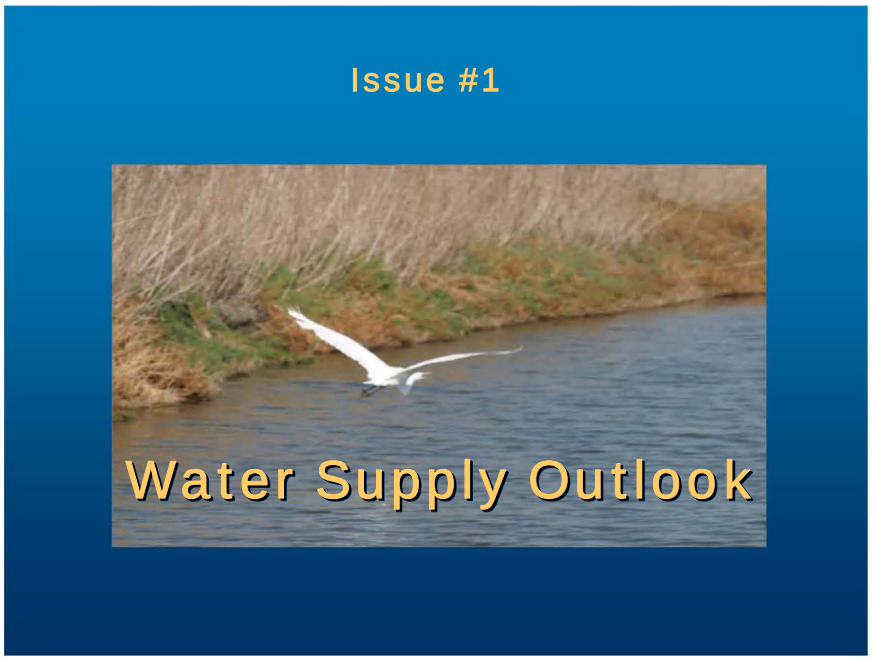
Groundwater recharge reuse refers to artificially recharging groundwater basins with recycled water.

As the demand for water has increased, so has the need to maximize the efficient use of available water supplies. Many agencies, including the District, recognize recycled water as an important component of their long-term water supply strategy. Within Santa Clara County, recycled water is currently used only for non-potable (non-drinking) uses including landscaping, irrigation and industrial uses. Some agencies in southern California and elsewhere around the country and world have implemented groundwater recharge reuse projects, where recycled water is used to augment groundwater supplies or prevent saltwater intrusion. These types of projects have stringent regulatory requirements with lengthy approval processes but supply critically needed water to maintain local economic development. The recycled water used for these types of projects is usually advanced treated with the best available treatment technologies such as reverse osmosis. Given the increasing costs of moving and treating water, groundwater recharge reuse is inarguably the most cost effective way to implement a large scale water recycling program.

Before the District can implement reuse through groundwater recharge, there are regulatory, institutional, and public perception issues that must be addressed. Gaining public acceptance will require a multi-year public outreach effort and extensive collaboration between the District and South Bay cities. Getting appropriate permits from the Department of Public Health and the Regional Water Quality Control Boards would also be a lengthy process. Implementing the Advanced Recycled Water Treatment facility and thereby reducing the salinity of the recycled water will be an important step in gaining public acceptance and the appropriate permits from regulatory agencies. District staff has prepared a budget proposal for a project to investigate the following issues related to groundwater recharge reuse in 2008-09:

- Regulatory issues related to protection of the groundwater basins– Getting appropriate permits from the Department of Public Health and the Regional Water Quality Control Boards.

- Institutional issues – Identifying and resolving water rights issues and the necessary changes in the operation of existing facilities and/or the development of new facilities.



Key Points and Fact Sheets

1.

- Format for the water supply discussion divided into three main areas, and water conservation and recycled water are key components.

2.

- Issue No. 1 is the Water Supply Outlook

3.

- Water supply in this County comes from many sources.

4.

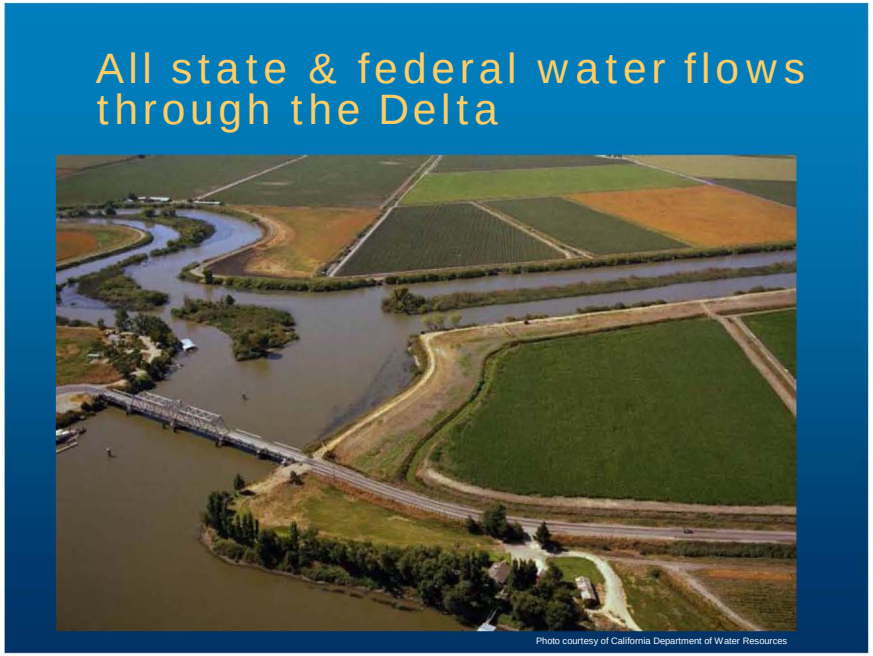
- Water imported into this County comes from three systems, the first of which is the State Water Project system.

