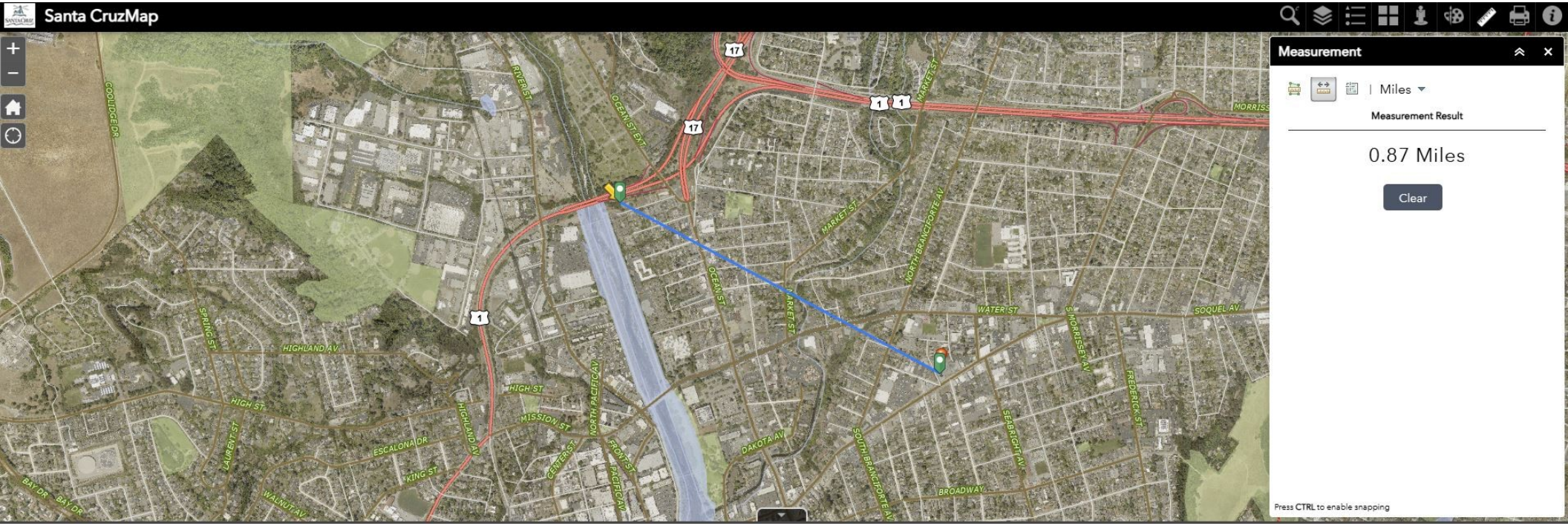
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COOLIDGE DR
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MARKET ST
MORRISSEY AV
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WATER ST
SOQUEL AV
SPRING ST
HIGHLAND AV
HIGH ST
LAUREL ST
ESCALONA DR
KING ST
BAY DR
WALNUT AV
MISSION ST
NORTH PACIFIC AV
CENTER ST
FRONT ST
PACIFIC AV
DAKOTA AV
SOUTH BRANCIFORTE AV
SEABRIGHT AV
FREDERICK ST
BROADWAY

About

The Santa Cruz Fire Department includes four fire stations and one lifeguard headquarters. Our apparatus includes four engines, one type 3 engine and one truck. We currently have over 60 staff members which includes firefighter/paramedics, captains, battalion chiefs, fire prevention staff, training staff, and administrative staff. Additionally we have about 70 seasonal lifeguards.

Emergency Services Provided

- Structure Fire Suppression
- Wildland Fire Suppression
- Emergency Medical Services (Paramedic)
- Hazardous Materials Incident Response
- Marine Rescue Services
- Technical Rescue

Station 1 - 711 Center St (built 1940)
Station 2 - 1103 Soquel Ave (built 1947)
Station 3 - 335 Younglove Ave (built 1954)
Station 4 - 701 Chinquapin Rd @ UCSC (built 1975)

Santa Cruz Fire History

SANTA CRUZ
General Plan 2030
DRAFT EIR

Figure 4.6-2
City Parks, Greenbelt and Open Space Lands

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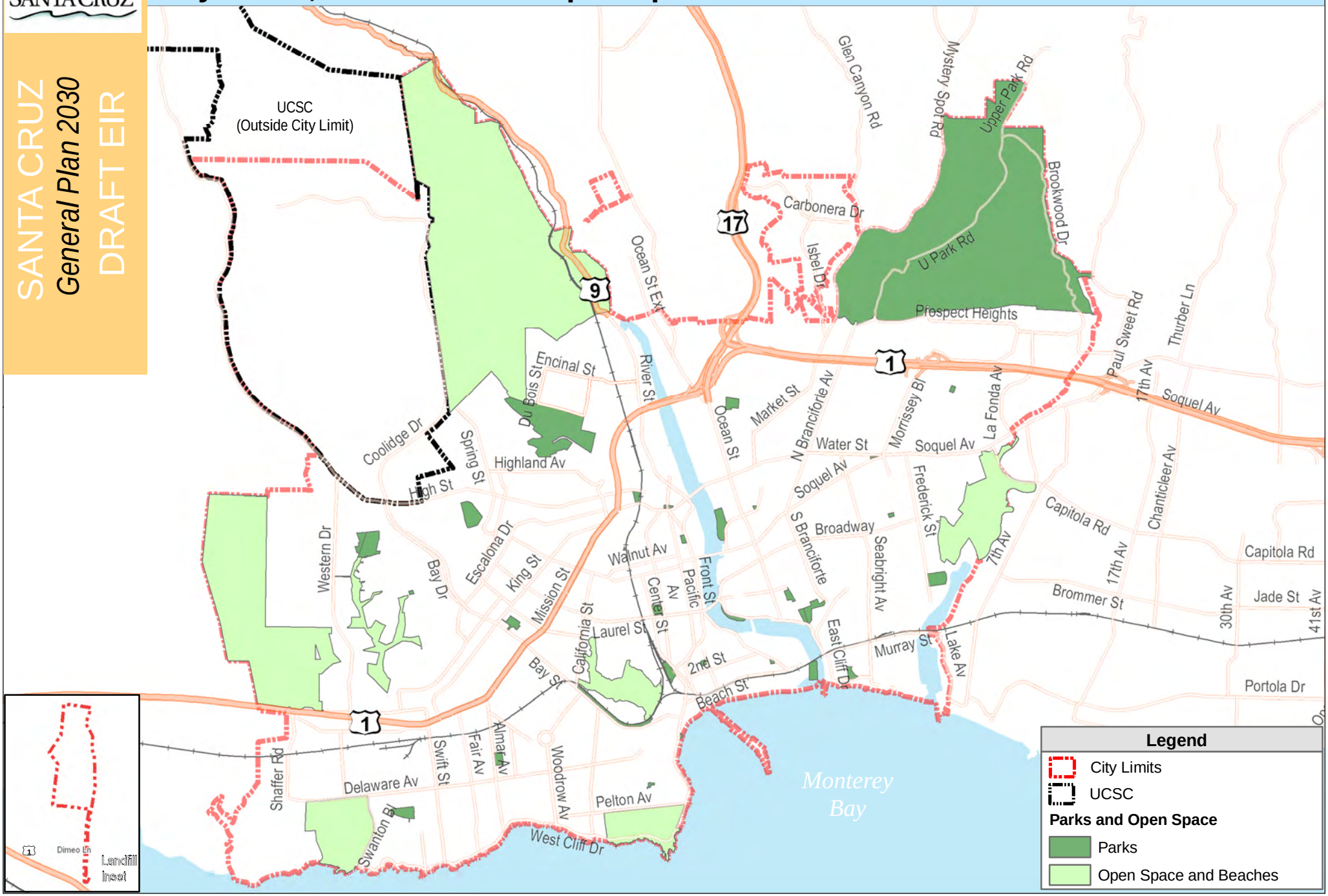


Santa Cruz City Parks

Beach Flats Park
Bethany Curve
Chestnut Park
City Hall Gardens
DeLaveaga Park
Depot Park
Frederick Street Park
Garfield Park
Grant Park
Harvey West Park
John Franks Park
Ken Wormhoudt Skate Park
La Barranca
Laurel Park
Lighthouse Ave Park
Lighthouse Field
Loch Lomond Recreation Area
Mission Plaza
Neary Lagoon
Ocean View Park
Riverside Gardens
San Lorenzo Park
Santa Cruz Riverwalk
Sergeant Derby Park
Star of the Sea
Trescony
Tyrrell Park
University Terrace
West Cliff
Westlake Park
West Side Pump Track

Under guidance from the County, City of Santa Cruz playgrounds are open. While we are excited to announce this, please remember to follow the recommended guidelines to help keep everyone safe:

● Practice social distancing and wear face coverings following State guidance.

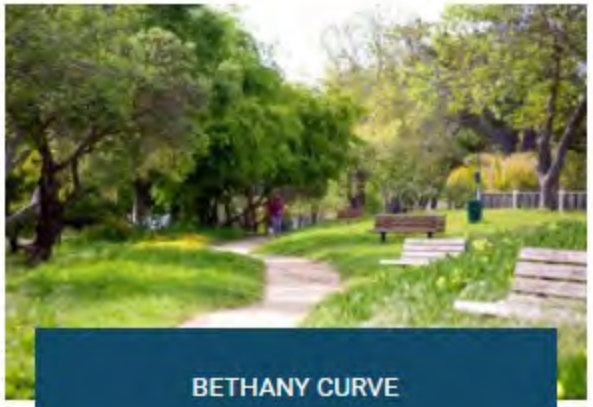
● Wash hands or use a hand sanitizer regularly, especially after playing with/on shared equipment and after using the restrooms.

● Be prepared for limited access to public restrooms.

● Stay home if you are not feeling well or showing symptoms.

● Playground equipment is not sanitized.

BEACH FLATS



BETHANY CURVE

CHESTNUT PARK

CITY HALL GARDENS

DELAVEAGA PARK

DEPOT PARK

FREDERICK STREET

GARFIELD PARK

GRANT PARK

HARVEY WEST

JOHN FRANKS

KEN WORMHOUDT

LA BARRANCA

LAUREL PARK

LIGHTHOUSE AVENUE

MISSION PLAZA

NEARY LAGOON

OCEAN VIEW PARK

RIVERSIDE GARDENS

SAN LORENZO

SANTA CRUZ RIVERWALK

SERGEANT DERBY

STAR OF THE SEA

TRESCONY PARK

TYRRELL PARK

UNIVERSITY TERRACE

WEST CLIFF

WEST LAKE PARK

WESTSIDE PUMP TRACK

- Parks & Recreation
+ COVID-19
Virtual Recreation
+ Advisory Bodies
+ Civic Auditorium
Current Job Openings
+ Event Permits
+ Facilities
+ How Do I...
+ Louden Nelson Community Center
- Parks, Beaches & Open Spaces
Beaches
Dog Off Leash Areas
+ Open Spaces
+ Parks
Parks Master Plan

Dog Off Leash Areas

Branciforte Dog Park: Quarter acre fenced dog park. Open Sunrise to Sunset. Located at 200 N. Branciforte Drive.

DeLaveaga Park: Sand Pit Service Road into Lower DeLaveaga Park. Designated off-leash times are sunrise to sunset. Take Market Street past Gruenwald Court.

Frederick Street Park: The off-leash area is clearly marked by signs and fencing. Monday-Friday- 8:00am-7:00pm (or sunset, if earlier) Saturday-Sunday- 8:00am-5:00pm. The area is located at 168 Frederick Street (Frederick at Broadway).

Grant Street Park: The off-leash area is clearly marked with signs. Off-leash times are sunrise to sunset. The area is located at 180 Grant Street.

Mimi De Marta Dog Park: Half acre fenced, off leash dog area. Open sunrise to sunset. Located at 130 Broadway.

Mitchell's Cove Beach: Dogs are allowed off-leash before 10 am and after 4 pm The beach is located near West Cliff Drive and Almar Avenue.

Pacheco Dog Park: This area is completely fenced and the off-leash times are sunrise to sunset. The area is located at Pacheco Avenue and Prospect Heights.

Ocean View Park: The off-leash area is clearly marked with signs. Off-leash times are sunrise to sunset. The area is located at 102 Ocean View Avenue.

University Terrace Park: Two off-leash dog park areas: one for all dogs and a separate park for smaller dogs. Both areas are fenced and off-leash times are sunrise to sunset. The designated off-leash area is located at the second entrance at Nobel Drive and Meder Street.

- Dogs are **not allowed** at the Wharf, Cowell Beach, Main Beach, Laurel Park, or San Lorenzo Park.
- Dog owners must be in full control of their dogs at all times. Control must be immediate. Dog owners are financially responsible for any damage caused by their dog to public property. SCMC 8.14.200.2
- Dog owners must clean up all of their dog's defecation and must carry dog defecation removal devices at all times. SCMC 8.14.215

Santa Cruz County "Where Can I Take my Dog?" Brochure

PARKS

1 Moore Creek Preserve
2 University Terrace
3 Westlake
4 Trescony
5 Sgt. Charles Derby and Skate Park
6 Garfield
7 Bethany
8 Neary Lagoon Wildlife Refuge
9 Depot Park, Scott Kennedy Fields, Freight Building and Bicycle Trip Bike Park
10 Beach Flats
11 Poet's
12 Town Clock
13 Mission Plaza
14 Harvey West
15 Pogonip
16 Grant
17 San Lorenzo
18 Central
19 Ken Wormhoudt Skate Park/ Mike Fox Roller Hockey Practice Area
20 Jessie Street Marsh
21 Ocean View
22 Tyrrell
23 Arana Gulch
24 Frederick Street
25 Star of the Sea
26 Laurel
27 DeLaveaga
28 DeLaveaga Golf Course
29 Disc Golf Course
30 John Franks
31 Lighthouse Neighborhood
32 Pump Track
33 Pacheco Dog Park
34 Mimi de Marta Dog Park
35 Riverside Gardens

greenbelt property

FACILITIES

A Surfing Museum
B Santa Cruz Wharf and Lifeguard Headquarters
C Nueva Vista Community Center
D Louden Nelson and Teen Center
E Pacific Avenue
F Civic Auditorium
G City Hall
H Harvey West Clubhouse, Scout House and Pool
I Museum of Natural History
J Kaiser Permanente Arena
K Archery Range
L Tannery Arts

Due to financial impacts of the COVID-19 pandemic, the Parks and Recreation Department has seen a temporary reduction in staffing levels. To mitigate this reduction the following parks have been temporarily closed:

- Lower DeLaveaga Park and George Washington Grove (Trails at DeLaveaga remain open)
- Laurel Park
- San Lorenzo Park Benchlands

Park restrooms will be replaced by portable restrooms and handwashing stations at Grant Park, San Lorenzo Park, Frederick St. Park, Ocean View Park, Neary Lagoon, and Garfield Park.

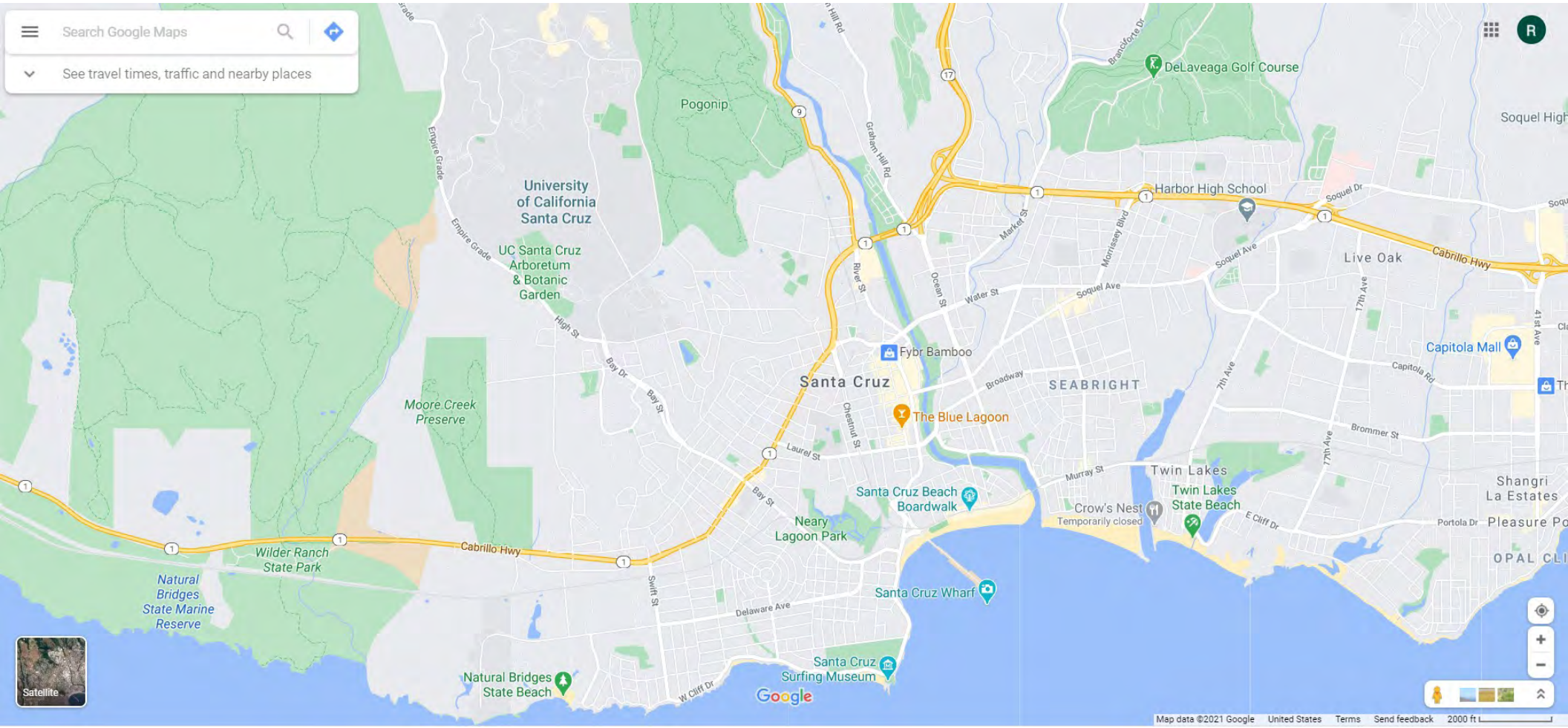
List of amenities and park features that have been affected countywide.

To help safeguard our community, please observe CDC guidance on stopping the spread of germs and review the Parks & Recreation COVID-19 page to keep up to date with our efforts to flatten the curve.


ARANA GULCH


MOORE CREEK


POGONIP


Search Google Maps
See travel times, traffic and nearby places
Pogonip
University of California Santa Cruz
UC Santa Cruz Arboretum & Botanic Garden
Moore Creek Preserve
Wilder Ranch State Park
Natural Bridges State Marine Reserve
Natural Bridges State Beach
Santa Cruz
Fybr Bamboo
The Blue Lagoon
Santa Cruz Beach Boardwalk
Neary Lagoon Park
Santa Cruz Wharf
Santa Cruz Surfing Museum
SEABRIGHT
Harbor High School
DeLaveaga Golf Course
Live Oak
Capitola Mall
Twin Lakes
Twin Lakes State Beach
Crow's Nest
Temporarily closed
Shangri La Estates
Pleasure Po
OPAL CLI
Cabrillo Hwy
Soquel Ave
Soquel Dr
Water St
Broadway
Laurel St
Bay St
Delaware Ave
Murray St
Brommer St
Capitola Rd
Portola Dr
E Cliff Dr
W Cliff Dr
Swift St
Chestnut St
River St
Ocean St
Market St
Morrissey Blvd
17th Ave
7th Ave
41st Ave
Graham Hill Rd
Empire Grade
High St
Bay Dr
Satellite
Google
Map data ©2021 Google
United States
Terms
Send feedback
2000 ft

Informational Links
Junior & Little Guards
The Santa Cruz Wharf
The Surfing Way: Surf Etiquette Brochure
Beach Safety
Water Quality
Santa Cruz Weather
Santa Cruz Surf Forecast
National Weather Service Marine Forecast
Visit Santa Cruz
Santa Cruz County Beaches

City Beaches

Santa Cruz City beaches are the heart of Santa Cruz coastline. Whether taking a scenic walk along the shore, enjoying a game of volleyball, exploring the Santa Cruz Wharf, or getting your toes in the soft sand, City beaches are the essential stop for any trip to Santa Cruz.

We ask visitors to help us stop the spread of COVID-19 in our community by remembering to do the following:

✔ Wear a mask - the order is still in effect ✔ Wash your hands ✔ Keep 6 foot distance

"Pack it in, Pack it out": There are reduced trash services on the beaches at this time. If you are using the beach we ask you to be responsible and take your trash with you when you leave.

Please visit our COVID-19 resource page for additional information.

Visit
Guidelines
Beach Conditions & Safety
Reserve
Beach Volleyball
Water Craft Launching
Surf Schools

Main Beach
108 Beach St
Santa Cruz, CA 95060

Cowell Beach
21 Municipal Wharf
Santa Cruz, CA 95060
Cowell Beach closed midnight to one hour before sunrise.
Beach visitors are allowed to cross the beach to access the water

Mitchell's Cove
West Cliff Drive
Santa Cruz, CA 95060

Lifeguard Headquarters
#1 Municipal Wharf
831-420-5715

Lifeguard Service:

- Area serviced- Cowell Beach to the San Lorenzo River

+ Civic Auditorium
Current Job Openings
+ Event Permits
+ Facilities
+ How Do I...
+ Louden Nelson Community Center
+ Parks, Beaches & Open Spaces
Recreation Events
+ Reservations
- **Senior Programs**
Senior Services
Senior Activities
Walking Adventure Group
Senior Computer Center
Trips
Senior Clubs
+ Sports
+ Teach a Class With Us!
Teen Center and Teen Programs
+ Youth Programs

DOWNTOWN SENIOR CENTER

at Louden Nelson Community Center

SENIOR ACTIVITIES

SENIOR SERVICES

SENIOR COMPUTER CENTER

WALKING ADVENTURE GROUP

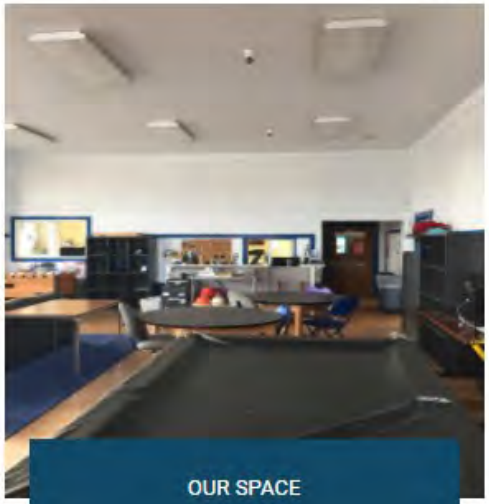
TRIPS

SENIOR CLUBS

SANTA CRUZ TEEN CENTER

Santa Cruz Teen Center

MONTHLY CALENDAR



OUR SPACE

BIKE PROGRAM

+ Civic Auditorium

Current Job Openings

+ Event Permits

+ Facilities

+ How Do I...

+ Louden Nelson Community Center

+ Parks, Beaches & Open Spaces

Recreation Events

+ Reservations

+ Senior Programs

+ Sports

+ Teach a Class With Us!

Teen Center and Teen Programs

+ Youth Programs

Today | Next 7 days | Next 30 days | All Upcoming | All Past | All

No results found.

Welcome to the City of Santa Cruz's Virtual Recreation Page.

Follow us on social media for more fun activities and updates. Share your Virtual Recreation with #CruzFunAtHome.

The Winter/Spring Activity Guide is online and interactive!

Want more information on a park or program? Click links for updates and details. Like a photo? Click on it to enlarge. Videos can be played right from the guide!

Parks & Recreation is committed to keeping our community members safe, active and connected!

Check back often as we will continue to add content!

- **Message from the Director** >
- **Fun For Seniors** >
- **Senior Center Without Limits** >
- **Fun At Home** >
- **Fun Outside** >
- **Arts & Culture** >
- **Get Active** >
- **COVID Creations** >
- **Local Resources** >
- **Stay Connected** >

City of Santa Cruz

PARKS MASTER PLAN 2030

Parks • Recreational Facilities • Open Spaces • Beaches

CITY OF SANTA CRUZ
PARKS AND RECREATION

City of Santa Cruz

PARKS MASTER PLAN 2030

Parks • Recreational Facilities • Open Spaces • Beaches

AUGUST 2020

CITY OF SANTA CRUZ
PARKS & RECREATION DEPARTMENT

Parks Make Life Better!

rhaa
LANDSCAPE ARCHITECTURE + PLANNING

ACKNOWLEDGEMENTS

This plan would not have been possible without the assistance and participation of a great number of individuals. A special thanks to all of the members of the public who participated in the public input process for the Santa Cruz Parks Master Plan 2030.

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Vice Mayor Donna Meyers
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Martine Watkins
Cynthia Chase
Cynthia Mathews
Sandy Brown
Richelle Noroyan
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Don Lane
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Applied Development Economics, Economic Planning & Strategies
Doug Svensson

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Mitchell’s Cove

SECTION 1.1: EXECUTIVE SUMMARY

A. Purpose of the Parks Master Plan 2030
B. Planning Process
C. Organization of the Parks Master Plan 2030
D. Overview of Chapters & Sections

A. PURPOSE OF THE PARKS MASTER PLAN 2030

The *Santa Cruz Parks Master Plan 2030* (Parks Master Plan 2030) is a tool to guide the City of Santa Cruz in parks, facility, beach, and open space planning on a long-term basis. This document contains policies and actions for the provision of parks services and recommendations for improvements at specific parks.

B. PLANNING PROCESS

The planning process included three significant report milestones:

- Administrative Draft – A working draft of the Parks Master Plan 2030 distributed amongst key City staff for review, study, and comment.
- Draft Plan – Comments on the Administrative Draft were incorporated, and the report was open to public review and comment.
- Final Plan – Final comments from the public, City Council, Parks & Recreation Commission, and key City staff were incorporated before release of the Final Plan. The Final Plan was adopted by the City Council on October 13, 2020.

University Terrace Park

C. ORGANIZATION OF THE PARKS MASTER PLAN 2030

The Parks Master Plan 2030 is comprised of the following chapters and sections:

CHAPTER 1: EXECUTIVE SUMMARY

1.1 Executive Summary

CHAPTER 2: INTRODUCTION & INVENTORY - WHO WE ARE & WHAT WE HAVE

2.1 Goals & General Objectives

2.2 History & Introduction

2.3 Community Profile

2.4 Existing Conditions

CHAPTER 3: COMMUNITY OUTREACH & NEEDS ASSESSMENT - WHAT WE NEED & WANT

3.1 Community Outreach

3.2 Emerging Trends

CHAPTER 4: IMPLEMENTATION - WHERE WE'RE HEADED & HOW WE'RE GETTING THERE

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4.2 Asset Inventory & Specific Recommendations

4.3 Funding Strategies

4.4 Ongoing Planning & Updates

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5.1 Existing Plans

5.2 Godbe Reports

5.3 Community Meeting Materials: Flyer, Handout, & Boards

5.4 Public Outreach Questionnaire

5.5 Summary of Community Input

5.6 Stakeholder Interviews

5.7 Joint Study Session Presentation

5.8 Presentations from Subcommittee Meetings

5.9 Potential Grant Sources

View up Woodrow Avenue, planted with drought-tolerant vegetation

D. OVERVIEW OF CHAPTERS & SECTIONS

CHAPTER 1: EXECUTIVE SUMMARY

This chapter provides an overview of the purpose and organization of the Parks Master Plan 2030, while also explaining the process that the Plan undergoes in order to be approved.

CHAPTER 2: INTRODUCTION & INVENTORY - WHO WE ARE & WHAT WE HAVE

In order to make relevant recommendations for the future, it is critical to understand the Santa Cruz community as well as the history and current condition of the parks system. This chapter presents an introduction to the City of Santa Cruz's existing parks and recreation system as well as the community. A detailed inventory and assessment of the existing parks, open spaces, beaches, and facilities is included. Specific recommendations for each of these assets can be found in Chapter 4.

Section 2.1 Goals & General Objectives of Master Plan

The Parks Master Plan 2030 presents a road map to improve the existing parks system and anticipate future needs of the community while still

preserving the City's unique character and environment. The Parks, Recreation, & Open Space chapter of the City of Santa Cruz General Plan 2030 provides the outline for the recommendations. The specific goals are:

- **Goal PR1**: Ample, accessible, safe, and well-maintained parks, open space, and active recreational facilities
- **Goal PR2**: High-quality, affordable recreational programs, activities, events, and services for all
- **Goal PR3**: Well managed, clean, and convenient public access to open space lands and coastline
- **Goal PR4**: An integrated system of citywide and regional trails

The objectives of the Parks Master Plan 2030 process were as follows:

- Identify and assess the City's various existing parks, open space, and facility assets.
- Conduct a comprehensive outreach effort including telephone surveys, community meetings, and interviews with key stakeholders and community members.
- Create a feasible vision and goals that prioritize community needs and desires for expansion and improvements.
- Generate policies to support community goals.
- Construct an implementable action plan to accomplish community goals, while establishing phasing and funding opportunities.

Section 2.2 History & Introduction

This section introduces the recreational lifestyle of Santa Cruz and the history of recreation in the City. The bay, beaches, and extensive greenbelts provide numerous opportunities to explore and recreate.

Additionally, the City has a variety of traditional park facilities for its residents and visitors. These include group picnic areas, a swimming pool, sports fields, basketball and tennis courts, playgrounds, a golf course, horseshoe pits and such unique facilities as an archery range and disc golf course. The City continues to embrace new trends in recreation with such facilities as pump tracks and pickleball courts. Indoor community facilities offer a wide variety of programs and activities. The extensive trail network provides both transportation and recreation throughout the City and access to a regional trail network.

Santa Cruz's history of recreation is also outlined in this chapter, starting with the incorporation of the City in 1866. Highlights include establishment of the Parks and Recreation Department, introduction of surfing, donation of DeLaveaga Park, construction of the wharf, interest in recreation after World War II, donation of Harvey West Park, and a rapid park expansion from the 60's to present time.

The City's 150th Anniversary Celebration on Main Beach in 2016

Section 2.3 Community Profile

This section focuses on the factors that influence recreation in Santa Cruz, including location, geography, climate, and demographics.

Santa Cruz's location, geography, and climate are conducive to recreation. The Monterey Bay and surrounding mountains provide diverse landscapes to accommodate a wide-range of recreational

interests and activities, and the mild climate facilitates year-round participation.

Increasing 7.1% between 2010 and 2014, the population of Santa Cruz continues to grow. The City has lower percentages of children and seniors than the state-wide averages, but both groups still need to be considered in recreation planning. The population of the University of California, Santa Cruz (UCSC) is a large user group for recreation. An additional significant user group that must be considered is the tourist population, with over three million trips to Santa Cruz County each year.

Youth Basketball at Kaiser Permanente Arena

Section 2.4 Existing Conditions

This section examines what assets the City of Santa Cruz has that can be used to meet the needs of the community.

Compared to other Central California cities, the City of Santa Cruz has a higher than average ratio of parks and open space. These ratios do not include other assets such as school property, privately owned recreation facilities, and adjacent county and state park lands.

Existing City facilities include 32 neighborhood parks, 6 community parks, 7 open spaces, and 18 community, cultural, or recreational facilities such as community centers. Though the overall ratio of parklands is relatively high, there are some neighborhoods that lack direct access to parks.

Besides the various parks owned and maintained by the city, there are many other resources both within and adjacent to the city. These include school facilities, the Boardwalk, the UC Santa Cruz campus, over 30 county parks, and 14 state parks in the county.

The City's parks have a great diversity of natural habitats that contribute significantly to Santa Cruz's unique character.

CHAPTER 3: COMMUNITY OUTREACH & NEEDS ASSESSMENT - WHAT WE NEED & WANT

The needs of the community are presented in this chapter, as uncovered through the public outreach process, and a discussion of emerging trends in parks and recreation that should be considered in future recreation planning.

Second community meeting at Louden Nelson Community Center

Section 3.1 Community Outreach

The goals, objectives and action items of the plan are the result of an extensive community outreach process which included quantitative surveys, open houses, stakeholder interviews and focus groups, department-wide meetings, and questionnaires distributed at parks, facilities, events, and online.

Key findings included:

- An overall favorable impression of City parks
- Concern about illegal activities and safety in many parks
- Need for more sports fields
- Desire for more recreation amenities and upgraded playgrounds
- Need for more bike trails and facilities
- Desire for greenbelt preservation
- Access to all parks and facilities for all users

The information obtained from the outreach process was used by a working group comprised of Parks and Recreation Commissioners, City Council members and City staff to frame key directives on parks management, specific parks and facilities action items, and safety and security.

Bicycle Trip Bike Park at Depot Park

Section 3.2 Emerging Trends

In addition to expressed community needs and desires, understanding trends in recreation is crucial for framing action items. These trends may influence future recreation needs within the community. Trends examined include changes in demographics, programming, access, marketing, and management.

CHAPTER 4: IMPLEMENTATION - WHERE WE'RE HEADED & HOW WE'RE GETTING THERE

Based on the information received in the community outreach and needs assessment process, this chapter frames specific recommendations, time frames for those recommendations, funding strategies, and ongoing planning and updates.

Scott Kennedy Fields re-opening dedication in 2014

Section 4.1 Goals, Policies & Actions

This section presents the vision, goals, policies, and actions proposed in the plan. Goals are intended to support those reached in the adopted City of Santa Cruz General Plan 2030 process and include:

- Provide attractive and sustainably maintained parks and facilities throughout the City.
- Provide ample parks and facilities throughout the City.
- Provide parks and facilities to meet the existing and emerging needs of residents and visitors of all ages and abilities.
- Protect the City's natural resources, wildlife habitat, and environment.
- Maintain a safe, clean, and comfortable environment for all park users.
- Provide an integrated parks system with clean, convenient access to parks, open spaces, and the coastline.
- Establish, maintain, and operate parks, facilities, and programs in a manner that is cost effective and manageable while engaging the community in a manner that maximizes involvement and support.

Each goal is supported by policies and action items that sustain that goal.

Section 4.2 Asset Inventory & Specific Facility Recommendations

This section contains recommendations and action items for specific parks, open spaces, beaches, and facilities. In addition there are detailed descriptions of amenities at each park, open space, beach, and facility. Many of the recommendations reflect community goals that have been studied and vetted during previous processes.

Section 4.3 Funding Strategies

This section examines possible funding mechanisms available in California for municipal parks and recreation acquisition, improvements, and on-going operations and maintenance costs. Funding strategies describe potential partnership opportunities for further exploration.

Section 4.4 Ongoing Planning & Updates

The Parks Master Plan 2030 is a means to guide future park improvements and to accommodate emerging needs to continue to provide a quality parks system. It is envisioned as a living document that continues to evolve and progress over time. Outlined in this section are the factors for consideration including need, environmental impact, and funding impacts. Other key factors are ability to move large projects forward with grants and responsiveness to community needs.

Pogonip Open Space

CHAPTER 5: APPENDICES

This chapter compiles the detailed information gathered throughout the planning process of the Parks Master Plan 2030 for reference and support of the final recommendations. Included in the appendices are links to pertinent existing plans, the results and analysis of the community telephone and email surveys, materials that were displayed and distributed at the community meetings, a summary of feedback from the community, the Joint Study and Subcommittee Meeting presentations, and potential grant funding sources.

