Executive Summary: Draft PA No. 2 – Recycled Water Projects

Description

SCWD and SqCWD have evaluated various recycled water projects and the two most feasible projects are discussed below. These two projects have been evaluated in significant detail and are used here to evaluate the potential GHG reduction associated with each of the projects.

Pasatiempo Golf Course (SCWD): This recycled water project would allow SCWD to reduce potable water used for irrigation. In concept, the neighboring Scotts Valley Water District (SVWD) would provide recycled water for irrigation of the Pasatiempo Golf Course. This would allow SCWD to reduce potable water supply to Pasatiempo. However, as part of the proposed project, SCWD would provide potable water to SVWD in winter months.

Seascape Golf Course (SqCWD): This recycled water project would help to reduce overdraft conditions of the groundwater basin that supplies SqCWD. Seascape Golf Course is irrigated by groundwater but is not a SqCWD customer. If Seascape is served 134 AFY of recycled water, the golf course could reduce its groundwater pumping by 134 AFY. Over time, this could help to reduce the overdraft conditions of the groundwater basin but would not provide SqCWD with an additional potable water supply.

Amount of GHG Reduction

Although recycled water projects at Pasatiempo and Seascape could provide water supply benefits, these projects have a fatal flaw as a GHG reduction project since they increase energy use and associated indirect GHG emissions.

Project Life and Sustainability

A recycled water project would continue to require energy to operate and thus increase, not reduce, energy use and associated indirect GHG emissions provide an additional water resource for the life of the project and beyond. The project would be sustained by normal maintenance to repair any infrastructure deterioration.

Project Cost

The estimated project costs as shown in Table ES-1. Because the projects would increase GHG's the unit cost of dollars per GHG reduction is shown as not applicable.

Table ES-1: Recycled Water Project Summary

Project	Project Life	Annualized GHG INCREASE (MT CO_2e/yr)	Capital Cost ($)	Average Annual Cost ($/year)	Lifecycle Energy Cost ($/kWh)	Lifecycle GHG Reduction Cost ($/MT)
Pasatiempo (SCWD)	30+ years (sustainable)	13 – 31[1] **(fatal flaw)**	$5.6 million	$619,000	N/A	N/A
Seascape (SqCWD)	30+ years (sustainable)	7 **(fatal flaw)**	$10.3 million	$907,000	N/A	N/A

[1] Depending upon the amount of desalination used in a drought year.

Draft Project Assessment No. 2 – Recycled Water Projects

Description

This assessment estimates the energy savings and GHG reduction potential from the development of recycled water projects.

Background: Kennedy/Jenks' Recycled Water White Paper dated January 2010 discusses the opportunities and limitations for recycled water use in the **scwd²** use area. Major findings of the white paper included:

- Both SCWD and SqCWD have implemented and/or are investigating recycled water programs as part of their integrated water portfolios.
- Current California (CA) regulations do not allow recycled water (i.e., highly-treated wastewater) to be discharged directly into a potable/drinking water distribution system (otherwise known as direct potable use) and therefore would not meet SCWD's drought water supply needs. Irrigation demands would be reduced in a drought by curtailment.
- Current California (CA) regulations do allow recycled water to be used for indirect potable reuse whereby highly-treated wastewater is injected into the ground via percolation ponds or pumping, and extracted later for use. However, indirect potable reuse currently is not feasible for SqCWD or SCWD because: 1) it requires blending recycled water with surface or groundwater prior to injection, and both surface and groundwater supplies are already limited; 2) injection wells are required to be located a prescribed distance away from any public or private drinking water well which is difficult due to the thousands of wells within Soquel-Aptos area groundwater basin; and, 3) local land limitations are not conducive to percolation/blending ponds.
- Recycled water for SCWD and SqCWD could potentially provide irrigation water for parks, sports fields, and/or golf courses during a drought, but would require a new dedicated distribution system that would be prohibitively expensive compared with the relatively small volumes of water delivered for appropriate use.
- Scotts Valley Water District (SVWD) could provide approximately 200,000 gallons per day of recycled water for irrigation of Pasatiempo Golf Course.

