



SECURING OUR WATER FUTURE

Our Water, Our Future

Agenda

1. Then and Now – trends for Santa Cruz’s water demand and water supply;
2. The Water Supply Advisory Committee’s water supply reliability problem statement;
3. Securing Our Water Future –
 - A. What we’ve learned about climate change and its impact on Santa Cruz’s water infrastructure and water supply;
 - B. Supply augmentation options we’re exploring; and
 - C. Shared interests among regional water providers and opportunities for regional collaboration

A scenic view of a lake with a wooden bench in the foreground, overlaid with a semi-transparent white box containing text. The background shows a calm lake reflecting the sky, with a dense forest of trees in the distance. A wooden bench is positioned on a sandy shore in the foreground. The text is centered within the white box.

**THEN AND NOW
SUPPLY AND DEMAND TRENDS**

2013

- Average Annual Water Demand: 3.2 BGY
- Residential Water Use: 61 GPCD
- Water Year Classification for previous 10 years:
 - 3 Wet, 4 Normal, 2 Dry, 1 Critically Dry
- WSCP Implementation for previous 10 years:
 - 4 years out of 10

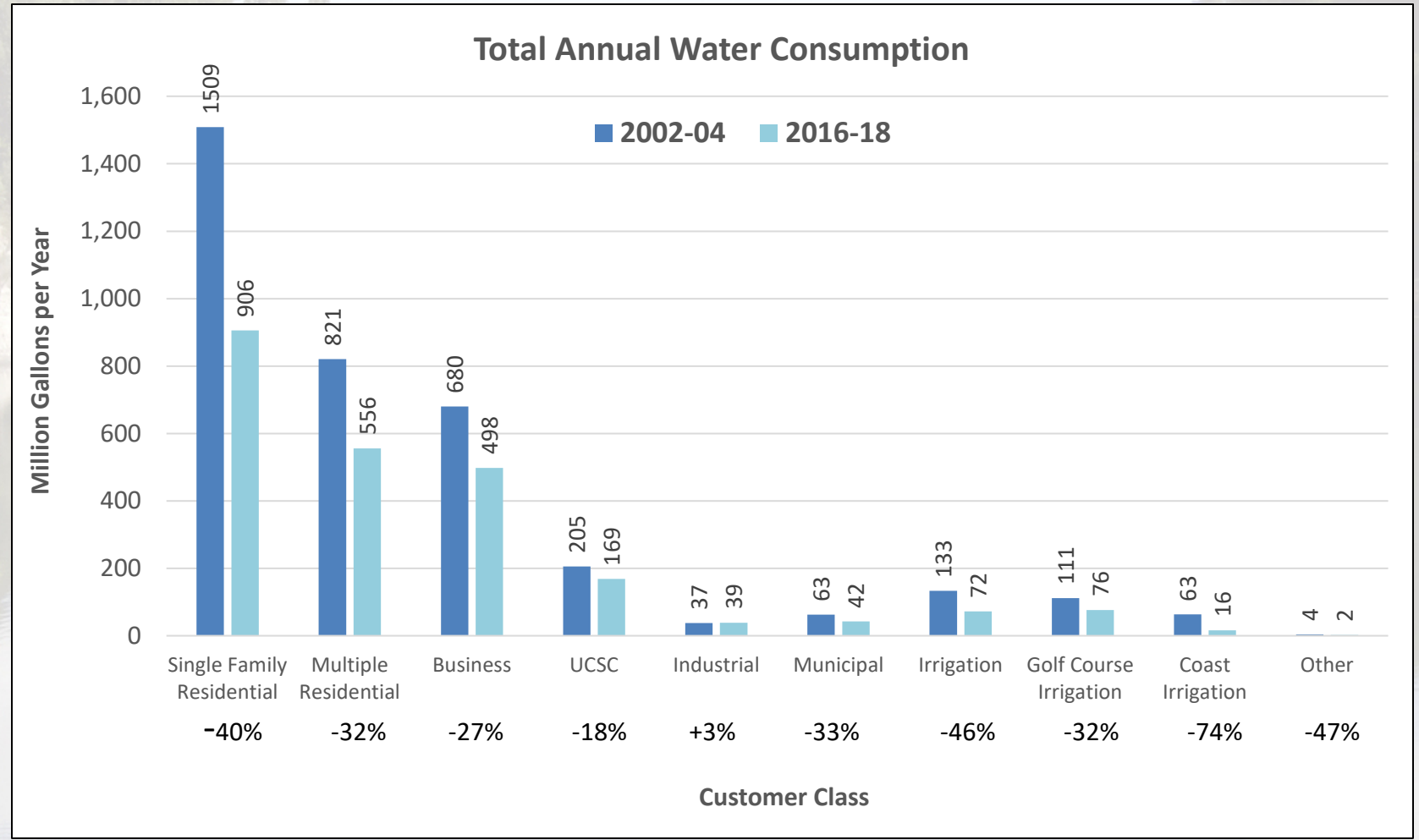
2022

- Average Annual Water Demand: 2.6 BGY
- Residential Water Use: 44 GPCD
- Water Year Classification for previous 10 years:
 - 2 Wet, 2 Normal, 4 Dry, 2 Critically Dry
- WSCP Implementation for previous 10 years:
 - 6 years out of 10

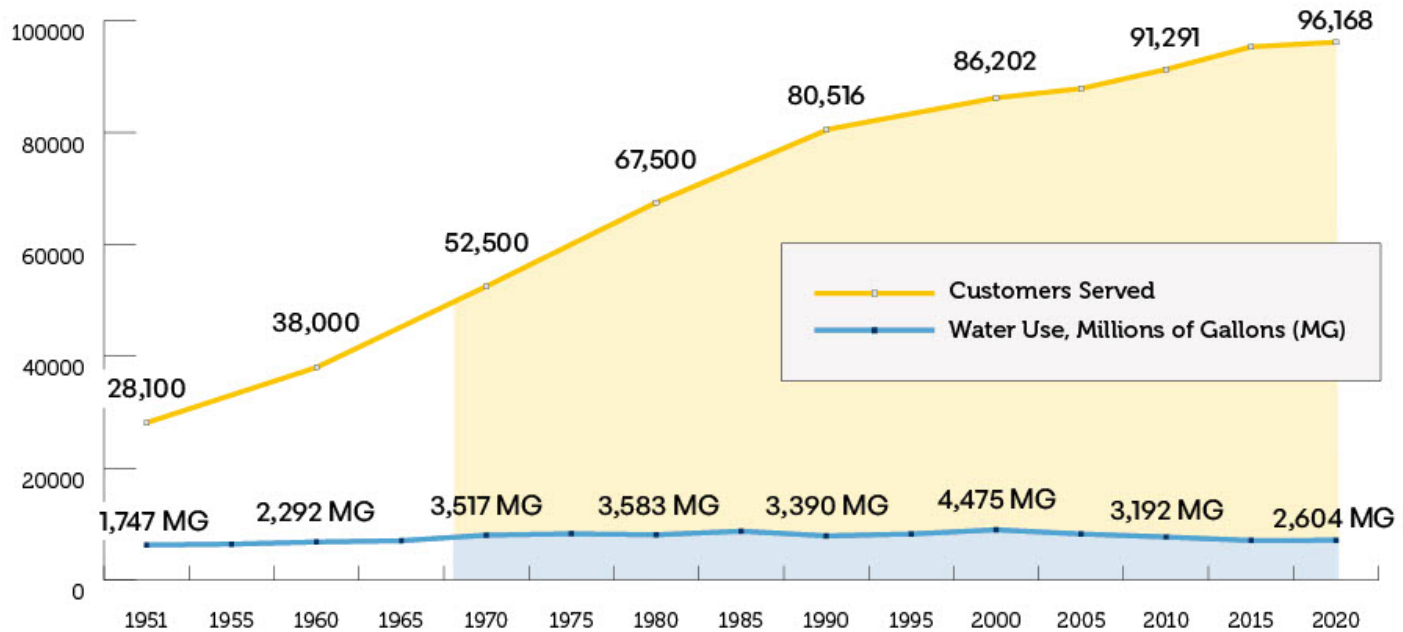
Water Use Comparison: Then versus Now

	2002-2004	2016-2018	Change (Volume)	Percent Change	Direction
Total annual production (billion gallons)	3.9	2.6	-1.3	-33%	↓
Peak season production (billion gallons)	2.3	1.5	-0.8	-35%	↓
Peak month (million gallons)	467	270	-197	-42%	↓
Peak day (million gallons)	15.2	10.4	-4.8	-32%	↓
Average day during peak season (million gallons)	12.7	8.0	-4.7	-37%	↓
Population	87,000	97,000	+10,000	+11%	↑
Visitors (tourism)	?	?	?		↑