5.

- The second imported water source is from the Federal Central Valley Project system.

6.

- The 3rd imported water source is the Hetch Hetchy Pipeline system owned and operated by SFPUC



7.

- State and Federal imported water flows through the Sacramento San Joaquin Delta system.

Fact Sheet:
2 – Water Supply Reliability

8.

- Delta water comes with its own risks, including the recent “regulatory drought” with the Smelt issue.

Fact Sheet:
2 – Water Supply Reliability

9.

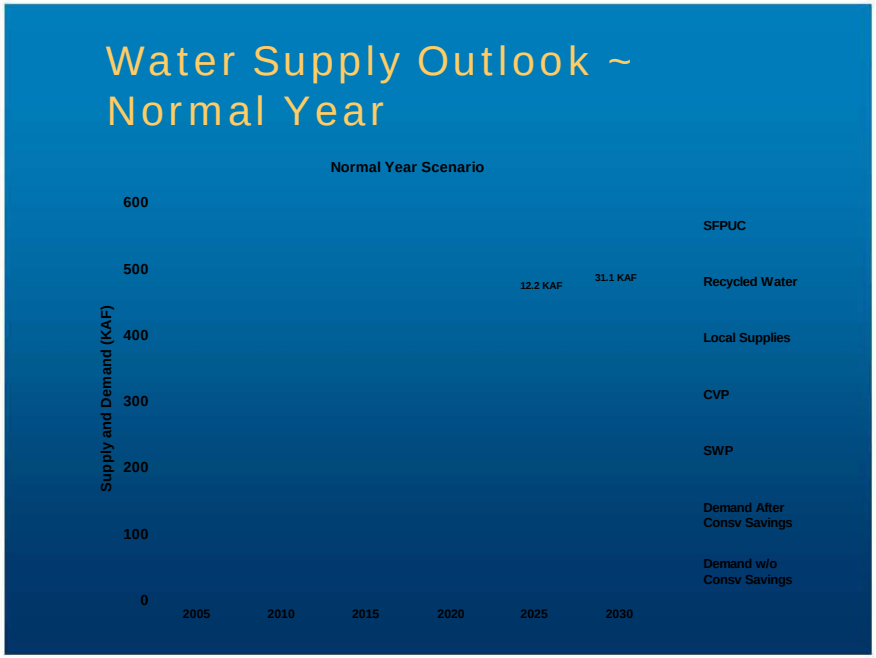
- Earthquakes and old and fragile levees can impact our imported Delta water.

Fact Sheet:
2 – Water Supply Reliability

10.

- The aging infrastructure will need to be replaced.

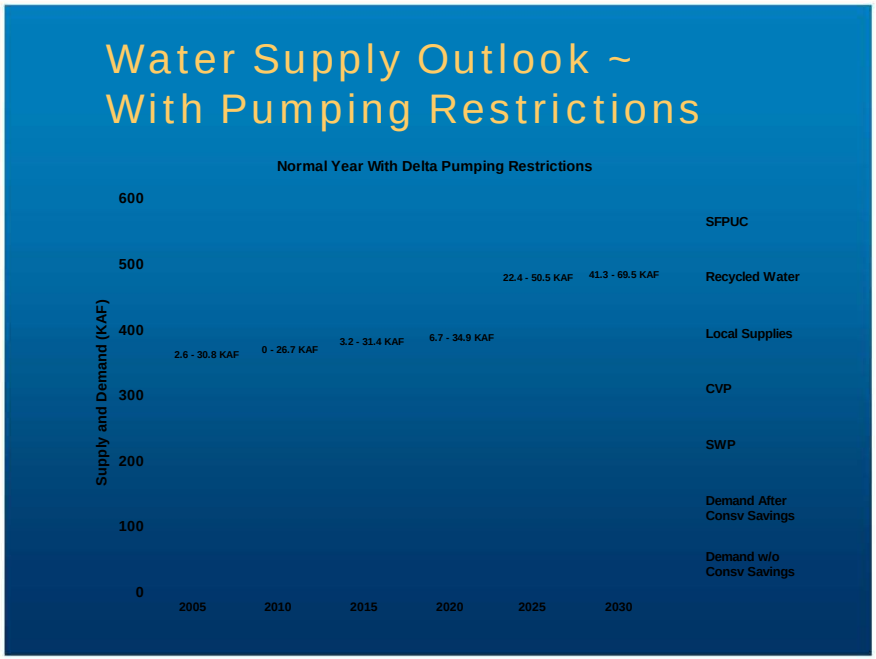
Fact Sheet:
2 – Water Supply Reliability



11.

- Even with normal precipitation, a shortfall is predicted after 2020.
- Conservation reduces the total water demand.