SCWD and SqCWD already have evaluated various recycled water projects, and the two most feasible projects are discussed below. These two projects have been evaluated in significant detail and are used here to generally describe the opportunities and limitations of this type of project.

Opportunity for Recycled Water for SCWD

Pasatiempo Golf Course: Kennedy/Jenks' Engineering Feasibility Report for Recycled Water Service to Pasatiempo Golf Course (Pasatiempo) dated March 2010 discusses the potential to build a satellite tertiary treatment plant at Pasatiempo to treat secondary effluent from Scotts Valley Wastewater Treatment Plant (WTP). In concept, Scotts Valley Water District (SVWD) would provide recycled water for irrigation of Pasatiempo, one of SCWD's potable water customers, and in exchange, SCWD would provide the SVWD with in-kind potable water during the winter, when SCWD has excess surface water available.

In non-drought years, SCWD could offset approximately 28 million gallons per year (MGY), or 87 acre-feet per year (AFY), of surface water delivered to Pasatiempo in the summer with recycled water from SVWD. SCWD would still serve Pasatiempo with 33 MGY of surface water to meet Pasatiempo's demand. In turn, SCWD would provide 28 MGY of surface water in the winter to SVWD.

In drought years, the scenario would be the same, except SCWD would serve Pasatiempo 33 MGY of a blend of surface water and desalinated water. The blend is estimated to be approximately 14% desalination, but the actual ratio would be calculated at the end of each year based on an actual usage of the desalination plant.

The potential recycled water use scenarios for Pasatiempo are summarized in Table 1.

Table 1: Potential Pasatiempo Recycled Water Use Scenarios

Drought Status	Current Scenario	Potential Future Scenario, No RW Project	Potential Future Scenario, with RW Project
Non-Drought Years	SCWD serves Pasatiempo Golf Course with approximately 62 MGY (189 AFY) with surface water.		In dry season, SVWD serves Pasatiempo with 28 MGY recycled water, and SCWD serves Pasatiempo with 33 MGY of surface water. SVWD receives 28 MGY of surface water from SCWD in wet season.
Drought Years	SCWD curtails and serves Pasatiempo with approximately 52 MGY of surface water	SCWD curtails and serves Pasatiempo with approximately 52 MGY of blend surface water/desal	In dry season, SVWD serves Pasatiempo with 28 MGY recycled water, and SCWD serves Pasatiempo with 33 MGY of blend surface water/desal. SVWD receives 28 MGY of surface water from SCWD in wet season.

Note that Pasatiempo has expressed an interest in shifting toward xeriscaping, which could reduce its water demand and reduce the need for irrigation water. This water supply scenario should be revisited if Pasatiempo's demands change significantly.

Opportunity for Recycled Water for SqCWD

Seascape Golf Course: Black & Veatch's Water Recycling Planning Study dated June 2009 identified recycled water production at Seascape Golf Course (Seascape) to be a potentially feasible recycled water project for SqCWD.

Seascape Golf Course is irrigated by groundwater extracted from their own private well. If Seascape is served 134 AFY of recycled water, the golf course could reduce its groundwater pumping by 134 AFY. Over time, this could help to reduce the overdraft conditions of the groundwater basin but would not provide SqCWD with an additional potable water supply. At this time, it is unlikely that SqCWD would request use of the groundwater well at Seascape. The Seascape golf course well is used for irrigational purposes and does not meet state requirements for potable wells. Additional treatment would add complexities and costs and this option does not align with SqCWD's groundwater management goals of shifting groundwater pumping inland. The potential recycled water use scenarios for Seascape are summarized in Table 2.