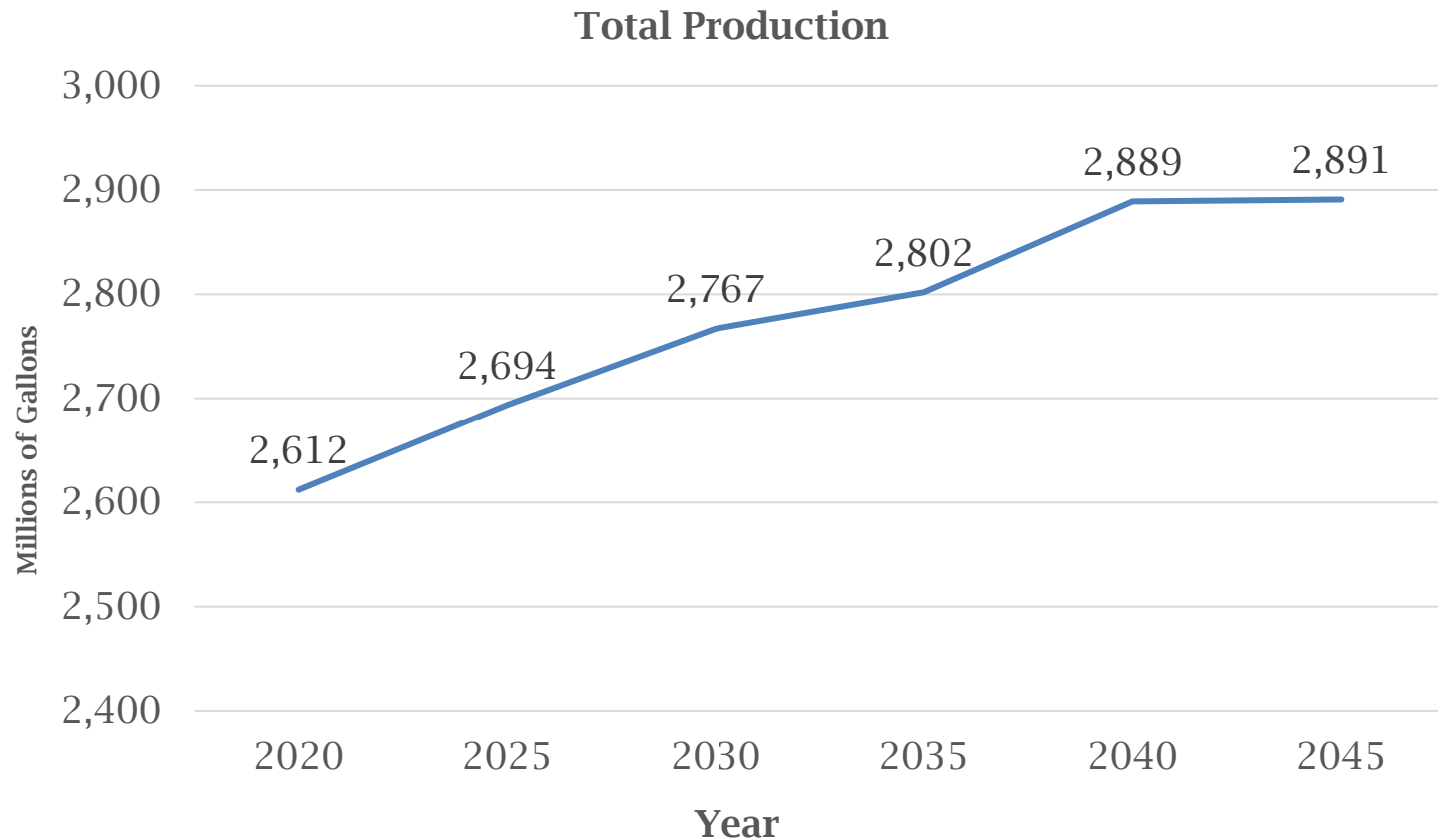
Water Use by Customer Class: Then versus Now



Population Growth and Water Use | Santa Cruz Water Department 1951 – 2020



Long Term Demand Forecast as updated in winter 2022





**SANTA CRUZ'S WATER SUPPLY
RELIABILITY PROBLEM STATEMENT**

WSAC's Problem Statement: Our System Is Highly Vulnerable to Drought Caused Shortages Because of:

- Limited storage
- Fish flow requirements
- Highly variable supply

Of these, limited storage most significant, and water conservation alone cannot solve the problem.

- Climate change is worsening our problem

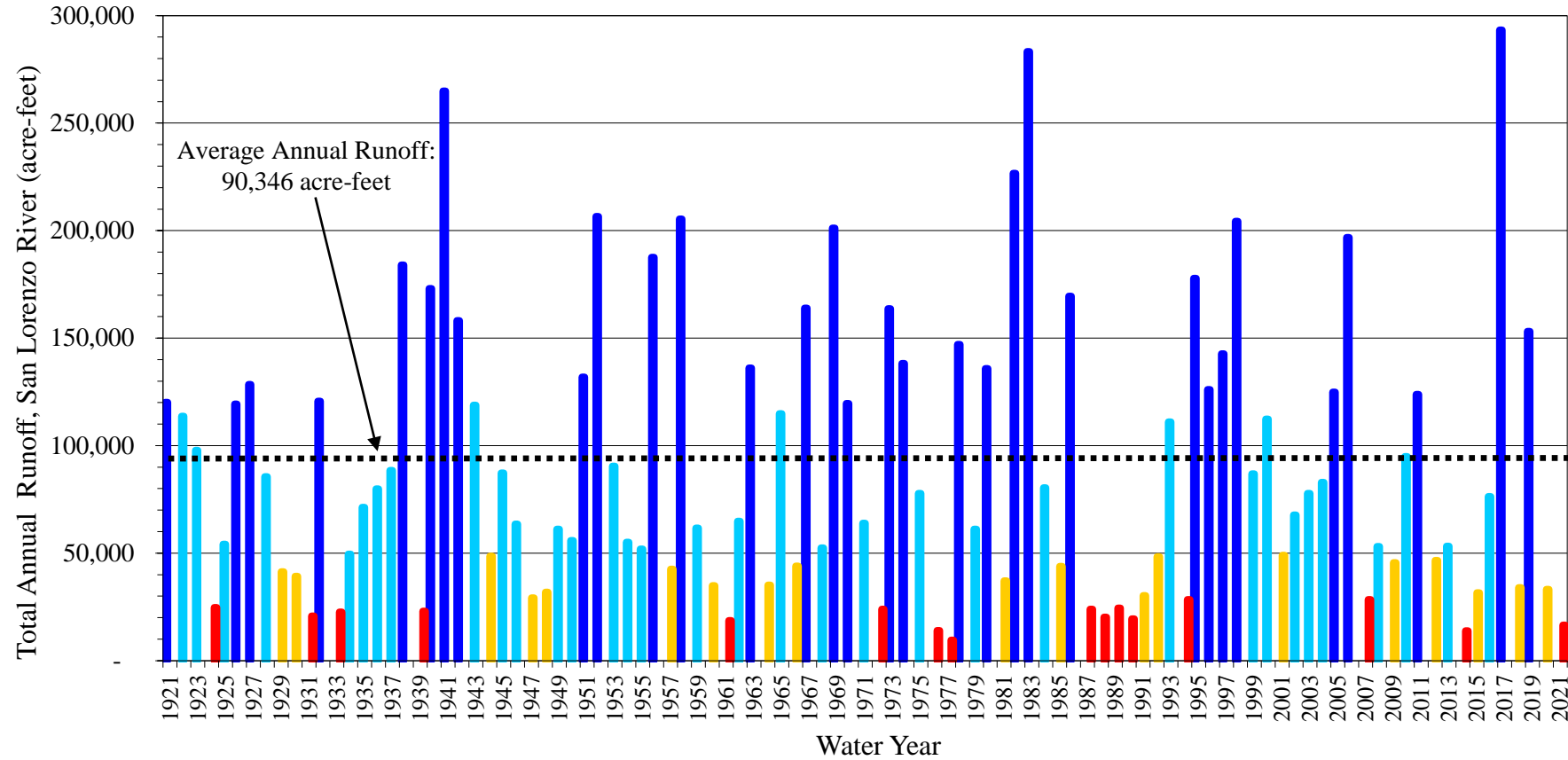


The Santa Cruz Water System Serves 100,000 People Using Highly Variable Surface Water Resources

14 out of the last 20 years show below average cumulative discharge from the San Lorenzo River