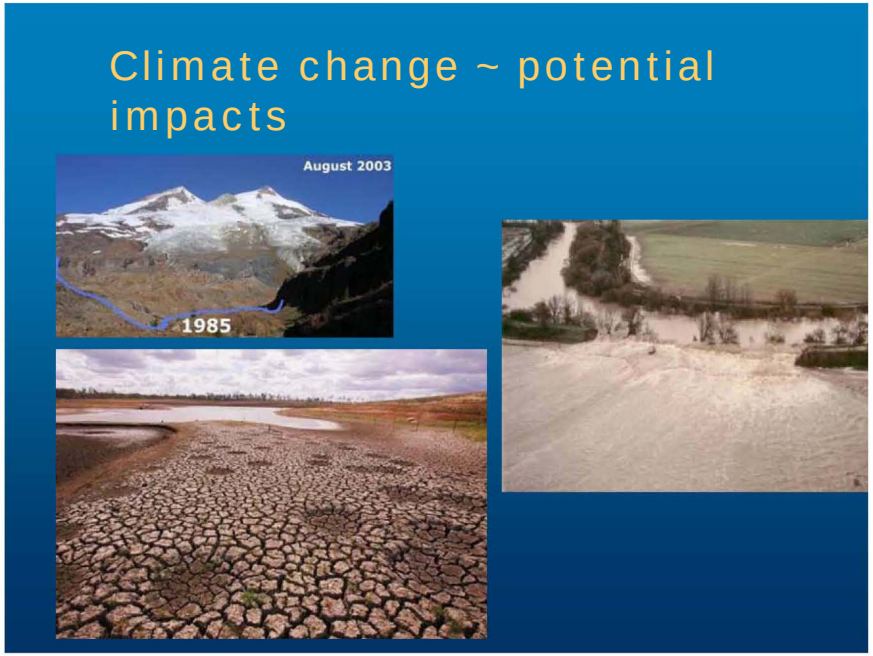
Fact Sheets:
1 – How We Measure Water
2 – Water Supply Reliability



12.

- Delta pumping restrictions would increase the shortfall.

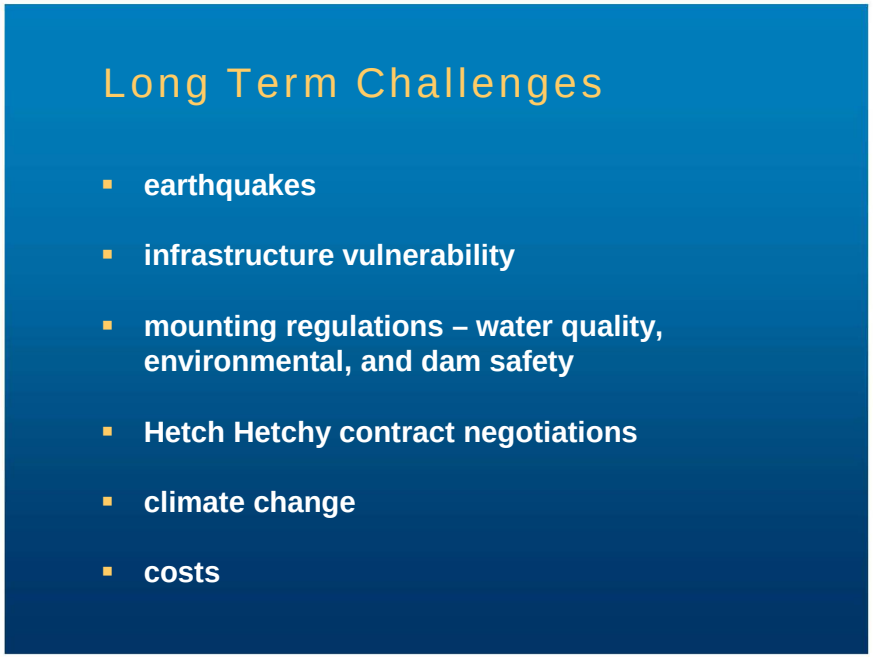
Fact Sheets:
1 – How We Measure Water
2 – Water Supply Reliability



13.

- Climate change will decrease available water.

Fact Sheets:
2 – Water Supply Reliability
3 – Global Warming



14.

- Future water supply will be scarce and expensive

Fact Sheet:
2 – Water Supply Reliability
3 – Global Warming

ACTIONS we should take today

- **Asset Management**
- **Public education**
- **10% voluntary conservation**
- **Expand recycled water**
- **Contingency plans**
- **Water banking**
- **Optimize system operations**
- **Support Delta capital projects** **(e.g. State Water Bond)**

15.