Table 2: Potential Seascape Recycled Water Use Scenarios

Project	Current Scenario	Potential Future Scenario
Seascape Golf Course	Seascape uses 440 AFY of groundwater from its own private well	Seascape uses 134 AFY recycled water and 306 AFY groundwater, and reduces 134 AFY pumping of groundwater. This could help reduce the overdraft conditions in the groundwater basin.

History and Technical Maturity

The use of recycled water to offset potable water use for irrigation is a technically mature concept that has been widely implemented throughout California.

Because state regulations and groundwater management plans may have site-specific treatment requirements, the approved uses for recycled water must always be evaluated on a case by case basis. Understanding the relationship between water quality requirements for potential uses, health related water quality requirements, and other regulatory water quality requirements related to the use of recycled water is critical to identifying the suitability and benefits of recycled water use.

The production, discharge, distribution, and use of recycled water are subject to federal, state, and local regulations, the primary objectives of which are to protect public health. In the State of California, recycled water requirements are administered by the State Water Resource Control Board, individual Regional Water Quality Control Boards, and the California Department of Public Health.

The regulatory requirements for recycled water projects in California are contained in the California Code of Regulations (CCR), which includes Title 22 and Title 17; the California Health and Safety Code; and the California Water Code.

Reliability and Operational Complexity

For SCWD, the summertime supply to Pasatiempo would be shifted to wintertime supply to SVWD. The water to SVWD would be delivered through a new connection and would require a new pump station and pipeline and minor operational changes. In addition, this may require additional treatment improvements at the SCWD Graham Hill WTP that are not accounted for in this analysis.

SqCWD currently does not serve Seascape for irrigation of it's greens, so SqCWD would have to incorporate this recycled water service into their operations. This would add complexity for SqCWD staff.

Sustainability

A recycled water project would continue to provide an additional water resource for the life of the project and beyond. The project would be sustained by normal maintenance to repair any infrastructure deterioration. However, as shown below, the projects do not provide an overall reduction in energy for the water supply and therefore do not provide a reduction in GHG emissions.

Local Considerations

Economic

The Pasatiempo and Seascape projects would provide some local benefit by creating shorter term construction jobs and a few long-term operations and maintenance jobs, and by providing an additional water resource. There would also be opportunity for public outreach and education on recycled water.

Environmental

Air: These projects do not create air pollution.

Land: Recycled water can have higher salinity than potable and groundwater sources. Water quality should be tested to ensure that it would not affect the soil or sensitive plant species.

Water: Diverting and treating a portion of secondary effluent would reduce the amount of secondary effluent to the ocean outfall. Recycled water would not create more supply of water during drought years.

Noise: The satellite treatment plants could have some equipment noise, which could be mitigated by placing the equipment in an enclosure.

Aesthetic/Visual: The satellite treatment plants could have a visual/aesthetic impact but could be constructed in a design and area that is less visually disruptive.

Waste by-product: There are no waste by-products of recycled water projects.

Energy and GHG Changes

Table 3 shows the estimated energy changes of a SCWD recycled water program.

Table 3: Estimated Energy Changes for SCWD Recycled Water Program

Assumptions		
Annual Pasatiempo Demand	189	AFY
Surface water power factor	1.3	kWh/kgal
Desalination power factor	14.5	kWh/kgal
Recycled water power factor	3	kWh/kgal
Power factor for new pumping station delivering potable water from SCWD to SVWD	1	kWh/kgal
1 AF	326	kgal
SCWD drought year blend assumed	86%	surface water
	14%	desal
Non-Drought Year, without Recycled Water project		
SCWD would provide	189	AFY of surface water
Annual Non-Drought Energy Use without Project	**80,000**	**kWh/yr**
Non-Drought Year, with Recycled Water project		
Dry Season		