Water Year Classification System

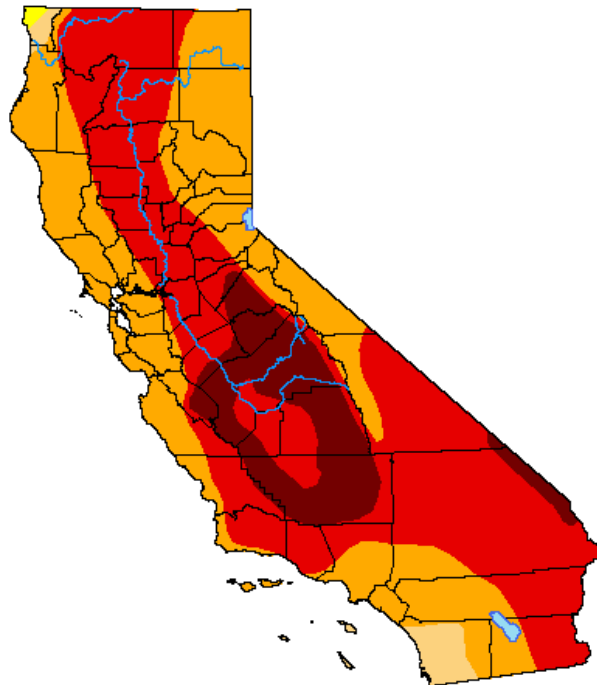
■ Wet
 ■ Normal
 ■ Dry
 ■ Critically Dry









Recent Droughts in California

U.S. Drought Monitor California

July 26, 2022
(Released Thursday, Jul. 28, 2022)
Valid 8 a.m. EDT



Intensity:

-  None
-  D0 Abnormally Dry
-  D1 Moderate Drought
-  D2 Severe Drought
-  D3 Extreme Drought
-  D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

Curtis Riganti
National Drought Mitigation Center

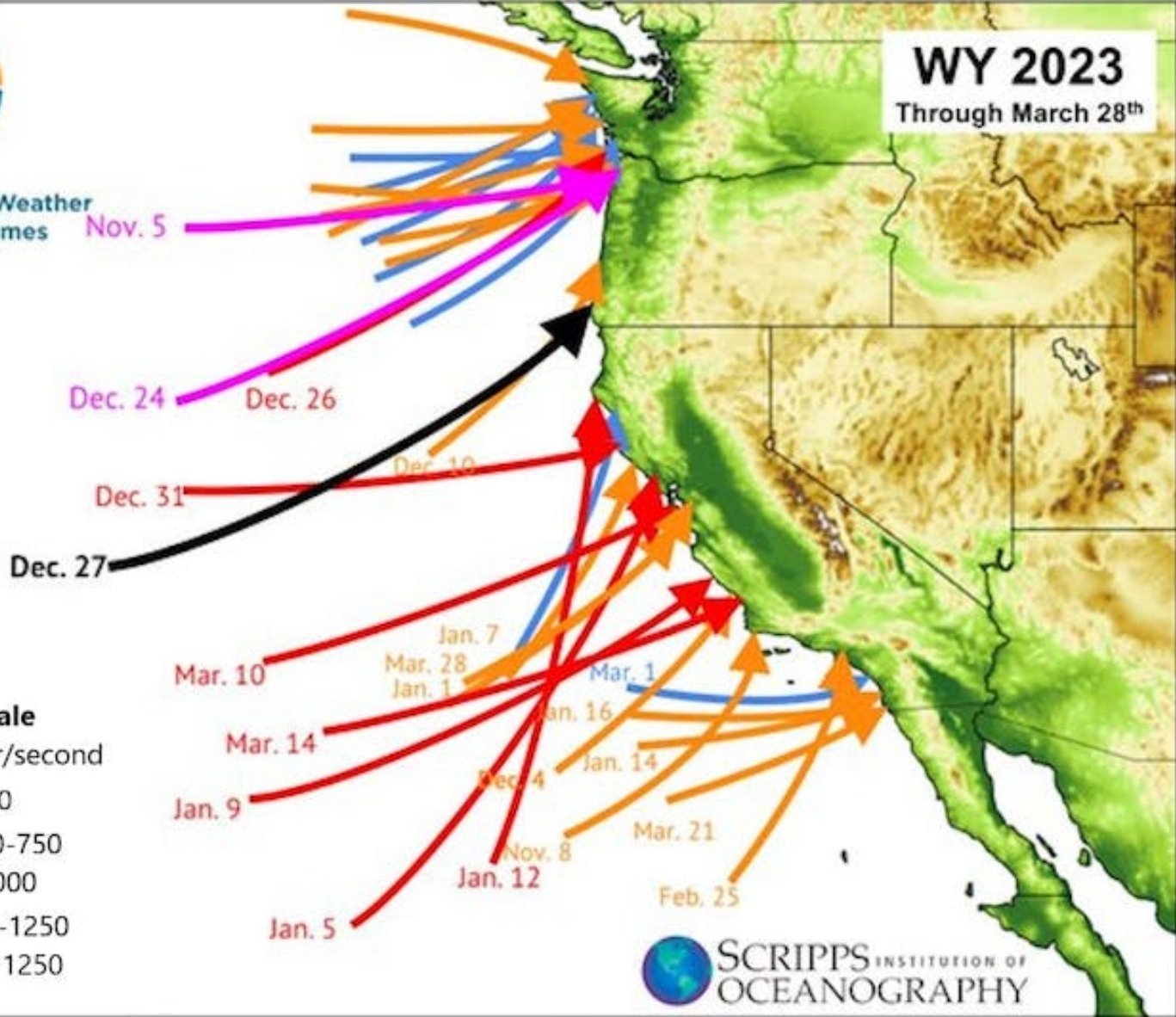


droughtmonitor.unl.edu



Center for Western Weather
and Water Extremes

WY 2023
Through March 28th



SCRIPPS INSTITUTE OF
OCEANOGRAPHY

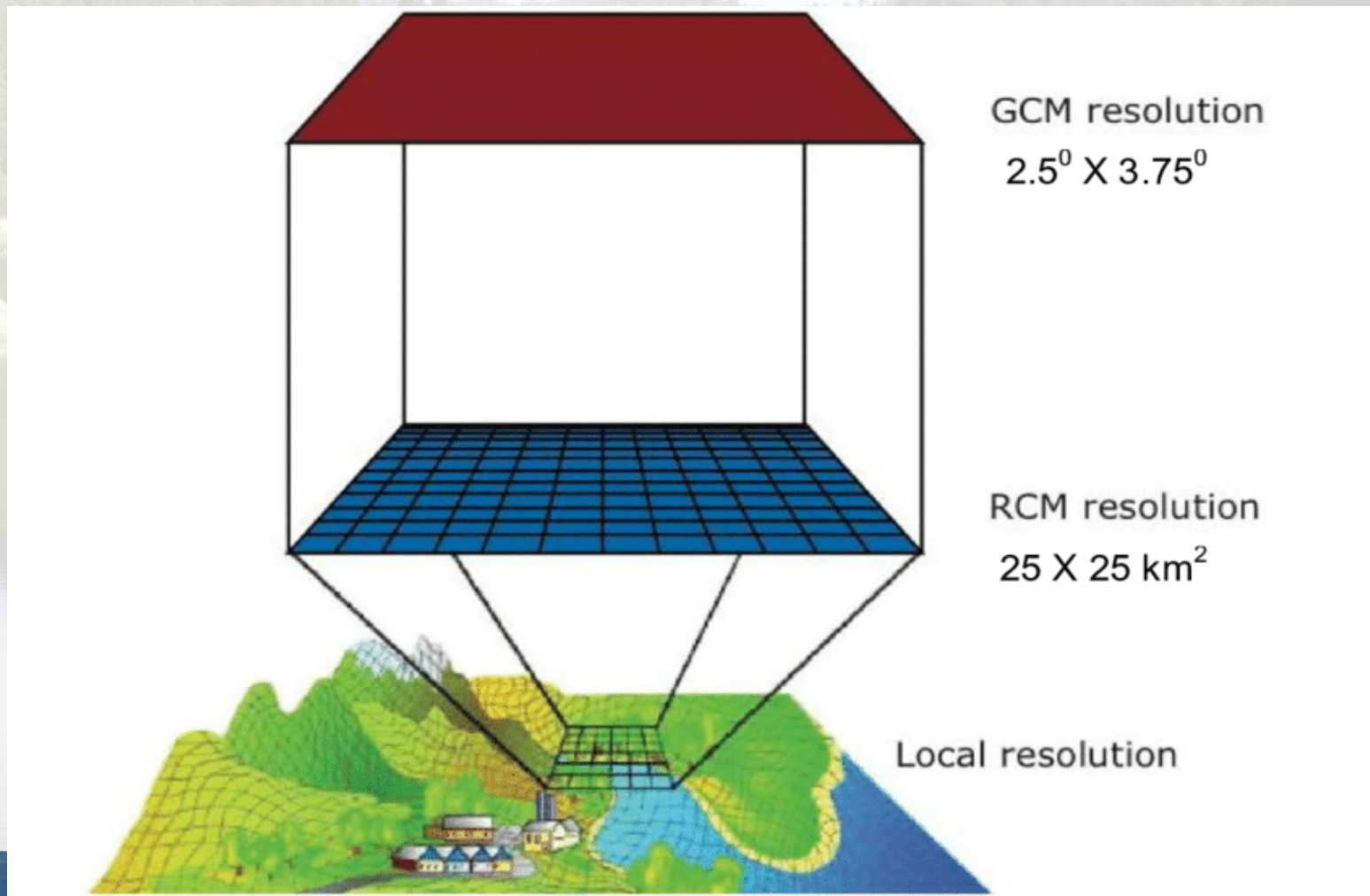
2022 NEW POLICY DIRECTION: “SECURING OUR WATER FUTURE”

- Implications of Climate Change,
- Supply Augmentation Options, and
- Opportunities for Regional
Collaboration

A scenic view of a lake with a wooden bench in the foreground, surrounded by trees and a forested background. The image is overlaid with a semi-transparent white rectangle containing the title text.