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CHAPTER 2: INTRODUCTION & INVENTORY

WHO WE ARE & WHAT WE HAVE

Grant Park

SECTION 2.1: GOALS & GENERAL OBJECTIVES

A. INTRODUCTION

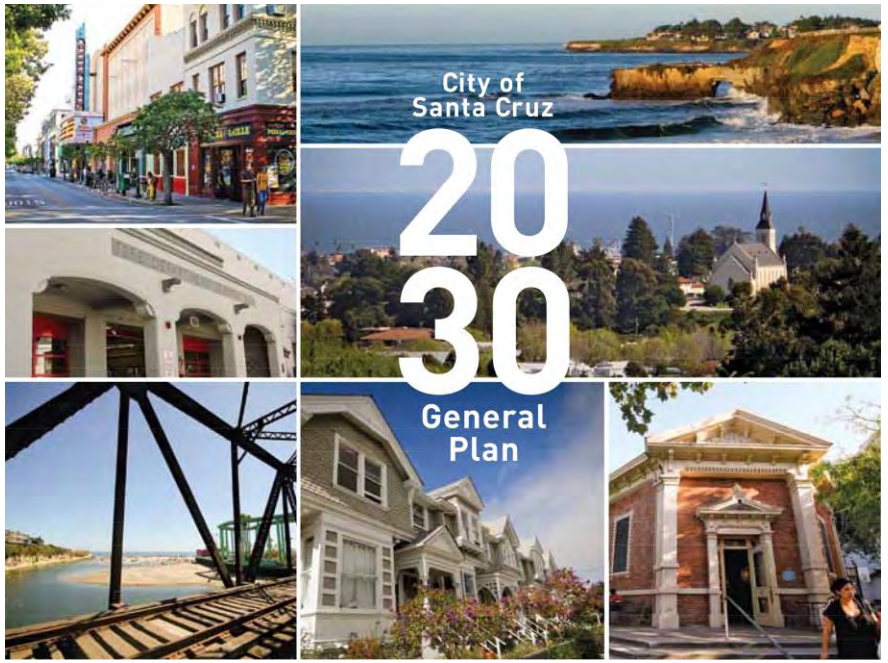
The *City of Santa Cruz Parks Master Plan 2030* (Parks Master Plan 2030) represents an opportunity to improve the existing parks system and anticipate future needs of the community while still preserving the unique character of the City's community and environment. The Parks Master Plan 2030 provides an analysis of the current parks, open spaces, and recreational facilities, based on assessments of the existing assets, quantitative and qualitative data gathered from the community, emerging trends in recreation, and standards for park development. This analysis directly shapes the Parks Master Plan 2030's recommendations, reflecting the wishes of the community and guiding the future development of the park system for the next 15 years.

The objectives of the Parks Master Plan 2030 process were as follows:

- Identify and assess the City's existing park, open space, beach, and facility assets.
- Conduct a comprehensive outreach effort including telephone surveys, community meetings, and interviews with key stakeholders and community members.
- Create a feasible vision and goals that prioritize community needs and desires for expansion and improvements.
- Generate policies to support the community goals.
- Create an implementable action plan to accomplish community goals, while establishing phasing and funding opportunities.

B. GUIDING PRINCIPLES FROM THE CITY OF SANTA CRUZ GENERAL PLAN 2030

The City of Santa Cruz General Plan 2030 acts as the long-term planning document for the City of Santa Cruz as required by California Law. The General Plan 2030 presents goals, policies, and recommendations for future development and is separated into State-mandated elements. The Parks Master Plan 2030 document helps implement the General Plan 2030, providing more detailed direction and recommendations for the future development and maintenance of parks, open spaces, beaches, and recreational facilities in Santa Cruz.



The Parks Master Plan 2030 lays out recommendations for the next 15 years, but is designed to be updated over time. This document should evolve with the City, providing a guiding framework while allowing for adjustments based on both presently anticipated and unforeseen future needs and community desires.

The general goals outlined in the Parks, Recreation, & Open Space chapter of the City of Santa Cruz General Plan 2030 helped to guide the progress of the Parks Master Plan 2030 and played a vital role in the development of its recommendations. Those goals are included here for reference:

- **Goal PR1**: Ample, accessible, safe, and well-maintained parks, open space, and active recreational facilities
- **Goal PR2**: High-quality, affordable recreational programs, activities, events, and services for all
- **Goal PR3**: Well managed, clean, and convenient public access to open space lands and coastline
- **Goal PR4**: An integrated system of citywide and regional trails

C. RELATIONSHIP OF THE PARKS MASTER PLAN 2030 TO EXISTING PLANS & STUDIES

Prior to the undertaking of this comprehensive Parks Master Plan 2030 process, the City of Santa Cruz has completed various other plans and studies that helped inform this document. The existing Plans listed here were considered, referenced, and incorporated where applicable into the overall Parks Master Plan 2030. Many suggestions from the community requested complying with the goals and actions of recently completed plans for specific parks. Conversely, as part of this planning process, new community needs were examined, and, some of the existing plans for specific parks and park assets may need to be updated to accommodate current and future trends and desires. These plans can be amended separately, and a concurrent amendment of the Parks Master Plan 2030 will not be required. The Plans are listed here alphabetically:

- Arana Gulch Master Plan (2006)
- Civic Auditorium - Concept Design Study (2012) and Business Planning Study (2015)
- Cowell and Main Beach Management Plan (2014)
- DeLaveaga Golf Course Master Plan (2002)
- DeLaveaga Park Master Plan (1960)
- Depot Park Master Plan (2001)
- Jessie Street Marsh Management Plan (1998)
- Moore Creek Interim Management Plan (2002)
- Neary Lagoon Management Plan (1992)
- Pogonip Clubhouse Rehabilitation Plan (2002)
- Pogonip Master Plan (1998)
- San Lorenzo Urban River Plan (2003)
- Santa Cruz Wharf Master Plan (2014)

The City has also adopted many plans to help guide the overall direction on community-wide level improvements that also helped inform this document. These plans include:

- Active Transportation Plan (2017)
- Arts Master Plan (2008)
- City-wide Creeks and Wetlands Management Plan (2008)
- Climate Action Plan and Climate Adaptation Plan (Currently being updated)
- Local Coastal Program (Currently being updated)

See Appendix 5.1 for links to view the full text of these existing plans, as well as summaries of other important documents that have provided background and context into the Parks Master Plan 2030 process.

SECTION 2.2: HISTORY & INTRODUCTION

A. A Recreational Lifestyle
B. Honoring Our Heritage

"The most rewarding use of life is to spend it for something that outlasts it!"

– Harvey West

A. A RECREATIONAL LIFESTYLE

Santa Cruz's temperate climate, location, scenic beauty, and diverse landscapes combine to create a unique and favorable recreational destination and support an active lifestyle. Santa Cruz and the surrounding region provide a broad range of recreational activities and natural treasures for residents and visitors to explore and enjoy.

THE COASTLINE:

Located at the northern tip of Monterey Bay, Santa Cruz is known for surf and beach play. The large sandy beaches of Cowell and Main Beach are popular to sunbathe, swim, play beach volleyball and other beach activities. These beaches host a variety of public and private programs and events such as the Junior Lifeguard Program, volleyball tournaments, concert performances, movies on the beach, and an occasional fireworks show. The Santa Cruz Wharf is located between Main and Cowell Beaches. The pier, spanning a half-mile in length, is the longest timber pile-supported pier structure in the United States. Visitors to the beaches and wharf can shop, dine, rent kayaks, fish, or view wildlife. Along the northern edge of Main Beach, the Santa Cruz Seaside Company's Beach Boardwalk amusement park features rides and games including the historic, wooden Giant Dipper roller coaster.

The coastal bluffs along West Cliff Drive are an additional feature, attracting visitors with coastal views and providing opportunities to walk, run, bicycle, watch wildlife, as well as access to beaches and surf breaks. Along this corridor resides Lighthouse Field and Natural Bridges State

Parks, managed by the California Department of Parks and Recreation. Natural Bridges State Park is an exceptional location to view large populations of Monarch Butterflies overwintering during the fall.

Santa Cruz is renowned for surfing, its numerous breaks are designated as a World Surfing Reserve. Surfing was introduced to Santa Cruz in 1885 by three Hawaiian princes, who surfed at the San Lorenzo River mouth. It is the first recorded board surfing in North and South America. Along West Cliff Drive, the Mark Abbott Memorial Lighthouse houses the Santa Cruz Surfing Museum and a Surfer Statue pays tribute to the sport. The museum is located on Lighthouse Point and contains interesting artifacts tracing more than 100 years of surfing in Santa Cruz. Lighthouse Point overlooks the world famous surf break, Steamer Lane, where spectators line the cliffs above the surf break to spectate. It is no wonder why most regard Santa Cruz as the "real surf city."

Steamer Lane

Additional resources along the City's coastline include the Santa Cruz Harbor Port District's Santa Cruz Harbor and the adjacent Seabright and Twin Lakes State Beaches. The Santa Cruz Harbor provides a boat launch ramp for recreational boating in addition to fishing, paddle boarding and kayaking rentals and other recreational opportunities.

THE GREENBELT:

Moore Creek Preserve

Beyond the coastline lay many scenic, natural environments to wander and admire. The City's Neary Lagoon Wildlife Refuge has a floating pathway which allows access across the lagoon. It is a respite of nature surrounded by urban development, where visitors can peacefully watch birds, turtles, and fish.

Arana Gulch Open Space features woodlands, creeks, and grasslands. Bluffs and bridges offer elevated perspectives of the creeks and surrounding natural features. Cattle graze the property seasonally to help restore the endangered Santa Cruz tarplant.

Pogonip Open Space contains natural habitat for a large variety of plants and animals. Trails pass through grasslands and forests and by creeks, former limestone quarries, and the historic Pogonip Clubhouse. The Emma McCrary trail is a relatively new addition and provides multi-use

access from the City to a regional network linking the City's Harvey West Park to the State's Henry Cowell and Wilder Ranch State Parks and UC Santa Cruz's wilderness areas.

The trails in Moore Creek Preserve wind through canyons, forests, and grasslands and provide views to the Pacific Ocean. Cattle graze the coastal prairie areas to help restore native plants and local species such as the Ohlone tiger beetle and San Francisco popcorn flower.

PARKS AND RECREATIONAL FACILITIES:

The City provides a variety of traditional park facilities including group picnic areas, a swimming pool, sports fields, basketball and tennis courts, playgrounds, community gardens, off-leash dog use areas, a golf course, and horseshoe pits. Throughout the years, the City has embraced new trends in recreation and the range of recreational facilities reflects the diversity of interests within the community. Sergeant Derby and Frederick Street parks were among the first public skate parks in the world, and the more recent addition of Ken Wormhoudt Skate Park has gained national recognition. Located in DeLaveaga Park, Santa Cruz Archery Range is an indoor and outdoor archery range and DeLaveaga Disc Golf Course is a 29 hole disc golf course that has hosted world championships. The San Lorenzo Park Lawn Bowling facility maintains a nearly perfectly flat artificial turf surface to meet playing standards. The Bicycle Trip Bike Park is the only ramped bike park of its kind in the area. The Main Beach volleyball courts allow for both pick-up games and tournaments. More recent recreational facility additions to accommodate emerging trends and desires have included pump tracks, pickelball courts, outdoor exercise equipment, bocce ball courts, and new multi-use trails.

Ken Wormhoudt Skate Park

COMMUNITY FACILITIES:

The City's community facilities provide programs and services. The 20,000 square foot Louden Nelson Community Center hosts Santa Cruz's teen center, community rooms for rent and programming, and an indoor auditorium and stage. The Civic Auditorium is a 34,000 square foot space which accommodates large gatherings, concerts, and sporting events.

Smaller community centers and facilities are leased out to separate non-profit providers to offer services. Senior Citizens Opportunity provides services and programming for seniors at 222 Market Street. At the Beach Flats Community Center, Community Bridges offers programs and

services for summer recreation, environmental education, application assistance, after school programs, advocacy, parent education, and food and nutrition. The Santa Cruz Museum of Natural History provides services, events, programs, exhibits, and other educational tools to inspire stewardship and connect people to nature and history at the Museum of Natural History. The City recently worked with Santa Cruz Shakespeare to locate a new outdoor amphitheater to hold summer performances in DeLaveaga Park.

Louden Nelson Community Center

TRAILS:

The City's 35 mile network of trails allow for hiking, biking, dog walking, and horseback riding. Many provide access through designated open spaces or along the coastline, and others provide linkages across the City to a regional network. Significant trails in the City include the Santa Cruz Riverwalk, an important north-south connector along the San Lorenzo River, and the Monterey Bay Sanctuary Scenic Trail which will soon cross through the City, connecting Davenport to Monterey.

Santa Cruz Riverwalk

B. HONORING OUR HERITAGE

The City of Santa Cruz General Plan 2030, the guiding document for the City, establishes a vision for the future.

"Surrounded by the greenbelt and the Pacific Ocean, Santa Cruz is a compact vibrant city that preserves the diversity and quality of its natural and built environments, creates a satisfying quality of life for its diverse population and workers, and attracts visitors from around the world".

The *Santa Cruz Parks Master Plan 2030* (Parks Master Plan 2030) will help achieve this vision and continue the traditions of efforts that led to the parks system we have today. The history of the parks system reflects a community that deeply cares about providing and preserving the quality and diversity of the recreational, natural, and urban environments. The following timeline highlights some of the milestones of the City's park system:

Santa Cruz Wharf and Cowell and Main Beaches

City incorporates.
1866

1876
The City's first charter establishes the Streets and Parks Department as one of the five departments governed by a Mayor and a four member Common Council.

1885
Surfing introduced to Santa Cruz by three Hawaiian Princes.

Jose De Laveaga leaves his 560 acre estate to the City and County for parkland. The City now owns more than 500 acres.
1894

1904
Laura Hecox, a naturalist and collector, deeds her collection of seashells, minerals, fossils, Native American artifacts, and other specimens to the City of Santa Cruz to establish a museum which opened in 1905. The museum moved to the Seabright Branch Library building in 1954. In 2009, the City's non-profit partner, Santa Cruz Museum of Natural History, took over operations to avert closure due to lack of funding.

1914
The Santa Cruz Wharf was constructed for cargo handling and shipping and would later shift towards commercial fishing. In the 1950s, it started to become more commercially oriented and was expanded for commercial uses and parking.

1940
The Civic Auditorium was constructed with assistance from the Federal Works Progress Administration.

The City forms a seven member recreation commission to guide recreation programs.
1944

Early programs concentrated on athletic skills development such as softball and swimming.
1946

1948
Interest in recreation renewed after World War II and recreation would be integrated into the new City Charter and the Parks and Recreation Department was formed. The charter established the Council/Manager form of government, with a Mayor and six Councilmembers setting policy for the City and a City Manager to administer.

A Workreation Program, modeled after similar programs in Oakland and Berkeley, was developed. It gave local youths job experience part of the day and supervised recreational activities for the remainder. The City continues to provide a Youth Trails Program where youths can gain work experience maintaining the parks.
1956

1957
Philanthropist Harvey West donates Harvey West Park to the City. Harvey West continued to supply lumber for park facilities and the bathhouse facilities for the original Harvey West Pool. The pool was constructed in 1959. He played a key role in the pool itself. He also purchased the Wagner Grove area for the City, and helped acquire the Southern Pacific steam engine.

1958
A levee is constructed along San Lorenzo River to mitigate flooding. Efforts in the late 80s and late 90s helped guide restoration, flood control, and public access improvements along the levee. In 2003, the San Lorenzo Urban River Plan updated the plans and includes recommendations for habitat, safety, and aesthetics.

1915 — Picnicking in DeLaveaga Park, Source of Information, Museum of Natural History.

Circa 1920s or 30s — Main Beach.

1960s

1964 — San Lorenzo Park opens.

1965 — The parents of Mark Abbott donated $20,000 to help construct the Mark Abbott Memorial Lighthouse. In 1986, the lighthouse became the location for the Surfing Museum.

1967 — Neary Lagoon is purchased by the City. Recreation facilities were developed gradually between 1975 and 1986.

1963 — "Serpent" at San Lorenzo Park.

1970s

1970 — The DeLaveaga Golf Course is constructed.

1971 — Garfield Park opens.

1973 — Grant Park opens.

1976 — Frederick Street Park opens.

1976 — John D. Franks Park is leased to the City without charge by the Franks family to provide park space in an underserved neighborhood. The City purchased the property from the Frank family in 1993.

1976 — Star of the Sea Park is dedicated.

1978 — Louden Nelson Community Center opens in the building previously used as an elementary school. The center was first known as the Laurel Community Center and was changed to honor Louden Nelson, a former slave who lived in Santa Cruz in the 1850s. Around the time of his death, Nelson owned land near the school and made an oral will leaving his estate to the school district of which the elementary school was a part of.

1978 — Bethany Curve Greenbelt was constructed.

1979 — Community interest grew to create greenbelt preserves and open spaces during the 1970s. In 1979, Measure O passed which identified specific open space properties to preserve.

1979 — Derby Park dedication (renamed to Sgt. Derby Park in 2014)

1980s

1980 — Ocean View Park is constructed.

1982 — Trescony Park is constructed.

1982 — Beach Flats Park is constructed.

1983 — University Terrace Park opens.

1984 — DeLaveaga Disc Golf course opens.

1988 — Pogonip Open Space is purchased.

1990s to Present

1993 — Beach Flats Community Center is constructed.

1994 — City purchases Arana Gulch Open Space.

1996 — Jessie Street Marsh is purchased.

1998 — The City acquires Moore Creek Preserve.

1999 — Lighthouse Avenue Park is constructed.

2003 — La Barranca Park is constructed.

2005 — Depot Park opens.

2007 — Ken Wormhoudt Skatepark opens.

2014 — Riverside Gardens Park is constructed.

2016 — Audrey Stanley Grove opens.

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SECTION 2.3: COMMUNITY PROFILE

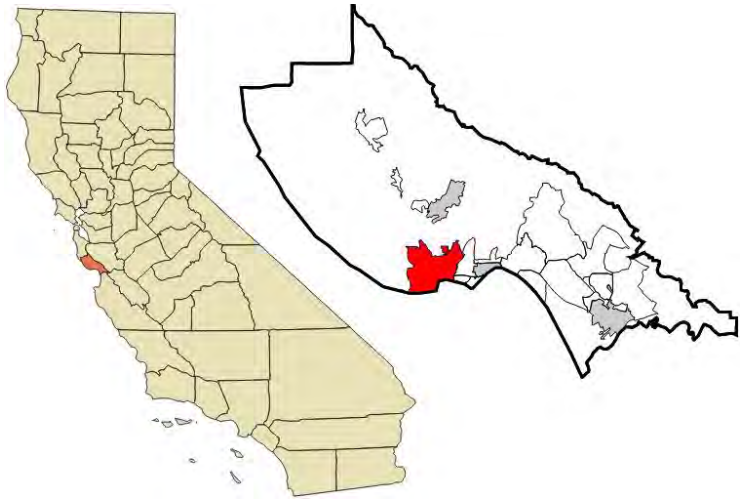
A. Location, Geography, and Climate
B. Demographics
C. Community Profile Summary

A. LOCATION, GEOGRAPHY, AND CLIMATE

The City's location, geography, and climate provide for a wide-range of outdoor recreational opportunities, not only within the City limits, but throughout the region. The City has a strong sense of physical identity because of its four miles of beautiful Monterey Bay coastline, and well defined natural features and open spaces along the City's edges. Its mild coastal Mediterranean climate contributes to the popularity of year round recreation.

LOCATION

Surrounded by the Santa Cruz Mountains, the City is on the northern edge of the Monterey Bay. The City is roughly 15.8 square miles in area, of which 12.7 square miles is land and 3.1 square miles is water. Part of Santa Cruz County, the City is approximately 32 miles south of San Jose and 75 miles south of San Francisco.



GEOGRAPHY

The geography of the City is split between the coastal plain and the slopes of the foothills and mountains. Divided by several rivers and streams, the coastal plain gently slopes toward the Bay and its beaches. The northern part of the City rises up into foothills along the edge of the Santa Cruz Mountains. The bay and mountains are natural boundaries which give Santa Cruz a strong physical identity.

CLIMATE

Santa Cruz has a Mediterranean climate influenced by its coastal location. According to the National Weather Service, temperatures are mild with monthly averages of highs ranging from 76 in the summer to 62 in the winter, and lows from 41 in the winter to 54 in the summer. Coastal fog, contributing to the mild summer climate, is common during morning and night hours in the summer. Rain occurs primarily during the months of November through March.

B. DEMOGRAPHICS

The following demographic figures are based on the 2010 Census and the US Census American Community Survey 2010-2014 projections.[1]

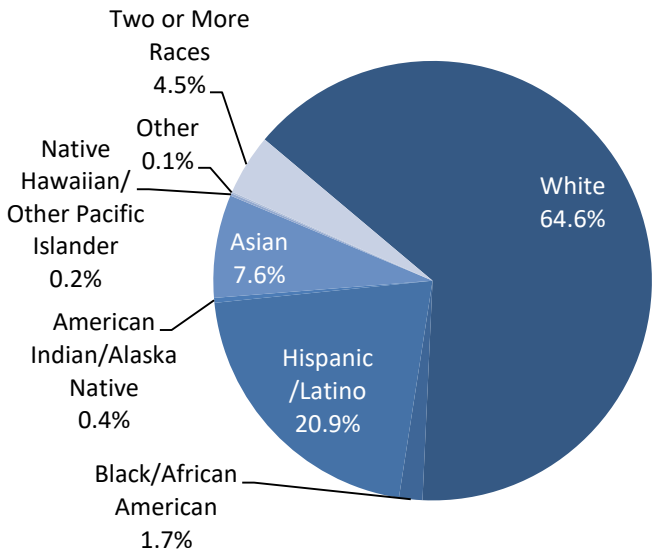
POPULATION

The City of Santa Cruz has a population of 63,364 (2014 US Census Bureau estimate). The population for Santa Cruz is higher in 2014 than that of 63,265 projected for 2020 in the Association of Monterey Bay Area Governments Monterey Bay Area 2008 forecast, indicating a strong growth pattern. In the 2010 Census, the City had a population of 59,948, showing a growth rate of 7.1% between 2010 and 2014.

RACE

The City of Santa Cruz is predominantly White and Hispanic. The chart below shows the racial distribution within the City.

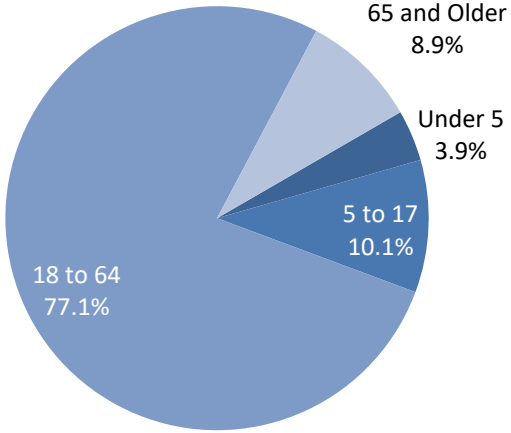
Racial Distribution in Santa Cruz



AGE DISTRIBUTION

According to the 2014 Census, at 77.1%, the majority of the population was between 18 and 64 years of age. The populations both under 18 and over 65 were significantly lower than the State-wide population averages at 13.7% and 8.8%, respectively. According to the census, the California population under 18 was 23.6% and the population over 65 was 12.9%. The senior population is expected to grow steadily. This existing and future distribution potentially influences the demand for active recreation in Santa Cruz.

Age Distribution in Santa Cruz



The City of Santa Cruz is home to the University of California, Santa Cruz. The three quarter average enrollment for the 2016-2017 year was 18,063 students. [2] The portion of this student population that declared Santa Cruz as their primary residence is included in the population data above, which may account for some of the skew in age distribution. Students do use City facilities and therefore should be considered in the needs assessment. This was particularly true during the recent drought conditions when the University stopped watering their sports fields. As a result, casual University sport groups used City sports fields.

POVERTY LEVEL

In 2014, 24.3% of the Santa Cruz population fell below the poverty level. This is higher than the overall California poverty level of 16.4%. This may impact the ability of certain persons to pay fees for recreation. Santa Cruz's large student population could impact poverty rates, as students living in non-campus housing are included in a census. Looking closely at the Census, the rates are highest for men and women age 18-24 in Santa Cruz which would include the student population.

DISABILITIES

The 2014 Census lists 9.2% of the population under 65 as having a disability and a total of 4,721 persons with disabilities. According to the website Local Disability Data for Planners', within the County of Santa Cruz, 11.6% of the population between the ages of 5 to 64 has a disability.[3] Neither the census or Local Disability Data for Planners' website gives statistics for persons below 5 or over 65, which would considerably raise these percentages. These statistics indicate a need for accommodation in park facilities and recreation programs for persons with physical and mental challenges.

TOURISM

One major influence on recreation in Santa Cruz is the large number of visitors to Santa Cruz. According to the Visit Santa Cruz County (VSCC) tourism board website, "Tourism ranks, alongside agriculture, as one of the top employers and revenue-producing industries in Santa Cruz County, generating over $700 million in direct travel expenditures annually. There are approximately 3 million visitor trips taken to Santa Cruz County each year."[4] In an intercept survey conducted by the VSCC, top activities of visitors included going to the beach, visiting attractions such as the Boardwalk and Wharf, exploring the area, and shopping. The high impact of visitors on recreation should be considered in recreation planning.

TRANSPORTATION

The City of Santa Cruz has high percentages of its population that commute by walking and bicycling. According to the American Community Survey, Journey to Work data 2010 - 2014, 9.9% of the population walked and 9.7% bicycled as compared to the state averages of 2.7% and 1.1% respectively. This indicates a need and high demand beyond recreation for pedestrian and bike routes and trails.

COMMUNITY WELL-BEING

According to the 2016 Community Well-Being Rankings, a report produced through Gallup-Healthways, Santa Cruz is highly ranked in the overall well-being of its community members.[5] The report assesses the following elements as indicators of well-being: purpose, social, financial, community, and physical. In the assessment, Santa Cruz ranked 3rd out of 189 communities evaluated in the United States revealing a high level of satisfaction with the City's quality of life.

C. COMMUNITY PROFILE SUMMARY

The City of Santa Cruz's location, climate and geography contribute to its recreation diversity and abundance. The population of the city is relatively young, most likely in part due to the adjacent university and the attraction of the outstanding access to outdoor recreation. Tourists are major users of Santa Cruz parks and beaches. Recreation programming and facility development will need to consider this community profile, while accommodating all age groups and abilities. When setting fees for recreation programs, consideration must be given to the large segment of the population that is below the poverty level.

REFERENCES

[1] United States Census Bureau, Quick Facts. Retrieved from http://www.census.gov/quickfacts/table/PST045215/0669112
[2] University of California Santa Cruz, Facts and Figures. Retrieved from https://www.ucsc.edu/about/facts-figures.html.
[3] Local Disability Data for Planners: A Planning Resource for County and State Data. Retrieved from http://disabilityplanningdata.com
[4] Visit Santa Cruz County, Tourism Facts. Retrieved from http://www.santacruzca.org/partners/tourism-facts.php
[5] State of American Well-Being: 2016 Community Well-Being Rankings. Retrieved from http://www.well-beingindex.com/2016-community-rankings

SECTION 2.4: EXISTING CONDITIONS

A. Parkland and Facility Inventory
B. Other Community Recreation and Facility Service Providers
C. Level of Service Assessment
D. Benchmarking Comparison of Similar Cities
E. Condition of Parks and Recreation Facilities
F. Safety and Security
G. Organizational Structure and Roles
H. Existing Parks Master Plans
I. Natural Resources

The City's Parks System covers more than 1,700 acres of parks, open spaces, beaches and recreational facilities. This section includes a review of the quantity, type, condition, level of service, access, and quality of the overall parks system. More information on each asset is provided in Section 4.2 Asset Inventory & Specific Recommendations.

A. PARKLAND AND FACILITY INVENTORY

The parks system is comprised of neighborhood parks, community parks, regional parks, open spaces, beaches and recreational facilities. The parks system offers a variety of recreational opportunities. Many recreational facilities are located within individual parks and open spaces and some stand alone. This section describes the types of parkland and recreational facilities that are provided in each area.

NEIGHBORHOOD PARKS

Neighborhood parks serve the recreational needs of those living or working within a service radius of one-half mile. They provide recreational facilities such as children's play areas, picnic areas, athletic fields, and outdoor basketball courts. The City's standard is to provide neighborhood parks at a ratio of 2.0 acres per 1,000 people. The City does not currently differentiate neighborhood parks from mini parks. Some communities account for parks smaller than 2 acres in size as a mini park. Smaller parks often provide less recreational opportunities for the surrounding neighborhood and the distinction helps in determining an adequate level of service.

Neary Lagoon Wildlife Refuge

Neary Lagoon Park and Chestnut Park have previously been accounted for as open space as part of the Neary Lagoon Wildlife Refuge. These parks provide neighborhood-serving facilities such as playgrounds, a basketball court, picnic tables, and tennis courts. These recreational facilities are more accurately described as neighborhood park space and have been listed as neighborhood parks in the inventory.

Neighborhood parks that have very limited recreational use such as Rincon Park, Scope Park, Town Clock Park, and El Portal Park are included in the neighborhood park inventory because they contain art, pathways,

landscaping treatments, monuments, or other features that provide a recreation benefit, although limited, to employees and residents.

School facilities are not included under neighborhood parks. School lands have been an important park resource for communities for the provision of park and recreational facilities during schools' off-hours. The use of school lands for public recreation can be an important resource to meet community needs given their size, distribution, seasonal and daily non-use periods, and proximity to neighborhoods. However, issues such as safety, liability, maintenance costs, enforcement, and vandalism have caused many schools to close or offer limited access during off-hours. The City's current reciprocal joint-use agreement with Santa Cruz City Schools is more specifically tailored for facility use and scheduled programming. The joint-use agreements could be updated and the acreage could be added to neighborhood parks at a future time.

The City leases underutilized land from private property owners to provide neighborhood park space at Beach Flats Community Garden and the Westside Pump Track. The leases are currently short-term. Therefore, the acreage has not been added to the total park acreage.

The City has 32 neighborhood parks (49 acres):

- Beach Flats Park (0.22 acres)
- Bethany Curve (3.4 acres)
- Branciforte Dog Park (0.22 acres)
- Central Park (0.16 acres)
- Chestnut Park (0.28 acres)
- El Portal Park (0.21 acres)
- Frederick Street Park (3.97 acres)
- Garfield Park (1.78 acres)
- Grant Park (2.36 acres)
- John D Franks Park (0.48 acres)
- La Barranca Park (2.26 acres)
- Laurel Park (1.77 acres)
- Lighthouse Avenue Park (0.35 acres)
- Mimi de Marta Dog Park(0.5 acres)
- Mission Plaza (0.94 acres)
- Moore Creek Overlook (0.12 acres)
- Neary Lagoon Park (1.27 acres)
- Ocean View Park (3.06 acres)
- Pacheco Dog Park (0.45 acres)
- Poets Park (0.13 acres) and Beach Flats Community Garden (Leased)
- Rincon Park (0.06 acres)
- Riverside Gardens Park (0.52 acres)
- Round Tree Park (0.28 acres)
- Scope Park (0.1 acres)
- Sgt. Derby Park (3.65 acres)
- Star of the Sea Park (2.1 acres)
- Town Clock (0.19 acres)
- Trescony Park (2 acres)
- Tyrrell Park (1.2 acres)
- University Terrace Park (8.7 acres)
- Westlake Park (6.03)
- Westside Pump Track (Leased)

Westlake Park

Table 2.4-1 below indicates facilities available in the parks system.

Table 2.4-1 Recreational Facilities by Location

General Recreational Facilities by Location	Baseball/Softball Field	Basketball Court	Bike Park	Bocce Courts	Community Gardens	Disc Golf	Exercise Equipment	Horseshoe Pits	Off-leash Dog Run	Pickleball Court	Playground/Play Equipment	Pump Track	Reservable Picnic Areas	Roller Hockey	Sand Volleyball Court	Skate Park	Soccer	Table Tennis	Tennis Court	Tot Lot Playground
Beach Flats Park											1									1
Branciforte Dog Park									1 (fenced)											
Central Park											1									
Chestnut Park		0.5									1									
Cowell Beach															2					
Depot Park/Bicycle Trip Bike Park /Scott Kennedy Fields			1								1						1 adult or 2 youth practice			
Frederick Street Park									1 (fenced)		1				1	1 (small)				1
Garfield Park		1									1							2		1
Grant Park	1 diamond field	1		1					1 (fenced)		1									1
Harvey West Park	6 baseball			2			1	2			1	1	9 (7 > 50 capacity)		1		2 (outfield of baseball fields)			1
John D. Franks Park							1				1									
Ken Wormhoudt Skate Park at Mike Fox Park		0.5								3 (painted on multi-purpose area)				1		1				
Laurel Park		1								1 (painted on b-ball)	1							1		1
Lighthouse Avenue Park					1 (18 plots)						1									1

Table 2.4-1 Recreational Facilities by Location

General Recreational Facilities by Location	Baseball/Softball Field	Basketball Court	Bike Park	Bocce Courts	Community Gardens	Disc Golf	Exercise Equipment	Horseshoe Pits	Off-leash Dog Run	Pickleball Court	Playground/Play Equipment	Pump Track	Reservable Picnic Areas	Roller Hockey	Sand Volleyball Court	Skate Park	Soccer	Table Tennis	Tennis Court	Tot Lot Playground
Lower DeLaveaga Park and George Washington Grove	2 softball			2				2			1		7 (5 > 50 capacity)		1					
Main Beach															16					
Mimi De Marta Park									1 (fenced)											
Mitchells Cove									1 (hour limitations on beach)											
Neary Lagoon Park											1								2	
Ocean View Park		0.5							1 (open, non-fenced)		1									1
Pacheco Dog Park									1 (fenced)											
Poets Park and Beach Flats Community Garden					2 (32 plots)						1									
Westside Pump Track												1								
Riverside Gardens					1 (11 plots)		1				1									
San Lorenzo Park						9 holes					1	1 (fiberglass)								1
Santa Cruz Riverwalk							2													
Sgt. Derby Park						3 holes				6 (painted on tennis courts)	1					1			2	
Trescony Park					1 (54 plots)						1									1

Table 2.4-1 Recreational Facilities by Location

General Recreational Facilities by Location	Baseball/Softball Field	Basketball Court	Bike Park	Bocce Courts	Community Gardens	Disc Golf	Exercise Equipment	Horseshoe Pits	Off-leash Dog Run	Pickleball Court	Playground/Play Equipment	Pump Track	Reservable Picnic Areas	Roller Hockey	Sand Volleyball Court	Skate Park	Soccer	Table Tennis	Tennis Court	Tot Lot Playground
Tyrrell Park																				
University Terrace Park		1							1 (Fenced-in)		1								2	
Westlake Park											1									1
West Cliff							1													
Total	**8**	**5.5**	**1**	**5**	**5 (115 plots)**	**2**	**6**	**4**	**8**	**10**	**21**	**3**	**16**	**1**	**21**	**3**	**3**	**3**	**6**	**11**

COMMUNITY PARKS

Community parks are designed to serve the entire community. They are generally larger than neighborhood parks and offer unique facilities such as larger picnic areas, swimming pools, ball fields, tennis courts, and recreation centers. They also host larger community events and recreation facilities. The City's standard for community parks is 2.5 acres per 1,000 people, with a service radius of 1.5 miles. The City currently has six community parks (181 acres).