- Many actions should be taken today to alleviate water supply shortfalls, for example, having voluntary conservation

Fact Sheet:
2 – Water Supply Reliability

State Water Bond

GOVERNOR'S PROPOSAL:

Potential grants for Water Conservation, Water Recycling and other water supply projects

Status: stalled

NEW WATER BOND (MACHADO) PROPOSAL:

Potential grants for Delta fix, water supply and water use efficiency

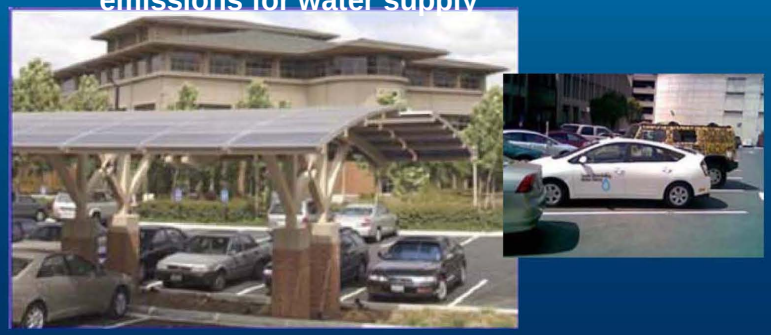
Status: introduced March 2008 to re-start negotiations

16. Both agencies need to work together to support legislation for a State Water Bond.

Fact Sheet:
2 – Water Supply Reliability

Climate Change Response
AB 32 Global Warming Solutions Act

- **Reduce greenhouse gases to 1990 levels by 2020**
- **City & District to quantify greenhouse gas emissions for water supply**



17.

- AB 32 will affect our water business significantly.

Fact Sheet:
2 – Water Supply Reliability

Ongoing priorities & focus

- **Public education**
- **Increase water use efficiency**
- **Continue investment in local resources**
- **Advocate for pertinent legislation and Delta solutions**
- **Increase regional coordination**
- **Coordinate on land use decisions related to Water Supply Assessments**

18.

- Here are the areas we are currently investing in and supporting to secure our water supplies

Fact Sheet:
2 – Water Supply Reliability

Where should we focus for the long-term?

- **Protect existing supplies and infrastructure (Baseline**
- **Solve Delta problems**
- **Advocate for a "smarter" water delivery system**
- **Continue investment in local resources**
- **Increase water use efficiency**
- **Advocate for pertinent legislation**
- **Increase regional coordination**

19.

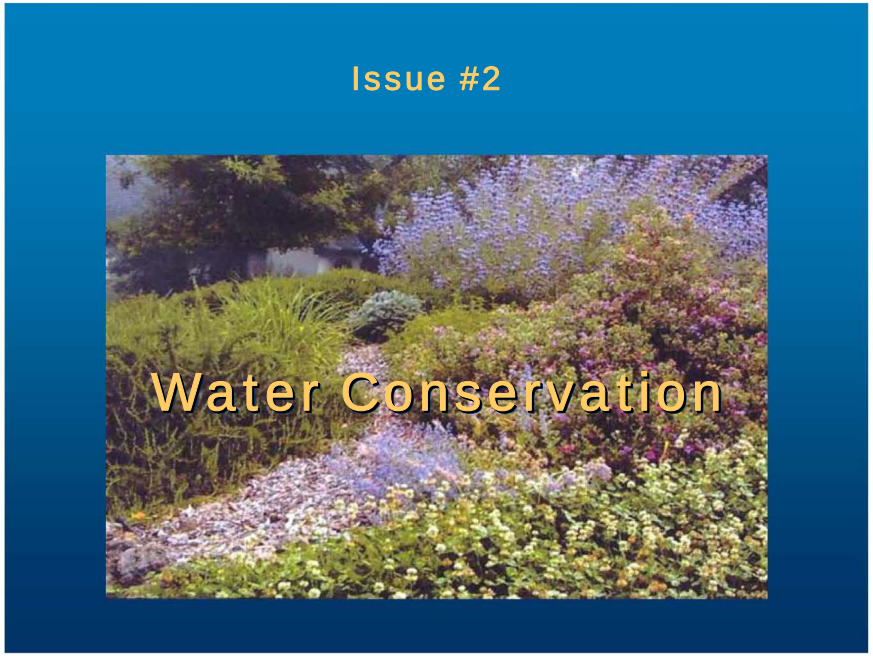
- Here are the areas we should invest in and support to sustain our water supplies in the long term

Issue #2

Anderson Reservoir in year four of 1987-1992 drought

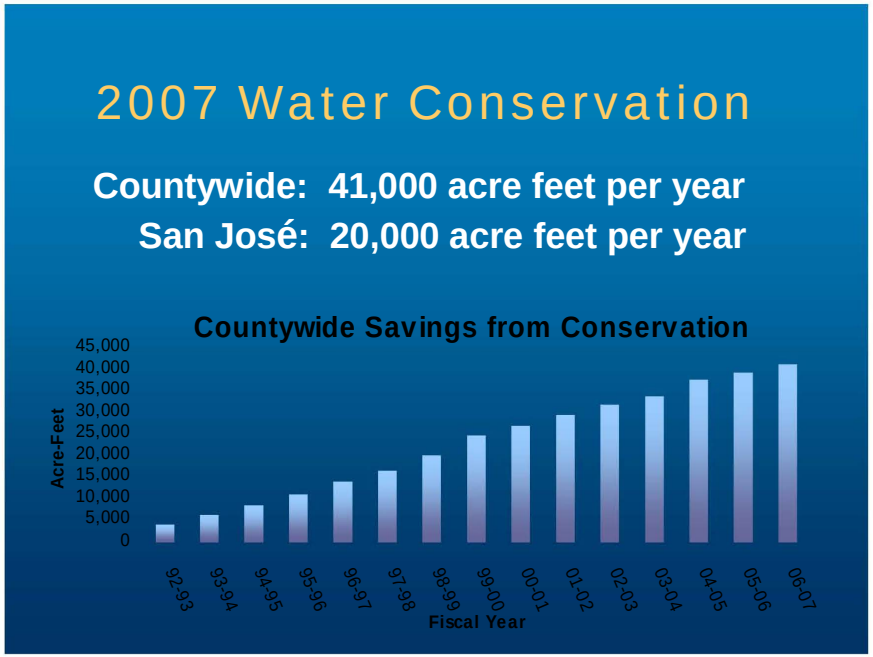
20.