IMPLICATIONS OF CLIMATE CHANGE

The Department's Past Efforts to evaluate Climate impacts involved "down-scaling"



We've developed a new vulnerability assessment approach for assessing climate impacts that doesn't involve down-scaling and looks at a wide range of potential future climate conditions

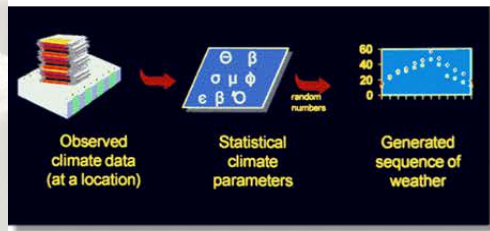
Non Climate Uncertainties



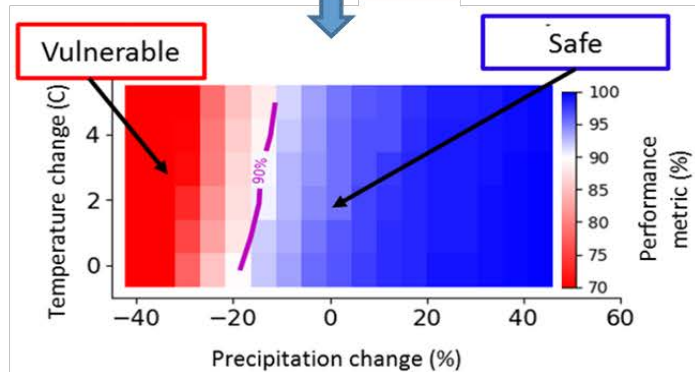
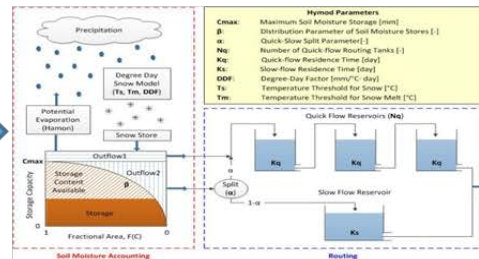
Santa Cruz Water System Model



Climate/Weather Generator

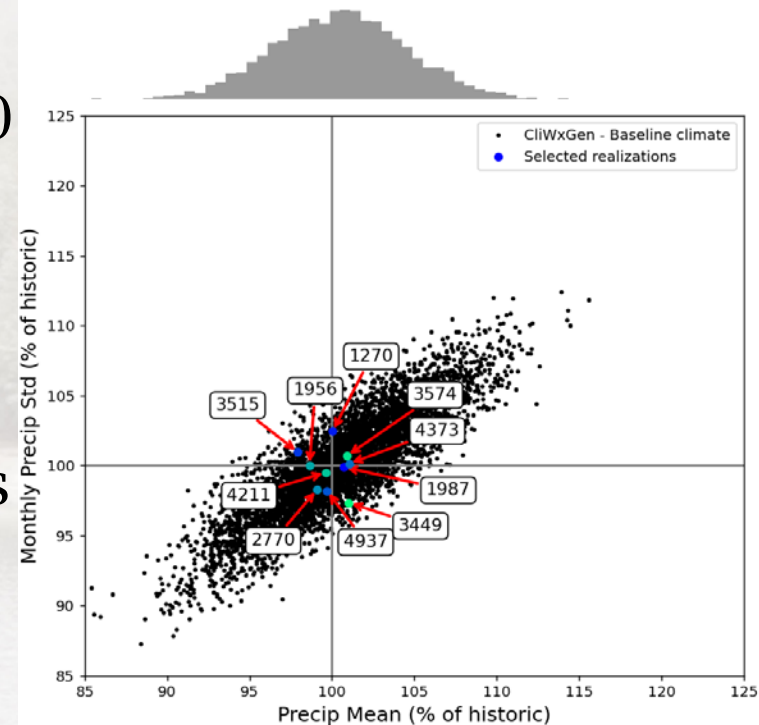


Water Balance Model



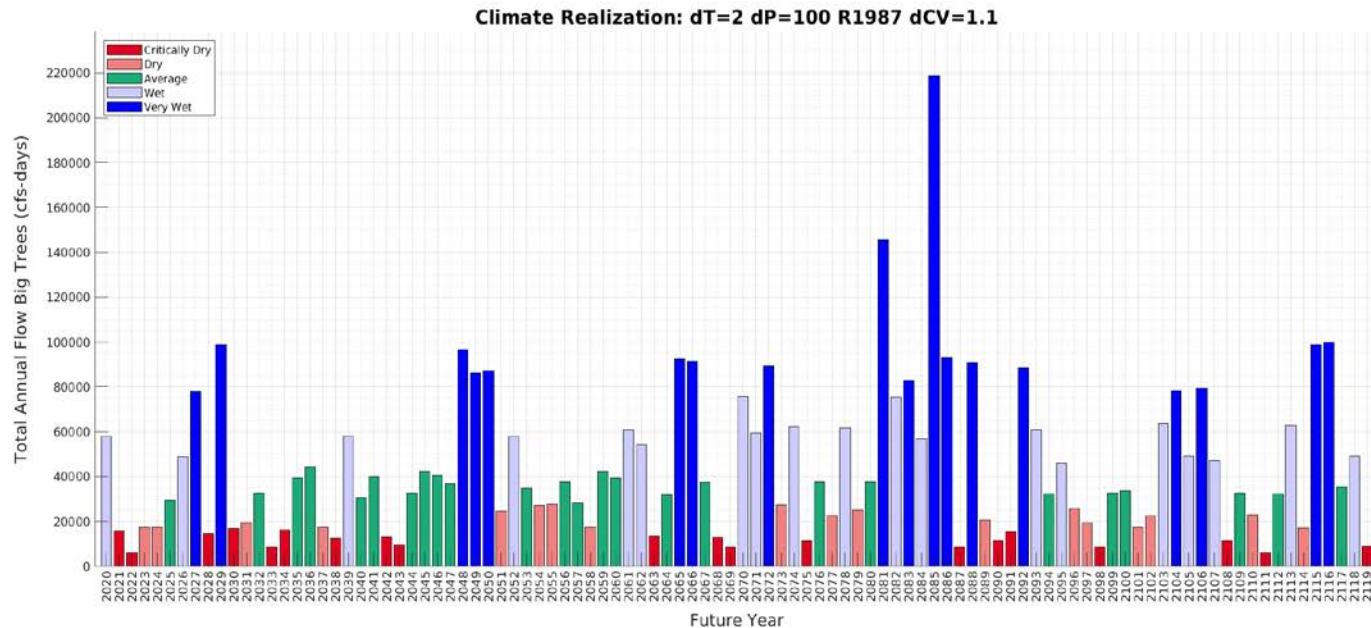
The Weather Generator developed for this work...

- Doesn't use downscaling;
- Selected 10 plausible climate Realizations based on looking at 5000 options using historic variability (see colored dots...);
- For each realization, generates weather inputs for precipitation and temperature that are fed into the Water Balance Model to produce local hydrology,