- DeLaveaga Park - Lower DeLaveaga Park, George Washington Park, Audrey Stanley Grove, DeLaveaga Disc Golf Course, and DeLaveaga Archery Range (100 acres)
- Depot Park, Bicycle Trip Bike Park, & Scott Kennedy Fields (9 acres)
- Harvey West Park (44.77 acres)
- Ken Wormhoudt Skate Park at Mike Fox Park (1.25 acres)
- San Lorenzo Park (11.12 acres)
- West Cliff (14.64 acres)

San Lorenzo Park

REGIONAL PARKS

Regional parks serve the recreational needs of a regional population and are 150 acres in size or larger. They offer active and passive recreation with activities and amenities not found in neighborhood and community parks, such as large areas of open space, large picnic facilities, golf courses, lake boating, ball fields, and multi-use trails. An accepted national standard for regional parks is 20 acres per 1,000 people.

DeLaveaga Park could be categorized as a Regional Park because it is greater than 150 acres in size and includes active and passive recreation activities that serve the region. However, many of the activities that are provided can also be described under Community Parks because they serve the entire community and are similar in scale to other community park uses. Additionally, much of the area within DeLaveaga Park is wilderness area with steep slopes and sensitive habitat which will not be developed with regional serving facilities. Therefore, DeLaveaga Park has multiple functions that are reflected in the inventory in different categories. At 151 acres, the Golf Course has been categorized under Regional Park. Lower DeLaveaga Park, George Washington Park, Audrey Stanley Grove, DeLaveaga Archery Range, and DeLaveaga Disc Golf Course have been categorized under Community Park space. The remainder of land in DeLaveaga Park is listed under Open Space.

DeLaveaga Golf Course

OPEN SPACES

Open spaces are natural areas that provide valuable wildlife habitats, scenic and recreational enjoyment, and an escape from the built environment. Open space lands are essentially unimproved and devoted to an open space use for the purposes of natural resource preservation, outdoor recreation, and public health and safety. The beauty of these areas compels resident and visitor uses such as walking, jogging, hiking, bird watching, and relaxing. Multi-use trails also provide mountain biking and horseback riding opportunities in DeLaveaga Park Wilderness Area and Pogonip Open Space, and a paved multi-use path enables bicyclists to access and pass through Arana Gulch Open Space. The City's parks system includes seven open spaces (1,315 acres):

- Arana Gulch Open Space (67.7 acres)
- Arroyo Seco Canyon (33.94 acres)
- DeLaveaga Park Wilderness Area (269 acres)
- Jessie Street Marsh (3.2 acres)
- Moore Creek Preserve (263.75acres)
- Neary Lagoon Wildlife Refuge (37 acres)
- Pogonip Open Space (640 acres)

Moore Creek Preserve

BEACHES

The parks system includes four primary beaches (33 acres):

- Its Beach (approximately 1.5 acre portion, the remainder is owned by the California Department of Parks and Recreation)
- Cowell Beach (5 acres)
- Mitchell's Cove (0.4 acres)
- Main Beach (26 acres)

Its Beach

COMMUNITY, RECREATIONAL, AND CULTURAL FACILITIES

Community, Recreational, and Cultural Facilities are buildings and other, larger facilities that serve the specific recreational needs and interests of individuals, neighborhoods, groups, and the community. Recreational facilities are located throughout the park system and differ in scale, function, operations, and primary use. Some facilities (like the Civic Auditorium) are freestanding; others are located in parks. Community, Recreational and Cultural Facilities are shown in Table 2.4-2.

Louden Nelson Community Center

Harvey West Clubhouse

Table 2.4-2 Community, Recreational & Cultural Facilities

Community, Recreational, and Cultural Facilities	Address	Operations of City-Owned Community Recreational Facilities	Features
Beach Flats Community Center	131 Leibrandt St	The facility is operated by Community Bridges.	2,742 sq. ft. community center with a community room, computer lab, classroom, and kitchen.
Carmelita Cottages	321 Main St	Leased to Santa Cruz Hostel Society until 2021.	Youth Hostel.
Civic Auditorium	307 Church St	Operated by the Parks and Recreation Department.	Multi-purpose auditorium (34,739 sq. ft.) with stage and seating for total capacity of 2,021. Used for concerts, sporting events, expos, theatrical performances, movie screenings, conferences, and receptions.
DeLaveaga Park - Audrey Stanley Grove	501 Upper Park Rd	Leased to SC Shakespeare for summer performances during July and August. Contract needs to be extended in 2018. Rented for private use in September and October.	Outdoor amphitheater, tech booth, ticket office, parking area for performances. 496 seats.
DeLaveaga Park - DeLaveaga Archery Range	DeLaveaga Park -- Access from Brookwood Dr entrance	Operated by the Santa Cruz Archery Club. Membership is necessary to use facilities.	Indoor and outdoor archery range.
DeLaveaga Park - DeLaveaga Disc Golf Course	Accessed from Upper Park Rd.	Operated by the DeLaveaga Disc Golf Club	29 hole disc golf course.
DeLaveaga Park - DeLaveaga Golf Course	401 Upper Park Rd	Maintained by the city. The Pro Shop, Golf Course, Driving Range, and Golf Course Lodge are operated by GSL, Inc.	18 hole golf course w/ double-deck driving range and clubhouse (5,500 sq. ft.). Disc golf basket sleeves have been added to facilitate disc golf play during certain times of the week.
Depot Park Freight Building	119 Center St	The Parks and Recreation Department rents the facility for private use and hosts programming.	Community Room (3,000 sq. ft.).
Harvey West Park - Kids Kottage and Wagner Cottage	275 Harvey West Blvd	Kids Kottage is leased to County Office of Education for an alternative education program during the school year. The Parks and Recreation Department operates camp programs during the remainder of the year. The department also operates summer camp programs in Wagner Cottage.	Kids Kottage (1,500 sq. ft.) Wagner Cottage (1,000 sq. ft.)
Harvey West Park - Harvey West Pool	275 Harvey West Blvd	The pool is leased to a concessionaire to run the facility. The concessionaire teaches swim lessons in the small pool from March through October. The large pool is open from June through August for open swim.	Pool house (3,450 sq. ft.), 25 meter long lap pool and a wading pool.

Table 2.4-2 Community, Recreational & Cultural Facilities

Community, Recreational, and Cultural Facilities	Address	Operations of City-Owned Community Recreational Facilities	Features
Harvey West Park - Harvey West Scout and Clubhouse	326 Evergreen St	The Parks and Recreation Department rents the facility for private use.	Clubhouse (3,500 sq. ft.).
Louden Nelson Community Center	301 Center St	Staffed and maintained by the Parks and Recreation Department and used for programming and private rentals.	Community Center (20,085 sq. ft.). Includes Teen Center, meeting and dance rooms, and an auditorium with theater seating and stage.
Museum of Natural History	1305 East Cliff Dr	Leased to Santa Cruz Museum of Natural History to provide services.	Natural History Museum (3,500 sq. ft.).
Pogonip Clubhouse	Pogonip Open Space	Currently closed.	Historic clubhouse currently closed due to poor condition of building (8,000 sq. ft.).
Santa Cruz Wharf	21 Municipal Wharf	Wharf operated by the Parks and Recreation Department. Retail and restaurant space leased to private businesses by the Economic Development Department.	Municipal wharf. Restaurants, retail, restaurants, fishing, boat rentals, and tours.
San Lorenzo Park Lawn Bowling	137 Dakota St	Operated by the Santa Cruz Lawn Bowling Club.	18,000 sq. ft. outdoor artificial turf lawn bowling area and 1,500 sq. ft. clubhouse.
Senior Citizen's Opportunity	222 Market St	Leased to Senior Citizens Opportunity to provide services.	Senior Center (5,437 sq. ft).
Surfing Museum	701 W. Cliff Dr	Operated by the Parks and Recreation Department.	Surfing Museum (630 sq. ft.).

TRAILS

Trails allow for a variety of forms of recreation. Not only are they located within parks and open spaces, but they also can serve as important links between parks, recreation facilities, and natural and urban areas. In total, the City provides nearly 35 miles of trails and more are planned. The Monterey Bay Sanctuary Scenic Trail Network is a paved multi-use trail project which will connect from Davenport to Monterey along the existing rail right-of-way. The Public Works Department is overseeing the segment through the city which will add 2.1 miles of paved, multi-use trails. The Public Works Department also recently oversaw the completion of a pedestrian/bicycle bridge crossing Branciforte Creek, which is the last segment along the Santa Cruz Riverwalk. Table 2.4-3 below lists the trails within the parks system.

Pogonip Open Space

Table 2.4-3 City of Santa Cruz Trails

Location	Existing Trail Name/Segment	Hiking (Miles)	Hiking, Biking, and Horses - Non-Paved (Miles)	Hiking and Biking - Paved (Miles)
Arana Gulch	Coastal Prairie Loop Trail	0.84		
	Marsh Vista Trail	0.12		
	Multi-Use Path from Arana Creek to Agnes Street and Broadway			0.73
Arroyo Seco	Arroyo Seco from Grandview to paved path		0.37	
	Paved path from bottom to Meder St			0.63
DeLaveaga Park	Branciforte Creek Trail		0.6	
	La Corona Trail		1	
	Park Way		0.3	
	Redwood Lower Loop		1	
	Upper DeLaveaga Loop Trail		1.5	
	Enchanted Trail		1	
	Old Vineyard Trail		0.7	
	Brookwood Trail			1
Harvey West	Dos Fuentes	0.18		
	Harvey West Trail	0.33		
	Stage Coach	0.22		
	Wagner Grove to Meadow Rd	0.24		
Jessie Street Marsh	Between E. Cliff St and Lemos Ave	0.15		
Moore Creek Preserve	Prairie View Trail	1.1		
	Costa Vista Trail	0.3		
	Terrace Loop Trail	0.4		
	Vernal Ridge Trail	0.3		
	East Meadow Trail	0.25		
	Moore Creek Trail	0.5		
Neary Lagoon	Trails and boardwalks	0.85		

Table 2.4-3 City of Santa Cruz Trails

Location	Existing Trail Name/Segment	Hiking (Miles)	Hiking, Biking, and Horses - Non-Paved (Miles)	Hiking and Biking - Paved (Miles)
Pogonip Open Space	Brayshaw Trail	0.5		
	Fern Trail	0.8		
	Limekiln Trail	0.3		
	Lower Meadow	0.4		
	Ohlone Trail	0.3		
	Prairie Trail	0.3		
	Rincon Trail	0.7		
	Spring Trail	1.6		
	Spring Box Trail	0.2		
	Harvey West Trail	0.3		
	Lookout Trail	0.5		
	Pognip Creek Nature Trail	1.2		
	Emma McCrary		1.93	
	Rincon Trail		0.2	
	Rincon Connector Trail		0.2	
	U-Con Trail		0.5	
Santa Cruz Riverwalk				3.56
West Cliff Dr. to E. Cliff Dr	Natural Bridges to E. Cliff Drive			3.5
Wharf	Walkway	1		
Other Key Connections:	Bay Street Walkway			0.33
	Branciforte Creek Path			1.21
	Evergreen to Potrero Street			0.36
	Mission Street Ext.			0.18
	West Cliff to Depot Park			0.25
Total Miles of Trails per Type		**13.88**	**9.3**	**11.75**
Total Miles of Trails All Types				**34.93**

SCHOOL FACILITIES

School facilities provide recreational opportunities during the school's non-programming times. The City has an overarching reciprocal joint-use agreement with Santa Cruz City schools as well as joint-use agreements for specific facilities. The facilities are primarily used by the Parks and Recreation Department to facilitate specific recreation and sports programming. Santa Cruz City Schools also has facilities available for rent for public use. These include multi-purpose rooms, gyms, locker rooms, swimming pools, stadiums, practice fields, baseball fields, tennis courts, and theaters:

- Bayview Elementary
- Branciforte (B40) Middle School
- Branciforte Small Schools
- DeLaveaga Elementary School
- Harbor High School
- Gault Elementary
- Mission Hill Middle School
- Formerly Natural Bridges Elementary (Not currently in use)
- Santa Cruz High School
- Westlake Elementary School

Santa Cruz High School

OTHER CITY RECREATIONAL AREAS AND FACILITIES

Other major City recreation destinations and facilities include:

- The San Lorenzo River is a major watercourse through the City and a major physical feature. The lower 2.5 miles are channelized for flood control. The Santa Cruz Riverwalk is a paved multi-use pathway along the levee. Many parks and facilities are located along the Santa Cruz Riverwalk, and, when considered together, they comprise a larger recreational corridor that provides access to a wide range of natural and developed recreational areas. This corridor contains San Lorenzo Park, Riverside Gardens Park, Ken Wormhoudt Skate Park at Mike Fox Park, Mimi De Marta Dog Park, Jessie Street Marsh, Ocean View Park, Main Beach, Kaiser Permanente Arena, and the Tannery Arts Center. The Riverwalk also connects to the Monterey Bay Sanctuary Scenic Trail and Branciforte Creek Trail. Most importantly, the river and surrounding vegetation provide natural habitat for wildlife. The San Lorenzo Urban River Plan (2003) guides future improvements and restoration efforts along the river. The plan recognizes that the river is a habitat area and a recreational area for the City.

- The Del Mar Theatre is located in Downtown Santa Cruz and is available for community use through the Economic Development Department during certain times of the year. The theater contains the 495-seat Grand Auditorium, and two smaller 140-seat theaters, and is equipped with state-of-the-art sound and projection facilities.

- The Tannery Arts Center was developed through a partnership between the City and Artspace Project. It is a world–class arts campus with 100 affordable housing live/work spaces. The campus includes the 200-seat indoor Colligan Theater which is run by the Jewel Theatre Company.

- Kaiser Permanente Arena is a temporary 2,500 seat indoor arena which is home to the Santa Cruz Warriors Development League basketball team. During their off-season, the facility can be used for tradeshows, conventions, meetings, and large scale events.

The Economic Development Department is conducting an Arena Market and Financial Feasibility Study to analyze market, location, size, operations, management, economic development benefits, and other factors for locating a permanent arena.

- The City's Water Department operates the Loch Lomond Recreation Area (LLRA) in Felton. Loch Lomond Reservoir's primary function is water storage for Santa Cruz residents. The LLRA provides a range of recreational opportunities including boat rentals, picnicking, fishing, hiking, and natural resources interpretive programming.
- Downtown Santa Cruz is the business and commercial center in Santa Cruz and has a semi-mall concept. The promenade contains benches, outdoor patio areas, and landscaping treatments. Abbott Square is an outdoor plaza, and the City, under the administration of the Economic Development Department, partnered with the Santa Cruz Museum of Art and History to create the inviting and interactive community gathering space.
- The City Hall Complex includes a rose garden and other landscaping treatments. The Parks and Recreation Department maintains the landscaping.
- The East Cliff Accent is a walkway connecting Seabright Avenue to 4th Avenue along the coastal bluff above Seabright State Beach. A stairway at 3rd Avenue provides access down to the beach. The Parks and Recreation Department primarily maintains the site furnishings, trash, and weeds. The Public Works Department recently completed a cliff stabilization project at Mariner Park Way.
- The City partnered with NOAA's Office of National Marine Sanctuary. NOAA leased City land for the construction of the 12,000 square foot Monterey Bay National Marine Sanctuary Exploration Center. One of the goals of the center is to educate visitors about the unique and fascinating coastal and marine environment. The center is located across Beach Street from the Santa Cruz Wharf which is the Gateway to the Monterey Bay National Marine Sanctuary.
- The City's paved pedestrian and trail network is primarily maintained by the Public Works Department. The Active Transportation Plan (2017) plans to further integrate the walkways and bikeways that connect the City's communities to employment, education, and recreation destinations.

Monterey Bay National Marine Sanctuary Exploration Center

OTHER PARK AND RECREATION DEPARTMENT ASSETS

In order to maintain and administer the many parks, open spaces, beaches, and community recreational facilities in the City, the Parks and Recreation Department has a variety of other administrative, maintenance, and storage facilities. These facilities primarily include the following:

- Parks and Recreation Administrative Building
- Wharf Headquarters
- Wharf Maintenance Yard (leased)
- Golf Course Maintenance Yard
- Parks Maintenance Yard
- Lower DeLaveaga Park Office
- Ranger Station at Harvey West Park
- Junior Lifeguard Storage Building at Cowell Beach

Park and Recreation Administration Building

B. OTHER COMMUNITY RECREATION AND FACILITY SERVICE PROVIDERS

Besides the various parks and facilities maintained by the City, there are numerous resource providers within the City and region. This section focuses on land and water used for recreation which is open or planned to be open for public access.

UNIVERSITY OF CALIFORNIA SANTA CRUZ

The university is a 2,020 acre campus, and approximately half of the campus is located within the city limits. The campus offers amenities for active and passive recreation on the main campus, while the north and upper campuses currently are undeveloped open space. The main campus and recreational facilities are open to the public during daylight hours for walking, bicycling and visiting campus facilities, such as the Arboretum and Chadwick Gardens. Trails are located throughout the campus and provide connections to Wilder Ranch State Park, Pogonip Open Space, and Henry Cowell State Park.

MONTEREY BAY NATIONAL MARINE SANCTUARY

Designated in 1992, the Monterey Bay National Marine Sanctuary is a federally protected marine area off of the California Central Coast. The shoreline length of 276 miles spans from Marin to the north, to Cambria to the south, and covers more than 6,094 miles of ocean. The sanctuary is very popular for kayaking, paddle boarding, boating, fishing, wildlife viewing, and other ocean-oriented recreational activities.

PARKS & OPEN SPACES

- Antonelli Pond: 13.7 acre park adjacent to Moore Creek on the Westside of Santa Cruz; comprised of a large man-made pond, riparian habitat, and grasslands; managed by the Land Trust of Santa Cruz County
- Bonny Doon Ecological Reserve: 552 acre natural preserve in the Santa Cruz Mountains protecting several rare and endangered plant and animal species
- Cotoni-Coast Dairies National Monument: Nearly 6,000 acres near Davenport that were recently designated a national monument in 2017
- Santa Cruz Harbor: The Santa Cruz Harbor offers scenic and wildlife viewing walks, kayaking and boating opportunities, and important connections between recreational destinations

COUNTY OF SANTA CRUZ PARKS NEAR SANTA CRUZ

- Hestwood Park
- Old Jail/ Octagon
- Santa Cruz Gardens Park
- Simpkins Family Swim Center
- Veterans Memorial Building
- Winkle Farm Park
- Brommer Street Park
- Coffee Lane Park
- Chanticleer Park
- Felt Street Park
- Floral Park

- Jose Avenue Park
- Moran Lake Park
- Twin Lakes Park

Simpkins Family Swim Center

STATE PARKS & BEACHES

- Big Basin Redwoods State Park: More than 18,000 acre park featuring 81 miles of trails, old-growth forest of coast redwoods, and the majority of the Waddell Creek watershed; California's oldest State Park, established in 1902
- Castle Rock State Park: 5,242 acre, largely forested park with 32 miles of trails and popular with rock climbers because of its steep canyons and unusual rock formations
- Castro Adobe State Historic Park: Historic building standing as one of the best examples of a preserved rancho hacienda in the Monterey Bay
- The Forest of Nisene Marks State Park: 10,223 acre park with 40 miles of trails through secondary growth redwood forest
- Henry Cowell Redwoods State Park: 4,623 acre park with 15 miles of trails through a variety of forested areas
- Lighthouse Field State Beach: 38 acre site within the City of Santa Cruz and overlooking the ocean and popular Steamer Lane surfing hotspot
- Manresa State Beach: 138 acre beach near Aptos
- Natural Bridges State Beach: 65 acre park which is very popular for its Monarch Butterfly Natural Preserve
- New Brighton State Beach: 95 acre park near Capitola and consisting of a beach and campgrounds
- Santa Cruz Mission State Historic Park: Located near Santa Cruz's Mission Plaza and featuring the only building remaining of the original mission, which now houses a museum
- Seacliff State Beach: Beach in Aptos, known primarily for the fishing pier and the concrete ship, the *SS Palo Alto*, located at the pier's end
- Sunset State Beach: 1.5 mile long beach near Watsonville and just south of Manresa State Beach
- Twin Lakes and Seabright State Beaches: Long stretches of sandy beaches on either side of the Santa Cruz Harbor
- Wilder Ranch State Park: Around 7,000 acre park with 34 miles of trails through coastal terraces and valleys

Seacliff and Rio del Mar State Beaches

C. LEVEL OF SERVICE ASSESSMENT

The supply of the City's parkland and recreational facilities was assessed considering how the City's existing park acreage compares with the City of Santa Cruz General Plan 2030's level of service goals as well as how the City's provision of recreation facilities compares to other California Central Coast cities. The Level of Service Assessment only considers parks, open spaces, beaches, and recreational facilities that each City owns.

LEVEL OF SERVICE

The City of Santa Cruz General Plan 2030 established level of service (LOS) goals for the City's neighborhood parks and community parks to ensure parkland is equitably distributed, accessible, and adequately supplied. The acreage per population goal is a common standard to help plan for the amount of park space a community aspires to meet. It can also be used to assess if parkland is equitably distributed by population and geography. The service radius goal helps ensure that parkland is accessible from where people live and work. The City's standard is to provide neighborhood parks at a ratio of 2.0 acres per 1,000 people, with a service radius of ½ mile. The City's goal for community parks is 2.5 acres per 1,000 people, with a service radius of 1.5 miles. LOS goals were not established for regional parks, open spaces, beaches, and facilities.

PARK ACREAGE

The City is currently underserved for neighborhood and community park space. To meet existing goals, a total of 67 acres of parks would need to be created to meet the forecasted population growth associated with the City of Santa Cruz General Plan 2030 growth estimates.

Table 2.4-4 Park Acreage per Population

Population and Level of Service Targets	Neighborhood Parks	Community Parks	Combined
Existing Population	63,364		
General Plan's Forecasted Population	65,884		
Existing Park Acreage	48.76	180.78	229.54
General Plan LOS Target	2 acres per 1,000 residents	2.5 acres per 1,000 residents	4.5 per 1,000 residents
2017 LOS Acreage Goal	126.73	158.41	285.14
2017 Acreage Deficiency (-) or Surplus (+)	-77.97	22.37	-55.60
2030 LOS Acreage Goal	131.77	164.71	296.48
2030 Acreage Deficiency (-) or Surplus (+)	-83.01	16.07	-66.94

PARK ACCESS

Most areas of the City have access to neighborhood park and community park space; however, there are still areas that are not as comprehensively served by all types of assets. Even if an area appears to be covered according to the radius thrown by a nearby park, some neighborhoods have limited access to parks because of barriers such as topography, waterways, or highways. Additionally, proximity of Community Parks needs to be considered, because they provide recreational amenities that serve the surrounding neighborhoods.

The City of Santa Cruz General Plan 2030's neighborhood park definition does not distinguish size. The City's standard in the General Plan 2030 is to provide neighborhood parks at a ratio of 2.0 acres per 1,000 people. Neighborhood parks are commonly considered greater than 1-2 acres in size. Parks less than 1-2 acres in size are often categorized as pocket parks or mini-parks. Due to the smaller size and often more limited recreational opportunity, mini-parks commonly have a ¼ mile service radius for access compared to the ½ mile in the City of Santa Cruz General Plan 2030 for neighborhood parks. This evaluation assumes that all neighborhood parks acreage serves the corresponding neighborhoods

regardless of size but will apply a ¼ mile service radius for neighborhood parks less than one acre in size.

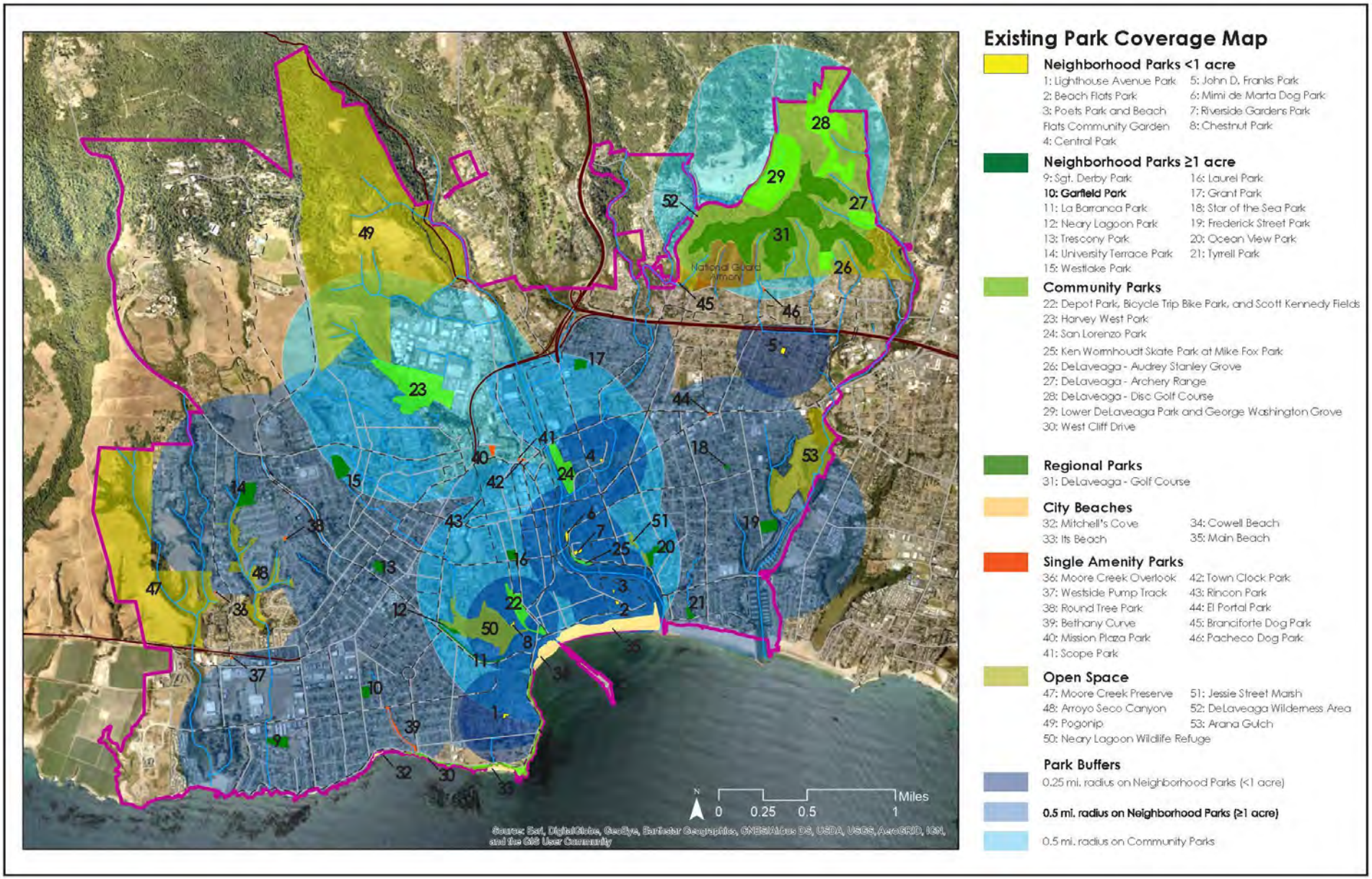
Community Parks provide recreational opportunities to surrounding neighborhoods. Applying a 1.5 mile radius from Community Parks shows that all neighborhoods in the City have access to Community Park space. Community Parks contain amenities that serve the surrounding neighborhoods. Therefore, to identify areas of the City that are underserved for access to any park space at a neighborhood-level, it is also important to consider areas that are neither located within a half-mile of a neighborhood park nor a community park, as these areas have less access to recreational amenities within a comfortable walking distance.

Harvey West Playground

Additionally, some neighborhood parks function as single-use facilities and do not provide a variety of recreational opportunities to serve the general population. Moore Creek Overlook, Westside Pump Track, Round Tree Park, Mission Plaza Park, Scope Park, Town Clock Park, Rincon Park, El Portal Park, Branciforte Dog Park, and Pacheco Dog Park serve very important roles in the parks system. However, they have not been included in the service mile radius due to their limited or specialized facilities. On the other hand, some single-use facilities are grouped with other nearby park assets and have been included in the service radius analysis. La Barranca Park and Mimi De Marta Dog Park are not considered single-use facilities because they are located within close proximity to other parks and serve a specific role in a broader mix of available uses.

The following exhibit, *Map A, Existing Park Coverage Map*, shows the access of residents to the parks, open spaces, and beaches owned by the City of Santa Cruz. The radii indicating walkable distances stop at major barriers such as freeways and rivers, when no pedestrian access across them is currently available. As shown in Map A, the areas with the most limited access opportunities include the portions of the Upper Eastside neighborhoods north of Soquel Avenue, the Carbonera Sphere neighborhood, and the areas on the west side near Shaffer Road and Grand View Street. Potential opportunities to improve access for the Upper Eastside include improving Joint Use Agreements with Santa Cruz City Schools and creating a small pocket park at the previous zoo site in DeLaveaga Park along Upper Park Road near the Pacheco Dog Park. For the west side areas near Shaffer Road and Grandview Street, the General Plan 2030 Goal LU1.1.4 describes that neighborhood parkland shall be considered on the 11-acre Swenson parcel during the planning process. The Carbonera Sphere neighborhood is more challenging given the lack of available land. Improvements could be explored to connect the neighborhood to Lower DeLaveaga Park if opportunities arise to work with adjacent property owners.

As Santa Cruz continues to grow, it will be necessary to evaluate park access and the corresponding wear and tear on existing facilities. If there is substantial growth in a specific neighborhood with limited park acreage or facilities, consideration should be given to providing additional neighborhood park amenities, either through expansion or rehabilitation of existing parks, or through purchase of new property.


Existing Park Coverage Map
Neighborhood Parks <1 acre
1: Lighthouse Avenue Park
2: Beach Flats Park
3: Poets Park and Beach Flats Community Garden
4: Central Park
5: John D. Franks Park
6: Mimi de Marta Dog Park
7: Riverside Gardens Park
8: Chestnut Park
Neighborhood Parks ≥1 acre
9: Sgt. Derby Park
10: Garfield Park
11: La Barranca Park
12: Neary Lagoon Park
13: Trescony Park
14: University Terrace Park
15: Westlake Park
16: Laurel Park
17: Grant Park
18: Star of the Sea Park
19: Frederick Street Park
20: Ocean View Park
21: Tyrrell Park
Community Parks
22: Depot Park, Bicycle Trip Bike Park, and Scott Kennedy Fields
23: Harvey West Park
24: San Lorenzo Park
25: Ken Wormhoudt Skate Park at Mike Fox Park
26: DeLaveaga - Audrey Stanley Grove
27: DeLaveaga - Archery Range
28: DeLaveaga - Disc Golf Course
29: Lower DeLaveaga Park and George Washington Grove
30: West Cliff Drive
Regional Parks
31: DeLaveaga - Golf Course
City Beaches
32: Mitchell's Cove
33: Its Beach
34: Cowell Beach
35: Main Beach
Single Amenity Parks
36: Moore Creek Overlook
37: Westside Pump Track
38: Round Tree Park
39: Bethany Curve
40: Mission Plaza Park
41: Scope Park
42: Town Clock Park
43: Rincon Park
44: El Portal Park
45: Branciforte Dog Park
46: Pacheco Dog Park
Open Space
47: Moore Creek Preserve
48: Arroyo Seco Canyon
49: Pogonip
50: Neary Lagoon Wildlife Refuge
51: Jessie Street Marsh
52: DeLaveaga Wilderness Area
53: Arana Gulch
Park Buffers
0.25 mi. radius on Neighborhood Parks (<1 acre)
0.5 mi. radius on Neighborhood Parks (≥1 acre)
0.5 mi. radius on Community Parks
National Guard Armory
N
0
0.25
0.5
1
Miles
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

D. BENCHMARKING COMPARISON OF SIMILAR CITIES

The National Recreation and Park Association recommends benchmarking to similar communities to help assess existing conditions in the evaluation of recreation goal setting for a community. There are currently no nationally accepted standards for determining levels of service for the variety of services that every parks system provides. Given that geography, climate, culture, demographics, and other characteristics vary widely nationally, a community must determine its own standards that are appropriate to meet their own local needs. Each community must establish standards that are relevant to its community. Benchmarking is useful because communities with similar characteristics can be compared to help evaluate how the City is performing in relation to them.

The Santa Cruz Parks System is unique for a number of factors and no City offers a perfect comparison. Watsonville, Monterey, San Luis Obispo, Santa Barbara, and Ventura were chosen for comparison because they are located in the California Central Coast region. All have favorable cool-summer or warm-summer Mediterranean climates for recreation. Santa Cruz, Watsonville and Monterey are located in the Monterey Bay region. Like Santa Cruz, Santa Barbara's and San Luis Obispo's top employers are universities. Santa Barbara, San Luis Obispo, and Ventura are also similar to Santa Cruz in that they are the county seat. San Luis Obispo has a large number of open spaces, while Monterey, Santa Barbara, and Ventura manage larger coastlines in addition to open spaces. There is no doubt that there are many differences between the communities. However, when considered together, Santa Cruz is near the average level of population size, median income, age demographics, square miles of City, population density per square miles, and funds allocated to provide Parks and Recreation Department services. That said, the cities' park systems offer a good comparison for the type, level, and provision of recreation services. The following comparison was completed in 2016 and uses budget data from FY 2016-17.

Table 2.4-5 Population Characteristics

Characteristics	Average of Comparable Cities	City of Santa Cruz
Population	64,833	63,364
<18	20%	16%
>65	13%	9%
Square Miles	14	13
Population Density Per Square Mile	4,860	4,974
Median Household Income	$57,752	$61,533
Park & Rec Department Operating Expense	$13,193,319	$14,997,297 (Includes the operating budget for the Santa Cruz Wharf)

COMPARISON OF PARK ACREAGE

As seen in the table below, the Santa Cruz Parks System currently supplies slightly more park acreage (excluding beaches) per resident, approximately the same developed park acreage per resident, and slightly more open space per resident than the average of the other communities.

Table 2.4-6 Park Acreage per Population

Park Acreage (Excluding Beaches)	Average of Comparable Cities	City of Santa Cruz
Population	64,833	63,364
Total Park Acreage (Acres)	1,493	1,696
Total Park Acreage (Acres)/1,000 Population	23	27
Developed Park Acreage	236	239
Developed Park (Acres)/1,000 Population	4	4
Open Space Acreage	1,161	1,315
Open Space Acreage (Acres)/1,000 Population	18	21

SPORTS FIELDS

The comparative analysis also considers the number of sports fields provided. The table below provides information on the number of fields that are lighted, grass or synthetic, and whether or not the baseball outfields are also used for soccer. It is important to note that there can be conflicts with sports programming, primarily in the spring, when the end of the baseball season conflicts with the beginning of the soccer season. For baseball, the majority of fields remain grass.

Comparison of the selected communities revealed that, for soccer, on average, half of the fields are synthetic turf and half are lighted. Seventy-five percent of the City of San Luis Obispo's fields are synthetic. All of San Luis Obispo's soccer fields are synthetic. Santa Cruz, Monterey, and Ventura have soccer fields located in the outfields of the diamond fields. Santa Cruz has the highest number of lighted fields.

Despite the number of ball fields reported, many of the communities are planning for additional field space. The City is particularly impacted in field space for soccer, and the overlap of baseball and soccer seasons has created difficult programming challenges to meet growing demand on shared fields. Harvey West and Scott Kennedy fields cannot accommodate additional needs for sports programming. As sports trends in soccer, lacrosse, and field hockey grow as seen at the State-level, there will be an even greater need for new field space.