- Anderson Reservoir in year 4 of the 1987-1992 drought



21.

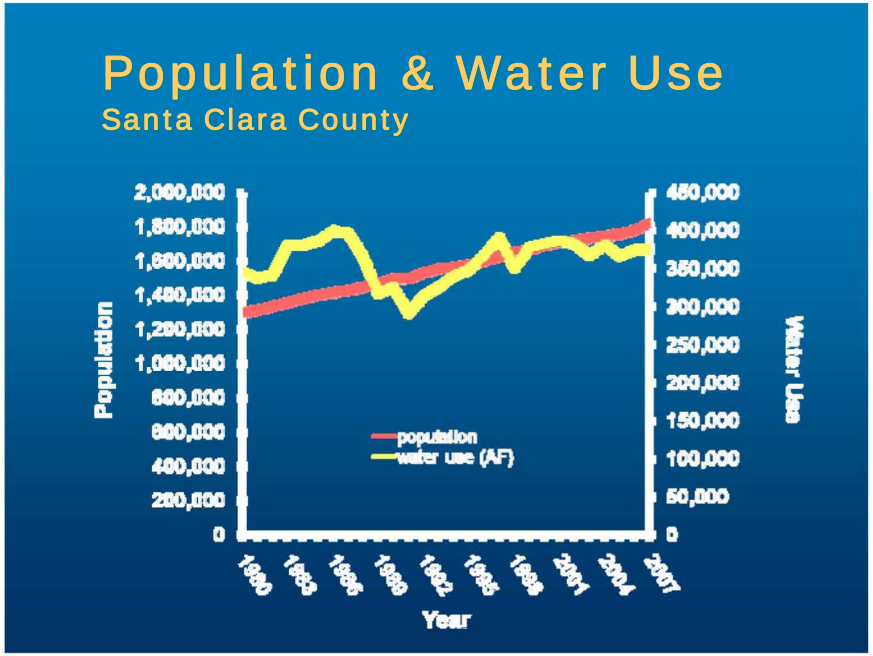
- Garden landscaped with low water use plants



22.

- We've made significant progress in water conservation, saving 41,000 af/yr in 2007

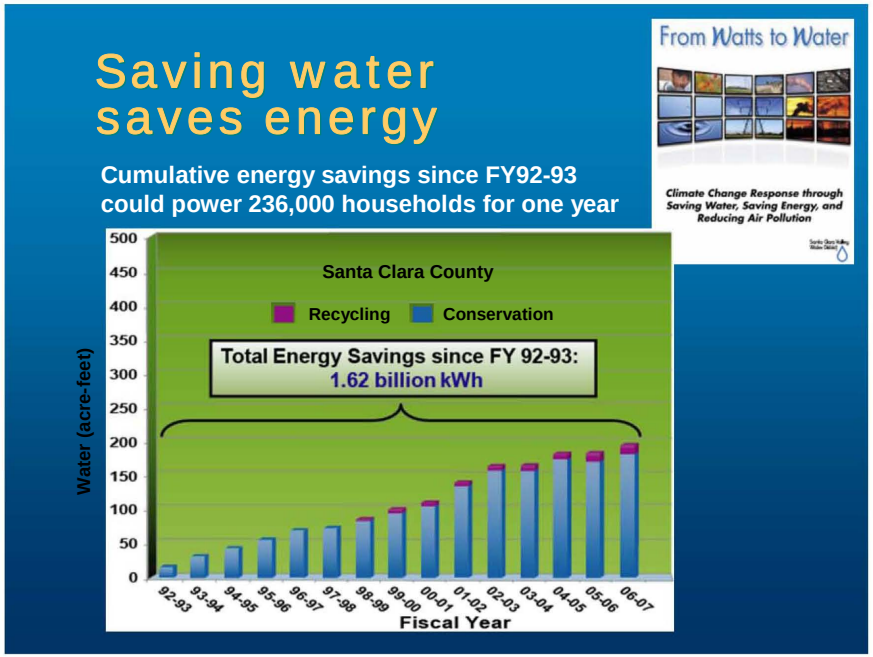
Fact Sheets:
1 – How We Measure Water
4 – Conservation



23.

- Although population has continued to increase, water use has remained fairly constant over the last 10 years and is still below pre-drought levels.

Fact Sheets:
1 – How We Measure Water
4 – Conservation



24.

- There are multiple benefits to conserving water, including reducing impacts of global climate change

Fact Sheet:
4 - Conservation

Water Conservation Goals

Long Term Target (by 2030)

acre-feet per year

- **100,000 countywide**
- **50,000 in San José**

25.

- Even though we've been successful in water conservation, still have a long way to go to reach our aggressive long-term goal

Fact Sheets:
1 – How We Measure Water
4 – Conservation

Conservation Program Overview

- **10 Residential programs**
- **10 Commercial programs**
- **2 Agricultural programs**

US EPA Award in 2007

EPA WATER EFFICIENCY LEADER AWARD

26.

- Currently offering a variety of programs

Fact Sheet:
4 – Conservation

27.