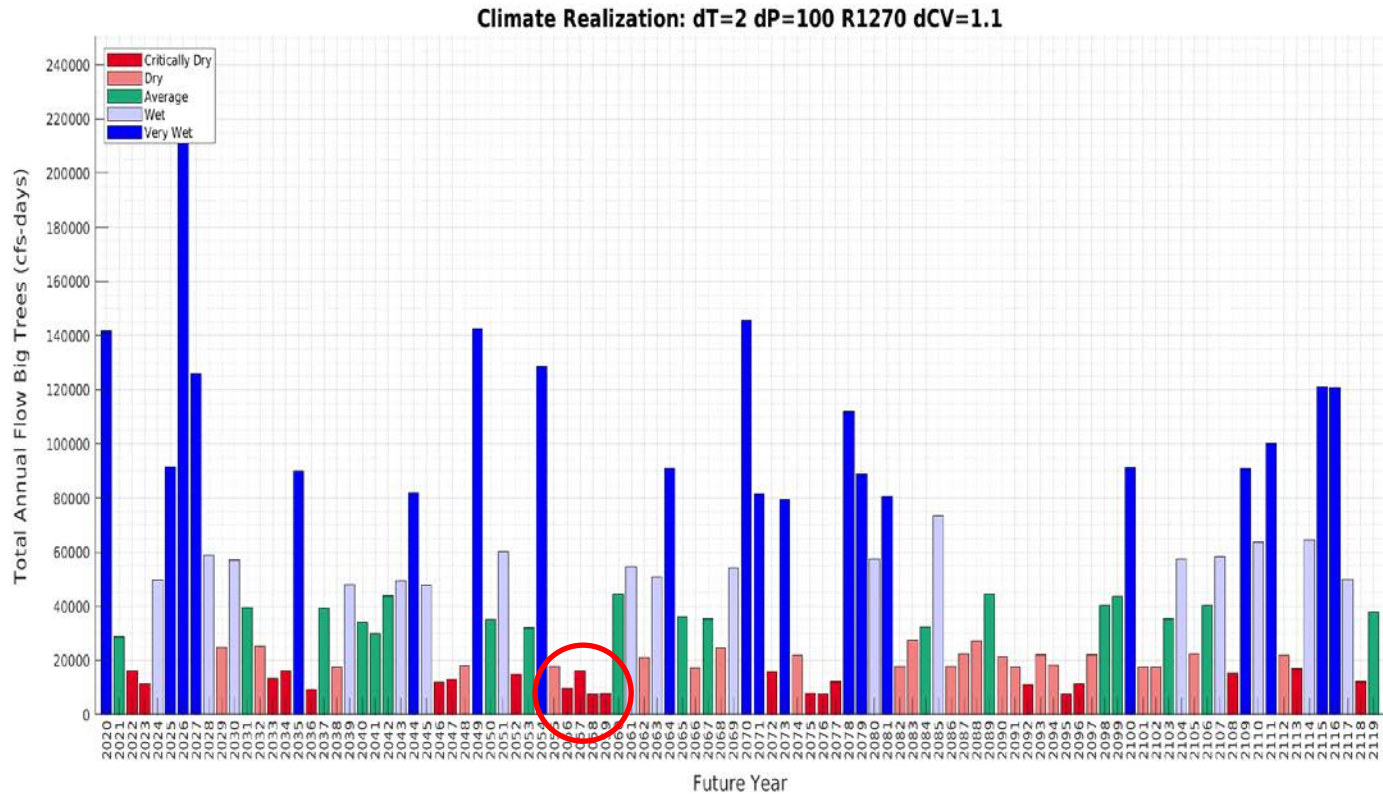


The Water Balance Model...

- Produces 100-year forecasts of local hydrology for 8,160 combinations of Climate Realization, Precipitation, Temperature and Climate Variability.
- Every one of these 8,160 hydrologic scenarios was used to challenge the new Santa Cruz Water System Model to identify worst year conditions.



Worst Case Scenario - 5-year drought sequence



Worst Year Shortage Projections Using 2.6 billion Gallons per Year of Demand

	Actual Climate	Down Scaled Global Climate Models		Based on Historic Climate	Based on Vulnerability Analysis
Worst Year Supply Deficits for Drought Years	Historic Hydrology	2015 WSAC Climate Change (GFDL)	2020 Water Rights EIR Climate Change (CMIP 5)	2020 MGA GSP Climate Change (Climate Catalog)	2022 Securing Our Water Future Climate: Realization 1270, +2 C, No Change in Precip, 10% Increase in Variability
Year 1 (MG)	0	419	241	315	1450
Year 2 (MG)	781	570	454	834	630
Year 3 (MG)	0	0	708	0	110
Total Deficit	781	989	1103	1149	2190

Key Take Aways: Water Supply Planning in the Face of Uncertainty

- Water supply planning is inherently uncertain and climate change is increasing that uncertainty.
- The water supply deficit is significantly affected by climate change, with many climate plausible future climate scenarios showing large increases in Santa Cruz's water supply deficit during droughts.
- The frequency of drought also increases rapidly with precipitation decreases.

A scenic view of a river with a wooden bench on the bank, overlaid with a semi-transparent white box containing text. The background shows a river with white water rapids, a sandy bank, and a dense forest of trees in the distance. A wooden bench is positioned on the sandy bank in the foreground. The text is centered within the white box.

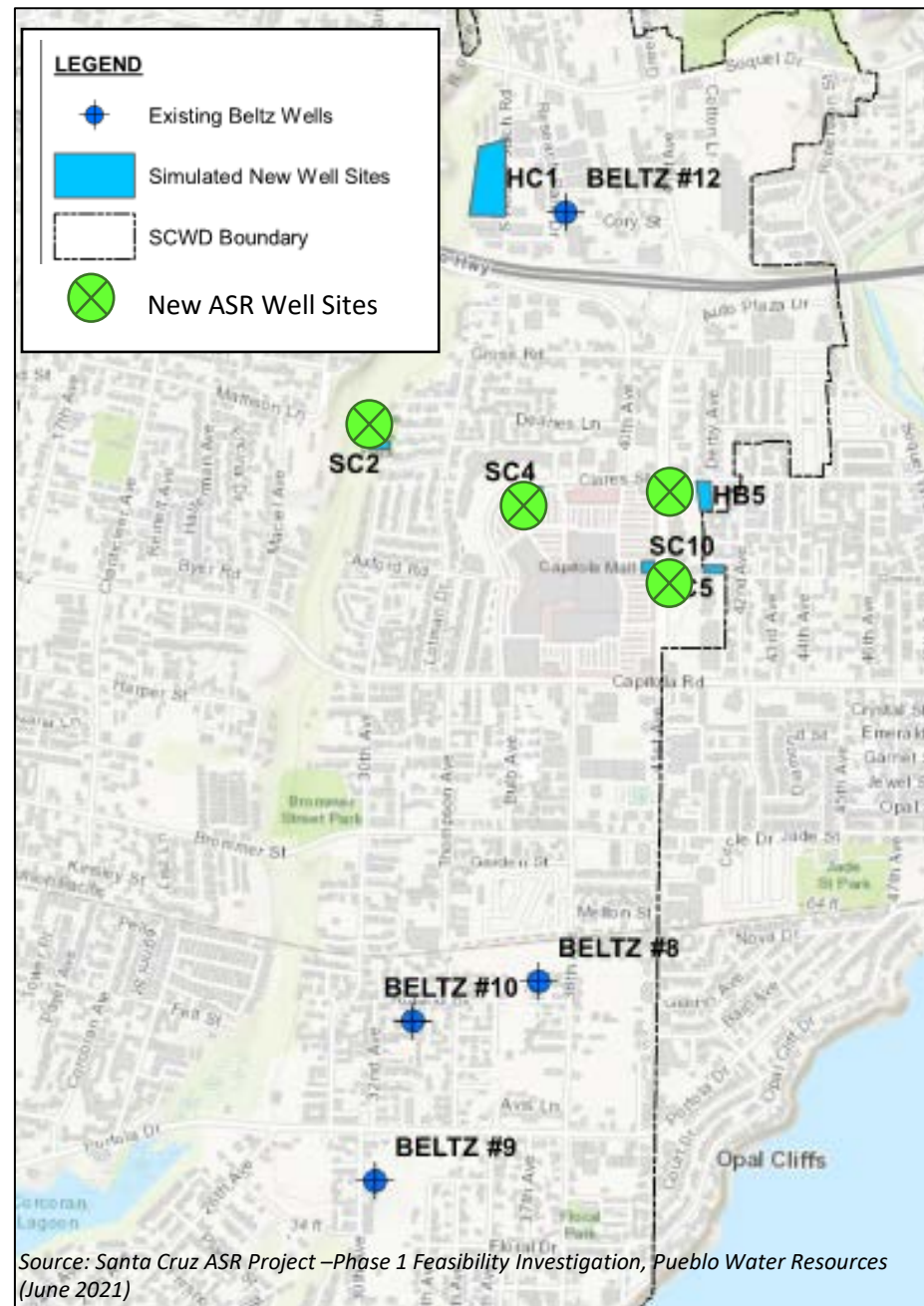
**SUPPLY OPTIONS BEING
EVALUATED**

SOWF – Concept Projects Evaluated

Concept	Project Type	Description
#1	Aquifer Storage and Recovery (ASR)	Groundwater replenishment in the Mid County Groundwater Basin (MCOGB) using available winter surface water flows treated at Graham Hill Water Treatment Plant (GHWTP)
#2	Indirect Potable Reuse (IPR)	Groundwater replenishment in the Santa Margarita Groundwater Basin (SMGB) using purified water produced at Pure Water Soquel (PWS) Chanticleer Advanced Water Treatment Facility (AWTF)
#3	Direct Potable Reuse (DPR)	Blending of raw water with purified water produced at a new AWTF for further treatment at GHWTP
#4	Seawater Desalination	New desalination facility