Scott Kennedy Fields at Depot Park

Table 2.4-7 Sports Fields Comparison

Sports Fields (Excluding Joint Use Agreements with School Districts)		**avg.**	**Average LOS for Comparable Communities**	**City of Santa Cruz**	**LOS for City of Santa Cruz**
Diamond fields	Total	8	1 per 8,104	8	1 per 8,000
	#Grass	6	N/A	8	N/A
	#Synthetic	2	N/A	0	N/A
	#Lighted	4	N/A	8	N/A
Soccer Fields	*Total*	4	1 per 16,208	3	1 per 21,121
	#Grass	2	N/A	2	N/A
	#Synthetic	2	N/A	1	N/A
	#Lighted	1	N/A	2	N/A
	#Located in outfield	1	N/A	2	N/A

OUTDOOR FACILITIES

In terms of outdoor facilities, as seen in the following tables, Santa Cruz provides a high number of community garden plots, dog park areas, playgrounds, tot-lots, sand volleyball courts, skate parks, disc golf, baskets, and reservable picnic areas. Santa Cruz is also the only City to provide a BMX bike park and pump tracks.

Westside Pump Track

Santa Cruz provides less tennis courts than the other communities. Santa Barbara, Ventura, San Luis Obispo, and Monterey provide a tennis center with at least six courts. Santa Cruz and Santa Barbara have striped pickleball courts but nets are not currently provided.

In terms of swimming pools, Santa Barbara, Ventura, and San Luis Obispo offer 50 meter long pools that are part of a larger swim center and allow for the possibility of competitions. Santa Cruz seasonally offers 25 meter lap lanes; however, the County of Santa Cruz provides a larger pool complex and 50 meter long lap lanes at Simpkins Family Swim Center. The more populated City of Ventura's Aquatic Center includes a recreation pool, water playground pool, two water slides, a 50 meter competition pool with two one-meter and two three-meter diving boards, locker rooms, and picnic areas. The less populated City of Monterey has a very large indoor swim center which is described under Indoor Facilities.

Santa Cruz offers a high number of playground facilities. Santa Cruz does not currently provide larger playground destinations such as Monterey's renowned Dennis the Menace Park.

Santa Cruz's Ken Wormhoudt Skate Park, Santa Barbara's Skaters Point, and San Luis Obispo's SLO Skate Park are the largest facilities at greater than 14,000 square feet in size and offer concrete bowls and street features.


Ken Wormhoudt Skate Park

Table 2.4-8 Comparison of Outdoor Facilities in Comparable Communities

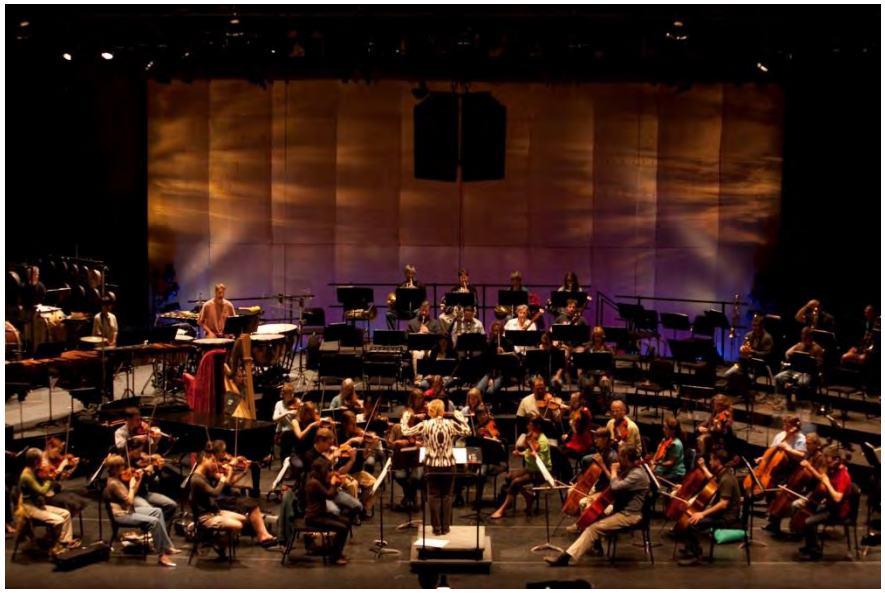
Common Outdoor Facilities	Average of Comparable Communities	Average LOS For Comparable Communities	City of Santa Cruz	Santa Cruz LOS
Basketball Courts	6	1 per 10,130	5.5	1 per 11,521
Playground	18	1 per 3,684	21	1 per 3,017
Sand Volleyball	8	1 per 7,906	21	1 per 3,017
Tennis Courts (Outdoor only)	12	1 per 5,403	6	1 per 10,561
Skate Park	1	1 per 46,309	3	1 per 21,121
Reservable Group Picnic Area	14	1 per 4,767	16	1 per 3,960

Table 2.4-9 Comparison of Less Common Outdoor Facilities in Comparable Communities

Less Common Outdoor Facilities	Median of Comparable Communities	Median LOS for Comparable Communities	City of Santa Cruz	City of Santa Cruz LOS
Community Garden Plots	117	1 per 555	115	1 per 551
Dog Park	1	1 per 64,883	8	1 per 7,921
Wading Pool	1	1 per 64,883	1	1 per 63,364
Swimming Pool	1	1 per 64,883	1	1 per 63,364
Disc Golf Course Baskets	0	N/A	59	1 per 1,074
BMX Park	0	N/A	1	1 per 63,364
Pump Track	0	N/A	3	1 per 21,121
Pickleball Courts (Painted/ no permanent nets)	0	N/A	10	1 per 6,336
Tot-Lot	5	1 per 12,967	11	1 per 5,760
Golf Course	0.5	1 per 129,766	1	1 per 63,364

INDOOR FACILITIES

The Cities compared provide a range of indoor recreation facilities. Not all the Cities provide each type of facility. Each City provides a community center and community rooms. Each City also provides teen and/or senior services out of the community center or has a separate facility to provide those services. Santa Cruz's Louden Nelson Community Center is the largest community center. Santa Cruz's Civic Auditorium is the largest auditorium. Santa Barbara and Monterey provide fitness centers. Monterey's Sports Center is one of a kind and offers two heated indoor pools, a water slide, sauna, a three court gymnasium, group exercise studios, and weight and cardio training areas. Santa Barbara has a large recreation center and a large gym. The City of Watsonville provides a high proportion of community facility space to the youth and seniors and provides a childcare center. Santa Barbara has a large number of facilities that can be rented out for weddings and private events.



Cabrillo Festival at the Civic Auditorium

Table 2.4-10 Comparison of Indoor Recreation Facilities in Comparable Communities

Indoor Recreation Facilities by City	Size (sq. ft.)	Community Center/ Meeting Rooms	Event Rental	Fitness Center	Gymnasium	Auditorium	Senior Center	Youth Center	Recreation Center	Pool
City of Monterey										
Casanova Oak Knoll Park Center	5,110	X								
Hilltop Park Center	18,400	X								
Monterey Sports Center	71,255			X	X				X	X
Monterey Youth Center	14,000							X		
Scholze Park Center	9,437	X					X			
City of Santa Barbara										
Cabrillo Pavilion Arts Center	15,000	X	X							
Carrillo Street Gym	10,000			X						
Carrillo Recreation Center	20,000	X	X							
Casa Las Palmas	2,000	X	X							
Chase Palm Park Center	3,200	X	X							
Chase Palm Arts and Crafts Center	1,000	X								
Franklin Neighborhood Center	12,000	X								
Louise Lowry Davis Center	4,000	X								
MacKenzi Park Adult Building	2,000	X								
Twelve 35 Teen Center	3,500							X		
Westside Community Center	2,000	X				X				
City of San Luis Obispo										
Ludwick Community Center	14,000	X			X					
Meadow Park Building	3,400	X								
SLO Senior Citizens Center	6000						X			
Historic Jack House and Gardens	3,000		X							
City of Watsonville										
Callaghan Park Cultural Center	3,400							X		
Gene Hourlaris and Waldo Rodriguez Youth Center	11,000							X		
Marinovich Community Center	10,000	X								

Table 2.4-10 Comparison of Indoor Recreation Facilities in Comparable Communities

Indoor Recreation Facilities by City	Size (sq. ft.)	Community Center/ Meeting Rooms	Event Rental	Fitness Center	Gymnasium	Auditorium	Senior Center	Youth Center	Recreation Center	Pool
Ramsay Park Family Center	2,800	X								
Senior Center	10000						X			
Childcare Center	2,670							X		
Veteran Memorial Building	6,000		X		X	X				
Muzzio Park Community Center	2,800	X						X		
City of Ventura										
Ventura Ave Adult Center	10,000						X			
Barranca Vista Center	3,500	X								
Westpark Community Center	11,000	X								
City of Santa Cruz										
Beach Flats Community Center	2,742	X								
Civic Auditorium	34,739	X	X		X	X				
Depot Freight Building	3,000	X	X							
Harvey West Kids Kottage and Wagner Cottage	2,500	X								
Harvey West Scout and Clubhouse	3,500	X	X							
Louden Nelson Community Center	20,085	X	X			X	X	X		
Senior Citizens Opportunity	5,437	X				X	X			

E. CONDITION OF PARKS AND RECREATION FACILITIES

Numerous studies have been conducted in recent years to study the condition of the larger recreational facilities in the parks system.

FACILITY CONDITION ASSESSMENT (2013)

The Public Works Department hired a consultant to conduct a Facility Condition Assessment (2013) which included the study of building system needs including foundations, superstructures, exterior enclosure, interior construction, interior finishes, conveying systems, plumbing, HVAC, and fire protection and electrical. The following recreation facilities were identified as in need of building system improvements and needs were projected to 2018, as indicated in the table below:

Table 2.4-11 Facility Condition Assessment Costs

Parks and Recreation Buildings	Total Needs in 2018
Civic Auditorium	$4,745,316
Harvey West Clubhouse	$337,397
Harvey West Poolhouse	$196,464
Harvey West Ranger Station	$63,829
Wagner Cottage	$69,333
Golf Course Cart Storage	$447,309
Golf Course Clubhouse	$499,399
Louden Nelson Community Center	$2,774,057
Senior Citizen's Opportunity	$548,795
Parks Yard Maintenance Garage	$140,350
Parks Yard Office	$161,645
DeLaveaga Park Office	$14,696
Wharf Headquarters	$285,423
Parks and Recreation Admin Building	$424,033
Total	**$10,708,048**

SANTA CRUZ WHARF ENGINEERING REPORT (2014)

The Santa Cruz Wharf Engineering Report (2014) evaluated the Santa Cruz Wharf and found that it is generally in good condition but there is a need for pile replacements, general improvements to the pavement and substrate, and improvements to increase public safety, weight bearing capacity, sewer, fire protection, and landings. The estimated costs of the improvements are $16,000,000.

Santa Cruz Wharf

POGONIP CLUBHOUSE REHABILITATION PLAN (2000)

The Pogonip Clubhouse Rehabilitation Plan (2000) includes interior, exterior, structural, mechanical, and electrical evaluations. Costs to complete the plan are currently estimated at $7,000,000.

PLAYGROUND INSPECTIONS

The City's park playgrounds and tot lots were visited and inspected for compliance with California playground safety regulations, per the California Department of Public Health, on Tuesday, December 23rd, 2014 and Sunday, March 29th, 2015. These were not full inspections with formal testing, but visual inspections for apparent problems.

PLAYGROUND EQUIPMENT

The playground equipment is generally new and well maintained in all of the parks.

Riverside Gardens Playground

FALL PROTECTION

Engineered wood fibar is used extensively in Santa Cruz playgrounds for fall protection. This fibar meets the criteria for fall protection for most playground heights if of sufficient depth and maintained. Engineered wood fibar is wood shredded to specific dimensions to increase its fall protection. The depth of fibar was not determined in the site visits as that would have required digging. In the play areas that use rubber matting, the matting needs to be annually tested for retention of fall attenuation properties. As matting ages, it loses its softness and ability to absorb impacts.

ACCESSIBILITY

For surfacing, most playgrounds had rubber matting extending to the transfer deck but engineered wood fibar elsewhere. Engineered wood fibar is considered an accessible surface, but must meet the requirement of no more than ½" change in level from surface to surface to be considered accessible. To maintain this grade difference, ramps must be installed extending from the adjacent walks into the engineered wood fibar. As the fibar settles, the ramp becomes more exposed but maintains an accessible route into the playground. Of note for future playground renovation and construction, accessibility of engineered wood fibar is being challenged in courts, though no resolution has been reached to date.

Play equipment met the criteria for accessibility for the apparent dates of installation. Going forward, Santa Cruz should be aware of new criteria that require all equipment reachable from a transfer station or ramp to be accessible upon exit- i.e. must be on accessible surfacing. Existing criteria includes:

- One of each type of play equipment to be accessible by transfer or ramping,
- A percentage, based on number of components, of accessible by transfer or ramping.
- A percentage, based on number of components, of ground level play.

RECREATIONAL FACILITIES AND SITE FURNISHING CONDITIONS

Staff inspected the site furnishings and recreational facilities at each park, ranking each site furnishing or recreational facility from very good to very poor based on conditions relating to cosmetic defects, rusting and warping, and noted known structural and functional issues. Tables are provided for each park in Chapter 4, Section 4.2. In general, most site furnishings are in the good to very good condition. Harvey West Park Ball Fields is notable because the facilities have extensive issues with a high cost of repair.

F. SAFETY AND SECURITY

Illegal camping, drug-use, gang activities, and criminal misconduct stem from challenging social, mental health, economic, and moral issues. The impacts from these and other illegal activities on the City's parks system

are prevalent and often pose environmental and safety issues and consume many City resources to mitigate them. The City has recently begun fencing and locking some of its parks and open spaces to deter illegal activities. For example, a temporary curfew limiting access to Cowell Beach is currently in effect. Other steps have included installing security cameras, increasing volunteer and staff clean-up days, imposing temporary closures of restrooms and park areas, developing maintenance protocols to find discarded hypodermic needles, and changes to park policies and programs to try to increase legal use in order to deter illegal activities.

G. ORGANIZATIONAL STRUCTURE AND ROLES

The Parks and Recreation Department's three divisions help oversee parks system assets. The Recreation Division manages sports and beach programming and events, class, and teen and senior programming as well as the Civic Auditorium, Louden Nelson Community Center, and facility rentals and maintenance. The Administration Division supports programs and reservation rentals and creates policies and plans. The Parks Division oversees the maintenance and operation of the DeLaveaga Golf Course, Urban Landscaped Medians, Arana Gulch, the Santa Cruz Wharf and Cowell and Main Beaches, and the Park Rangers unit. Additionally, parks and open spaces are grouped under three management zones: the east, west, and central zone.

Though the recommendations from this Parks Master Plan 2030 focus primarily on core areas of the Parks and Recreation Department, it is important to note that the provision of recreation facilities is a multi-departmental effort. The following lists just some of the major roles other departments play:

- City Manager's Office:
    - Administers larger scale temporary and special use permits in parks, beaches, and open spaces.
    - Oversees important community studies and projects.
    - Coordinates GreenWharf projects and relationships with UCSC academic partners.
- Economic Development Department:
    - Administers contracts with businesses on the Santa Cruz Wharf and assists drafting leases with new vendors and concessionaires.
    - Manages the development of the Santa Cruz Wharf Master Plan and the Kaiser Permanente Siting Feasibility Study.
- Planning:
    - Planning and Community Development:
        - Often takes the lead on major planning efforts
        - Reviews new parks development applications to ensure code compliance.
- Public Works:
    - Oversees water quality efforts such as the tule removal and water quality testing at the Neary Lagoon Wildlife Refuge and along the San Lorenzo River and Main and Cowell Beaches
    - Removes vegetation from the San Lorenzo River corridor.
    - Manages the construction and maintains multi-use pathways such as the construction of the Arana Gulch Multi-Use Trail, the Santa Cruz Riverwalk, and the Monterey Bay Marine Sanctuary Scenic Trail segment through Santa Cruz.
    - Assesses condition of buildings and funds improvements.
    - Assesses cliff erosion and stabilization along West Cliff and East Cliff Drives.
    - Maintains the parking area at Depot Park.
    - Reviews engineering plans and makes recommendations for new development projects.
- Police Department:
    - The Parks Unit was created in 2006 following a voter-approved sales tax initiative in the city of Santa Cruz known as Measure H. The unit works closely with the Park Rangers to maintain a safe environment in neighborhood parks, open spaces and waterways.

H. EXISTING PARKS MASTER PLANS

The City has many master or management plans that help guide future uses and corresponding management actions for specific parks, open spaces, and beaches. Not all park assets have management plans. Some of the Management Plans could be updated to accommodate new facilities and activities to meet current needs and desires.

- Arana Gulch Master Plan (2006): The plan guided the development of the multi-use trail project which was completed in 2014. It also guides natural restoration of the property.

- Cowell and Main Beach Management Plan (2014): Guides beach maintenance operations, safety operations, recreation programming, commercial uses, and flood and drainage discharge operations for Cowell and Main Beaches.

- DeLaveaga Park Master Plan (1960): The plan includes ambitious recreational projects, many of which have been implemented. Projects include campgrounds, a small train track, a fishing lake, golf course, softball fields, a children's wading pond, tennis courts, a natural science center, a rifle and archery range, among others.

- DeLaveaga Golf Course Master Plan (2002): The plan recommends a variety of improvements, including constructing a new clubhouse to accommodate larger events, installing a new irrigation system to conserve water, adding solar to the upper deck of the golf course to provide shade and conserve energy, performing tree management work to reduce dead and diseased trees, redesigning and updating the sand traps, leveling the tees, grading the fairways, increasing the parking areas, and improving the maintenance yard.

- Depot Park Master Plan (2001): The plan guided uses and improvements to Depot Park were completed in 2005.

- Jessie Street Marsh Management Plan (1998): The plan aims to restore the marsh and improve access. A major component of the plan would be creating a tidal exchange between the fresh water marsh and the San Lorenzo Urban River. An interpretive trail would connect from East Cliff Drive to Lemos Avenue.

- Moore Creek Preserve Interim Management Plan (2002): Guides natural restoration activities and trail alignments, design, and use.

- Neary Lagoon Management Plan (1992): Guides activities to manage hydrology, water quality, vegetation, wildlife, mosquitoes, cultural resources, public use and safety, infrastructure, and aesthetics.

- Pogonip Clubhouse Rehabilitation Plan (2002): The plan guides the rehabilitation of the historic Pogonip Clubhouse.

- Pogonip Master Plan (1998): The plan envisions the restoration of the historic clubhouse, a Homeless Garden farming operation and support facilities, an outdoor education camp, improvements to trails, interpretive programs, parking improvements, and natural restoration activities.

- San Lorenzo Urban River Plan (2003): The San Lorenzo Urban River Plan provides a number of recommendations for the locations and designs of plazas, unpaved nature loops, native planting treatments, interpretive signage, bird watching platforms, and art. The plan recommends that restoring the river is the top priority.

- Santa Cruz Wharf Master Plan (under review): The Santa Cruz Wharf Master Plan guides future restoration and expansion including the development of a landmark building, an events pavilion, a gateway entrance sign, a welcome center, a small boat landing area, and increased pedestrian and bicycle access.

I. NATURAL RESOURCES

EXISTING NATURAL RESOURCES

The City's parks and open spaces contain several diverse, native plant and wildlife communities/habitats. Habitats include freshwater marsh, redwood forest, mixed evergreen forest, coastal scrub, grassland/coastal prairie, oak woodland, and riparian woodlands/corridors. Some of these habitats are considered sensitive because they are vulnerable to disturbance or do not recover easily once disturbed. Sensitive areas also include springs and seeps, nesting and breeding sites such as standing dead trees, riverbanks, movement and migration corridors, pathways to perennial streams, overwintering sites (i.e., Monarch butterfly), and foraging areas.

Riparian (streamside), and other wetland habitats (brackish and freshwater marshes), with their wide variety of plants and readily available water, are vital for wildlife such as waterfowl, fish, and amphibians. These habitats provide a drinking source and dense, green foliage for protection, shelter, and food. Perennial or seasonal water bodies are breeding areas for some amphibian and other wildlife species. Most wildlife species depend on external sources of water and will often travel long distances to reach it. Excessive human use in these areas can result in trampling, soil compaction, erosion, destruction of vegetation, alteration of water quality and temperature, introduction of non-native and invasive plant species, and frequent disturbances to wildlife.

Some of these habitats are protected by federal and state laws and require special permits for new improvements. City parks and open spaces containing rare, threatened, or endangered species as listed by Federal and/or State agencies are shown on the following tables. More information on sensitive habitats and species can be found in the City of Santa Cruz General Plan 2030, individual park master plans, and past studies.

Table 2.4-12 Native Habitats within City Open Spaces

Open Space	Brackish or Freshwater Marsh[2]	Redwood Forest	Mixed Evergreen Forest	Coastal Scrub	Grassland Coastal Prairie[2]	Riparian Woodland	Oak Woodland[2]	Eucalyptus Groves[1]
Pogonip Open Space		X	X	X	X	X	X	
Moore Creek Preserve		X	X	X	X	X	X	
DeLaveaga Wilderness Area	X	X	X	X	X	X	X	X
Neary Lagoon Wildlife Refuge	X					X		
Jessie Street Marsh	X				X	X	X	X
Arana Gulch Open Space	X				X	X	X	X
Arroyo Seco Canyon			X			X		X
San Lorenzo River	X					X		X

[1] Eucalyptus is a non-native tree species, but some eucalyptus groves in the City provide overwintering habitat for the Monarch butterfly.

[2] Sensitive habitat, as identified under City, State, and/or Federal policies.

Table 2.4-13 Special Status Plants and Animals Known within City Open Spaces

Open Space	San Francisco Popcorn Flower	Santa Cruz Tarplant	Gairdner's Yampah	Santa Cruz Clover	Robust Spineflower	CA Red-legged Frog	Southwestern Pond Turtle	Ohlone Tiger Beetle	Dusky-footed Woodrat	Monarch Butterfly[2]	Steelhead/Coho Salmon and Tidewater Goby
Pogonip Open Space	X		X	X	X	X	X	X[1]	X		
Moore Creek Preserve	X					X	X	X	X	X	
DeLaveaga Wilderness Area									X	X	
Neary Lagoon Wildlife Refuge							X		X		
Jessie Street Marsh											
Arana Gulch Open Space		X							X	X	
Arroyo Seco Canyon									X	X	
San Lorenzo River											X

[1]Ohlone Tiger Beetle last observed in 2004.

[2]Overwintering site.

RESOURCE MANAGEMENT

Selecting effective management strategies requires understanding natural ecological processes at a specific site. Management measures often include eliminating or restricting activities that destroy vegetation, restoring grasslands and meadows that were formerly maintained by natural processes, managing vegetation to benefit aquatic species, conservation grazing, perimeter fire management/fuel reduction, and controlling/ removing invasive, non-native vegetation. The City is also currently updating its Climate Action Plan and Climate Adaptation Plan which provide guidance for incorporating conservation and resiliency into management policy and actions.

Table 2.4-14 Resource Assessments, Guidance Documents, and Open Space Restoration Activities

Open Space	Natural Resource Assessments	Current Management Activities
Pogonip Open Space	Park-wide biotic assessment, 1996 Pogonip Master Plan, 1998 Various focused work area assessments, 1999 to 2017	Prairie management (mowing and invasive plant control). Rare plant survey and habitat management. Ohlone Tiger Beetle survey.
Moore Creek Preserve	Property-wide baseline environmental assessment, 1995 Moore Creek Preserve Interim Management Plan, 2001	Prairie management (grazing and invasive plant control). Rare plant survey and habitat management. Ohlone Tiger Beetle survey.
DeLaveaga Wilderness Area	Focused work area assessments from 2010 to 2017. No comprehensive biotic assessment has been performed.	Coastal prairie mowing.
Neary Lagoon Wildlife Refuge	Neary Lagoon Management Plan, 1990 Focused work area assessments	Marsh vegetation management.
Jessie Street Marsh	Jessie Street Marsh Management plan, 1998	Marsh vegetation management.
Arana Gulch Open Space	Biotic assessment, 1996 Arana Gulch Master Plan, 2006 Habitat management plan, 2013 Invasive Weed Work Plan, 2015	Prairie management (grazing, invasive plant control, revegetation planting). Rare plant survey and habitat management.
San Lorenzo River Corridor	San Lorenzo Urban River Plan, 2003	Riparian management.

CHAPTER 3: COMMUNITY OUTREACH & NEEDS ASSESSMENT

WHAT WE NEED & WANT

Neary Lagoon Wildlife Refuge

SECTION 3.1: COMMUNITY OUTREACH

A. INTRODUCTION

Parks and recreation services play a critical role in the quality of life for residents and visitors. The *Santa Cruz Parks Master Plan 2030* (Parks Master Plan 2030) will help guide future improvements to the parks system to improve the overall experience for park users. The Parks Master Plan 2030 outreach process provided an opportunity to engage community members and solicit their feedback to help inform the recommendations. Community input not only helps the City evaluate existing conditions and current and future needs, but also identify opportunities from the perspectives of park users.

Community input was gathered through a variety of methods, including a community telephone survey, community meetings, focus groups, questionnaires, stakeholder interviews, department-wide meetings, public meetings, and a supplemental quantitative email survey to receive representative input from the general community on topics where specific interests conflict.

B. QUANTITATIVE VS. QUALITATIVE DATA

Collection of data is provided in two forms as part of this outreach process: quantitative and qualitative. Quantitative data provides usable statistics through the generation of numerical data, formulating facts and uncovering patterns in research. Qualitative research reveals trends and opinions through non-statistical data analysis that provides explorative findings which inform further decision making.

The Parks Master Plan 2030 planning process provides quantitative data through statistically valid, random telephone and email surveys that utilized a prepared questionnaire. Qualitative data was collected through information gathered from interviews, community and departmental open houses, and questionnaires that were distributed at City parks, community events, and online. The qualitative data provides subjective information with additional detail in user interests. It was provided by respondents who chose to engage in the outreach process, rather than from a random sampling.

Comparing the quantitative and qualitative data collected through community outreach enables the planning process to identify emerging patterns and consistent themes and issues regarding park system use in Santa Cruz.

C. COMMUNITY TELEPHONE SURVEY 2015

In 2015, the City of Santa Cruz commissioned Godbe Research to conduct a telephone survey of residents to inform the Parks Master Plan 2030. The 2015 survey was conducted with the following research objectives:

- Gauge satisfaction with the overall quality of life in Santa Cruz
- Understand leisure time activity and sports preferences
- Assess the usage and importance of parks, trails, and recreation facilities
- Gauge satisfaction with specific services and facilities
- Determine attitudes towards DeLaveaga Municipal Golf Course and Harvey West Swimming Pool

- Understand resident support for financial funding of programs and facilities
- Identify any differences in opinion due to demographic and/or voter behavioral characteristics.

METHODOLOGY OVERVIEW

- Data Collection: Telephone Interviewing
- Universe: Adults 18 years of age or older
- Fielding Dates: January 6 – January 11, 2015
- Interview Length: 15.7 minutes
- Interview Language: English and Spanish
- Sample Size: 304
- Margin of Error: ± 5.06%

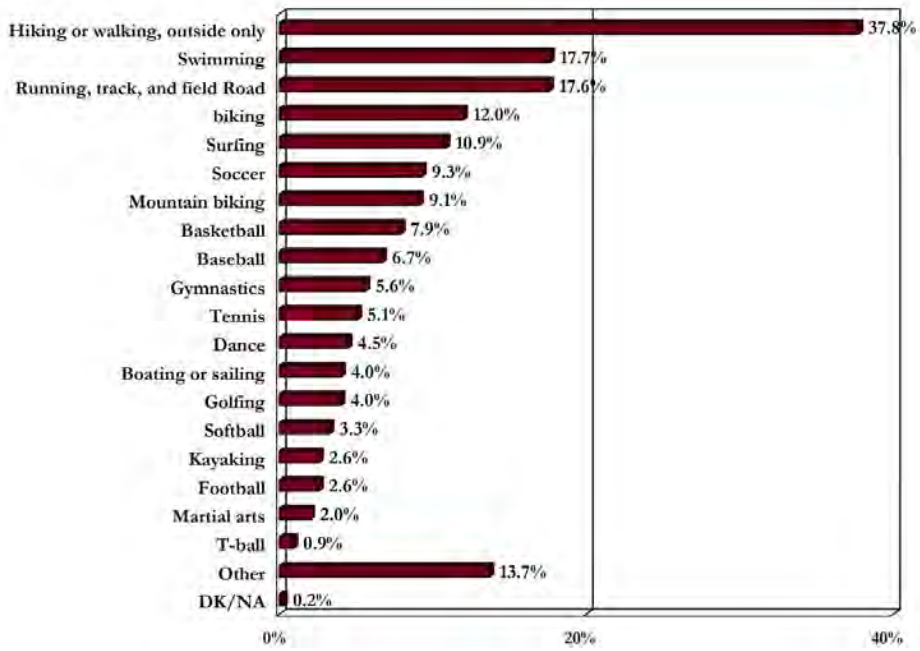
KEY FINDINGS

Quality of Life

- Santa Cruz residents enjoy their quality of life. More than 9 out of 10 respondents indicated that they were satisfied with the quality of life in Santa Cruz (92.4%).

Sports and Recreational Activities

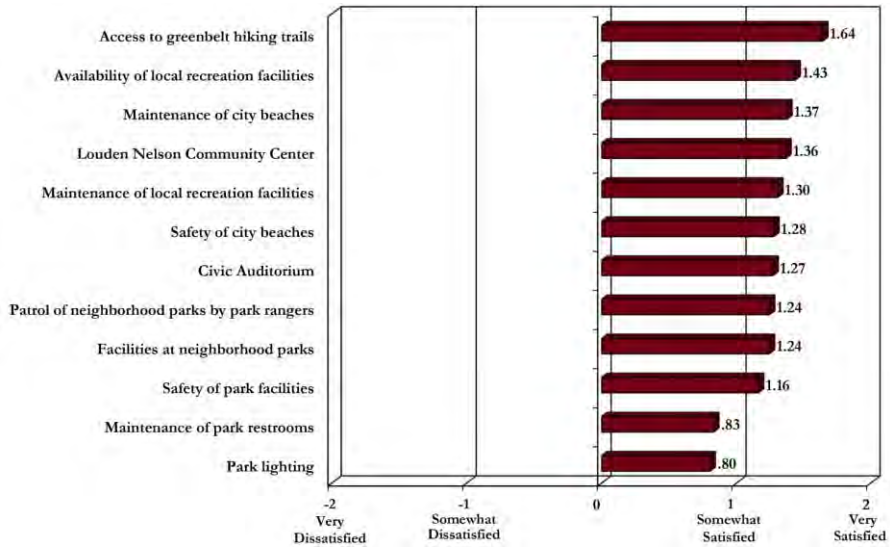
- Santa Cruz is a very active community. Respondents indicated that the top two preferences for leisure time activities include going to the beach and outdoor sports or athletic activities.
- More than three quarters of respondents indicated that a member of their household participates in an outdoor activity. The top preference for an outdoor recreation activity is hiking or walking outside.
- Respondents with children in their household tended to indicate at higher levels that they enjoyed "Basketball," "Baseball," "Surfing," "Swimming," and "T-ball" when compared to those residents without children in the household.



Recreational Activity Preferences from 2015 Phone Survey

Parks and Recreation Facilities

- A vast majority of respondents have visited City parks, trails, or recreation facilities in the past 12 months. About 46% of the households had used a walking or hiking trail in the past 12 months, 45% had used the beaches, and 43% had used a city park.
- Santa Cruz residents are highly satisfied with the parks and recreation services provided by the City of Santa Cruz. Of the services listed, park lighting and maintenance of park restrooms were the only services that fell below the somewhat satisfied ranking.



Satisfaction Responses from 2015 Phone Survey

- The availability of recreational activities such as walking, hiking, jogging, swimming, surfing, road cycling, and mountain biking are relatively more important to Santa Cruz residents than organized sports such as basketball, baseball, softball, football, and volleyball.
- The variety of recreation options is important to Santa Cruz residents.
  - All but one of the 18 sites and facilities reached or exceeded the level of somewhat important.
  - Two-thirds of the residents or more rated 8 of the 14 sports and recreational activities tested in the survey as at least "somewhat important."
  - More than 90% of respondents indicated importance for "City beaches," "Outdoor sports fields," "Open space parks," and "Trails."
  - More than 80% of residents placed importance on "Swimming pool," "Civic auditorium," 'Children's play areas," and "Community gardens."
  - More than 70% of survey respondents stated they felt "Gymnasium," "Reservable picnic areas or Harvey West Clubhouse," "Senior Center," "Teen center," "Louden Nelson Community Center," and "Dog parks" were important.
- A significant plurality of respondents (47.3%) preferred continuing to subsidize the DeLaveaga Golf Course, while a quarter (25.7%) preferred leasing the course to a private golf management company.
- Just over half of the respondents (50.9%) indicated that the Harvey West Swimming Pool should be open year round, while about a quarter (26.7%) felt the current schedule was adequate.
- A significant plurality of respondents (48.4%) believe that the parks should not be locked at night, while 38% believe they should be locked.

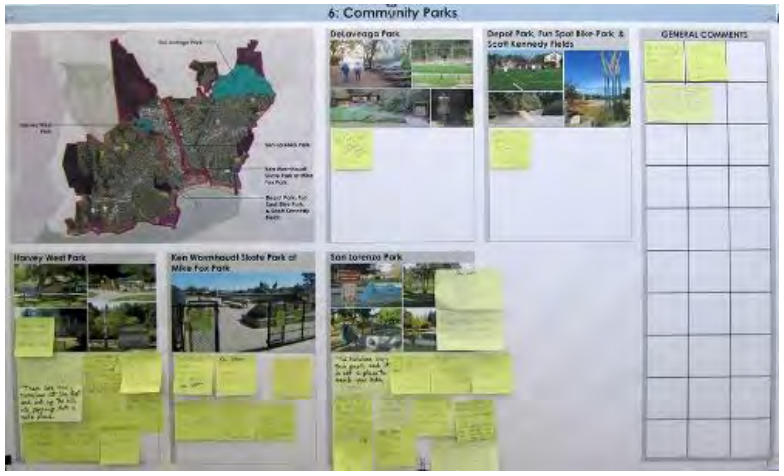
The Godbe report is available in Appendix 5.2 with a link to the report's appendices.

D. COMMUNITY MEETINGS


March 29th Community Meeting

Two open house meetings were held on March 26 and 29, of 2015, at the Louden Nelson Community Center. Approximately 60 community members attended the meetings. Community members were invited to review 12 exhibit posters and provide input by placing sticky notes onto

the exhibits or completing a questionnaire if they had more lengthy comments or suggestions. Staff, public officials, and the consultant were available to discuss topics and ideas. Spanish translators were available for Spanish translation. Appendices 5.3 and 5.5 contain presentation materials and a complete list of comments received during the community outreach process. Comments followed by a (C) were received during the community meetings.



Two of twelve exhibit posters with sticky note comments from meetings

E. STAKEHOLDER INTERVIEWS AND FOCUS GROUPS

From January 2015 to April 2015, staff and the consultant met with a variety of key staff members who manage the parks and recreation facilities as well as interested community members to hear perspectives on parks and recreation topics. Focus group discussions were held with organized sports field users, Friends of Parks and Recreation, and other interested community members. Appendix 5.6 includes comments received from stakeholder interviews and focus group meetings.

F. INTERNAL DEPARTMENT-WIDE MEETING

An internal open house meeting was held with parks maintenance and recreation personnel. Parks and Recreation staff have a unique perspective on the parks system. Not only are they park users, but they are also the day-to-day face of the Parks and Recreation Department. They hear feedback from park users regarding the parks and recreation facilities during their maintenance and recreation programming activities.

G. PUBLIC INPUT QUESTIONNAIRE AND EMAIL CORRESPONDENCE

Staff and the consultant created an English and Spanish version of a public input questionnaire. Community members were asked about their ideas and observations regarding parks and recreation facilities in Santa Cruz. The questionnaire was distributed by staff at parks and facilities. An online version was created and signs were posted at parks to inform park users of the opportunity to provide feedback. Staff had booths at six community events to answer questions and collect input through the questionnaires. Nearly 500 questionnaires and emails were received. Appendices 5.4 and 5.5 contain the general city-wide and park-specific questionnaires and the comments received during the outreach process. Comments followed by a (Q) are specifically from the questionnaire while comments followed by an (L) are from email and letter correspondence.