- Examples of Residential Water Conservation Programs

Fact Sheet:
4 – Conservation

28.

- Examples of Commercial Water Conservation Programs

Fact Sheet:
4 – Conservation

Conservation Programs ~ Agricultural

Mobile Lab for Irrigation Efficiency

California Irrigation Management Information System

29.

- Examples of Agricultural Water Conservation Programs

Fact Sheet:
4 – Conservation

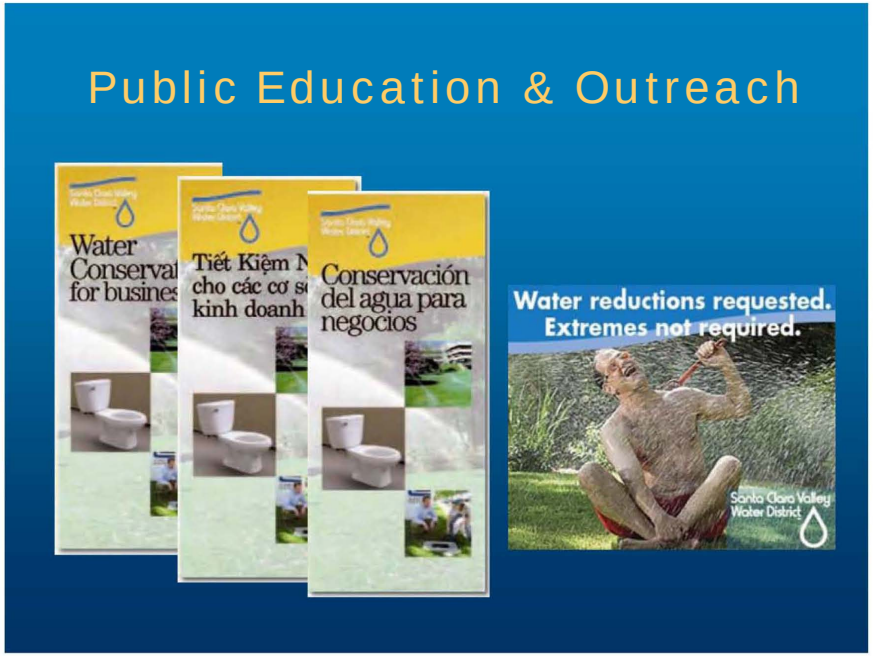
Possible Policies & Ordinances

- **New landscape ordinance by 2010**
- **Revised building design guidelines**
- **Retrofit on Resale, Water Demand Mitigation and other ordinances being considered**

30.

- Adopting and enforcing ordinances is a cost-effective approach to reaching the aggressive long-term goals

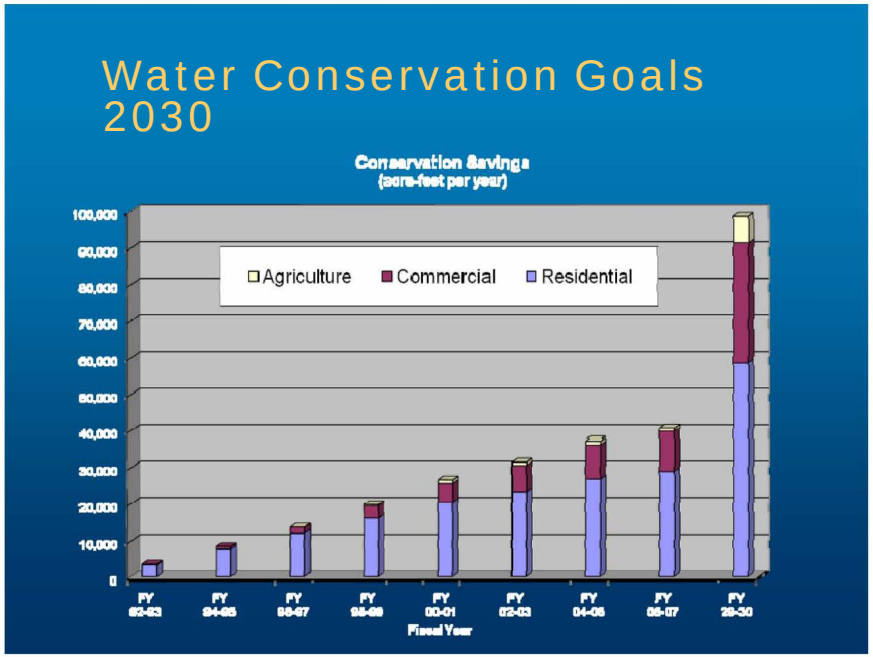
Fact Sheet:
4 – Conservation



31.

- Water conservation programs will not be successful without significant public outreach/education

Fact Sheet:
4 – Conservation



32.

- Again, still have a long way to go to reach our aggressive long-term goals.

Fact Sheets:
1 – How We Measure Water
4 – Conservation

Priorities to Achieve Our Conservation Goals

- **Expand outreach/education**
- **Continue existing programs**
- **Support new water efficient technologies**
- **Adopt water efficiency policies and ordinances**
- **Secure funding**

33.