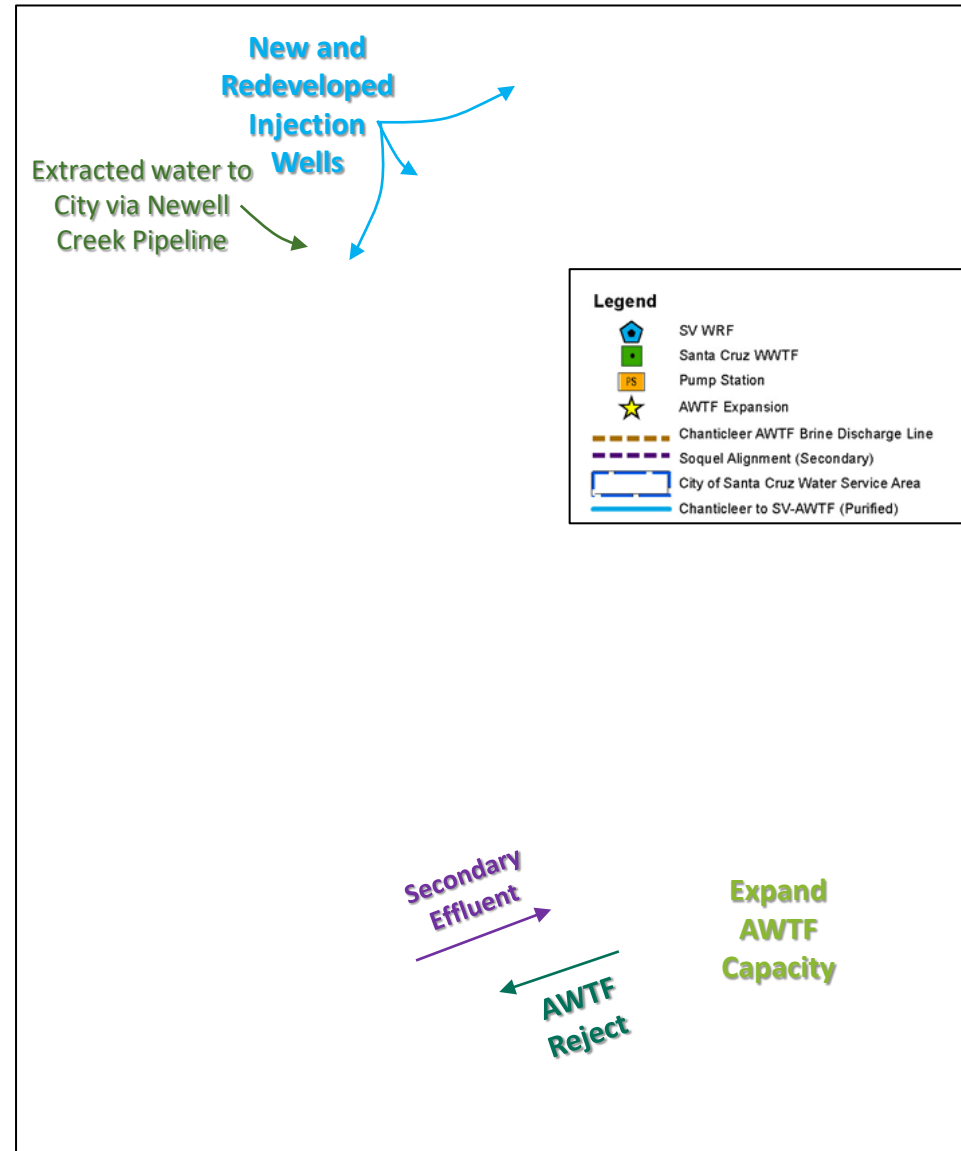
Concept #1: Aquifer Storage and Recovery (ASR) in the Mid-County Groundwater Basin (MCOGB)

1. Injection of available treated surface water during winter months in MCOGB
2. Extraction of groundwater from MCOGB
3. Infrastructure Assumptions:
 - Conversion of 4 existing Beltz wells to ASR wells
 - 4 New ASR wells
 - Upgrades to Beltz WTP
 - Upgraded treatment for Beltz 12
 - New wellhead treatment for new ASR wells
 - Connections from wells to/from City's Potable Water System



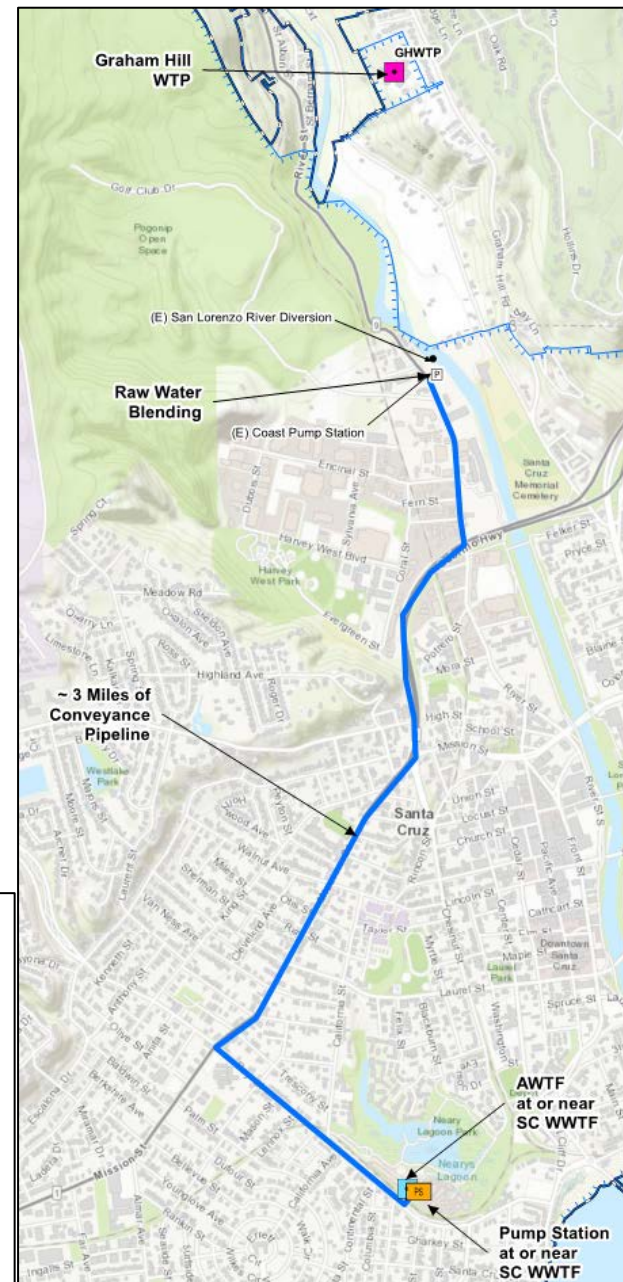
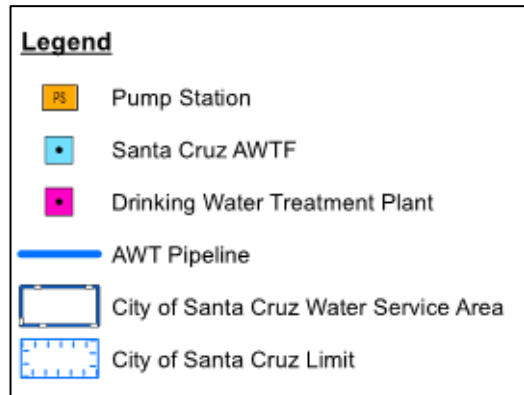
Concept #2: Indirect Potable Reuse (IPR) in the Santa Margarita Groundwater Basin (SMGB)

1. Injection of Purified Water in SMGB
2. Extraction of groundwater from SMGB
3. Infrastructure Assumptions:
 - ✓ Expansion of PWS Chanticleer AWTF to produce additional 1,500 AFY
 - ✓ New Pipeline from AWTF to Scotts Valley
 - ✓ 2 Upgraded injection wells at El Pueblo
 - ✓ 7 New injection wells
 - ✓ 2 New extraction wells
 - ✓ New pipeline from extraction wells to Newell Creek Pipeline



Concept #3: Direct Potable Reuse (DPR) via Raw Water Augmentation

1. Production of Purified Water in Santa Cruz
2. Blending of Purified water with Raw Surface Water
3. Treatment of blended water at Graham Hill WTP
4. Infrastructure Assumptions:
 - ✓ New AWT Facility near SC WWTF Conveyance of purified water to Coast Pump Station



AWTF: Advanced Water Treatment Facility
 SC WWTF: Santa Cruz Wastewater Treatment Facility