City staffed booth at the Santa Cruz Mountain Biking Festival on April 11, 2015

KEY FINDINGS

- Many community members describe a favorable impression of the upkeep of the parks system. Some expressed concern that maintenance should be a higher priority than expansion.
- A very high number of comments expressed concerns regarding illegal activity, safety, and cleanliness in the parks system and the desire for more enforcement.
- Sports field user groups and other community members expressed the need for more field space to accommodate off-season play and to limit use conflicts between baseball and soccer. Programs would expand if there were more fields to play-on. Harvey West fields could use renovation. Lacrosse is growing in demand and it would be difficult to accommodate the sport with the existing field space.
- Off-leash dog use is a popular activity in Santa Cruz and there is a desire for more opportunities. Some respondents expressed concerns about off-leash dog use at beaches and open spaces.
- There is a general desire for more recreational amenities and facilities throughout the parks system and more interesting playground features.
- The San Lorenzo River Corridor/Santa Cruz Riverwalk is a very important resource for community members. Many preferred more environmental restoration and learning activities; however, others requested more activities for recreation.
- Pickleball is a rapidly growing recreational activity and there is demand for more courts.
- Many expressed a desire to clean-up and add more amenities and events to San Lorenzo Park.
- Respondents shared that the Beach Flats Neighborhood area needs a permanent community garden facility.
- Mountain biking is a popular activity and there is a need for skill building areas and separated trails with obstacles. Concerns were raised regarding conflicts between bike riders and hikers, and impacts to the environment.
- Pump track bike riding is a growing recreational activity in the area and there is a desire to see more opportunities.
- Many expressed the need for more restrooms or the renovation of existing restrooms.
- Preservation and restoration of the City's greenbelts are important to the community.
- Harvey West Pool remains an important facility to teach kids how to swim and there is a need to expand the duration of the season.
- The Pogonip Clubhouse remains an important resource and there is a desire to see it restored.
- The City's beaches should remain clean and free from loose litter and debris, especially during the tourist season. Respondents noted that water quality at Main and Cowell Beaches needs to be improved.
- Jessie Street Marsh remains a challenging site and is in need of improvement.
- Parks and recreation facilities should be accessible for all users.
- More art and interpretive displays should be added to the parks.

H. 1ST JOINT STUDY SESSION WITH PARKS AND RECREATION COMMISSION AND CITY COUNCIL

On October 13, 2015, a Joint Study Session was held to provide staff with direction on topics where contrasting opinions were received during the outreach process. The high-level topics within the presentation included Safety and Illegal Activity, Neighborhood Parks, Community Parks, Open Space, Existing Facilities, and New Facilities. As part of the outcome of the meeting, a general recommendation was to continue to work through the topics with a subcommittee comprised of two Parks and Recreation Commission members and two City Council members. Below is a summary of the discussion that followed the presentation.

KEY DIRECTION

Parks Management

- Parks services must have resiliency regardless of the economy. Parks need to be funded to provide benefits to residents and visitors. Consider capacity issues in relation to staffing when seeking new development. Update the existing parks system before expanding the system further. There should be a strategic funding component of the Parks Master Plan 2030. Seek funding endowments.
- Parks and Recreation management should allow parks to evolve and be flexibly responsive to changing demands in recreation.
- Continue to seek ways to improve recreation on existing lands instead of purchasing new land. Utilize edges of existing open spaces to create more recreational opportunities rather than acquiring new land.
- Ensure that underserved communities are provided enough resources, parks, and facilities.

Parks and Recreation Facilities

- Use some of the greenbelt open space for active use. Land was originally designated for both open space and active use but the active use element has not been implemented successfully.
- Fully utilize existing parks.
- Increase the provision of sports fields. Continue the shared use of parks and sports fields. Seek creative uses of new and existing infrastructure such as locating sports fields on top of parking structures. Provide practice space throughout the City for sports teams.
- Increase mountain biking opportunities and partner with the industry to hold events. Protect hiking trails and reduce conflicts.
- Differences in opinion were expressed regarding acquiring Antonelli Pond and Lighthouse Field for the City's park system. Consider a partnership to improve maintenance of Lighthouse Field.
- Add more restrooms to parks. Some prefer the use of porta-potties for cost savings.
- Improve coordination for litter pick-up on beaches and expand the ranger program to patrol them.
- Support pickleball expansion and create dedicated courts.
- Create City-owned community gardens in every neighborhood, especially the Beach Flats Neighborhood. Consider roof-top gardens.
- Prioritize revisiting the Jesse Street Marsh Master Plan. Hold a neighborhood meeting to discuss options.
- More pump tracks including the Benchlands at San Lorenzo Park.
- Improve playgrounds.
  - Replace the wood chips with sand or rubber matting at playgrounds.
  - Build a themed 'Dennis the Menace' playground at San Lorenzo Park.
- Create a legal, supervised campground for the homeless to sleep to deter sleeping in parks.
- Civic Auditorium is not a high priority.
- Golf Course is highly subsidized and should be phased out unless it can bring in more revenue in the next five years.

- Use the Fire Department Training Structure as some kind of joint facility that can be used for recreation. For example, creating a ropes course.
- Expand the Harvey West pool use by adding times when the Simpkins Family Swim Center is not open for recreational swimming.
- Restore the Pogonip Clubhouse. Explore public-private partnerships. Release a request for proposal to explore options.
- Create more off-leash dog use areas.
- Create a Coastal Recreation Zone to showcase the natural resources and coastline and improve the coordination between multiple agencies.
- Support the Riverwalk project and activate the entire length of the river with art and lighting.
- Renovate Harvey West Park as it is currently underutilized.
- Establish better connectivity between existing parks by identifying gaps to close them.
- Recognize that natural areas are valued and are utilized through their preservation.
- Consider all users in design and expansion of system (ADA, seniors, etc.).

Safety and Security

- Safety and security are paramount. Increasing ranger patrols, lighting, activating parks with new amenities (low cost if possible), and park hosts should be explored as a way to help address safety issues. Park hosts could be tied to new restrooms to keep them clean and safe.

Appendix 5.7 contains the presentation from the Joint Study Session.

I. PARKS MASTER PLAN SUBCOMMITTEE MEETINGS

The Parks and Recreation subcommittee meetings were held on January 13, March 28, and April 4, of 2016, to provide staff direction on contentious issues and help develop policies and actions for the plan. The following feedback was received during the meetings:

KEY DIRECTION

Visioning

- Parks and Recreation enhances the quality of life of residents and visitors. Connectivity is important as the City moves in a sustainable direction. The City's natural heritage should be preserved and protected while providing experiences for a diverse community.

Parks and Recreation Facilities

- New off-leash areas should be fenced-in. A target for off-leash dog use areas should be created for each area of the City.
- DeLaveaga Park needs improved connectivity.
- Consider adding lights to Depot Field to optimize field space. More opportunities are needed for organized sports groups.
- Harvey West Park needs renovation.
- Renovate San Lorenzo Park and create a variety of opportunities, especially for families and youth. Create a safer environment. Increase programming, such as yoga in the park, and hold more events to draw people.
- Moore Creek Open Space Preserve needs improved access to the open space. Explore creating a parking area off of Highway 1.
- Pogonip is an open space and should not be used to locate sports fields. Restore the clubhouse. Minimize conflicts between hikers and bikers.
- The Santa Cruz Riverwalk is an important community asset and needs continued efforts to improve the area.
- The coastal area needs a more cohesive, consistent identity and needs a vision and plan to improve the long-term management and coordination between multiple agencies.
- The beach areas need to remain free of litter and debris and safe from illegal activity. Availability of bike parking should be increased and cyclists should feel confident they can park their bikes without fear of theft.

- The Louden Nelson Community Center is an important resource that needs some renovation. The park does not always feel safe for families.
- Need to use the plan to help fund improvements to facilities.

Safety and Security

- Park hosts could be a great program to help care for parks and could potentially create workforce housing opportunities. Avoid landlord tenant situations and instead provide hook-ups for an RV/Trailer.
- Volunteer docents could help monitor and care for parks.

Appendix 5.8 contains the agendas and presentations made at the March 28th and April 4th meetings.

J. COMMUNITY EMAIL SURVEY 2016

The outreach process identified several issues that needed more feedback from a representative sample of the community to inform the recommendations in the plan, resulting in a second survey being conducted in 2016. The first set of questions followed the same general format as the initial survey. The second set of questions allowed for more detailed feedback on specific areas and topics.

METHODOLOGY OVERVIEW

- Data Collection: Online interviews from email invitation
- Universe: Adults 18 years of age or older
- Fielding Dates: September 29 to October 12, 2016
- Interview Language: English and Spanish
- Sample Size: 314
- Margin of Error: ± 5.06%

KEY FINDINGS

Quality of Life

- At 72.4%, the reported satisfaction level of respondents in the 2016 survey was lower than the 2015 survey rate of 92.4%, though still quite high.

Sports and Recreational Activities

- Santa Cruz continues to be a very active community with 89.5% reporting that their household participates in fitness, athletic or sports activities in the 2016 survey compared to 77.5% in 2015.
- Comparing both surveys, the activities that respondents or members of their household participate in were very similar. Hiking or walking was the highest ranked. Swimming, running, road biking, mountain biking, surfing, and soccer scored in the medium tier.

Parks and Recreation Facilities

- As in 2015, a vast majority of respondents have visited City parks, trails, or recreation facilities in the past 12 months with only 0.8% using facilities less than once a year and 2.8% unsure of usage.
- The 2016 survey allowed for a more detailed response on park usage, with 78.4% of respondents indicating they visit a park, trail, beach and recreational facility at least a few times a month, and nearly 50% indicating a few times a week.
- Beaches had the highest percentage of usage at 82.7% followed by walking and hiking trails at 80.5%, parks at 75.6% and bike paths or lanes at 46.2%.

Parks and Recreation Satisfaction & Preferences

- Respondents were generally satisfied with the maintenance of local recreation facilities, with 62% being either very or somewhat satisfied, though restroom maintenance satisfaction was lower at 42.3%

- Regarding safety of facilities, only 52.5% replied satisfied with park safety, though 65.5% were satisfied with safety at City beaches. Park lighting satisfaction was less positive, with a total satisfaction rate of 50.5%. Patrol of neighborhood parks by park rangers also received a lower rating at 44.9%.
- The availability of local recreational facilities received a high satisfaction rating of 72.5%.
- 66.2% of respondents were satisfied with facilities at neighborhood parks.
- Satisfaction for access to greenbelt hiking trails was high at 70.3%, though satisfaction ratings on mountain bike trails was lower at 44.4%.

Importance of Recreational Activities & Frequency

- In line with usage responses, walking, hiking and jogging were extremely important activities for survey participants with 99.4 % of respondents ranking this as very important or somewhat important. Other sports ranking greater than 50% in importance were mountain biking and soccer.
- Facilities ranking highest in importance in descending order were open spaces with park amenities, undisturbed open spaces, paved trails, unpaved trails, children's play areas, outdoor sports fields, community gardens, mountain bike trails, and fenced and unfenced off-leash dog areas.

Park Planning Preferences

Survey results were very mixed on park planning preferences.

- For sports fields, there was more support than other activities with 52.3% of respondents favoring an increased number of sports fields. When asked where these fields should be built, contributors split evenly between using Pogonip, buying industrial land, and partnering with the school district for joint-use of its facilities.
- Three questions addressed the use of greenbelts as future resources for park planning. Responses on the question of building sports fields, trails, playgrounds and park amenities in the greenbelts were 52.3% in favor with 30.9% opposed. Regarding trail use in these spaces, 75.7% of respondents supported creating additional trails. When asked what type of trails, 49.2% were in favor of multi-use trails; 26.1%, hiking only; and 11.1%, downhill mountain biking, separating mountain bikers from hikers. 0% indicated downhill trails with berms and obstacles.
- Respondents were asked for their opinions on the use of San Lorenzo Park in a series of seven questions. Only 16.3% wanted to keep the park as is. All questions regarding changes in events or features received favorable responses with the strongest support for hosting more events and programs, expanding facilities and activities, creating a food truck court and renovating the playground. Improved San Lorenzo River access was supported by 62.9% of respondents.
- Other survey responses included:
    - Respondents were neutral on the question of striping tennis courts to accommodate pickleball with 21.1% favoring and 25.9% opposing.
    - There was strong support for more restrooms (79.1%).
    - Many respondents (42.2%) felt that they have sufficient off-leash dog areas near their neighborhood compared to 21.6% who felt they do not.
    - Responses on fencing and locking parks at night were inconclusive with 42.1% having mixed opinions.
- When asked if they would be willing to contribute financially to supporting programs and facilities, 80.2% of the respondents responded favorably.

The Godbe Report can be referenced in Appendix 5.2.

K. 2ND JOINT STUDY SESSION WITH PARKS AND RECREATION COMMISSION AND CITY COUNCIL

On February 7, 2017, a study session was held to receive feedback on the draft Parks Master Plan 2030. Feedback was received prior to the meeting that there were concerns regarding some of the draft recommendations and priorities. The Joint City Council and Parks and Recreation Commission approved a motion to work through identified issues, refine and establish priorities, clarify recommendations through a series of Parks and Recreation Commission meetings and return to Council with the revised plan and action plan for final review and adoption by the summer 2017. Policies would be added to the plan to increase fruit tree plantings. Councilmembers and Commissioners provided feedback on the draft and process.

KEY DIRECTION

CEQA Process

- Review the environmental review process so that there is clarity for the public, City Council, and Commission.
- Place more attention on separating the recreation and open space sections of the plan.
- Environmental review should be done for new trails. Need to ensure that the trails neither restrict wildlife movement across corridors nor degrade habitats.

Implementation Chapter

- Improve the link between the recommendations section and the funding strategies in the PMP. Both chapters should have more continuity to findings and data from the PMP process. Need to map community's future.
- Implementation strategy needs improvement.
- More discussion on how to reach the standards for acreage per capita for parks since SC is short in acreage.
- Important that the long-term plan can change with time.
- Remove cycling from active recreation and place in passive recreation.
- Consider hiring a grant writer for the department.
- Explore an endowment fund.
- Happy to see the Wharf and Civic are separate projects outside of the Parks Master Plan.
- Parks are underfunded. Need to partner with more stakeholders and look at the State's funding models.
- Need to have a firewall between Ranger's budget and the Parks and Recreation Department budget to ensure that programmatic cuts do not affect park services because of an increase in overall spending on the Ranger's budget.
- More strategic about how we seek State funding.
- Look at multiple locations for pickleball. Do not focus on a tournament facility. Concern for converting tennis courts to pickleball courts.
- Teach more youth skateboarding.
- Clarify the goal for Harvey West Pool.
- Create equal access for the public for recreational activities.
- Support for mountain biking in Pogonip but not at the Spring Trail (which is not being recommended in the draft). Supportive of providing more connectivity, such as from Harvey West Park to Pogonip Open Space.
- Off-leash areas near hiking trails help dogs release energy before a hike and the B-40 off-leash dog use area works well and could be considered near the Golf Club Drive to Spring Trail connection in Pogonip Open Space.
- Bike valet for special events.
- Supports community fruit gardens and orchards.
- Look further into the trade-offs and environmental effects of synthetic turf fields.
- Improve the tie-in of the Santa Cruz Riverwalk recommendations.
- More attention needs to be given to Lighthouse Field and the City's intentions.
- Public spaces need to be a shared-use to include all people.
- Interested in linear park to connect East and West Cliff Drives - stretches across the City.

- Focus on health equity and be purposeful. Don't only think about an aging population but also consider our youth. Do the people who access the programs reflect our population?
- Public safety is important. When increasing the Ranger's monitoring, where are populations displaced to?
- Partnerships are an important theme and one could be envisioned for the Pogonip Clubhouse.
- Use existing facilities in a more robust way.
- Mountain biking access will require careful consideration.
- Mountain biking is welcome but not everywhere.
- More money needs to be set aside for restrooms and the purchase of the Beach Flats Community Center.
- Extend the hours of the Harvey West Pool.
- Offer valet bike parking Downtown.
- Consider a linear park on Pacific Avenue with moveable street furniture.
- Improve the relationship between existing master plans and the recommendations.
- Protect our precious resources. New trails may inspire future generations of stewardship but there are also real concerns for erosion and damage to the environment. Biking community needs more self- policing.
- Incorporate comments from the River Summit into the plan.

Conservation and Stewardship Chapter

- Seek more native plant restoration throughout the parks system.
- More natural restoration.
- Find more balance between the community and environment.
- Work with UCSC to improve policies and actions.
- The plan represents the commercialization of the parks system and does not discuss natural restoration sufficiently.

L. COMMUNITY OUTREACH SUMMARY

The community outreach process produced a sampling of information and feedback for the City of Santa Cruz. It created an opportunity for residents to be heard and to offer their views, input, and desires. Staff estimates that more than 1,600 members of the public participated in the process. The information received from both the quantitative data and qualitative input informed the Parks Master Plan 2030 "Recommendations, Goals, Policies and Actions" which will ultimately help meet the needs and wants identified during the process. Additional information was collected after the draft Parks Master Plan 2030 was released to the public.

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SECTION 3.2: EMERGING TRENDS

A. Introduction
B. Demographic Trends
C. Recreation Trends
D. Programming Trends
E. Additional Park & Recreation Trends

A. INTRODUCTION

In order to set goals and make appropriate recommendations for the future development and maintenance of Santa Cruz's parks, open spaces, beaches and facilities, it is critical to understand emerging trends amongst local user groups as well as national trends in parks and recreation.

A variety of resources were referenced to more fully understand the trends in parks and recreation. These include reports from the National Recreation and Park Association, California State Parks, Learning Resources Network, Outdoor Resources Review Group, Outdoor Industry Association, Recreation & Tourism Initiative, relevant online journals, and Roper ASW.

B. DEMOGRAPHIC TRENDS

As discussed in section 2.3 Community Profile, Santa Cruz has a diverse population. Though there is a large percentage of residents aged 18 to 64, there are significant populations in other age groups as well. By anticipating the needs of each age group, resources and efforts can be focused to ensure there are minimal gaps in service to the community.

ADULTS & YOUNG ADULTS

Adults and young adults are actively participating in newer recreational experiences, including extreme sports and adventure sports. They are generally waiting longer to marry and start families, so recreational activities are more friend- and group-oriented than in past generations, where they have been more family-oriented.

Cowell Beach

UNDER 18

The younger generation is becoming more sedentary and solitary due to technology.[1] For future generations, it is important to encourage outdoor recreation for social and health benefits.

Junior Lifeguard Program at Cowell Beach

BABY BOOMER GENERATION

As the Baby Boomer generation retires, they continue to be very active and are especially looking for amenity-rich and meaningful recreation experiences. In particular, they are drawn to conservation and heritage initiatives.[2]

Touring Pogonip Open Space through the Walking Adventure Group Program

SENIORS

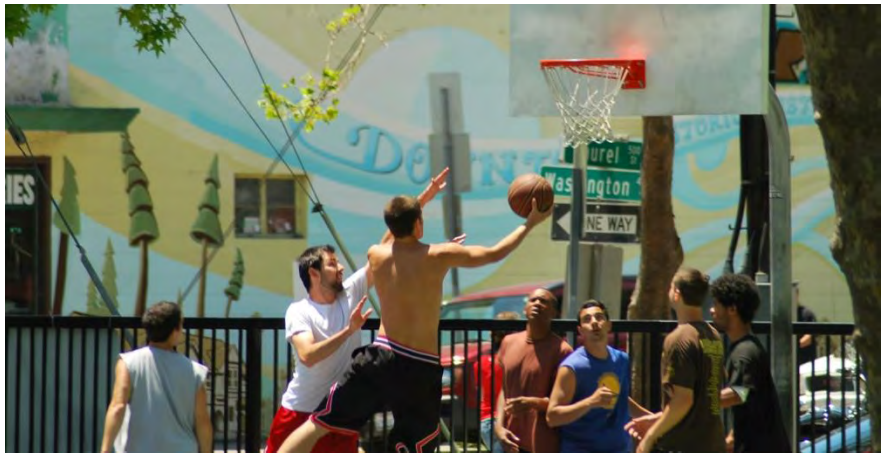
Adults aged 65 and older comprise nearly ten percent of the City's population. This population is growing and it will be important to tailor facilities and programs to meet their needs and interests. Seniors are increasingly active, with a particular desire for both pedestrian and bicycle trails. An increase in active seniors may require a necessary expansion in therapeutic recreation and exercise programs.

Line dancing class for seniors at Louden Nelson Community Center

C. RECREATION TRENDS

HEALTH, FITNESS, & LIFE-LONG SPORTS

According to the National Park & Recreation Association, walking, running, biking, and swimming continue to dominate the list of top ten recreational activities. This is in part due to an increased concern for health and fitness. Rather than joining a gym, many are participating in these low-cost individual activities that can start in childhood and continue into adulthood with little financial commitment. These activities are key in the effort to combat childhood obesity as well. Parks and Recreation departments are creating programs and events for both children and adults to provide incentives for exercising.



Pick-up basketball game at Laurel Park

TEAM SPORTS

Another continuing trend is participation in team sports, which also provides an excellent outlet for increased health and fitness. In particular, there is a participation increase in soccer, lacrosse, field hockey, and rugby, while there has been a decrease in participation in softball and baseball.


Scott Kennedy Fields, Depot Park

ADVENTURE SPORTS AND RECREATION

As previously mentioned regarding trends amongst adults and young adults, adventure sports are becoming very popular. In particular, there is a new trend towards extreme and adventure sports. The Outdoor Industry Association noted an increase in the popularity of adventure racing, traditional and off-road triathlons, stand-up paddling, kayak fishing, trail running, kayaking, and mountain biking. To accommodate these new sports, facilities and appropriate programming within existing parks and facilities should be considered. Santa Cruz has been a leader in many of these trends.


Emma McCrary Trail, Pogonip Open Space

D. PROGRAMMING TRENDS

MULTI-GENERATIONAL PROGRAMMING

In the past, parks and recreation programming has often been geared towards younger children. Now there is an emerging trend toward programs and events for all age groups. This includes multi-generational programs and events for families to enjoy collectively as well as more targeted niche programs specifically aimed at teens, adults, and the elderly.[3]

Ping-pong at the Depot Park Freight Building

ENVIRONMENTAL PROGRAMS & EDUCATION

Santa Cruz has been at the forefront of environmental responsibility. And now, with recent droughts and concerns regarding climate change, there continues to be a strong desire for environmental programs and education as well as ensuring that any changes and developments to new and existing parks consider environmental implications. One element of environmental education is the installation of interpretive signage for flora, fauna, and natural processes along trails and waterways – a request that was persistently reiterated by community members and key stakeholders during the outreach process.

Interpretive panel at the Santa Cruz Riverwalk

SPECIAL OUTDOOR EVENTS FACILITIES

The National Recreation and Park Association noted a growing attendance in major special events, such as concerts, festivals, fairs, and parties. To accommodate these events, it is important to have enough group picnic areas, outdoor stages and amphitheaters, and indoor auditoriums with up-to-date equipment that are accessible to all user groups.

Food Truck Event at San Lorenzo Park Benchlands

OUTDOOR EDUCATION

Along with the trend towards health and fitness recreation, there is also a trend towards activities with a learning or educational component. From the environmental standpoint, this corresponds with the previously mentioned interpretive signage. From the recreational perspective, as emerging sports gain popularity, new park and facility users can be recruited by offering instruction and skills classes.

Example of an outdoor classroom for educational programs

COOPERATIVE PROGRAMMING

In order to attract participants, cooperative, consortium based programs should be offered, which allow several communities or organizations to form partnerships to jointly offer programs. These programs can utilize and share the best resources that the communities or organizations can collectively offer. This can eliminate duplicate programming and attract a larger group of participants to each program.

ADAPTIVE & INCLUSIVE PROGRAMMING

Outdoor and adventure programming for persons with disabilities is a growing trend amongst recreation providers. Along with programs tailored towards those with disabilities, programs designed for inclusive participation provide opportunities for those with and without disabilities to recreate side by side. People without disabilities tend to have more positive impressions and greater acceptance of people with disabilities after engaging in inclusive outdoor recreation programs.[4]

E. ADDITIONAL PARK & RECREATION TRENDS

ACCESS

With an increasingly urban population that relies on public transportation and alternative means of transit, such as bicycles, as a primary mode of transport, the development of comprehensive transportation and bicycle trail networks is crucial. Creating direct linkages between parks and facilities will help to maintain and encourage their usage as well.

There is a continuing trend to provide increased park and facility access for those with disabilities. At the most fundamental level, this involves removing existing physical barriers at parks and facilities. But this trend also incorporates increasing opportunities for inclusive participation in recreational activities by providing equipment that is accessible to those of all mental and physical abilities.[5] For instance, playgrounds can integrate play equipment with features that appeal to and are accessible to those with and without disabilities, allowing for inclusive play.

Magical Bridge Playground Palo Alto

MARKETING

The trend in marketing and information distribution is towards utilization of technology, which has become the primary means by which most people gather information about use of parks and facilities as well as programming and special events.[6] This includes having an easily navigable and comprehensive website with maps, brochures, and online registration. Potential park, facility, and program users can be reached by utilizing email newsletters and social media as well.

MANAGEMENT

There are also trends in the management of parks and recreation departments towards smooth, cost efficient operation and streamlined interaction with the public. According to the Learning Resources Network, there is a trend in registration patterns towards people registering in-person and on the day of events.[7] With so many competing options for recreation, people often do not sign up in advance, wanting to leave themselves open to possible alternative opportunities. This inundation of day-of registrants needs to be accommodated with better customer service so that the parks and recreation department's programs can successfully compete for participants.

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[1] California State Parks Planning Division (see reference 1).
[2] California State Parks Planning Division (see reference 1).
[3] Learning Resources Network. (2015). *Top Trends in Recreation Programming, Marketing and Management.* Retrieved from http://www.lern.org/blog/2014/07/07/top-trends-in-recreation-programming-marketing-and-management/
[4] Williams, R., Vogelsong, H., Green, G., and Cordell. K (2004). Outdoor Recreation Participation of People with Mobility Disabilities: Selected Results of the National Survey of Recreation and the Environment. *Journal of Park and Recreation Administration, 22:2,* 85-101. Retrieved from http://srs.fs.usda.gov/trends/pdf/ORDisabilities04.pdf
[5] Williams et al (see reference 6).
[6] Learning Resources Network (see reference 5).
[7] Learning Resources Network (see reference 5).

CHAPTER 4: IMPLEMENTATION

WHERE WE'RE GOING & HOW WE'RE GETTING THERE

Bird’s Eye View of Depot Park, Bicycle Trip Bike Park, and Scott Kennedy Fields

SECTION 4.1: GOALS, POLICIES & ACTIONS

A. VISION

The Santa Cruz Parks Master Plan 2030 (Parks Master Plan 2030) envisions a quality park system that connects the surrounding greenbelts to the Pacific Ocean, preserves and protects its natural heritage, enhances its cultural and recreational environments, and provides a diversity of experiences that enrich lives and support a healthy community.

B. GOALS FROM THE SANTA CRUZ GENERAL PLAN 2030

The goals from the Parks, Recreation, & Open Space chapter of the City of Santa Cruz General Plan 2030 were referenced continuously during the development of the goals, policies, and actions for the Parks Master Plan 2030 in order to ensure compatibility and comprehensive coverage. Concurrently, the Parks Master Plan 2030 expands upon the City of Santa Cruz General Plan 2030 goals in order to more fully support the Vision statement above. The General Plan 2030 goals are included here for reference:

- **Goal PR1**: Ample, accessible, safe, and well-maintained parks, open space, and active recreational facilities
- **Goal PR2**: High-quality, affordable recreational programs, activities, events, and services for all
- **Goal PR3**: Well managed, clean, and convenient public access to open space lands and coastline
- **Goal PR4**: An integrated system of citywide and regional trails

C. THEME FRAMEWORK

The City developed a framework of six themes for the Parks Master Plan 2030 that act as indicators of a healthy, balanced, and functional parks system.

Grant Park

These themes are used as both a filter and framework for synthesizing the information gathered during the outreach phase into the goals, policies, and actions of the Parks Master Plan 2030. In short, they provide the context for developing goals that align with the City's vision.

THEME 1: DESIGN EXCELLENCE

The City will set a standard of design excellence with the aim of creating an engaging, long-lasting, safe, comfortable, and sustainable park system. By holding the design of the City's parks and facilities to a high standard, assets will attract and retain more users from the community.

THEME 2: PLAY, COMMUNITY HEALTH, & INTERACTION

Parks and public spaces will encourage and support play, health, and interaction. The City will provide places to engage in a multitude of recreational activities, including supporting new trends in recreation. The physical infrastructure of parks and facilities will support and promote public health. Parks will provide opportunities for people to engage in activities together as well as to be active independently.

THEME 3: STEWARDSHIP & SUSTAINABILITY

The City will protect and conserve natural resources while providing opportunities for the community to both support and learn from the natural environment. Impacts from recreational use will be minimized and additional efforts will be undertaken to restore and expand natural habitats.

THEME 4: CONNECTIONS AND ACCESS

The City's network of parks, open spaces, beaches and public spaces will continue to make all assets accessible to residents and visitors of all ages and abilities. A trail system will link the various destinations. Access will be maintained to the open spaces and beaches, and efforts will continue to ensure that use of these areas neither diminishes the quality of the experience nor degrades the environment. The City will continue to seek new opportunities to provide and enhance connections and access for recreation, supporting an active and healthy lifestyle and encouraging the use of alternative modes of transportation across the city.

THEME 5: PARTNERSHIPS

The City will strive to partner with schools, the university, other public agencies, and private service providers to provide recreation and natural restoration services to improve efficiency and coverage. Partnerships will help reduce redundancies within the existing parks system, freeing up resources that can be directed towards assessing and meeting unmet needs.

THEME 6: GOOD GOVERNANCE

In order to practice good governance, the City will be transparent and accountable in its decision-making process, while being responsive to the community's needs and open to community participation. Good governance will aid in promoting the community's confidence in the City to not only expand the parks system, but to also manage, maintain, and improve the existing resources and programs.

D. GOALS, POLICIES, & ACTIONS

The following seven goals were developed during the Parks Master Plan 2030 process to guide the future development and maintenance of the City of Santa Cruz's parks, open spaces, beaches, and recreational facilities. These goals are based on community input, direction from the City Council and Parks & Recreation Commission, and an understanding of current needs as well as emerging trends in recreation. The goals also serve to comprehensively address each of the themes detailed above, and the icon for the applicable theme or themes will be noted in relation to each goal. Ultimately, the implementation of these goals will be achieved through the identified policies and actions enumerated below.

PARKS MASTER PLAN 2030 GOALS

GOAL I. Design

- Provide attractive and sustainably maintained parks and facilities throughout the City.

GOAL II. Distribution

- Provide ample parks and facilities throughout the City.

GOAL III. Facilities

- Provide parks and facilities to meet the existing and emerging needs of residents and visitors of all ages and abilities.

GOAL IV. Conservation & Stewardship

- Protect the City's natural resources, wildlife habitat, and environment.

GOAL V. Safety

- Maintain a safe, clean, and comfortable environment for all park users.

GOAL VI. Connectivity and Access

- Provide an integrated park system with clean, convenient access to parks, open spaces, and the coastline.

GOAL VII. Administration & Management

- Establish, maintain, and operate parks, facilities, and programs in a manner that is cost effective and manageable while engaging the community in a manner that maximizes involvement and support.

GOAL I. DESIGN

Provide attractive and sustainably maintained parks and facilities throughout the City.

Well-designed and engaging parks and facilities attract users and foster community involvement and interaction. Throughout the outreach process, the Santa Cruz community has indicated a desire for improvements in quality, maintenance, and amenities at existing parks and facilities. Some of these improvements are more focused on sustainability, such as conserving resources, creating habitat, and reducing erosion and sedimentation. Other desires focused on creating attractive and interesting parks, facilities, and programs that offer unique and egalitarian access. National trends suggest that park users are looking for more unique experiences and programming is becoming more multi-generational. Feedback received during the outreach process supports these trends.

POLICY A. Design, upgrade, and maintain parks and facilities with sustainable features and green building best management practices.

Use native, drought-tolerant planting that enhances biodiversity

ACTION 1. Use sustainable landscaping design and maintenance practices to conserve water, prevent erosion and run-off, and provide habitat and food sources.

a. Investigate and implement the use of recycled water for irrigation.
b. Update irrigation systems to be weather-based, monitored, and controlled remotely.
c. Continue to conduct landscape audits for all parks, and incorporate results into budgetary decisions for upgrading systems and scheduling irrigation.
d. Replace turf in non-recreational areas with water-conserving landscapes, native plantings, and demonstration gardens. Include educational displays describing the environmental benefits.
e. Select materials and native plants to enhance biodiversity and attract pollinators and birds in parks.
f. Increase the number of trees and tree canopy to increase carbon sequestration, reduce heat island effect, and provide habitat.
g. Expand the dedication planting program to plant more trees.


Solar panels can be installed on facilities


Drinking fountains with water bottle fill

h. Increase the number of bioswales and continue to implement stormwater erosion best management practices to reduce runoff, erosion, and sedimentation.
i. Incorporate edible and medicinal landscaping treatments within parks and establish community gardens and orchards.

ACTION 2. Employ energy conserving practices to reduce energy use and produce clean energy.

a. Install computer controlled, energy-efficient lighting in parks and facilities. Minimize light spillover and wildlife impacts.
b. Install solar products or panels to provide clean energy for lights, new shade structures, or on larger facilities such as Harvey West Pool, the Golf Course Driving Range's deck, and/or the Louden Nelson Community Center.
c. Implement the Climate Action Plan's short-term and long-term projects.

ACTION 3. Use water conserving practices to reduce potable water use.

a. Install additional waterless urinals and low flow fixtures in parks and facilities.
b. Investigate water capture and reuse for large water users such as the DeLaveaga Golf Course.
c. Consider installing composting toilets in remote restrooms.
d. Install recycled water systems in facilities for watering adjacent landscapes.
e. Increase the number of drinking fountains with water bottle fill station features.

POLICY B. Design, renovate, and maintain parks to be attractive and functional, increase longer-term use, optimize space, and enhance the unique identity for each park.

Picnic shelter at San Mateo Shoreline Park

Custom fence and gate at Riverside Gardens

ACTION 1. Enhance man-made and natural settings when renovating parks through the use of complementary materials, colors, and features and the compatible placement, size, and layout for site furnishings, landscaping, pathways, plazas, artwork, and architectural features. Highlight key natural features in the design.

ACTION 2. Consider design features and site furnishings that add character and are not replicated in every other community.

ACTION 3. When feasible, replace asphalt pathways with decorative, permeable, hardscaped pathway surfaces.

ACTION 4. Create colorful and artistic expressions of landscape and garden design.

ACTION 5. Consider the function of landscaping in relation to the surrounding setting.

a. Install native plants in areas abutting open spaces, waterways, or other natural surroundings.
b. Install ornamental plantings along streets, at entrances, along primary pathways, around plazas, or other architectural features.

ACTION 6. Ensure that new parks have at least one street frontage for increased visibility, safety, and access.

ACTION 7. Work with the Arts Commission to incorporate interactive art and interpretive signage to highlight cultural, art, and historic elements within parks. Consider developing an Art in the Parks program.

ACTION 8. Carefully coordinate the site furnishings, plazas, pathways, passive and active recreational features and spaces, and landscaping to create meaningful experiences, minimize conflicts between new and existing uses, and optimize use.