SVWD would provide	87	AFY of recycled water
SCWD would provide	102	AFY of surface water
Pasatiempo would use	189	AFY
	128,000	kWh/yr
Wet Season		
SCWD would provide potable water to SVWD…	87	AFY of surface water
…which would use (water treatment & pumping energy)	65,000	kWh/yr
Annual Non-Drought Energy Use with Project	**193,000**	**kWh/yr**
Annual Non-Drought Year Energy INCREASE	**113,000**	**kWh/yr**
Drought Year, without Recycled Water project, with curtailment		
SCWD curtailment (15% or more)	85%	of potable water delivered
SCWD would provide	161	AFY of blend surface water/desal
Annual Drought Year Energy Use without Project	**167,000**	**kWh/yr**
Drought Year, with Recycled Water project, with curtailment		
Dry Season		
SVWD would provide	87	AFY of recycled water
SCWD would provide	102	AFY of blend surface water/desal
Pasatiempo would use	189	AFY
	191,000	kWh/yr
Wet Season		
SCWD would provide potable water to SVWD…	87	AFY of surface water
…which would use (water treatment & pumping energy)	65,000	kWh/yr
Annual Drought Energy Use with Project	**256,000**	**kWh/yr**
Annual Drought Year Energy INCREASE	**89,000**	**kWh/yr**
Annualized energy INCREASE (2 drought years every 7 years)	**106,000**	**kWh/yr**

Although a recycled water project at Pasatiempo could provide water supply benefits, it has a fatal flaw as a GHG reduction project because it increases energy use and associated indirect GHG emissions. Sensitivity analyses were run on these calculations to consider the percent of desalination use and the Pasatiempo demand, and these analyses also showed an increase in energy use.

Table 4 shows the estimated energy changes of a SqCWD recycled water program.

Table 4: Estimated Energy Changes for SqCWD Recycled Water Program

Assumptions		
Assumed groundwater power factor for Seascape (average of SCWD and SqCWD groundwater power factors)	2.5	kWh/kgal
Recycled water power factor	3	kWh/kgal
1 AF	326	kgal

Seascape demand	440	AFY
Annual recycled water production at Seascape	134	AFY
Without Recycled Water project		
Seascape would pump	440	AFY of groundwater
Annual Energy Use without Project	**354,000**	**kWh/yr**
With Recycled Water project		
Seascape would receive	134	AFY of recycled water
Seascape would pump	306	AFY of groundwater
Annual Energy Use with Project	**377,000**	**kWh/yr**
Annual Energy INCREASE due to Project	**23,000**	**kWh/yr**

Although a recycled water project at Seacape could provide water supply benefits, it has a fatal flaw as a GHG reduction project because it increases energy use and associated indirect GHG emissions.

Table 5 provides a summary of the energy and GHG changes from a recycled water program.

Table 5: Estimated Energy and GHG Changes for Recycled Water Program

Project	Annualized Energy Increase (kWh)[1]	Total GHG Increase (MT CO_2e)
Pasatiempo (SCWD)	106,000	31
Seascape (SqCWD)	23,00	7

[1]Assuming a 7 year drought cycle with 5 non-drought and 2 drought years.

Cost

Table 6 below summarizes the estimated costs of the Pasatiempo and Seascape recycled water projects.

Table 6: Estimated Costs of Recycled Water Projects

Project Title	Life (yrs)	Capital Cost ($ million)	Average Annual Cost ($/year)	Lifecycle GHG Reduction Cost ($/MT)
Pasatiempo (SCWD)	30	$5.6 million[1]	$619,000	N/A
Seascape (SqCWD)	30	$10.3 million	$907,000	N/A

[1]Does not include cost of a new potable water supply pipeline from SCWD's Loch Lomond to the SVWD distribution system.

Summary of Advantages and Disadvantages

Advantages:

- Utilization of a water resource that currently is untapped.
- Low environmental impacts.

Disadvantages:

- Does not reduce energy or GHG.
- High unit cost of water production.
- Does not provide additional water or reduce water demands for SqCWD.
- Increased operational complexity for SCWD and SqCWD.