Concept #4: Seawater Desalination



SOURCE: URS 2013; Updated by Dudek in 2017, Bing 2017

FIGURE 4

Updated Seawater Desalination Project Overview

City of Santa Cruz Seawater Desalination Project



Evaluation Results for Concept Projects

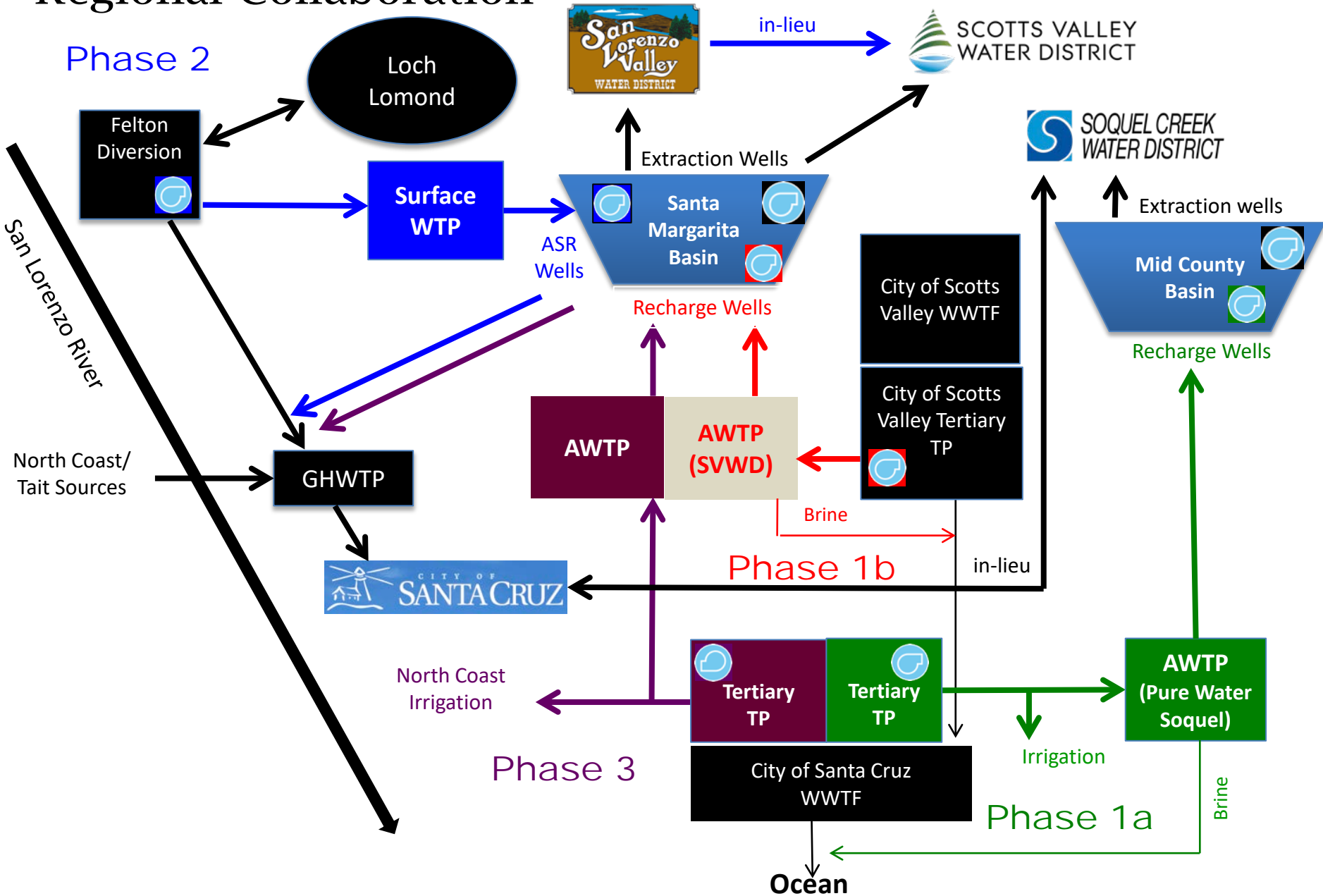
Criteria	ASR ^a	IPR ^b	DPR	Desal ^c
Annual Yield	Ave: 250 MGY (750 AFY) Max: 530 MGY (1,620 AFY)	260 MGY (790 AFY)	1,200 MGY (3,700 AFY)	1,200 MGY (3,700 AFY)
% of Supply gap	44%	21%	100%	100%
(\$/AF)	\$4,100 to \$8,500	\$7,800	\$3,500	\$4,500 to \$5,800
GHG (MT of CO2)	110 to 140	1,210	960	2,500
Energy use (MWh/yr)	710 to 930	8,220	6,750	17,500
(MWh/AF)	0.6 to 0.9	5.5	1.8	4.7

- a. ASR ranges for ACAYY, GHG, and Energy Use are based on average and max yield.*
- b. IPR yield limited by 1,500 AFY production less 710 AFY to restore SMGB groundwater levels.*
- c. Desal range for ACAYY is based on cost for three alternatives ocean intakes.*
- d. Refer to Fact Sheets for additional information and assumptions made for each concept.*

A scenic view of a river with a wooden bench on the bank, overlaid with a semi-transparent white box containing the title text.

OPPORTUNITIES FOR REGIONAL COLLABORATION

2016 Brainstorming on Potential Opportunities for Regional Collaboration

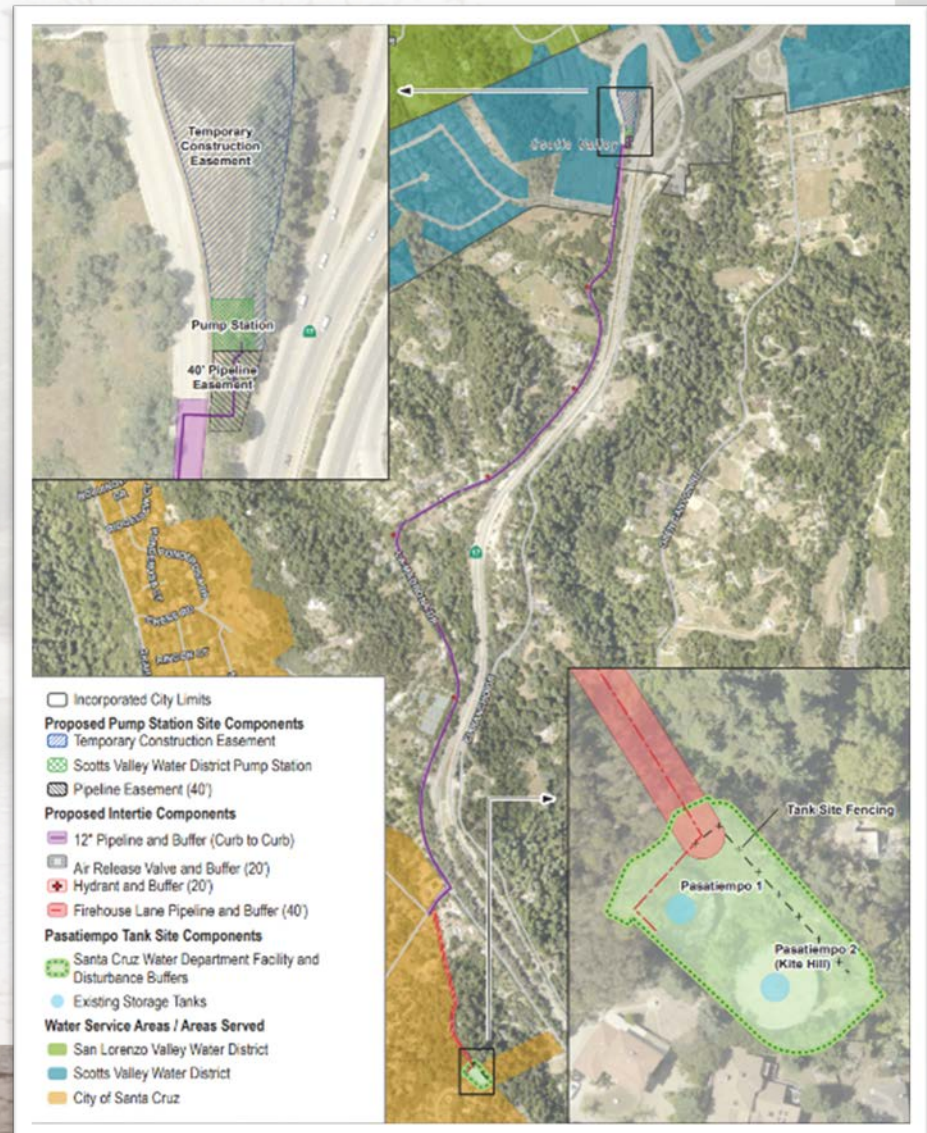


Groundwater sustainability planning has helped move regional collaborations forward

- Both the Santa Cruz Mid-County and Santa Margarita Groundwater Sustainability Plans include projects and management actions that explore and, when appropriate, implement regional projects. Examples include:
 - The Pure Water Soquel Project that will protect the aquifer from seawater intrusion; and
 - The Scotts Valley-Santa Cruz intertie that offers additional opportunities for collaboration.