Bench at San Lorenzo Park incorporates art with a function

ACTION 9.	Increase the number of bike parking spaces throughout the parks system.
ACTION 10.	Provide an adequate level of service of restroom facilities and renovate existing restrooms to maintain a clean, safe, inviting appearance. Place restrooms at larger or more extensively used neighborhood parks.
ACTION 11.	Develop and periodically update a site materials, colors, and site furnishings list to ensure continuity in overall park style and design.
ACTION 12.	Maintain a signage program and other features that help maintain a united identity for the parks system as a whole.
ACTION 13.	Increase the replacement of the deteriorating concrete garbage cans with decorative or BearSaver cans to improve appearance and increase recycling.
ACTION 14.	Invest in quality materials and newer designs, technologies, and products that will use less resources over time and ensure that preventative maintenance schedules are followed to maintain their appearance and function.

POLICY C. Improve accessibility for all users to all parks and facilities.

Access ramp to beach

ACTION 1.	Improve access for disabled users. a. Consider improvements to increase beach and open space access for disabled users. b. Increase accessible parking near facility and park entrances and trailheads. c. Consider Universal Design principles when locating new recreational facilities to accommodate use by all users.
ACTION 2.	Consider the needs of seniors in circulation and park design and expand recreational facilities for seniors.
ACTION 3.	Provide fitness facilities for all users and encourage multi-generational play spaces.
ACTION 4.	Seek additional community garden space in higher density or lower income areas.
ACTION 5.	Increase bilingual services, programs, and signage, especially in areas where English may not be the primary language for larger populations of residents.

GOAL II. DISTRIBUTION

Provide ample parks and facilities throughout the City.

All neighborhoods and residents in the City should have equal access to quality parks and facilities. During the outreach process, some residents expressed concern about a lack of parks or facilities within close proximity to their neighborhood. Therefore, as new opportunities arise, the City will look at the distribution of existing parks and facilities. As the following policies and actions illustrate, the City will purchase or lease new property where it is most needed, and explore partnerships to improve opportunities for recreation. National trends indicate an increase in health and fitness sports that are easy and inexpensive to participate in, while the Godbe surveys conducted in the Santa Cruz community showed that walking, hiking, and jogging are three of the most popular activities amongst residents. Additionally, studies find that children under 18 are becoming more sedentary and solitary because of technology, so it is important to encourage outdoor recreation for social and health benefits. To support the national trend and findings of the Godbe surveys as well as empower children to recreate outdoors, it is crucial to provide easy access to nearby parks and facilities.

POLICY A. Distribute recreation amenities evenly throughout the community.

Opportunity to add amenities and furnishings at Round Tree Park

ACTION 1. Continue to seek opportunities to purchase or lease additional parkland: 1) in areas that lack existing parks and amenities in close proximity, 2) larger properties that can accommodate a variety of recreational facilities, 3)underutilized land, 4) higher density growth areas, 5) or properties with significant cultural heritage.

ACTION 2. Explore opportunities for partnerships to use land within or adjacent to the City to help provide facilities to meet unmet needs. Examples include improving the joint-use agreements with the school district to allow public use of outdoor recreational areas during non-school hours, working with UCSC to provide pickleball striping at the tennis courts at 207 Natural Bridges Drive, and partnering with the County to provide recreational facilities on the vacant, adjacent parcel near the lawn bowling facility at San Lorenzo Park.

ACTION 3. Evaluate all lands, regardless of size, for the development of small parks and facilities.

ACTION 4. Improve the Joint Use Agreements with the School District to improve access and more clearly define roles and responsibilities, funding, enforcement, and repair to ensure facilities and play areas remain open and in good condition during agreed upon public use times.

GOAL III. FACILITIES

Provide parks and facilities to meet the existing and emerging needs of residents and visitors of all ages and abilities.

Of equal importance to the quantity and distribution of parks and facilities is the quality of their amenities. These amenities should meet residents' current and anticipated needs, while also providing unique and interesting experiences that encourage repeated use. The following policies reflect feedback from the community outreach process as well as unmet needs identified by the City. Both suggest a need for more sports fields, bike amenities, indoor recreational space, and off-leash dog areas. The City also plans to develop diverse and iconic playgrounds that serve users of all abilities. National studies suggest that adults and young adults are creating new alternative recreational experiences faster than ever before, so it is crucial for parks and facilities to have the flexibility to meet these new and emerging trends in order to best serve the community as a whole. Additionally, the number of seniors will continue to grow, creating an increased desire for facilities and programs that cater to their needs.

POLICY A. **When adding new uses to neighborhood parks, consider how the use meets unmet needs of the community in addition to meeting needs of the surrounding neighborhood.**

POLICY B. **Scale recreational facilities to neighborhood parks that are compatible with the neighborhood character.**

Playground at Trescony Park

ACTION 1. Continue to hold neighborhood meetings to help inform the addition, modification, or removal of recreational facilities.

ACTION 1. Provide neighborhood park uses including, but not limited to, off-leash dog use areas, ball fields, skateboard parks, tennis courts, basketball courts, ping-pong tables, playgrounds and tot-lots, climbing and exercise equipment, slack-lining, pickleball courts, community gardens, pump tracks, bocce courts, disc golf courses, horseshoe pits, picnic areas, sand volleyball courts, when designed to minimize impacts to the surrounding neighborhood.

ACTION 2. Considerations in design should include minimizing potential impacts of light spillover, attenuating noise, and providing appropriate tree screening.

POLICY C. **Consider increasing the scale and uniqueness of each type of recreational facility located in a community park setting. Provide uses and experiences that are not common in neighborhood parks in order to draw use from the whole community.**

POLICY D. **Accommodate the need for more active sports fields for club, league, and casual play.**

Youth club baseball game at Lower DeLaveaga Park

ACTION 1. Conduct an athletic field feasibility study to explore locations and options for additional multi-use field space (i.e. can accommodate soccer, football, lacrosse, rugby, field hockey, baseball, softball, etc.) and the use of synthetic turf to increase the duration of play.

ACTION 2. Explore or expand more cooperative agreements with the Santa Cruz City School district and UC Santa Cruz for the use of sports fields.

ACTION 3. Ensure sports fields have adequate drainage and lighting to increase the duration of play. Carefully consider health, environmental, and long-term costs when determining whether or not to convert grass to synthetic turf fields.

ACTION 4. Expand opportunities for informal sports play.

POLICY E. **Develop playgrounds that meet a broad range of physical, creative, and social needs for all demographics.**

Magical Bridge Playground in Palo Alto is designed and built for children of all abilities

ACTION 1. Renovate and maintain playgrounds to create more unique and interesting play experiences. Incorporate:

a. Universal Design principles so parks and facilities are more inclusive and available to all users.
b. Natural playgrounds (water, rocks, trees, etc.).
c. Interactive playgrounds.
d. Multi-dimensional playgrounds.
e. Themed playgrounds.
f. Sand and water play.
g. Play structures that offer more than one type of play and allow children of varying abilities to play together.
h. Complementary facilities for adults, such as adult play/exercise equipment near playgrounds.

Sensory harp at Magical Bridge Playground

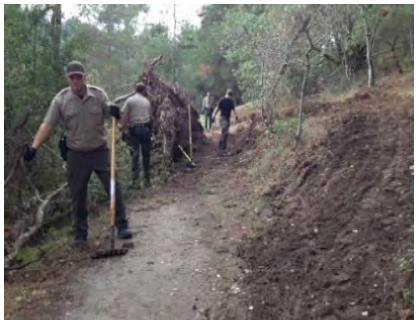
Natural willow branch play structures at Mission Bay Playground in San Francisco

ACTION 2. Assure accessibility and safety on all City playgrounds.

a. Use playground surfacing that meets criteria of accessibility and safety.
b. Consider fencing playgrounds.
c. Provide signage about play equipment and safety rules.
d. Separate tot and school-age play areas.

POLICY F. Enhance trail programs, trails, and infrastructure.

Bridge building and trail maintenance



Emma McCrary Trail

Moore Creek Preserve

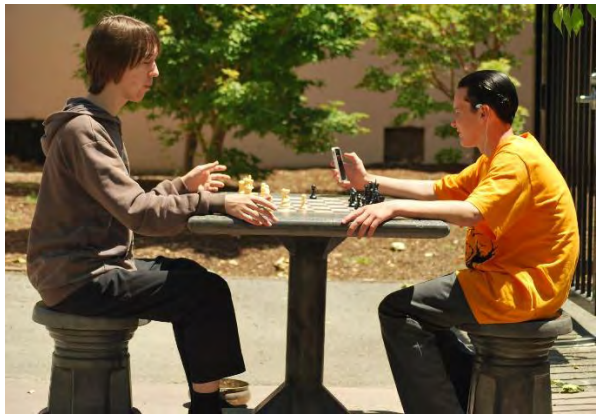
ACTION 1. Develop, improve, and enhance trails to provide for a range of uses.

a. Evaluate new trail uses through a public process to determine if they are appropriate for a specific open space, and help the City provide for a range of trail uses. Collect usage data on existing trails and study impacts to wildlife and habitat to inform the decision-making process.
b. Expand the trail network and connections.
c. Seek partnerships with UCSC, State Parks, non-profits, and private property owners to improve network connectivity, signage and trail designations.
d. Rate and sign trails with the difficultly level, rules, and etiquette and provide wayfinding markers with accurate mileage.
e. Incorporate natural features such as fallen trees or rocks for seating and to block ad-hoc trails.
f. Realign trails or perform design improvements to address run-off, erosion, steepness of grade, and/or use conflict issues.
g. Provide access to areas with scenic views or historical significance.
h. Conduct trail assessments that will inform and help plan for future maintenance projects, grant applications, volunteer efforts. Increase the number of partnerships to help maintain the trails.
i. Create and maintain sustainable design guidelines and maintenance standards for existing trails.
j. Consider creating spurs from multi-use trails to enable mountain bikers to reach more advanced features and terrain to accommodate a variety of skill levels. Consider adding a technical downhill trail with jumps and obstacles for mountain bikers and adequately sign the trailhead with maps and signage indicating features and the difficulty level.

Santa Cruz Museum of Natural History's Nature Ranger Program

ACTION 2.	Provide opportunities for classes, tours, and practice space. a. Seek programming and locations to host children's classes to learn "bike smarts". b. Increase skills clinics for advanced riders. c. Consider working with an outside provider to hold horseback riding classes within an appropriate open space during the summer months. d. Hold more natural and historical interpretive tours and volunteer days.

POLICY G. Accommodate new and emerging trends and satisfy unmet needs.




Outdoor chess and table tennis tables at Louden Nelson Community Center


Seasonal pump track in the San Lorenzo Park benchlands

ACTION 1. Provide activities that improve physical activity and mental health for all ages, abilities, and interests.

a. Provide outdoor game tables such as chess, checkers, table tennis, or foosball.
b. Continue to promote outdoor fitness and health initiatives and increase the distribution and number of outdoor exercise facilities.
c. Seek opportunities for community garden space, particularly on the east side of San Lorenzo River and in the Beach Area.
d. Seek opportunities and partnerships for the use of a walking track.
e. Consider locations for adding climbing wall and slack-lining facilities to be placed in equally distributed locations.
f. Consider adding a tennis court facility on the east side of the San Lorenzo River.
g. Identify a location for a pickleball facility with 6 to 10 courts and/or smaller facilities that can be located in different areas of the City.
h. Increase the number of wildlife interpretive signage and viewing areas.
i. Seek opportunities for the installation of a ropes course in a natural or urban setting.
j. Consider establishing a drone course only after further study demonstrates use of the facility would not result in significant impacts to sensitive habitat areas and wildlife including disturbance or harm to nesting birds. Prohibit recreational use of drones and/or establishment of a recreational drone course within sensitive habitat areas or near wildlife nesting areas that could cause disturbance or harm to breeding or nesting wildlife.

k. Provide spaces for intergenerational programming and activities to increase the interactions between older and younger generations.

l. Develop more bike parks, pump tracks, and jump facilities with features and amenities to meet a variety of skill levels.

ACTION 2. Expand concessions in parks and recreational facilities.

a. Continue to evaluate and monitor locations for mobile food vendors and determine if site furnishings or other amenities can be added to support successful locations.

POLICY H. Upgrade, acquire and develop new community recreational facility buildings to accommodate new and emerging recreational trends and satisfy unmet needs.

Roller derby bout at Kaiser Permanente Arena

ACTION 1. Prioritize upgrading and optimizing existing community recreational facilities.

ACTION 2. Capitalize on opportunities for partnerships and joint-use agreements to develop new community recreational facilities when rare opportunities are presented.

ACTION 3. Expand partnerships and concessionaire agreements to allow for outside providers to provide a recreational service on City land.

ACTION 4. Continue to seek community recreational facilities to host community events and programming. Continue to provide large gathering areas for family celebrations and group functions.

ACTION 5. Consider partnerships to allow for public recreational uses in the permanent Kaiser Permanente Arena during the Santa Cruz Warriors off-season.

a. Evaluate potential Parks and Recreation programming uses, events, designs, and costs during the planning phases of the arena.
b. Explore mechanisms to facilitate Parks and Recreation Department programming to facilitate multi-purpose sports and events throughout the year.

POLICY I. **Seek opportunities to enhance off-leash dog use experiences while minimizing conflicts with other park uses and wildlife.**

Example of fenced off-leash dog area with separate areas for smaller and larger dogs

ACTION 1.	New formal off-leash dog use areas in parks will be completely fenced and located in an underutilized area.
ACTION 2.	Identify a location for a fenced off-leash dog use area for the Lower Westside neighborhood.
ACTION 3.	Provide amenities and features that enhance the experience for dogs and their owners such as drinking fountains, shade structures, seating, picnic tables, and play features.
ACTION 4.	Consider creating separate, smaller facilities for smaller dogs or for dog training to reduce dog conflicts.
ACTION 5.	Increase enforcement of off- leash and dog access laws.
ACTION 6.	Clearly sign rules and etiquette to minimize conflicts. Educate users of the importance of cleaning-up waste to reduce odor impacts to the park and surrounding property owners. Work with the County Animal Shelter to provide animal behavior classes at dog parks.
ACTION 7.	Review the existing day-use access areas for domestic animals onto beaches and open spaces. Consider creating a licensing program to manage off-leash dog use.
ACTION 8.	Consider locations for off-leash dog use near open spaces to allow dogs to release energy before embarking on designated hiking trails.

GOAL IV. CONSERVATION & STEWARDSHIP

Protect the City's natural resources, native wildlife habitats and plant communities, and environment.

Santa Cruz has an incredible wealth of open space and natural resources to manage and protect. During the outreach process, community members expressed a strong desire to preserve existing open spaces. Though the City's natural areas provide the majority of habitat within the City's park system, urban parks can also serve an important role in providing habitat and connectivity across the greater landscape. Many urban parks are located adjacent to open spaces, riparian areas, water bodies, or the coastline. Some species have adapted to human influences and development and find habitat at an urban park or facility, such as a bird nesting under a bridge. Other species may make use of urban parks as migratory habitat or for passage to other habitat areas. A park's location may be important in terms of greater connectivity, enabling wildlife to cross, shelter, drink, and/or feed. It is important to consider the role of urban parks for increasing biodiversity. Restoration plans will help identify, prioritize and implement long-term projects. The provision of recreational facilities within open spaces requires additional consideration to minimize impacts to the environment. National trends suggest an increased interest in environmental programs and education, which will help engender environmental stewardship in current and future generations. As the baby boomer generation retires, they continue to be active and are drawn to conservation causes, so they can be enlisted to help with volunteer and educational efforts.

POLICY A. Maintain and enhance natural habitats to increase biodiversity and sustain long-term ecological function.

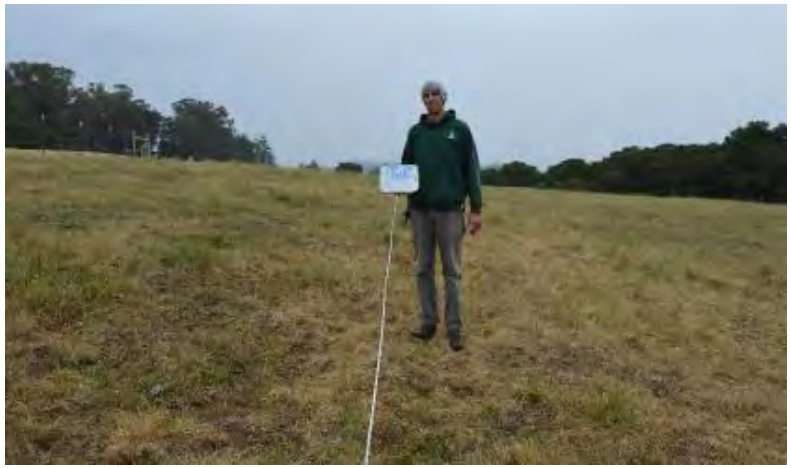
ACTION 1. Understand and maintain the diversity of native plant communities.

a. Map and describe plant communities; analyze successional trends; and formulate site-specific vegetation management goals, targets, restoration methods, and monitoring protocols for parks and open spaces.
b. Periodically update the inventory of invasive plants and input data into Cal-Mapper, Cal-Flora to help track the spread of invasive plants at a regional level.

ACTION 2. Understand and maintain the diversity of native wildlife.

a. Identify wildlife usage, movement patterns, and habitat features with high value to wildlife and formulate site-specific management goals for parks and open spaces.

Example of invasive weed mapping, Arana Gulch, Area C


Measuring grass height along transect lines to determine if targets were met

b. Inventory critical and sensitive wildlife habitats and develop management strategies for their protection.
c. Collect data to identify how urban parks can be landscaped and contain features to help improve habitat and connectivity across the City for specific species.
d. Consider programs and partnerships to increase the documentation of local wildlife such as through eBird, iNaturalist, Bio Scan, and other wildlife data collection sources to increase the amount of data available for informing management decisions.

ACTION 3. Develop and implement restoration work plans to restore natural processes and control invasive species.

a. Identify habitat specific restoration actions to be implemented within each park/open space, including a yearly schedule and long-term timeline based on existing Master Plan policies and actions. Utilize an adaptive management approach to guide and prioritize specific restoration activities with the goal being the establishment of functional ecosystems. Use SMART principles (specific, measurable, achievable, results-focused, and time-bound) as a framework. Prioritize restoration objectives with the number one priority being the conservation of rare, threatened, or endangered species and their supporting habitats. Undertake projects in areas that would increase public exposure and education. Develop a condensed work plan for each site that is practical to use in the field for maintenance staff and volunteers. Create clear guidelines for City personnel, contractors, and volunteers that reflect the conditions of specific projects and sites to ensure that sensitive resources are not mistakenly damaged during restoration activities.

Cattle grazing at Moore Creek Preserve to restore the coastal terrace prairie and improve habitat for the endangered Ohlone tiger beetle

Partnering with the Santa Cruz Museum of Natural History's Earth Stewards Program to teach students job skills in the natural restoration field

b. Conduct periodic training sessions for City personnel, contractors, and volunteers on best management practices to prevent the entry of invasive plants and maintenance of existing native plants.
c. Seek partnerships with agencies, schools, universities, organizations, and community groups to help learn, fund, perform, or study restoration activities.
d. Maintain an adopt-a-park program and engage and support community members who wish to commit to a longer-term undertaking. Provide guidance and assistance to ensure work is performed in accordance with a restoration plan.
e. During future organizational reviews and strategic planning, consider the creation of an Open Space Maintenance and Restoration Division.
f. Increase the number of large clean-up days to remove waste from illegal camping activities. Continue to provide training to participants to reduce the risk from public hazards. Provide ongoing, steady, monitored maintenance to prevent the large scale build-up of trash. Ensure that clean-up efforts avoid damaging bird nests.
g. Develop a funding strategy for the long-term implementation of the work plans.
h. Seek partnerships to study, enhance, and expand wildlife corridors, increase habitat value, control invasive plant species, and educate the public whenever possible.
i. Work with county, state, and federal agencies to identify and control feral or pest populations that have a negative impact on plants and/or wildlife.

ACTION 4. Improve habitat within urban parks and facilities.

a. Identify and convert non-usable turf fields to native gardens. Base landscaping treatments on appropriate native communities, taking into account geology and other microsite conditions. Create park specific planting lists and incorporate Xerces Society planting recommendations to increase habitat for pollinators.

Community members team-up to remove invasive species at Tyrrell Park

Native planting along the Santa Cruz Riverwalk

b. Consider certifying landscaping through the National Wildlife Federation's Garden for Wildlife Program and post signs to increase awareness of the importance of gardens for butterflies, bees, birds, and other wildlife.
c. Increase the tree canopy and/or provide plants and features that provide habitat value in public right-of-ways, drainage areas, or on other lands managed by the Parks and Recreation Department.
d. Inventory trees and increase the tree canopy to increase bird nesting opportunities, improve air quality, decrease heat island effect, and increase carbon sequestration.
e. Explore the installation of habitat enhancement structures in parks, such as owl boxes near turf fields to help control gophers.

ACTION 5. Use native species occurring naturally on similar sites in ecological restoration projects when feasible.

a. Use seed and cuttings collected from the same geographic area to revegetate or enhance degraded areas.
b. Prevent the spread of *Phytophthora* in city parks and open spaces.
c. Use fill, mulch, plants, and seed mixtures that are free of non-native plants and disease in ecological restoration projects.
d. Work with nurseries to grow native plants needed for ecological restoration projects.
e. Use site appropriate native or sterile plants for erosion control. Do not use invasive, non-native plant species.
f. Use plant material that is ecologically and visually appropriate to the surrounding wild landscape and appropriate to the stage of plant community development at the site.

Downtown Tree Walk

ACTION 6. Maintain and expand tree canopy coverage and manage forest diseases, when necessary, to protect native biological diversity and critical ecosystem functions.

a. Assess impacts and determine strategies to address areas if infested by high priority insects and diseases; utilize best phytosanitary management practices to control the spread of disease and infestations; support research to guide land management decisions; utilize nursery stock from nurseries that implement best management practices and test for *Phytophthora*; and pursue partnerships with public agencies to implement treatments.

b. Complete an inventory to quantify the number of trees on public lands including streets, parks, and open spaces. Increase the City's urban tree canopy by 10% between 2008 and 2020.

c. Promote the Urban Forestry Program to provide new trees for public property, celebrate Arbor Day, and increase the number of neighborhood tree plantings. Coordinate the preservation of trees whenever possible. Expand the Heritage Tree Grant Program.

POLICY B. Manage greenbelt and open spaces for conservation and to minimize recreational use impacts.

The endangered Ohlone tiger beetle

Livestock grazing to control invasive plant species at Neary Lagoon Wildlife Refuge

ACTION 1. Protect and enhance the habitat and populations of special status plant and animal species.

a. Monitor locations and conditions of special status plants and wildlife and their habitats within a park or open space.
b. Conduct surveys for special status plants and wildlife during the appropriate season before significant site-specific development or any unusual anticipated increase in use. Modify the project or use to avoid impacting such plants or wildlife.
c. Ensure resource conservation and environmental sensitivity in project design and construction.
d. Evaluate new uses for potential impacts to watershed, riverine, stream, and riparian environments.
e. Protect areas with special status species from negative human activities and other impacts such as erosion, trampling, and litter. Examples of protective measures include trail rerouting, educational signs, and fencing.
f. Give priority to protection of special status species.
g. Continue to partner with wildlife agencies in managing special status species.

ACTION 2. Protect, maintain and enhance habitat features that are important to native wildlife and native plant communities.

a. Avoid, minimize, or off-set impacts on wildlife and native vegetation when planning trails and other facilities.
b. Revegetate plants native to the specific habitat in buffer/setback areas adjacent to creeks and wetlands.
c. Minimize potential erosion from new trails using sustainable design features and improve existing eroding trails.
d. Monitor the impacts from new improvements to identify remediation solutions and to inform future decision-making.

Volunteers repair erosion on the U-Con Trail, Pogonip Open Space

Youth Trail Crew repairing a puncheon crossing

e. Leave snags and fallen trees in areas where they do not pose a fire or physical hazard, to provide cover and nesting sites for animals, and nursery conditions for forest seedlings.
f. Evaluate the wildlife habitat value associated with human-made structures before altering or removing them and avoid or mitigate any impacts.
g. Discourage human intrusion into sensitive wildlife habitats by appropriate placement of facilities and trails.
h. Identify and eliminate barriers (e.g. remove unnecessary fences, old barbed wire, and other barriers) and provide safe crossings (e.g. protect existing and promote additional wildlife crossings and use wildlife friendly fencing) to enhance wildlife movement.
i. Reduce conflicts between wildlife and humans through notification and education, control of human access and, as a last resort, control of wildlife presence or movement in concert with State and/or Federal agencies.
j. Where consistent with riparian and wetland protection, provide views or low impact access.
k. Evaluate new uses for potential impacts to watershed, riverine, stream, and riparian environments.
l. Work with local and regional agencies to implement strategies to reduce or mitigate impacts of uses and development on the City's watershed lands.
m. Conserve creek, riparian, and wetland resources in accordance with the City-wide Creeks and Wetlands Management Plan, San Lorenzo Urban River Plan, Moore Creek Interim Management Plan, Jessie Street Marsh Management Plan, and the Neary Lagoon Management Plan.
n. In the CEQA review process for new projects, evaluate and mitigate potential impacts to sensitive habitat (including special-status species and nesting birds) for sites located within or adjacent to these areas.

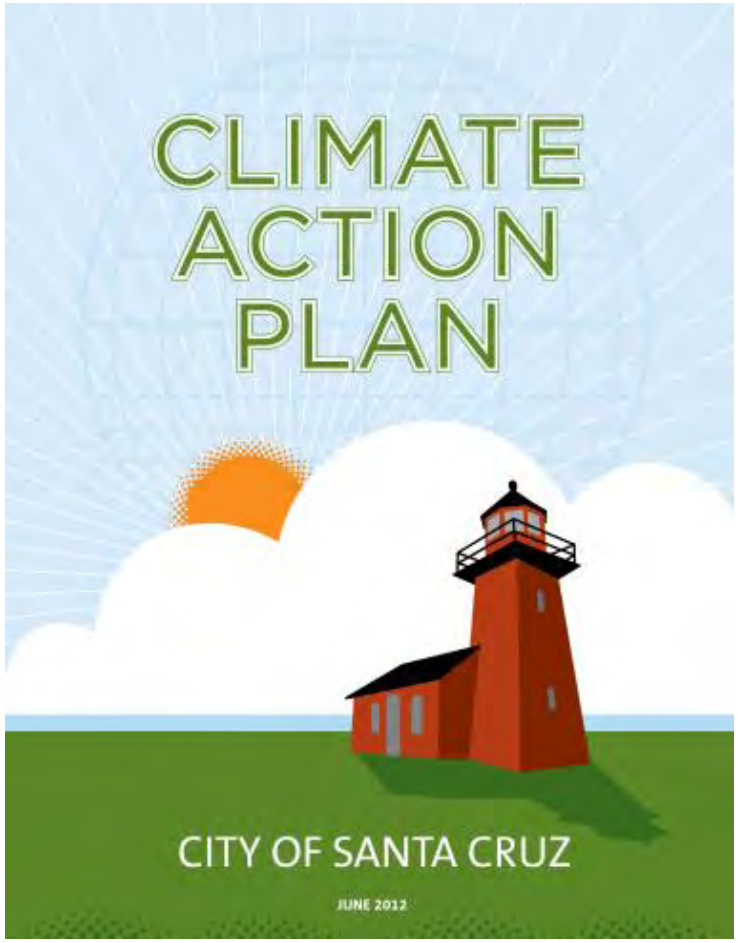

Bioswale near the Cowell Beach parking lot

o. Maintain a trash management policy and continue to install new receptacles designed to prevent trash from subsidizing predator and pest populations (corvids, gulls, rats, raccoons).
p. Continue to conform to the City's Integrated Pest Management Program.
q. Protect coastal roosts and rookeries in the course of activities that could disturb or disrupt breeding or result in loss of habitat, such as construction activities, recreational activities, or special events.
r. Implement site design and erosion control measures for new trails and other facilities in areas subject to high erosion hazards or adjacent to streams and wetlands.

ACTION 3. Protect waterbodies, including creek systems, riparian environments, and wetlands from uses that would degrade their value to native species.

a. Reduce erosion and sedimentation from roads and trails.
b. Increase the number of bioswales to increase percolation, entrap and filter sediments, and reduce stormwater runoff from developed areas.
c. Decrease illegal camping and access to non-designated areas.

POLICY C. Support and seek funding for long-term projects.



ACTION 1.	Continue to partner with the Resources Conservation District to reduce stormwater run-off, sedimentation, and erosion.
ACTION 2.	Pursue reclaimed water, water capture, and water recharge projects to decrease erosion and sedimentation and conserve water.
ACTION 3.	Continue to implement the Climate Action Plan and Climate Adaptation Plan.
ACTION 4.	Continue to improve partnerships with local, state, and federal agencies and organizations to help address regional challenges such as habitat fragmentation, connectivity, global warming, invasive species control, fishery management, and water pollution.
ACTION 5.	Seek grant funding opportunities for specific projects but ensure funding is available to maintain restored areas to prevent issues from remerging after the project is complete.

POLICY D. Provide more environmental education to the public.

Parks & Recreation's Camp Spot Rocks in Neary Lagoon

ACTION 1. Provide youth with environmental education programs.

a. Collaborate with City schools and others on outdoor classroom programs. Special emphasis should be provided in engaging youth in meaningful ways to learn and appreciate the local plants and wildlife. Build wild elements into parks and open spaces, formal and informal play areas, with materials that encourage inquiry and dialogue with nature.

ACTION 2. Provide interpretive programs for the public.

a. Provide more interpretive signage in parks and open spaces and along waterways.
b. Continue the downtown tree walk tour.
c. Consider the development of park docent program.
d. Provide interpretive education programs led by park rangers and/or docents. Partner with organizations and hold classes and interpretive walks.
e. Continue to partner with the Santa Cruz Museum of Natural History to provide interpretive tours within the City's open spaces.

GOAL V. SAFETY

Maintain a safe, clean, and comfortable environment for all park users.

For the community to enjoy the City's parks and utilize their amenities, park users need to feel safe and comfortable. Throughout the outreach process, residents repeatedly provided feedback concerning a perceived lack of safety and cleanliness in the parks and open spaces, which has affected usage of parks and playgrounds. Therefore, the City proposes to improve the safety and cleanliness in the parks by mitigating the impacts of illegal activities through design treatments to help create more visible, navigable, and activated parks. At the same time, increased enforcement of rules and presence of rangers, police, park hosts, and mental health services in parks will help to deter illegal activities.

POLICY A. Mitigate impacts of illegal activities on park use.


Camp clean-up with Rangers


Levee damage caused by illegal camping

ACTION 1. Use defensible space design treatments to deter illegal behaviors.
- a. Increase lighting and visibility in parks and on trails.
- b. Increase visibility into parks by maintaining clear lines of site and eliminating hidden nooks and enclaves.
- c. Activate underutilized spaces by providing additional programming and facilities to encourage lawful uses.
- d. Make parks easily navigable with way-finding elements.
- e. Explore fencing, locking, and temporary closures of areas of concern.

ACTION 2. Explore rules and policies regarding park uses (drones, off-leash dogs, camping, and closures).

ACTION 3. Develop a caretaker or park host program to help care for open spaces and community parks.

ACTION 4. Explore partnerships and programs to provide information and referrals about mental health, drug abuse, and homeless services.

ACTION 5. Increase resources to remove trash and debris from illegal camping.

POLICY B. Increase patrols and enforcement.

Increased park ranger presence in downtown Santa Cruz

ACTION 1. Increase park ranger/police presence and interaction.

a. More patrolling earlier in the morning and later in the evening.
b. More alternative methods of patrol (bikes, motorcycles, etc.).

ACTION 2. Increase enforcement of park rules.

GOAL VI. CONNECTIVITY AND ACCESS

Provide an integrated park system with clean, convenient public access to parks, open spaces, and the coastline.

The network of parks, open spaces, beaches, and trails provide access and connectivity across the City. They provide opportunities for recreation, a buffer from the more urban environment, a means for alternative transportation, and critical natural resources. The beaches and open spaces embody the City's unique sense of place and identity. In many areas of the City, trails provide nearly continuous links between parks, open spaces, and the beaches. National trends indicate a move towards more interconnected park systems through trails, connector parks, and greenways, allowing easier park and facility access to residents of all ages and abilities. A greater emphasis on pedestrian and bicycle pathways also aligns with national trends indicating an increase in the popularity of health and fitness recreation. The City will continue to resolve gaps in the park system through partnerships and land acquisition. Some neighborhoods are disconnected and it is important that all neighborhoods have access to quality parks and facilities as described under Goal II. Distribution.

POLICY A. Continue to integrate, expand, and improve the connective and accessible network of parks, open spaces, and trails.

ACTION 1. Continue to seek opportunities to purchase or lease additional land to enhance recreational corridors and extend network connectivity. Seek properties and improvements that fill gaps within the trail system, expand recreational opportunities along existing corridors, or provide important habitat and wildlife connections.

ACTION 2. Implement the San Lorenzo Urban River Plan and enhance and maintain the recreational value of the riverfront.

ACTION 3. Help develop and implement an integrated design, land-use, recreation, cliff stabilization, and landscape plan for West Cliff and East Cliff Drives to enhance public safety, access, connectivity, preservation, and recreational enjoyment along the coastline.

Monterey Bay Sanctuary Scenic Trail Master Plan

ACTION 4. Support and help implement and maintain the Monterey Bay Sanctuary Scenic Trail multi-use path. Seek opportunities for additional parkland along the corridor. Consider adding complementary features and design treatments at existing parks along the trail such as by placing wayfinding signage and maps, benches, trash receptacles, drinking fountains, picnic areas, shade structures, artwork, or plazas adjacent to the trail.

ACTION 5. Acquire new open space when there are opportunities to increase access and improve public safety and management. If the opportunity presents itself, support the acquisition and management of Lighthouse Field.

ACTION 6. Work with the Public Works Department to help implement the Active Transportation Plan and connect major parks throughout the City with smaller loop options and spur trails that connect to the bike and pedestrian system through the City and to the regional network.

ACTION 7. Support a Felton-Santa Cruz recreational trail and transportation/commuter corridor.

ACTION 8. Provide and maintain trails within parks and appropriate open space areas.

ACTION 9. Develop trailhead locations.

a. Provide well signed trails with maps.
b. Provide parking.

POLICY B. **Protect, maintain, and enhance publicly accessible coastal, riverfront, and open space areas to ensure they maintain a safe, quality appearance. Provide recreational and educational experiences that reflect the unique sense of place and identity of Santa Cruz.**

Multi-use trail project at Arana Gulch Open Sace

ACTION 1.	Ensure staffing-levels are adequate to patrol, maintain, and clean the coastal, riverfront, and open space areas.
ACTION 2.	Evaluate existing and develop new rules, policies, and programs to ensure they promote a safe and clean environment.
ACTION 3.	Ensure existing facilities and site furnishing are updated and new ones are added in a manner that ensures a quality appearance that maintains continuity over time as projects are phased-in.
ACTION 4.	Continue to partner with agencies, organizations, and community members to keep the coastal, riverfront, and open space areas pristine and attractive.
ACTION 5.	Maintain and improve access and the recreational value of the coastal, river front, and open space areas while ensuring that new uses, facilities, or site furnishings do not diminish their intrinsic qualities and natural resources.

GOAL VII. ADMINISTRATION & MANAGEMENT

Establish, maintain, and operate parks, facilities, and programs in a manner that is cost effective and manageable while engaging the community to maximize involvement and support.