- Need to work together to reach these goals

Fact Sheet:
4 – Conservation

Issue #3

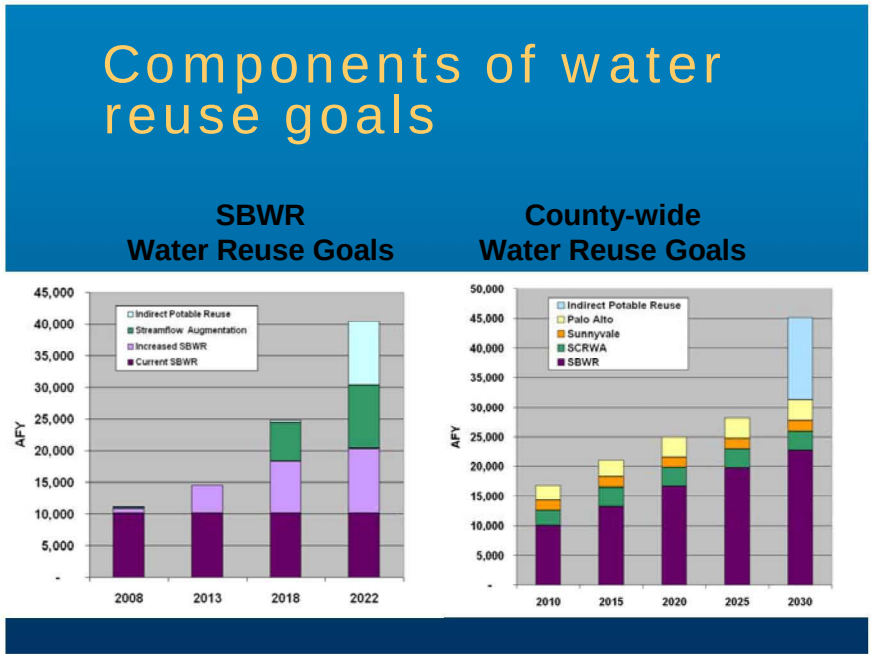
34.

- The 3rd issue is on recycled water.

35.

- The City's Green Vision goal for recycled water is in alignment with the District's Policies for recycled water.

Fact Sheet:
5 – A Shared Vision for Recycled Water



36.

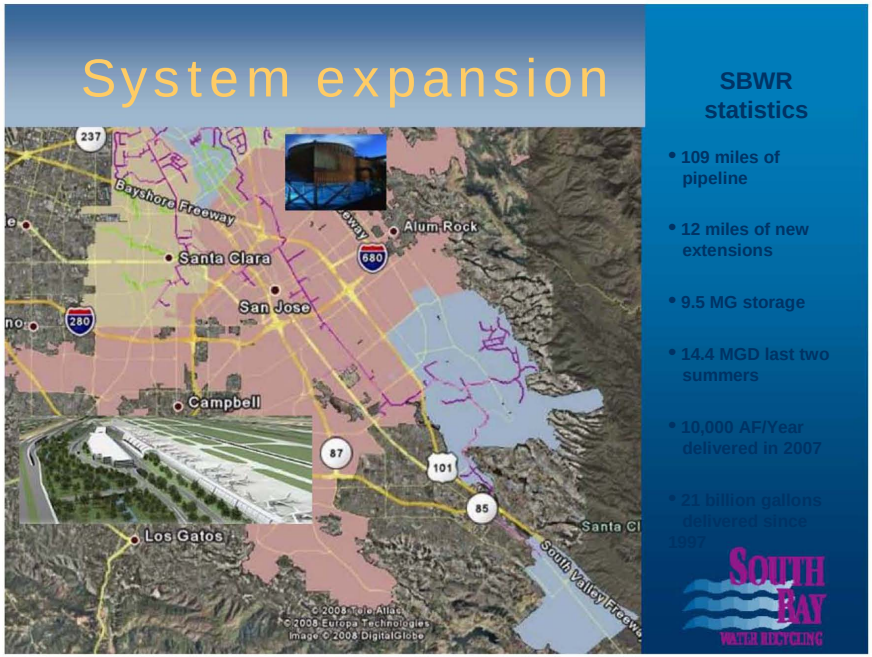
- The District 10% ends policy target for future recycled water used meshes with the City's Green Vision recycled water goal.

Fact Sheet:
5 – A Shared Vision for Recycled Water

37.

- Current South Bay recycled water outlook

Fact Sheet:
5 – A Shared Vision for Recycled Water



38.

- Map of the current South Bay recycled water system and potential future expansion (green lines).

Fact Sheet:
5 – A Shared Vision for Recycled Water

39.

- Recycled water can be used for many purposes other than landscape irrigation, including a variety of commercial and industrial uses.

Fact Sheet:
5 – A Shared Vision for Recycled Water

40.

- Community Outreach is vital for expanding recycled water use. For example, gardeners at the new Guadalupe River Park & Gardens Community Gardens will have the opportunity to grow vegetables with recycled water in an innovative project, jointly funded by the City of San José, the GRPG and the WateReuse Foundation.

Fact Sheet:
5 – A Shared Vision for Recycled Water

41.

- If the salinity in the recycled water is adequately managed, recycled water can be used in more places and for more uses.

Fact Sheet:
5 – A Shared Vision for Recycled Water

42.

- The agencies are evaluating using recycled water for stream flow augmentation – both for an environmental benefit, and a water supply benefit.