Collaborative Project Overview: Scotts Valley Water District/Santa Cruz Bi-Directional Intertie

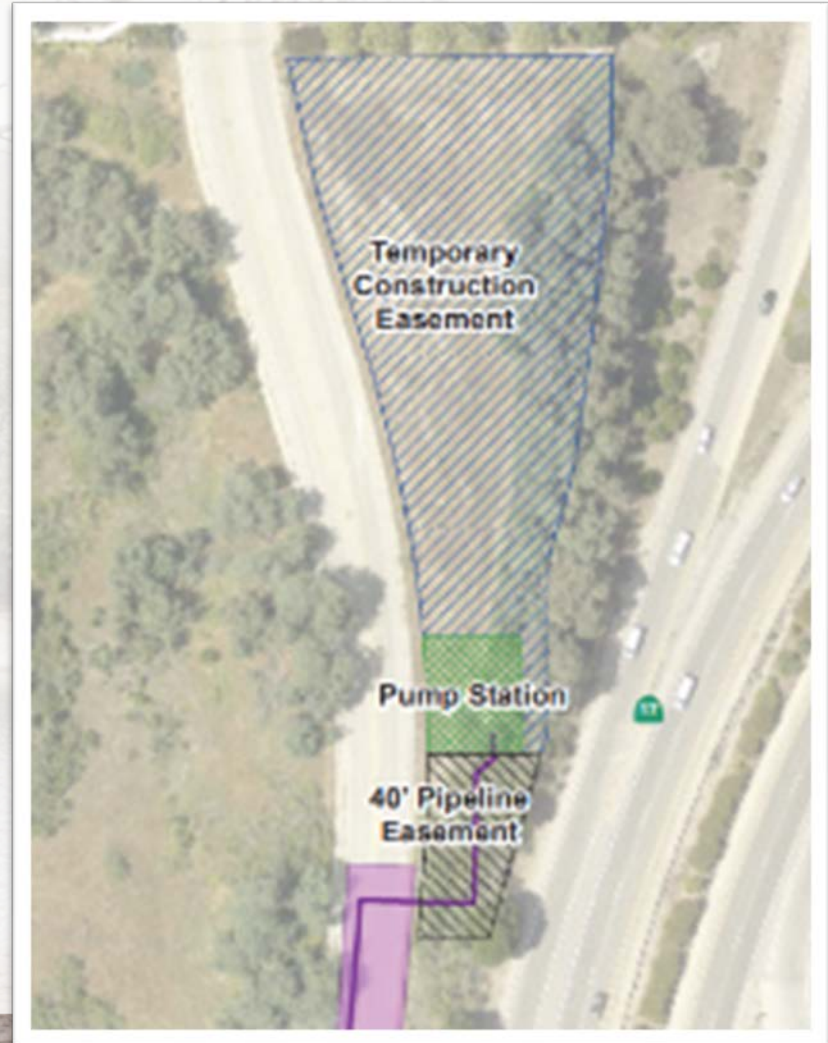
- 9,600' of 12" pipeline, plus appurtenances
- SVWD distribution system to City's existing Pasatiempo Tanks
 - La Madrona Drive
 - Sims Road
 - Firehouse Lane
- Pumped flow north, gravity flow south



Details at the Scotts Valley Connection

Pump Station

- 800 square foot building
 - Pumps
 - Variable Frequency Drives
 - Electrical Equipment
 - Piping
- Scotts Valley Fire Department parcel
- 1 million gallons per day operational capacity, designed to allow future capacity expansion



Potential Intertie Operating Scenarios

- Increasing reliability and resiliency are key priorities for both agencies. Staff is exploring several potential operating scenarios for the new intertie that would address these priorities. For example, the intertie could be operated in the following ways:
 - To provide emergency water supply to either utility;
 - To support passive or active recharge of the Santa Margarita Groundwater Basin, including potential water banking for drought supply for Santa Cruz; and
 - To support potential drought supply for either utility.

What is Water Banking and How Might It Work Here?

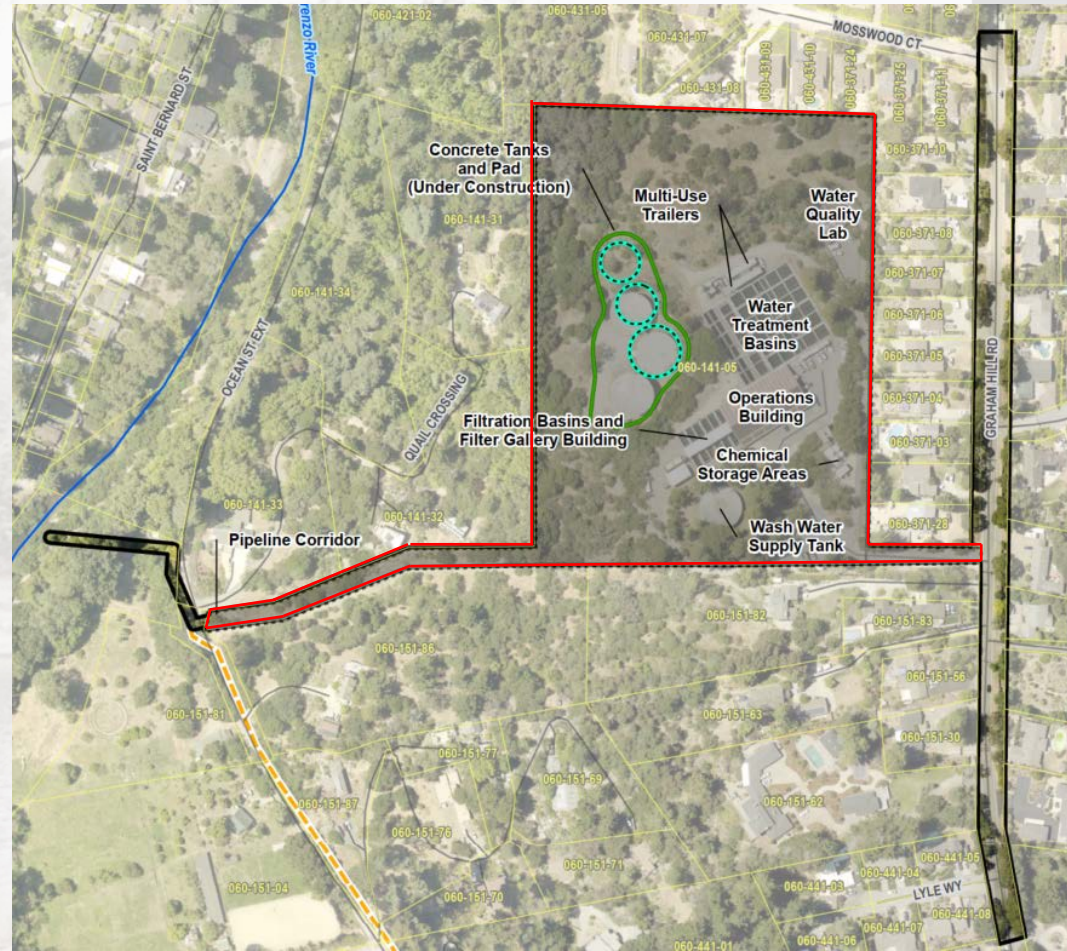
- In general water banking involves having one entity use water from another's source during times of plenty and then leaner times pay water back to the partner entity.
- It doesn't have to involve a 1 to 1 exchange, and in a groundwater storage option, a "leave behind" volume that benefits the basin could be included.
- In this case the strategy could involve having Scotts Valley Water receive treated water from Santa Cruz, and letting the Santa Margarita Basin passive recharge with water, and sending back a portion of that volume to Santa Cruz as drought supply when needed.

The background image shows a river with white water rapids, a wooden bench on a sandy bank, and trees in the distance. A semi-transparent white rectangular box is centered over the image, containing the project title in bold black text.

**SANA CRUZ GRAHAM HILL WATER
TREATMENT PLANT FACILITY
IMPROVEMENT PROJECT**

Graham Hill Water Treatment Plant

- GHWTP (red boundary in map) is the conventional water treatment plant property completed in 1960
- Treats multiple water sources
- Produces over 95% of the water served to City water customers
- Rated capacity of 24 million gallons per day (MGD)
- Typical demand of 9 to 12 MGD



GHWTP FIP Project Development

WATER SUPPLY AUGMENTATION STRATEGY (2015)

- Aquifer Storage and Recovery (ASR) approaches being pursued for water supply augmentation
- Requires ability to treat San Lorenzo River water that is often more turbid during the wet season

ADDRESS RESILIENCY OBJECTIVES (ongoing)

- Build resiliency to respond climate change induced extreme weather events
- Recognize increased wildfire risk and potential impacts on water quality and supply availability
- Consider emerging contaminants, e.g., CECs and PFOS/PFOA

GHWTP FACILITY IMPROVEMENT PLAN (2020)

- Identified best approach to support water supply objectives
- Upgrade aged facilities, meet current and anticipated future regulations
- Improve quality of water delivered to customers

GHWTP PROGRESSIVE DESIGN BUILD (PDB) PROJECT PHASE 1 & 2 (2021-2028)

- Progressive Design-Build contract selected deliver and implement project
- Completed Basis of Design Report establishing technical design criteria,
- 60% design review in progress
- WIFIA loan for 49% financing acquired, SRF loan in the works for remaining funding

Major Treatment Process Upgrade Being Planned





Questions

Our Water, Our Future