Well-managed parks, facilities, and programs attract more use and participation from residents, which helps to generate community support for the parks system. During the outreach process, key stakeholders suggested the need to increase both maintenance staff and park rangers to provide a better experience for park users. In order to increase staffing and accomplish many of the improvements outlined in this Parks Master Plan 2030, a sustainable funding mechanism must be developed. National trends indicate an increase in the use of technology for promoting and registering for programs and events as well as providing basic information to park visitors, so utilizing the City's website and email lists is critical in communicating efficiently and cost-effectively with the public. Technology can help to reduce administrative costs to allow more funds for improvements to parks, facilities, programs, and staffing.

POLICY A. Administer parks and recreation facilities to continue to deliver quality parks and recreation services.

Youth Trail Crew Program and Park rangers

ACTION 1. Develop maintenance and safety standards for parks and facilities and evaluate staffing levels to achieve goals.

a. When acquiring new facilities, consider long-term staffing and maintenance costs.
b. Increase full-time staff to improve park maintenance
c. Increase the number of park rangers to allow more focus on natural resource management, park maintenance, and interpretation in addition to law enforcement and illegal camp clean-ups.
d. Hire a grant writer.

ACTION 2. Work with the Parks and Recreation Commission to establish and maintain annual short-term and long-term priorities for capital improvement projects that are proposed to the City Council. Develop and maintain conditions assessments to help inform the review process which include information on year of installation, maintenance costs and issues, replacement costs or alternatives, safety concerns, and other relevant data.

ACTION 3. Coordinate efforts with CA State Park and other recreation providers to ensure public use areas are adequately maintained.

POLICY B. Continue to improve community outreach and communication.

WebTrac, on the City of Santa Cruz website, allows for online registration

POLICY C. Develop a sustainable funding mechanism for the maintenance and operation of City parks, open space, beaches and facilities.

Friends of Parks & Recreation homepage

ACTION 1. Publicize park programs and facilities.

a. Continue to utilize website for marketing events, programs, and classes.
b. Utilize emerging technologies to publicize events, programs, classes, and park and facility improvements.
c. Consider developing an outdoor tour cell phone application where park users can take tours and learn about the history, environment, and things to do and see when they visit each park and open space.

ACTION 1. Increase funding for parks.

a. Consider a ballot initiative or other alternative financing options to augment Parks and Recreation Department funding.
b. Expand partnerships with private organizations.
c. Develop maintenance agreements with other entities.

ACTION 2. Develop, implement and adopt a parks program and increase volunteer efforts.

ACTION 3. Consider the establishment of a parks endowment fund.

ACTION 4. Consider prioritizing projects which are economic generators and draw use from residents and visitors.

ACTION 5. Utilize and support Friends of Parks and Recreation (FOPAR) to help in their fundraising, scholarship, and funding of smaller special projects to improve the parks system.

ACTION 6. Evaluate fees and use rates to reflect the current costs to provide services. During the fee study, consider the viability of use passes to help offset maintenance costs.

E. SUMMARY

The goals, policies, and action items developed during the Parks Master Plan 2030 process will guide the future development of the City of Santa Cruz's parks, open spaces, beaches, and recreational facilities. Many reflect long-standing goals and others are based on community input, direction from the City Council and Parks & Recreation Commission, and an understanding of current needs as well as emerging trends in recreation, the action items represent the broad spectrum of values, needs, and desires of the Santa Cruz community.

In addition to the overarching goals, policies, and actions just presented, specific recommendations for individual parks, open spaces, beaches and facilities evolved out of the outreach process. The following section, 4.2 Asset Inventory and Specific Facility Recommendations, outlines the recommendations for each park, open space, beaches, or facility in the park system. The general policies and actions in the previous sections would also apply to each of these facilities.

SECTION 4.2: ASSET INVENTORY & SPECIFIC FACILITY RECOMMENDATIONS

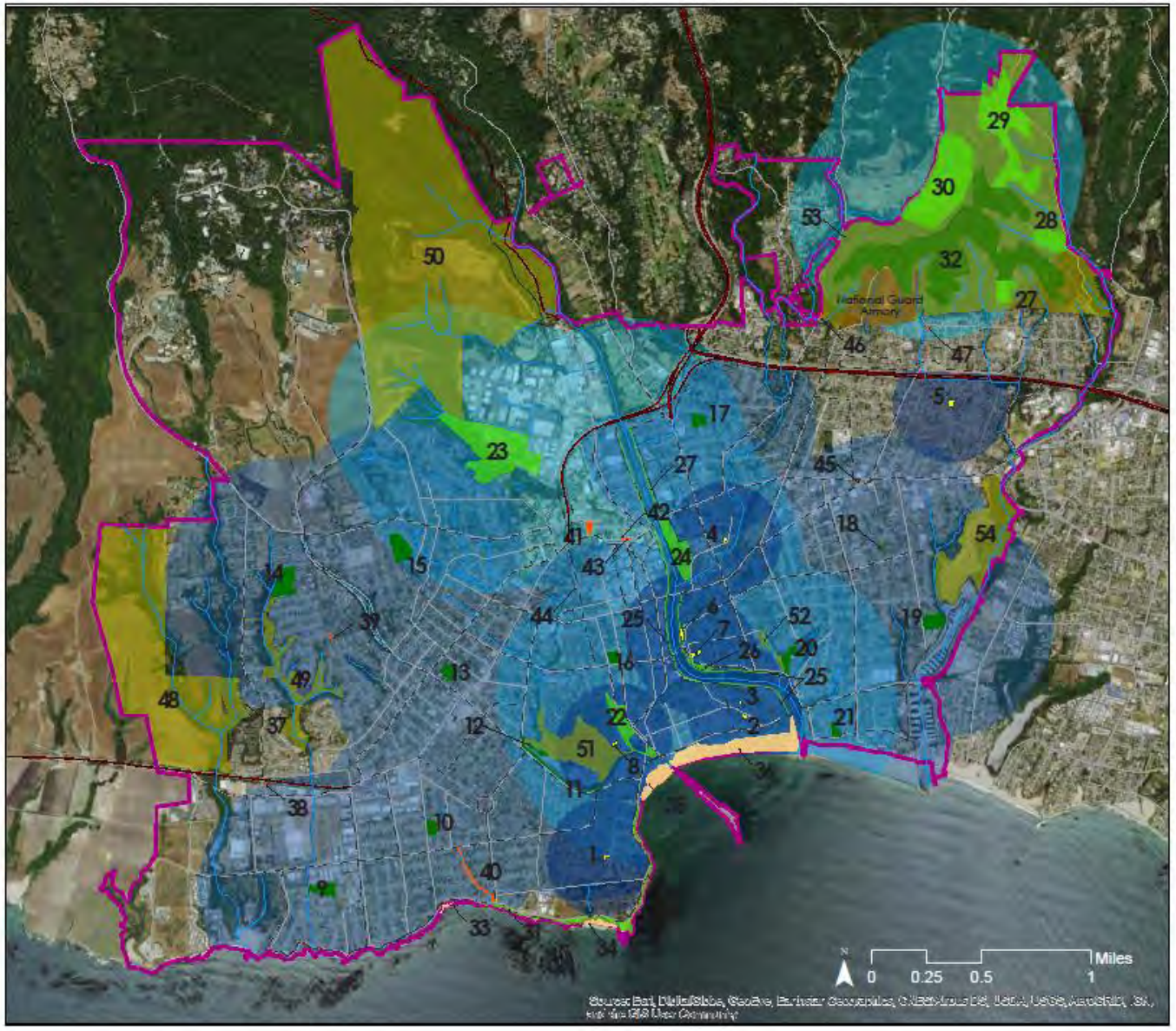
In addition to broader goals for the park system, the *Santa Cruz Parks Master Plan 2030* (Parks Master Plan 2030) has specific recommendations for each location. These recommendations are based on the input received during the community outreach process, input from City staff on current usages and condition of the facility, and opportunities to meet unmet needs of the community.

The following pages contain detailed descriptions of each of the City's assets. Each assessment includes recommendations, location or access point, proposed classification, size, master plan where applicable, a general description, photos and maps, and a table describing and assessing the condition of the asset's features.

For ease of use, the facilities are shown in alphabetical order:

- Arana Gulch Open Space
- Arroyo Seco
- Beach Flats Community Center
- Beach Flats Park
- Bethany Curve
- Branciforte Dog Park
- Carmelita Cottages
- Central Park
- Chestnut Park
- City Hall Complex
- Civic Auditorium
- Cowell & Main Beaches
- DeLaveaga Park – Audrey Stanley Grove
- DeLaveaga Park – DeLaveaga Archery Range
- DeLaveaga Park – DeLaveaga Disc Golf Course
- DeLaveaga Park – DeLaveaga Golf Course and Maintenance Yard
- DeLaveaga Park – DeLaveaga Wilderness Area
- DeLaveaga Park – Lower DeLaveaga Park and George Washington Grove
- DeLaveaga Park – Lower DeLaveaga Park Office
- Depot Freight Building
- Depot Park, Bicycle Trip Bike Park, and Scott Kennedy Fields
- Downtown Santa Cruz
- East Cliff Accent
- El Portal Park
- Frederick Street Park
- Garfield Park
- Grant Park
- Harvey West Park
- Harvey West Park – Harvey West Pool
- Harvey West Park – Kids Kottage and Wagner Cottage
- Harvey West Park – Ranger Station
- Harvey West Park – Scout and Clubhouse
- Its Beach
- Jessie Street Marsh
- John D. Franks Park
- Ken Wormhoudt Skate Park at Mike Fox Park
- La Barranca Park

- Laurel Park
- Lighthouse Avenue Park
- Louden Nelson Community Center
- Mimi de Marta Dog Park
- Mission Plaza Park
- Mitchell's Cove
- Moore Creek Overlook
- Moore Creek Preserve
- Museum of Natural History
- Neary Lagoon Park
- Neary Lagoon Wildlife Refuge
- Ocean View Park
- Pacheco Dog Park
- Parks and Recreation Administration Building
- Parks Maintenance Yard
- Poets Park and Beach Flats Community Garden
- Pogonip Clubhouse
- Pogonip Open Space
- Rincon Park
- Riverside Gardens Park
- Round Tree Park
- San Lorenzo Park
- San Lorenzo Park Lawn Bowling
- Santa Cruz Riverwalk
- Santa Cruz Wharf, Wharf Headquarters, and Maintenance Yard
- Scope Park
- Senior Citizens Opportunity (222 Market Street)
- Sgt. Derby Park
- Star of the Sea Park
- Surfing Museum
- Town Clock
- Trescony Park
- Tyrrell Park
- University Terrace Park
- West Cliff
- Westlake Park
- Westside Pump Track



Existing Park Coverage Map

Neighborhood Parks <1 acre
1: Lighthouse Avenue Park
2: Beach Flats Park
3: Poets Park and Beach Flats Community Garden
4: Central Park
5: John D. Franks Park
6: Mimi de Marta Dog Park
7: Riverside Gardens Park
8: Chestnut Park

Neighborhood Parks ≥1 acre
9: Sgt. Derby Park
10: Garfield Park
11: La Barranca Park
12: Neary Lagoon Park
13: Trescony Park
14: University Terrace Park
15: Westlake Park
16: Laurel Park
17: Grant Park
18: Star of the Sea Park
19: Frederick Street Park
20: Ocean View Park
21: Tyrrell Park

Community Parks
22: Depot Park, Bicycle Trip Bike Park, and Scott Kennedy Fields
23: Harvey West Park
24: San Lorenzo Park
25: San Lorenzo Riverwalk
26: Ken Wormhoudt Skate Park at Mike Fox Park
27: DeLaveaga - Audrey Stanley Grove
28: DeLaveaga - Archery Range
29: DeLaveaga - Disc Golf Course
30: Lower DeLaveaga Park and George Washington Grove
31: West Cliff Drive

Regional Parks
32: DeLaveaga - Golf Course

City Beaches
33: Mitchell's Cove
34: Its Beach
35: Cowell Beach
36: Main Beach

Single Amenity Parks
37: Moore Creek Overlook
38: Westside Pump Track
39: Round Tree Park
40: Bethany Curve
41: Mission Plaza Park
42: Scope Park
43: Town Clock Park
44: Rincon Park
45: El Portal Park
46: Branciforte Dog Park
47: Pacheco Dog Park

Open Space
48: Moore Creek Preserve
49: Arroyo Seco Canyon
50: Pogonip
51: Neary Lagoon Wildlife Refuge
52: Jessie Street Marsh
53: DeLaveaga Wilderness Area
54: Arana Gulch

Park Buffers
0.25 mi. radius on Neighborhood Parks (<1 acre)
0.5 mi. radius on Neighborhood Parks (≥1 acre)
0.5 mi. radius on Community Parks

Arana Gulch Open Space

Location: Mentel Ave. @ Agnes St., Brommer St. @ 7th Ave., and Broadway @ Frederick St.

Proposed Classification: Open Space

Size: 67.7 acres

Master Plan: Arana Gulch Master Plan (2006)

Arana Gulch Open Space was developed to include a multi-use path which connects Brommer Street, Broadway, and Agnes Street. The multi-use path was constructed to be ADA compliant, allowing for members of the public with mobility difficulties to access an open space. Bridges cross Arana Creek and Hagemann Gulch, offering elevated and unique perspectives of the open space. The open space also includes roughly a mile of hiking trails. Interpretive signage was installed to educate visitors about the unique habitat and history of the property. Grazing is conducted onsite to help restore the SC tarplant and coastal prairie. Many visitors enjoy watching the cattle graze. The open space also overlooks the Santa Cruz Harbor. The City has adopted a Habitat Management Plan and works with a technical advisory group to help guide restoration efforts.

Recommendations:

1. Continue to implement the Habitat Management Plan and restore the Santa Cruz tarplant population and coastal prairie, woodland, and riparian areas.
2. Explore the Joint Use Agreement with the Santa Cruz Port District to allow for the public use of the restroom facility near the harbor yard, or explore opportunities to add a porta-potty on the west side of the Hagemann Bridge entrance.
3. Provide educational tours to improve awareness and seek scientific partnerships to inform restoration efforts.

Feature		Condition	Description
Site Access	Parking	Very Good	Off-street parking is provided at the intersection of Broadway and Frederick Street.
	Entrance Sign	Very Good	Three large trailhead signs with trail map.
	Trail	Very Good	Multi-use trail is pervious concrete and hiking trails are bare ground.
Site Furnishings	Benches/Seating	Very Good	Two wood, nine recycled plastic.
	Bike Parking	Very Good	Four U racks.
	Combined Garbage & Recycling	Very Good	Three metal BearSaver cans.
	Interpretive Signs	Very Good	Seven interpretive signs, six steel frames, one large wooden sign.

Arroyo Seco

Location: Access at University Terrace Park and Grandview St. near Escalona Dr.

Proposed Classification: Open Space

Size: 33.94 acres

Master Plan: Meder Canyon Management Plan (1999)

Arroyo Seco Canyon is a natural ravine with an approximately one mile long multi-use path (bike-pedestrian)/maintenance road connecting University Terrace Park to Grandview Street. The top section is paved. Public Works maintains the majority of the property. Parks and Recreation primarily performs vegetation and trail maintenance activities along the lower trail section. In 1980, a concept plan which included rest stops and access improvements was approved. Implementing the plan did not receive support during future neighborhood meetings and the project was not pursued. The Meder Creek Management Plan was developed by Public Works and provides recommendations for maintenance and restoration activities. Recreational improvements could include the removal of invasive plants, formalizing the ad-hoc trail connections from the neighborhoods to the east which connect down to the trail, and providing exercise equipment, benches, and interpretive and park signage. Additional neighborhood input is needed before moving forward.

Recommendations:
Improve connections to lower and adjacent neighborhoods and consider installing benches, exercise equipment, interpretive and park signage, and other small amenities at key locations.

Beach Flats Community Center

Location: 133 Leibrandt Ave.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 2,742 sq. ft.

The community center has a community room, computer lab, classroom, and kitchen. It is operated by the non-profit organization Community Bridges who provides programs and services for summer recreation, environmental education, application assistance, after school programs, advocacy, parent education, and food and nutrition.

Recommendations:
None.

Beach Flats Park

Location: 122 Raymond St.

Proposed Classification: Neighborhood Park

Size: 0.22 acres

Beach Flats Park is one of two small parks serving the Beach Area neighborhood. It is a well-used park located adjacent to the Beach Flats Community Center. The small stage is used for events and parties.

Recommendations:

1. An outdoor table game such as table tennis or foosball could be incorporated into the park. The proximity to the Beach Flats Community Center could allow for ball check-outs. An outdoor table tennis game is popular with community members at Laurel Park, which is adjacent to the Louden Nelson Community Center, and at Garfield Park.
2. Add bicycle parking racks as the park currently has none.
3. The matting of the playground area will require replacement in the 1-2 year timeframe.

Feature		Condition	Description
Recreational Facilities	Playground	Good	One metal structure with slide and swing set with fibar fill.
	Tot-lot	Fair	One structure with swings and bucket swings. Fenced-in with rubber matting (in need of replacement in the 1-2 year timeframe).
Safety and Security	Lighting	Good	Five light poles.
Site Access	Pathway	Good	Concrete.
	Entrance sign	Very good	One metal.
Site Furnishings	Art	Very good	Mural.
	Benches/Seating	Very good	Five metal.
	Drinking fountain	Good	One metal.
	Event electrical hook-ups	Very good	Two hook-ups.
	Garbage	Good	One concrete.
	Recycle	N/A	One toter.
	Picnic tables	Fair	Four wood tables.
	Stage	Good	Small wood stage.

Bethany Curve

Location: Delaware Ave. to West Cliff Dr.

Proposed Classification: Neighborhood Park

Size: 3.4 acres

Bethany Curve is a passive creekside walking trail connecting Delaware Avenue to West Cliff Drive. It contains benches, artwork, and dog play features. The vegetation includes non-native weeds and ice plant. Native, drought tolerant landscaping could be planted along the trail to both beautify the park as well as provide nectar-producing plants for Monarch butterflies which overwinter in the surrounding area. Increasing native habitat could also benefit migrating birds that visit the park. The Parks and Recreation Department can solicit volunteers to help plant and maintain the garden areas. Bethany Curve should be included in the analysis of a West Cliff Drive Master Plan. It is located along West Cliff Drive and midway between the restroom facilities at the State's Lighthouse Field and Natural Bridges State Park and could be evaluated as a potential location for a low-profile restroom facility. Special attention would need to be given to design and the view corridor.

Recommendations:
Include the park in the planning analysis of a West Cliff Drive Master Plan. The park could be beautified by planting native gardens which could improve habitat for migrating birds and Monarch butterflies. The pathways could be renovated. The dog play features could be relocated to an off-leash dog use area.

Feature		Condition	Description
Site Access	Pathway	Fair	Pathway extends from Delaware Ave to West Cliff Dr.
Site Furnishings	Art	Very good	One metal structure.
	Benches/Seating	Fair	Sixteen wooden benches. Most benches are in good condition. Some need refinishing.
	Dog features	Good	One set of steps, one ramp and bridge, and one set of hoops.
	Garbage	Fair	Four small metal cans. Two concrete cans show rust and warping of metal.
	Interpretive signs	Good	One interpretive sign near West Cliff Dr.

Branciforte Dog Park

Location: Creekside Ln. @ Branciforte Dr.

Proposed Classification: Neighborhood Park

Size: 0.22 acres

Branciforte Dog Park is a fenced-in dog park which is next to the Carbonera Sphere and Upper Eastside neighborhoods. The off-leash dog use area is located at the trail head to the Enchanted Trail, DeLaveaga Park, which allows off-leash dog use on the trail below the sand pit area. It is very hot during the summer months and there is full exposure to sunlight.

Recommendations:
Dog play features, shade structures, and seating could be added to enhance the experience for dogs and/or owners.

Feature		Condition	Description
Recreational Facilities	Off-leash dog use	Very good	A fenced off-leash dog use with two tunnel features. Wood chips are used for the surface. No shade structures or trees.
Site Access	Parking	Fair	Dirt parking area.
	Entrance sign	Very good	One metal sign on a wood post.
Site Furnishings	Garbage	N/A	One plastic garbage can.
	Picnic tables	Good	One picnic table.

Carmelita Cottages

Location: 321 Main St.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: N/A

Carmelita Cottages is currently leased to the non-profit organization Santa Cruz Hostel Society. Up to 45 guests can stay in five of the renovated Victorian cottages. More than 10,000 guests stay in the hostel each year. The current lease expires in 2021 and will need to be renewed prior to expiration.

Recommendations:
None.

Central Park

Location: 301 Dakota St.

Proposed Classification: Neighborhood Park

Size: 0.16 acres

Central Park's small size and street frontage limits the type of recreational facilities that can be located there. The park currently has a small landscaped area that is often saturated and prone to flooding during the rainy season due to poor drainage. There is a small playground area with relatively limited features. It could be expanded into the grassy area. Picnic tables, exercise equipment, or other small features could be added to create more opportunities for recreation.

Recommendation:
Improve the playground area and add picnic tables.

Feature		Condition	Description
Recreational Facilities	Playground	Fair	Swings, roundabout, spring toys, small climbing rock feature.
Site Furnishings	Benches/Seating	Very good	Two recycled plastic benches.
	Garbage	Fair	One concrete garbage bin.
	Recycle	N/A	One toter.

Chestnut Park

Location: Southern terminus of Chestnut St.

Proposed Classification: Neighborhood Park

Size: 0.28 acres

Chestnut Park is located at the southeastern edge of Neary Lagoon Wildlife Refuge. The park was upgraded to include new playground equipment, picnic tables, BBQ pits, and a new half-court basketball facility in 2016.

Recommendations:
Add signage.

Feature		Condition	Description
Recreational Facilities	Basketball court	Very good	Half court.
	Playground	Very good	Play structure with slides and fibar fill.
Site Access	Pathway	Very good	Decomposed granite surface.
Site Furnishings	BBQ pits	Very good	Two metal bbq pits.
	Benches/Seating	Very good	Six recycled plastic benches.
	Bike parking	Very good	Nine U racks.
	Drinking fountain	Very good	One metal drinking fountain.
	Garbage & Recycle	Very good	One BearSaver can.
	Picnic tables	Very good	Two recycled plastic tables.

City Hall Complex

Location: 809 Center St.

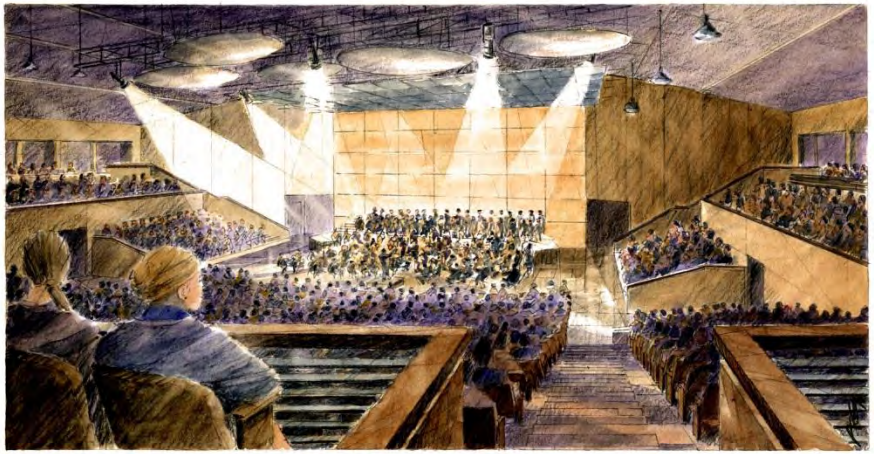
Proposed Classification: Other

Size: N/A

The Parks and Recreation Department maintains the gardens and water fountains for the City Hall complex. Recent improvements have included replacing turf with garden areas and the installation of decomposed granite pathways and decorative rock features.

Recommendations:
None.

Civic Auditorium



Conceptual rendering of the Civic Auditorium as an arts, cultural, and entertainment venue

Location: 307 Church St.

Proposed Classification: Community, Recreational, and Cultural Facility

The Civic Auditorium was opened in 1940 and is a multi-purpose auditorium (34,739 sq. ft.) with a stage and seating for total capacity of 2,021. It is configured with a large flat floor space with 1,105 fixed seats surrounding the floor in a u-shape layout with a stage at one end. Additional seating can be placed on the floor. The facility is used for concerts, sporting events, expos, theatrical performances, movie screenings, conferences, and receptions. It has five primary tenants which include the Cabrillo Festival of Contemporary Music, the Santa Cruz Symphony, the Santa Cruz Ballet Theatre's Nutcracker, the Santa Cruz Follies, and the Santa Cruz Derby Girls. The City conducted a Concept Design Study in 2014 and a Business Planning Study in 2015 which recommended improvements to the building systems and modifications to improve the facility as an arts, cultural, and entertainment venue.

Size: 34,000 sq. ft.

Recommendations:

1. Move forward with the studies recommendations and renovate and operate the facility as an arts, cultural, and entertainment venue.
2. Explore the possibility of setting-up an indoor pickleball league until the Civic Auditorium is renovated.

Cowell & Main Beaches

Location: Beaches to the east and west of the Santa Cruz Wharf

Proposed Classification: Beach

Size: 31 acres

Management Plan: Cowell and Main Beach Management Plan (2014)

Cowell and Main Beaches are popular local and tourist destinations. The proximity to the Santa Cruz Wharf and Santa Cruz Boardwalk create a wide range of recreational activities for visitors to explore. A number of hotels and restaurants support locals and tourism. A small parking area, a Jr. Lifeguard storage building, and restrooms are located at the east end of Cowell Beach. A ramp, stairs, and an ADA accessible walkway provide access down to the beach from the parking area. The Santa Cruz Wharf is located between Cowell and Main Beaches. The Santa Cruz Boardwalk is located along the northern edge of Main Beach and a walkway extends along Beach Street from the Santa Cruz Wharf to the Boardwalk. Restrooms are located next to Ideal Bar and Grill near the entrance to the Wharf. The City's Junior Lifeguard Program uses Cowell Beach and a surf equipment rental concessionaire rents beach recreational items daily during the summer months. Two volleyball courts are located below the Dream Inn on Cowell Beach. Sixteen public volleyball courts are located on Main Beach. The Santa Cruz Seaside Company maintains an additional two volleyball courts on Main Beach. Beach areas are rented for private events. Illegal behavior and safety issues at Cowell Beach prompted the City to implement a beach curfew which limits access from midnight until one hour before sunrise to crossing the dry sand portion of the beach to reach the wet sand portion of the beach and water. The curfew is in effect until 2019. No curfew exists for Main Beach. The high use of the beach during the summer months necessitates the need for the City to operate beach clean-up and grooming on a regular basis. The City continues to study and improve the poor water quality issues at Cowell and Main Beaches.

Recommendations:

1. Continue to improve beach clean-up efforts and create guidelines to direct volunteer efforts.
2. Continue to form partnerships, support volunteer efforts, provide signage, enforce litter laws, invest in equipment, and work on projects that clean-up the beach area, improve water quality, and help provide a safe environment.
3. Improve ADA access to the beach area.
4. Maintain a curfew on Cowell Beach until risk issues for beach goers have been resolved.
5. Consider improving the Junior Lifeguard Headquarters and storage area at Cowell Beach to accommodate growth, improve programming, and store equipment.
6. Consider installing a seasonal tot-lot on Cowell Beach or Main Beach.
7. Renovate the Beach Street restrooms.
8. Consider utilizing the parking area near Cowell Beach for more bike parking and recreational amenities. Seek opportunities for bike valet during the summer to deter theft.
9. Consider improving the layout of the volleyball courts at Main Beach to increase the number of courts and explore seasonally lighting the courts, taking into account light spillover and bird and wildlife concerns in the design recommendations.

DeLaveaga Park – Audrey Stanley Grove

Location: 501 Upper Park Rd.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 5 acres

Audrey Stanley Grove is a 496 seat outdoor amphitheater with a sound booth, ticket booth, and parking area that is located in Upper DeLaveaga Park. Santa Cruz Shakespeare developed the amphitheater in 2016 and leases the space from the City, holding summer performances during June, July, and August. During the off-season, the Parks and Recreation Department will use the space for programming or private rentals during September and October. As part of the project approvals, a trail from the lower neighborhood to Upper DeLaveaga Park near the entrance to the Audrey Stanley Grove was improved in 2017.

Recommendations:

1. Expand the use of the amphitheater for private and public events during the Santa Cruz Shakespeare off-season. Seek opportunities to coordinate receptions and other public events with the Golf Course restaurant.
2. Renegotiate lease before the 2018 season.
3. Explore future opportunities to enhance the utility and comfort as a performance and community space such as by adding permanent restroom facilities, dressing rooms, and small concession areas.

DeLaveaga Park - DeLaveaga Archery Range

Location: Accessed from the Brookwood Dr. entrance to DeLaveaga Park

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 5 acres

The Santa Cruz Archery Club maintains the indoor/outdoor archery range at DeLaveaga Park. A membership to the club is necessary to use the facilities. The outdoor range area includes practice and picnic areas with 28 targets. Target areas offer a variety of skill challenges which are not limited to variations of shooting lines, angles, and distance.

Recommendations:
None.

DeLaveaga Park - DeLaveaga Disc Golf Course

Location: Access from Upper Park Rd.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 40 acres

DeLaveaga Disc Golf Course is a world famous 29-hole disc golf course located in DeLaveaga Park. It is maintained by the Disc Golf Club and tournaments are often held. Erosion control and tree protection need to be improved at this site. Discussions with staff and the club have included the possibility of charging players a fee to play in order to help fund improvements.

Recommendations:
Consider a pay-for-play facility to help improve maintenance and care of the facility, including tree protection and replacement, erosion control, poison oak abatement, invasive weed removal, native plant restoration, and other improvements.

DeLaveaga Park – DeLaveaga Golf Course and Maintenance Yard

Location: 401 Upper Park Rd.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 151 acres

Master Plan: DeLaveaga Golf Course Master Plan (2002)

DeLaveaga Golf Course is an 18-hole golf course. Golf Course facilities include a double-decked driving range with lighting, a BBQ group picnic area, a clubhouse with a banquet facility, and practice greens for putting and chipping. The operations of the golf course, driving range, and restaurant are leased to a concessionaire. The City maintains the golf course and a maintenance yard is located onsite. The City adopted the DeLaveaga Golf Course Master Plan in 2002 which recommends a variety of improvements, including constructing a new clubhouse to accommodate larger events, installing a new irrigation system to conserve water, adding solar to the upper deck of the golf course to provide shade and conserve energy, performing tree management work to reduce dead and diseased trees, redesigning and updating the sand traps, leveling the tees, grading the fairways, increasing the parking areas, and improving the maintenance yard.

Recommendations:
Implement the DeLaveaga Golf Course Master Plan.

DeLaveaga Park - DeLaveaga Wilderness Area

Location: Access from Upper Park Rd., Branciforte Dr., Prospect Hts., and Brookwood Dr.

Proposed Classification: Open Space

Size: 269 acres

Master Plan: DeLaveaga Park Master Plan (1960)

The DeLaveaga Park Wilderness area contains the undeveloped portions of DeLaveaga Park. The area contains multi-use trails that connect the various facilities located within the George Washington Grove, Lower DeLaveaga Park, and the Upper DeLaveaga Park areas. Trail connectivity should be improved throughout the park, and trail linkages will need to avoid crossing the Golf Course which is a large barrier. Improvements could be pursued to link the ad-hoc trails north of Prospect Heights to the Sandpit trail head off of Branciforte Drive to improve connectivity around the park. Easements may need to be granted by the National Guard Armory depending on the trail alignment. A new trail could link to the historic zoo site to the west of Prospect Heights along DeLaveaga Park Drive. A portion of the area is level and is currently fenced. Remnants of the zoo are found in the surrounding hillside. The site could be developed to be a play area with unique features that blend recreation with history, serve the surrounding neighborhood. It could also be a stop along a new multi-use trail. The Wilderness area may also have potential for adding a separate mountain biking trail or skill building area. Arana Creek deposits sediment into the lower portion of the watershed. The City works with the Resource Conservation District to seek grant opportunities for watershed enhancement projects and should continue to pursue these projects.

Recommendations:

1. Consider expanding the multi-use trail network and improve connectivity throughout the park, utilizing existing fire roads and ad-hoc trails.
2. Consider a separate downhill mountain biking facility or skill building area.
3. Consider locating a play area or other recreational use and interpretive signage in the historic zoo area. Link the area to a multi-use trail.
4. Continue to work with Resource Conservation District and implement the Arana Gulch Creek Stormwater Watershed improvement projects.

DeLaveaga Park – Lower DeLaveaga Park and George Washington Grove

Location: Entrances are located on Branciforte Dr. north of Mill Rd.

Proposed Classification: Community Park

Size: 50 acres

Management Plan: DeLaveaga Park Master Plan (1960)

George Washington Grove is located across Branciforte Creek to the north of Lower DeLaveaga Park. George Washington Grove contains a seasonally-opened group picnic area, two bocce ball courts, and restrooms. The restrooms at George Washington Grove are in a poor condition. Parking is sometimes limited for the park and an additional parking area could be located to the north of George Washing Grove. A trail could connect the parking area to the picnic area. Seven reservable picnic areas are located at these parks. Lower DeLaveaga Park has restrooms, two softball fields, a large grass field, a sand volleyball court, two horseshoe pits, and a playground. There is currently no access between the parks, therefore a pedestrian bridge across the creek could allow for more recreational opportunities for park users. Trail improvements and access improvements should be sought to link the Upper Eastside Neighborhood to this park.

Recommendations:

1. Create spillover parking area and construct a pedestrian bridge across Branciforte Creek to connect George Washington Grove to Lower DeLaveaga Park, possibly a replica of the covered bridge. Add interpretive signage describing the unique history of the property and covered bridge which used to be located onsite.
2. Renovate the restrooms at George Washington Grove.
3. Larger scale renovations to the ballfield should evaluate the potential redesign of the dugout, fencing, bleachers, and field goal posts layout and configuration to potentially accommodate more field space within the park. Considerations could also include the meadow area.
4. Consider artificial turf and energy-efficient lighting improvements to conserve resources.
5. Consider as a potential location for pickleball courts.

Feature		Condition	Description
Recreational Facilities	Baseball or softball field	Good	Two softball fields with grass outfields and lighting. Metal bleachers. No scoreboards. Three porta-potties are provided. Small dugouts.
	Bocce ball	Good	Two bocce ball courts are located in George Washington Grove area.
	Horseshoe pits	Good	Two horseshoe pits with backstops next to picnic areas in Lower DeLaveaga Park.
	Large, grass field	Good	Large multi-use field in Lower DeLaveaga Park is relatively level with some gopher holes and bare spots.
	Playground	Good	Includes a couple of climbing structures, slides, and a tire swing. Fibar is used for the playground surfacing.
	Reservable picnic areas	Good	The seven combined picnic areas include 51 large, wooden picnic tables; ten large BBQ pits with a masonry exterior, 16 serving tables. Two include wet bar areas. Drinking fountains are located in or around most of the picnic areas, and most include electric hook-ups. Plastic garbage bins and recyclable toters are placed for trash pick-up.
	Sand volleyball court	Fair	Some of the surrounding edges are taller and limit play for loose balls.
Safety and Security	Lighting	Fair	Lighting is provided in the parking lot at Lower George Washington and next to the group picnic areas. A light is provided at Forty Thieves picnic area.
	Gate and locked at night	Good	Vehicle access gates are located at both park entrances.
Site Access	Pathway	Good	The pathway around the meadow and ball fields is concrete and is in a very good condition. The pathway between the softball fields is decomposed granite and is in a good condition.
	Parking	Fair	Off-street.
	Entrance sign	Good	One wood sign at each entrance.
Site Furnishings	Art	Good	Logger arch historical artifact.
	BBQ pits	Good	Twelve located along the meadow area of Lower DeLaveaga Park, one located in George Washington Grove.
	Benches/Seating	Very good	Two benches near meadow area. Two wood benches and one recycled plastic in grove area.
	Drinking fountain	Fair	Four drinking fountains (not including reservable picnic areas).
	Garbage	Fair	Fourteen combined concrete, six metal, and two plastic trash bins (not including reservable picnic areas).
	Recycle	N/A	Five recyclable toters (not including reservable picnic areas).
	Both	Very good	Twelve BearSaver cans.
	Picnic tables	Fair	A combined four wood and 20 concrete (not including reservable picnic areas.
	Restroom	Poor	The restrooms (one dual facility) in Lower DeLaveaga are in fair condition. The restrooms (one dual facility) at the George Washington grove are in poor condition. Porta-potties are provided at the softball fields.