Fact Sheets:
5 – A Shared Vision for Recycled Water
6 – Stream Flow Augmentation
7 – Pharmaceuticals

Rates, ordinances & fees

- **Developer funding of pipeline extensions and system improvements**
- **Dual-plumbing & cooling use for developments**
- **Set rates to maintain fiscal health and encourage recycled water use**

43.

- There are a number of sources for funding recycled water expansion.

Fact Sheet:
5 – A Shared Vision for Recycled Water

Prior direction from Board & Council

2003

- **Identify opportunities and costs for improved water quality to maximize recycled water uses**

2006

- **Identify opportunities for Groundwater Recharge Reuse (GWRR)**
- **Develop long term recycled water partnership agreement**

2007

- **Form Joint District/TPAC/Council Committee**

44.

- The Board and Council have supported expansion of recycled water and improving recycled water quality.

Fact Sheet:
5 – A Shared Vision for Recycled Water
7 – Pharmaceuticals

Greater usability, reliability with advanced treatment

ARWT = Advanced Recycled Water Treatment

- **Reduced salinity, chemicals enables expanded uses of recycled water**
- **Demonstrate reliability of ARWT**
- **Evaluate brine removal for groundwater recharge**
- **Joint funding (district, city, private & public grants)**

45.

- There are many benefits to advanced treating recycled water.

Fact Sheets:
5 – A Shared Vision for Recycled Water
7 – Pharmaceuticals
8 – Advanced Recycled Water Treatment Facility
9 – Groundwater Recharge

Why should we build ARWT now?

Resulting better quality water will …

- Expand uses of recycled water
- Enable stream flow augmentation
- Give us a headstart on 10-15 years needed for groundwater recharge projects

46.

- There are solid reasons to build the Advanced Treatment Facility now and not wait for the future.

Fact Sheets:
5 – A Shared Vision for Recycled Water
7 – Pharmaceuticals
8 – Advanced Recycled Water Treatment Facility
9 – Groundwater Recharge

ARWT potential funding

Date	Size	Planning, CEQA & Design Costs	Construction Costs	Potential Funding Sources
2007/08	MF 10 MGD RO 8 MGD UV 10 MGD	$3.68M	$49M	• $13M City • $3M state grant • $5.5M WRDA • $8.25M federal* • Explore potential development fees

Note: *Federal grant (Miller Bill) passed the house and is scheduled for Senate hearing

47.

- Both agencies are seeking to secure financial grants and assistance to build this facility.
- Plant to contribute $13M
- District to fund the balance upfront
- both agencies are also seeking state and federal grants which will be used to offset the District's up front contribution

Fact Sheets:
5 – A Shared Vision for Recycled Water
8 – Advanced Recycled Water Treatment Facility

Proposed ARWT site

48.

- The Advanced Recycled Water Treatment facility will be located next to the gateway to the San Jose/Santa Clara's Water Pollution Control Plant.

Fact Sheets:
5 – A Shared Vision for Recycled Water
8 – Advanced Recycled Water Treatment Facility

49.

- A long-term recycled water relationship is necessary

Fact Sheet:
5 – A Shared Vision for Recycled Water

50.

- Elected officials from both agencies will work together to create and forge a long-term agreement.

Fact Sheet:
5 – A Shared Vision for Recycled Water

Increased public support for indirect potable reuse

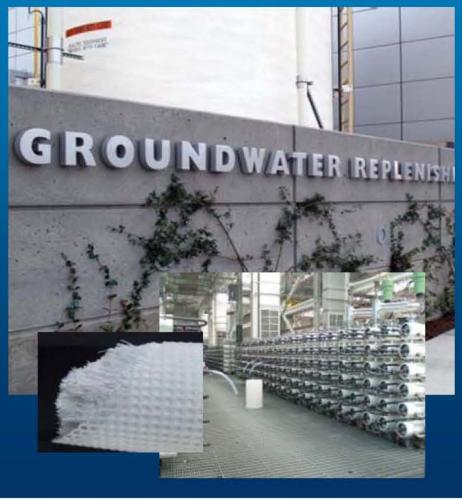
- **San Diego: reservoir augmentation**
- **OCWD: groundwater recharge**
- **Gwynette County, Georgia: reservoir augmentation**
- **Singapore: high-purity industrial and reservoir augmentation**
- **Queensland (Brisbane area): industrial use and reservoir augmentation**

51.

- Getting public to accept the safety of recycled water is key/vital for indirect potable reuse.

Fact Sheets:
5 – A Shared Vision for Recycled Water
9 – Groundwater Recharge

Groundwater Replenishment Project (Orange County Water District)



World's largest potable reuse facility purifies water with …

- microfiltration
- reverse osmosis
- UV disinfection

Produces 70 million gallons daily for groundwater recharge

52.

- Using recycled water for Indirect Potable Reuse has been successful both in the US and worldwide.

Fact Sheets:
5 – A Shared Vision for Recycled Water
9 – Groundwater Recharge

Community Recycled Water Task Force

Will help to ~

- **increase public participation**
- **build support for expanded uses**
- **explore indirect potable recharge**

53.

- A Community Task Force will improve public acceptance

Fact Sheets:
5 – A Shared Vision for Recycled Water
9 – Groundwater Recharge

Priorities for next steps?

- **Policy on indirect recharge reuse**
- **Stream flow augmentation**
- **Recycled water long term agreement (using ad hoc Joint Advisory Committee)**

Santa Clara Valley Water District

54.

- Possible next steps to expand use of recycled water