DeLaveaga Park – Lower DeLaveaga Park Office

Location: Lower DeLaveaga Park

Proposed Classification: Other

Size: 440 sq. ft.

A park office and maintenance shed is located within Lower DeLaveaga Park to help staff maintain the park facilities.

Recommendations:
Additional covered space is needed to protect park tools and equipment.

Depot Freight Building

Location: 119 Center St.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 3,000 ft.

The Depot Freight Building is a historic building that is used for City programming and private rentals. The historic freight building used to be a transportation hub. It is now a large, open room with renovated hardwood floors. The restrooms are only accessible from the outside of the building and serve all of Depot Park. The maximum occupancy of the main room is 100 persons. There is room outside at the rear of the building to place a shed or storage unit to help maintain Depot Park and store items that could help programming of the facility. Table Tennis has become a popular programming activity. Technological upgrades could help to facilitate meetings and trainings. Interior access to the restrooms could improve the use of the facility as a rental space.

Recommendations:

1. Explore the ability to add exterior storage.
2. Upgrade technological capabilities and interior space to help facilitate meetings and trainings.
3. Explore adding interior access to the restrooms.
4. Explore the addition of a kitchenette to improve programming opportunities.

Depot Park, Bicycle Trip Bike Park, & Scott Kennedy Fields

Location: 115 Center St

Proposed Classification: Community Park

Size: 9 acres

Master Plan: Depot Park Master Plan (2001)

The park has an adult soccer field and practice area which can be used as two practice or youth fields. The soccer field receives a lot of use due to the lack of field space in Santa Cruz and the surrounding region. Lights would extend play. The lights would need to be designed to ensure there is minimal spillover to the surrounding homes. Outreach with the surrounding neighborhood should be conducted to discuss any new proposal. The Depot Freight Building contains restrooms which are open to park visitors. The park also contains the only ramped, wooden bicycle park in the area. Bicycle Trip Bike Park's wooden ramps are deteriorating and will need revamping and replacement in the near future. The Parks and Recreation Department has been working with a consultant on the design and replacement of the wooden ramps with metal which will require less maintenance over time. One metal ramp has been installed as a pilot project to test durability. The park contains a large plaza area, picnic tables, artwork, parking, and a small play features. A pathway connects the southern end to Beach Street towards Cowell Beach. The park includes the Monterey Bay National Marine Sanctuary Exploration Center and adjacent parking area. An approximately half acre site at 101 Washington Street (former location of Lighthouse Liquors) was purchased for incorporation into the park and is currently being leased. The City will explore opportunities for the future use of the site.

Recommendations:

1. Continue to revamp the bike park with more durable ramps that require less maintenance.
2. The playground area could be improved to include additional play equipment facilities such as a swing-set.
3. Explore lighting the field to increase usage.
4. Explore new uses for the ½ acre parcel at 101 Washington Street.

Feature		Condition	Description
Recreational Facilities	Bike park	Very poor	Large variety of wooden ramps and technical features.
	Playground	Very good	Variety of small features including teeter totter and a roundabout.
	Soccer field	Very good	One adult artificial turf soccer field w/ small practice area. Field can also be played as two smaller practice or youth fields.
Safety and Security	Lighting	Very good	Lights in park and parking area.
Site Access	Pathway	Very good	Concrete.
	Parking	Very good	Paid parking lots.
	Entrance sign	Very good	Large archway sign at entrance to parking lot.
Site Furnishings	Art	Very good	Metal sculpture of grass.
	Benches/Seating	Very good	Seven recycled plastic benches.
	Bike parking	Very good	Twenty-three u-shaped spaces.
	Drinking fountain	Very good	Two metal drinking fountains. One has a refillable bottle feature.
	Garbage	Very good	Seven garbage cans.
	Recycle	N/A	Toters placed next to each garbage can.
	Picnic tables	Very good	Four picnic tables.
	Plaza	Very good	Concrete plaza with trees, art, benches, and picnic tables incorporated into design.
	Restroom	Poor	Restrooms are located in the Depot Freight Building.

Downtown Santa Cruz

Location: Pacific Ave. and side streets between Mission Ave. and Laurel St.

Size: N/A

Proposed Classification: Other

Downtown is the business and commercial center in Santa Cruz. The Parks and Recreation Department helps maintain the benches, outdoor patio areas, landscaping treatments, drinking fountains, and trees along Pacific Avenue and side streets. The Downtown Recovery Plan recommends the creation of a park on the existing parking lot at 1100 Cedar Street, near the intersection of Union Street and Cedar Street and adjacent to Plaza Lane. The San Lorenzo Urban River Plan and Downtown Recovery Plan include additional recommendations for improving the connection between Downtown to the Santa Cruz Riverwalk. In 2017, a Downtown Ranger Unit was created and helps monitor and address safety concerns while assisting downtown visitors with directions and interpretive information.

Recommendations:

1. Seek opportunities to build parklets, plazas, and mini-parks and improve the connections between Downtown and the Santa Cruz Riverwalk. If opportunities arise, consider the top of parking garages as potential space for locating recreational facilities.
2. Continue to install tree protection fencing.
3. Continue to address public safety concerns.

East Cliff Accent

Location: Southern terminuses of Seabright Ave., 1st Ave., 2nd Ave., 3rd Ave., 4th Ave., and Mariner Park Wy.

Size: N/A

Proposed Classification: Other

East Cliff Accent overlooks Seabright Beach. A walkway extends from Seabright Avenue to 4th Avenue along the bluff. Small parking areas are provided at the southern terminus of 1st and 3rd Avenues, and stairway access to the beach is provided at 3rd Avenue. A small overlook is also provided at the terminus of Mariner Park Way, but it is not connected to the walkway. Erosion has caused issues with the railings and walkways. In 2017, the Public Works Department completed a cliff stabilization project at Mariner Park Way. The Parks and Recreation Department maintains the site furnishings, picks-up trash, monitors the condition of the stairs, and performs minor landscaping maintenance. The coastline is a recreational, natural, and scenic treasure that embodies the City's unique sense of place and identity. A master plan could be created to guide future improvements; help maintain a more cohesive, consistent identity; and improve the long-term coordination and management.

Recommendations:
Partner with other stakeholder departments to develop and implement an integrated design, land-use, recreation, cliff stabilization, and landscape plan for West Cliff and East Cliff Drives to enhance public access, safety, preservation, and recreational enjoyment along the coastline.

Feature		Condition	Description
Site Furnishings	Benches	Fair	Two recycled plastic benches in a very good condition. Five wood benches that are in a fair condition with some minor cracking and/or engraving vandalism.
	Bike parking	Good	Two t-posts. Paint is fading.
	Garbage	Fair	Three BearSaver cans in very good condition. Three concrete in poor condition with warping and rusting metal.

El Portal Park

Location: Soquel Ave. @ Water St.

Proposed Classification: Neighborhood Park

Size: 0.21 acres

El Portal Park is located at the intersection of Water Street and Soquel Avenue. It is not suitable for more active recreational uses but offers a brief reprieve from the streets that surround the park. The location is optimal for landscaping treatments, wayfinding signage, and small gateway features such as art, monuments, or interpretive elements.

Recommendations:
Consider installing artwork or interpretive elements.

Feature		Condition	Description
Site Access	Pathway	Very good	Decomposed granite.
	Entrance sign	Very good	Two metal.
Site Furnishings	Art	Very good	Concrete monument with library plaque.

Frederick Street Park

Location: 168 Frederick St.

Proposed Classification: Neighborhood Park

Size: 3.97 acres

Frederick Street Park is located on a bluff overlooking the Santa Cruz Harbor and Arana Gulch Open Space. It is an extremely popular destination for the Lower Eastside Neighborhood and the overall community. A wooden staircase descends from the park to the harbor. An asphalt pathway connects from Frederick Street to the staircase. The park contains restrooms, a volleyball court, a fenced off-leash dog use area, a playground, a tot-lot, and one of the first skate parks. Picnic tables with BBQ pits are located on the bluff on the eastern side of the park and are popular for small parties and gatherings. The off-leash dog use area was fenced and is one of the largest off-leash dog use areas in the parks system. An obelisk art piece is located near Frederick Street at the southwestern section of the park. Erosion concerns exist along the eastern side of the park and retaining wall improvements will be necessary in the near future. The volleyball court needs some minor improvements.

Recommendations:

1. Drinking fountains need repair.
2. Improvements to the off-leash dog use area could include shade structures, benches, drinking fountains, and pathways.
3. The playground could be expanded and new equipment could be added.
4. The volleyball court could be renovated or replaced. A fence may need to be installed around it to prevent animal waste from entering the sand and make game play more enticing. The area could accommodate one pickleball court with low fencing or a half-court basketball court.
5. Improve the stairs to the harbor by exploring different, more durable options and improving the retaining wall.
6. Install drainage and erosion control in the picnic areas to control erosion and grading issues on the hillside.

Feature		Condition	Description
Recreational Facilities	Large, grass field	Fair	Uneven surfaces, gophers, and sand patches.
	Off-leash dog use	Very good	Large, fenced off-leash dog use area with grass surface. Water spout for dogs.
	Playground	Poor	One large playground with swing and tower/slide features. Fibar fill.
	Sand volleyball court	Poor	Uneven court, Bermuda grass encroaching on sand.
	Skate park	Good	Popular for young kids. Asphalt was recently resurfaced.
	Tot-lot	Very good	Small structure with slide, bucket swing, and sand box.
Safety and Security	Lighting	Good	Six light poles.
Site Access	Pathway	Fair	The new permeable paving and the concrete pathway are very good. The asphalt will need to be resurfaced soon. The d.g. in the front will need to be compacted.
	Entrance sign	Good	One wooden and two metal signs.
Site Furnishings	Art	Poor	The top of the obelisk sculpture has been vandalized and broken off.
	BBQ pits	Fair	One is missing a bottom and needs to be replaced.
	Benches/Seating	Good	One recycled plastic, 18 wood.
	Bike parking	Good	Two bike parking posts.
	Drinking fountain	Poor	Two (one on restroom exterior).
	Garbage	Good	Twelve concrete, one plastic, one metal.
	Recycle	Fair	One toter, two w/slat screen.
	Picnic tables	Poor	Eight wood, one concrete. Wood picnic tables show some damage from rot and bugs.
	Restroom	Good	One dual facility.

Garfield Park

Location: 624 Almar Ave.

Proposed Classification: Neighborhood Park

Size: 1.78 acres

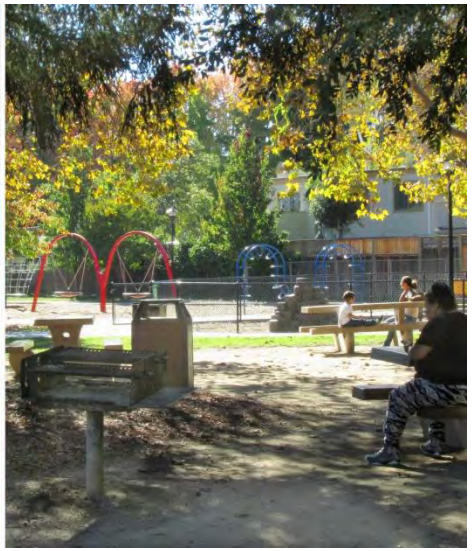
Garfield Park is a very popular park for the lower Westside Neighborhood. It offers a variety of recreational activities including a grass field, picnic tables and BBQ pits, a playground and tot-lot, two table tennis tables, and a full-size basketball court. It is the only park on the Westside of town with BBQ pits, and the picnic areas often host birthdays and other small gatherings.

Recommendations:

1. Drinking fountains need repair.
2. Playgrounds could be upgraded or expanded.
3. A shed could help to improve maintenance of the park.
4. Several trees are causing damage and root pruning or other treatments may be necessary to limit damage.

Feature		Condition	Description
Recreational Facilities	Basketball court	Good	One full-size basketball court.
	Large, grass field	Fair	Grass field has some minor dips.
	Table tennis	Very good	Two concrete table tennis tables were recently installed.
	Playground	Good	One structure with slides. One swing set. One tire swing. Sand fill.
	Tot-lot	Good	One structure with slides. One bucket swing set. Sand fill.
Safety and Security	Lighting	Fair	Lights poles are rusting and need some touch-up work.
Site Access	Pathway	Good	The decomposed granite path needs trim in some areas. Concrete pathway around playground is good.
	Entrance sign	Very good	One wooden engraved sign and four metal signs.
Site Furnishings	Art	Very good	One decorative, painted concrete bench.
	BBQ pits	Good	Three BBQ pits.
	Benches/Seating	Good	Twelve wood, one recycled plastic, and one concrete.
	Bike parking	Very good	One U bike rack.
	Drinking fountain	Poor	One metal.
	Garbage	Fair	Six concrete garbage bins.
	Recycle	Fair	Two recycle bins with slat screens and three toters.
	Picnic tables	Very good	Four concrete tables.
	Restroom	Fair	One dual facility.

Grant Park



Location: 150 Grant St.

Proposed Classification: Neighborhood Park

Size: 2.36 acres

Grant Park provides a variety of recreational activities onsite and is very popular for the Upper Eastside Neighborhood. The park is fenced and locked at night. A small baseball field is sometimes used for youth league practices. A full-size basketball court is used frequently. A bocce ball court is adjacent to a small fenced off-leash dog use area. The restrooms were renovated in 2017. Picnic tables with BBQ pits are located adjacent to the playground and tot-lot areas and are popular on the weekends. A bucket swing for tots could be added as the park receives a lot of use from this age group.

Recommendations:

1. Replace the restrooms with modern facilities in 5-10 years.
2. Add a tot-lot swing.

Feature		Condition	Description
Recreational Facilities	Baseball or softball field	Good	Small baseball field is used for neighborhood play and occasionally for youth league practice.
	Basketball court	Very good	One full-size court.
	Bocce ball	Very good	One bocce ball court.
	Off-leash dog use	Very good	One small fenced off-leash dog use area with grass surface.
	Playground	Very good	One climbing rock, two climbing roundabouts, two swings, one teeter totter. Fibar fill.
	Tot-lot	Very good	One structure with slide, two climbing structures, one small spring toy. Fibar fill.
Safety and Security	Lighting	Good	Seven light poles.
	Gate and locked at night	Very good	Black aluminum wrought iron style fence panels.
Site Access	Pathway	Good	D.G. is in good condition. Concrete in very good condition.
	Entrance sign	Very good	One wood with rock masonry support structures. Three metal.
Site Furnishings	BBQ pits	Good	Three metal.
	Benches/Seating	Good	One artistic bench is very good. One wood bench is very poor w/ major cracking. Three recycled plastic benches are in very good condition.
	Bike parking	Fair	One six-foot rack locked. Should install a more permanent rack.
	Recycle	N/A	Two toters.
	Picnic tables	Good	Ten concrete tables.
	Restroom	Good	One dual facility.

Harvey West Park



Location: 324 Harvey West Blvd.

Proposed Classification: Community Park

Size: 44.77 acres

Harvey West Park is a large community park that is used for a variety of recreational activities, including recreation programming and summer camps, events, sports, and large gatherings. It contains a pump track, athletic fields, reservable picnic areas, a playground and tot-lot, exercise equipment, a sand volleyball court, horseshoe pits, and bocce ball courts. The park hosts large community events. It also contains Community Recreational Facilities which include the Harvey West Pool, Wagner Cottage, Kids Kottage, and Scout and Clubhouse. The Ranger Station and Parks Maintenance Yard are also located on the grounds. Hiking trails connect to the Upper Westside Neighborhood and Pogonip Open Space. A bus stop is located on Harvey West Blvd. Harvey West Park contains six ballfields. The outfield areas are used for soccer and football during the baseball off-season. The overlap between baseball and soccer causes conflicts for practice and overall use. Additionally, wear and tear is a continual issue on the fields as they are extensively used. The ballfield facilities are aging and will require extensive upgrades to bring them up to date.

Recommendations:

1. Harvey West Park is the major sports field complex for the City. Future upgrades should include improvements to drainage, installation of artificial turf to improve the playing time and reduce maintenance costs, renovation and installation of additional bleachers, and upgrades to pitching mounds, scoreboards, lighting, and concession stands. Additionally, movable/collapsible soccer goals would improve the efficiency of setup and use for soccer play.
2. The playground at Harvey West Park serves the general public and youth camps and could be expanded to accommodate more features.
3. A small amphitheater could be added to Wagner Grove to host wedding ceremonies and kids camp activities.

Feature		Condition	Description
Recreational Facilities	Bocce ball	Very good	Two bocce ball courts.
	Exercise equipment	Very good	Four pieces.
	Horseshoe pits	Good	Two horseshoe pits.
	Playground	Good	One large structure w/ slides, swings, tire swing. Sand and rubber matting fill.
	Pump track	Very good	One dirt pump track.
	Reservable picnic areas	Good	Eight reservable picnic areas. Some have sinks and power hook-ups.
	Sand volleyball court	Fair	One volleyball court.
	Tot-lot	Very good	One structure w/ slide and bucket swings. Sand and rubber matting fill.
Safety and Security	Lighting	Good	Parking lot lighting and lighting in Friendship gardens.
	Gate and locked at night	Very good	Vehicle access gates.
Site Access	Pathway	Good	Most of the pathways are in a good condition. Some have some lifting issues.
	Parking	Fair	Off-street parking lot will need to be resurfaced soon.
	Entrance sign	Good	One large wooden
	Trail	Good	Three trails.
Site Furnishings	Art	Poor	One train.
	BBQ pits	Good	Eleven metal and five w/ rock masonry structure.
	Benches/Seating	Good	Six wood and two recycled plastic.
	Bike parking	Good	Two t-posts and five u racks.
	Drinking fountain	Fair	One metal and two concrete.
	Flag pole	Good	One flag pole.
	Garbage	Fair	Six metal, twenty-six concrete.
	Recycle	N/A	Eight toters.
	Both	Very good	Two BearSaver cans.
	Picnic tables	Good	Twenty-one concrete, 55 large wood, and 10 recycled plastic.
	Restrooms	Very good	One main restroom (one dual facility) for all of park. Located next to Field 1.

Ballfield Features	Field(s)	Condition	Description
Backstop	1	Poor	Chainlink.
	2 & 3	Poor and Fair	Chainlink. Field 3 is not tall enough to provide sufficient protection.
	4	Poor	Chainlink backstop showing warping and rust.
	5 & 6	Fair	Wood and chainlink.
Bleachers/Seating	1	Poor	Stepped concrete with wooden planking. Concrete is cracking.
	2 &3	Fair	Stepped concrete with wooden planking.
	4	Fair	Stepped concrete with wooden planking.
	5 & 6	Fair to poor	Metal bleachers. Opportunity to utilize hillside on Field 6 to create amphitheater seating.
Concessions stand	1	Fair	Concessions stand.
	2 &3	Fair	Concessions stand.
	4	Poor	Concessions stand. Rotting of wood and needs interior upgrades.
	5 & 6	Very poor	Wood concessions stand. Rotting wood.
Drinking fountain	1	Very poor	Two stand pipe drinking fountains.
	2 &3	Fair	Two standpipe drinking fountains.
	4	Very poor	Two stand pipe drinking fountains.
	5 & 6	Very poor	Two stand pipe drinking fountains.
Dugouts	1	Very poor	Partially undergrounded dugouts take in water and need to be pumped during rainy season.
	2 &3	Fair	Caged, chainlink dugouts.
	4	Fair	Masonry block dugouts with chainlink fencing.
	5 & 6	Fair	Masonry block dugouts with chainlink fencing.
Lights	1	Fair	Metal poles with metal halide lights.
	2 &3	Poor	Combination of wood and metal posts with metal halide lights. The lighting does not provide complete coverage and there are dark spots on the baseball fields.
	4	Good	Metal poles with metal halide lights.
	5 & 6	Fair	Wood poles with halide lights. The light does not cover soccer field and there are dark spots on the baseball fields.
Restroom/Porta-potty	1	N/A	Use main park restroom.
	2 &3	Very good	Harvey West Park's restrooms (one dual facility) are provided between Fields 2 &3 and Field 1.
	4	N/A	Use main park restroom.
	5 & 6	Poor	Two porta-potties. Restrooms at this side of the park are highly desirable.

Scoreboard	1	Very good	Recently upgraded scoreboard.
	2 &3	Poor	Scoreboard is small and outdated.
	4	Poor	Small and outdated scoreboard.
	5 & 6	Poor	Small and outdated scoreboards.
Scorers Booth	1	Fair	Scorers booth.
	2 &3	Fair	Scorers booth.
	4	Fair	Scorers booth.
	5 & 6	Very poor	Poor lighting, portions of siding and framing needs replacement, and shingles are worn-out.
Trash and Recycle	1	Fair	Two concrete and three metal bins. Two toters.
	2 &3	Poor	Three concrete and five metal garbage bins. Four recycle toters.
	4	Fair	Three concrete and two metal garbage cans. Two recycle toters.
	5 & 6	Poor	Two concrete and two metal bins. One plastic toter.
Turf	1	Poor	Field is worn from overuse.
	2 &3	Very poor	Irrigation and overuse issues.
	4	Fair to poor	Root intrusion. Irrigation system uses different heads than designed for because the heads are no longer manufactured. New heads do not allow for an optimal head-to-head ratio.
	5 & 6	Fair	Irrigation system uses different heads than designed for because the heads are no longer manufactured. New heads do not allow for an optimal head-to-head ratio.

Harvey West Park - Harvey West Pool

Location: 275 Harvey West Blvd.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 3,500 sq. ft. pool house, lap pool with diving area, wading pool

The small pool is leased to a concessionaire. The large pool is open from June through August for open swim. The concessionaire teaches swim lessons in the small pool from March through October. The large pool is available for lap swim, water fitness, and recreational swimming during the summer, and swimming is one of the many activities provided during youth summer camps. The large pool is most often used by families during the summer weekends. The pool does not open until 11 a.m. which does not accommodate morning lap swimming. Pool maintenance and funding are necessary year-round and should the City seek opportunities to increase use and access to the pool. Future studies to increase usage could consider complementary uses such as a fitness center or larger picnic area. Partnerships and cost-sharing opportunities to fund the project should be explored.

Recommendations:
Consider conducting a use and business plan study to improve operations and funding opportunities, identify more comprehensive renovations, and increase community use and continue to seek funding to expand the hours and duration of time the pool remains open for public use during the year.

Harvey West Park – Kids Kottage and Wagner Cottage

Location: 275 Harvey West Blvd.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: Kids Kottage (1,500 sq. ft.) Wagner Cottage (1,000 sq. ft.)

The Kids Kottage is leased to the County Office of Education for an alternative education program during the school year. The City operates summer camp programs in the Kids Kottage during the remainder of the year. Wagner Cottage is used for summer camp programs. Both cottages could use improvements to the restroom facilities. Wagner Cottage has some visible foundation issues. The Kids Kottage has termite issues.

Recommendations:
Improve the restrooms and address the structural issues.

Harvey West Park – Ranger Station

Location: 275 Harvey West Blvd.

Proposed Classification: Other

Size: 1,000 sq. ft.

The Ranger Station houses the Parks Ranger unit. The Ranger Station is not located in a very visible location and the unit has outgrown the small building. Consideration should be given to relocating the Ranger Station to a larger, more visible space. The Ranger Station could be an important informational resource for park visitors. If a more suitable location is found, consideration should be given to relocating the summer camps from Wagner Cottage to the building so that program participants are closer to the program activities and other camp uses.

Recommendations:
Consider relocating the Rangers to a larger, more visible location.

Harvey West Park – Scout and Clubhouse

Location: 326 Evergreen St.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 5,000 sq. ft.

The Harvey West Park Scout and Clubhouse is rented for private use such as weddings, gatherings, and meetings. It is also used for City programming. The clubhouses have seating indoors and outdoors, a deck area, a full kitchen, two barbecue pits, two wet bars, an indoor fireplace, and restrooms. The entryway, kitchen, and patio area could be improved to be more functional and attractive.

Recommendations:
Consider minor renovations to approve the function and appearance, such as by enhancing the entry and patio areas.

Its Beach

Location: Accessed from a stairway to the north of Lighthouse Point

Proposed Classification: Beach

Size: 1.5 acres (City owned)

Its Beach is a popular beach for a variety of beach and ocean oriented recreational purposes. A stairway is provided down to the beach from West Cliff pathway to the north of Lighthouse Point. The City owns approximately 1.5 acres of the beach area and the remainder is owned by the State of California.

Recommendations:
Improve coordination with the State to maintain rules and enforcement.

Jessie Street Marsh

Location: Access from E. Cliff Dr., path from Ocean View Park, and the terminus of Lemos Ave.

Proposed Classification: Open Space

Size: 3.2 acres

Master Plan: Jessie Street Marsh Management Plan (1998)

Jessie Street Marsh is adjacent to Ocean View Park and E. Cliff Drive and currently has an ad-hoc trail that extends from E. Cliff Drive to Lemos Ave. In 1998, the City created the Jessie Street Marsh Management Plan. The plan aims to restore the marsh and improve access. A major component of the plan would be creating a tidal exchange between the fresh water marsh and the San Lorenzo Urban River. The tidal exchange aspect of the plan was determined to be "unbuildable" during plan review by the City's Engineers. The marsh area has been vulnerable to criminal activity. City staff hired an engineering consultant to help redesign the plan to address community desires and concerns about the area. Additional outreach and study will need to be conducted through a public process.

Recommendations:
Improve the connection from the marsh to the Santa Cruz Riverwalk. Hire an engineering consultant to work through design issues and public concerns with the Jessie Street Marsh Management Plan. Discuss potential modifications to the plan through a public process.

John D Franks Park

Location: Marnell Ave. @ Fairmont Ave.

Proposed Classification: Neighborhood Park

Size: 0.48 acres

John D Franks Park is a small but important park because it is the only neighborhood park for the surrounding area. The park contains a grass field, picnic tables, an elliptical piece of exercise equipment, and a playground.

Recommendations:
Consider adding additional picnic tables, play equipment, and fitness equipment.

Feature		Condition	Description
Recreational Facilities	Large, grass field	Fair	Grass field for multi-use. Redwood roots and some minor mounding and dipping.
	Playground	Very good	Recently installed play structure with slides and toddler swings. Fibar surface material.
Safety and Security	Lighting	Good	Two light poles.
Site Access	Pathway	Good	Decomposed granite surface.
	Entrance sign	Very good	Engraved wood. Paint is in good shape.
Site Furnishings	Benches/Seating	Good	Two wooden benches.
	Drinking Fountain	Good	One metal.
	Exercise Equipment	Very good	One elliptical.
	Garbage	Good	One concrete.
	Picnic tables	Good	Two concrete tables.

Ken Wormhoudt Skate Park at Mike Fox Park

Location: 225 San Lorenzo Blvd.

Proposed Classification: Community Park

Size: 1.25 acres

Ken Wormhoudt Skate Park at Mike Fox Park is located along the Santa Cruz Riverwalk and is across the street from Riverside Gardens Park. The skate park is very popular and contains bowls and a street course. Bleachers are located outside of the fencing for spectating. The skate bowl's concrete pool coping is preferred by skaters but also requires continual upkeep and repairs. To the east of the skate park, the park has a multi-use, shared area which includes three painted pickleball courts, a roller hockey practice rink, and a basketball hoop. Fruit trees were planted to the east of the shared-use area as part of a community orchard project. The orchard utilizes an area with limited recreational opportunity and increases access to food while providing opportunities to learn about resource conservation and sustainable growing practices in a public setting. A porta-potty is placed onsite. Lighting could be explored to increase use of the skate park.

Recommendations:

1. Improve pool coping and perform general repairs to the skate park.
2. Consider adding lighting.
3. Increase programming to teach skateboarding.

Feature		Condition	Description
Recreational Facilities	Basketball court	Very good	Half court with asphalt surface.
	Pickleball court	Very good	Three painted courts. Nets need to be installed before play.
	Roller hockey	Very good	One fenced roller hockey practice area w/ plastic dasher boards.
	Skate park	Fair	Concrete pool coping needs repair.
Site Access	Pathway	Fair	Minor cracking near entrance to skate park.
	Parking	N/A	Off-street parking.
	Entrance sign	Very good	Two wood framed with plastic panels.
Site Furnishings	Art	Fair	Photographs of skateboarders in a metal frame with plastic encasement. There is some wear and tear from vandalism remediation. There is also a wave mural on the full pipe.
	Benches/Seating	Good	Aluminum bleachers.
	Bike parking	Very good	Six low profile racks.
	Drinking fountain	Good	One metal drinking fountain.
	Garbage	Fair	One metal with screen.
	Recycle	N/A	One toter.
	Both	Good	Two BearSaver cans.
	Restroom	N/A	Porta-potty with wood screen.

La Barranca Park

Location: California St. to Laguna St.

Proposed Classification: Neighborhood Park

Size: 2.26 acres

La Barranca Park, a linear park with a decomposed granite pathway along Bay Street, offers an opportunity for a casual stroll off of Bay Street. It is primarily landscaped with lawn. Its proximity to the Wastewater Treatment Plant makes it a prime location for a demonstration garden using recycled water.

Recommendations:
Convert the turf areas to a demonstration garden using recycled water.

Feature		Condition	Description
Site Access	Bus stop	N/A	Yes.
	Pathway	Fair	Decomposed granite pathway along Bay St connecting California St to Laguna St.
Site Amenities	Art	Good	Two rocks w/ commemorative plaque and one small rowing sculpture.
	Benches/Seating	Good	Fourteen recycled plastic benches. Most are in good condition. Some show fading and cracking.
	Garbage	Fair	Five concrete cans.
	Interpretive signs	Fair	Five interpretive signs. Most are in good condition.

Laurel Park

Location: 301 Center St.

Proposed Classification: Neighborhood Park

Size: 1.77 acres

Laurel Park is located adjacent to the Louden Nelson Community Center and offers a variety of recreational activities for general use and for recreational programming and events. The park contains a grass field, a chess table, a table tennis table, a playground, and a full-size basketball court painted to accommodate pickleball. Issues with illegal activities have led to a Ranger being posted at the site, and discussions with the neighborhood about whether or not the park should be fenced. Consensus with the neighborhood is necessary before moving forward with a fencing project. The Louden Nelson Community Center has restrooms which are available during open hours. The park is heavily used by teens, seniors, and other groups using the center. It is also an extension of the Louden Nelson Community Center for events put on by Parks and Recreation.

Recommendations:

1. Fencing or decorative gardening displays could provide a barrier between other park uses and the playground area.
2. Parcourse equipment could be installed and incorporated into the senior center or other health-related programming at the Louden Nelson Community Center.
3. Underground electrical connections could be installed to accommodate community events.
4. Volleyball insert sleeves could be installed in the lawn and the community center could check-out nets and balls to allow for volleyball play.
5. Improvements to the garden area could allow for potential senior and teen based gardening programs.

Feature		Condition	Description
Recreational Facilities	Basketball court	Very good	Full-size court is painted to allow for pickleball play.
	Chess table	Good	One outdoor chess table.
	Large, grass field	Good	One grass field for multi-use play and events.
	Pickleball court	Good	Striping on basketball court.
	Table tennis	Very good	Concrete table tennis table.
	Playground	Very good	One bucket seat, one swing set, one structure w/ slide, one large webbed climbing structure. Fibar fill.
Safety and Security	Lighting	Good	Four light poles.
Site Access	Pathway	Very good	Concrete pathway.
Site Furnishings	Art	Very good	The mural on the back of Louden Nelson was recently refurbished.
	Benches/Seating	Good	Concrete bench along b-ball court and playground. Seven wood.
	Bike parking	Good	Two large metal, cork screwed structures.
	Drinking fountain	Good	One metal.
	Garbage	Good	Two concrete.
	Recycle	N/A	Toters are placed near garbage cans.

Lighthouse Avenue Park

Location: Lighthouse Ave. near Oregon St.

Proposed Classification: Neighborhood Park

Size: 0.35 acres

Lighthouse Avenue Park offers a small playground area and eighteen community garden plots. Vandalism and theft has been an issue for the gardeners.

Recommendations:
The playground area could be expanded to offer more features.

Feature		Condition	Description
Recreational Facilities	Community gardens	Poor	Eighteen garden plots. The raised garden beds will need to be updated soon. The decomposed granite surrounding the beds can be weeded and a new layer can be added.
	Playground	Fair	Small structure with slides and rubber matting and a small sand area with digging features.
Site Access	Pathway	Very good	Concrete and brick tiles. Decomposed granite around garden area can be resurfaced.
	Entrance sign	Very Good	Three metal signs. One arbor near Lighthouse Avenue as entrance feature.
Site Furnishings	Benches/Seating	Very good	Three recycled plastic near playground.
	Bike parking	Very good	Three metal bike posts.
	Garbage	Good	One concrete can near playground. Toters are provided in a screened area for the community garden.

Louden Nelson Community Center

Location: 301 Center St.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 20,000 sq. ft.

The Louden Nelson Community Center hosts senior and teen programs and services, recreation classes and programming, rentable rooms, and an auditorium with theater seating and a stage. Programs and classes make use of the adjacent Laurel Park. The Louden Nelson Community Center offers a wide selection of spaces available for rent, including a dance studio, meeting rooms, a banquet room, a kitchen, and an auditorium with a stage and retractable seating.
In 2015, the City received more than $500,000 dollars of grant funding to improve the facility. The grant funded general building improvements such as new boilers, roof repairs, refinished hardwood floors, updated technology, carpeting, fans, and paint. New office space and a conference room were configured in the layout. Appliances and storage space were upgraded in the kitchen. The auditorium was renovated with new seating, refinished hardwood floors, and new media technology and stage lighting.

Recommendations:
Seek additional funds to continue to renovate and update the Louden Nelson Community Center. Examples include remodeling the restrooms and café/kitchen area; installing sound absorbing panels in the classrooms, replacing the hallway doors, installing new window blinds, and updating the marquis, and redesigning the Teen Center exterior yard area.

Mimi De Marta Dog Park

Location: Broadway near Dakota Ave.

Proposed Classification: Neighborhood Park

Size: 0.5 acres

Mimi de Marta Park is a fenced off-leash dog use area with a picnic table adjacent to the Santa Cruz Riverwalk.

Recommendations:
Dog play features and additional seating could be added to enhance the experience for dogs and/or owners.

Feature		Condition	Description
Recreational Facilities	Off-leash dog use	Good	One fenced off-leash dog use area with dirt surface.
Site Furnishings	Drinking fountain	Good	One metal drinking fountain with dog bowl feature.
	Picnic tables	Good	One concrete, one wooden.

Mission Plaza Park

Location: 103 Emmet St.

Proposed Classification: Neighborhood Park

Size: 0.94 acres

Mission Plaza Park is located across the street from the State's Santa Cruz Mission State Historic Park. It contains a plaza with a water fountain, drinking fountain, and benches and the design complements the surrounding setting of the Mission, Holy Cross Catholic Church and School, and Neary-Rodriquez Adobe and State Park. The plaza is used for community events, parties, weddings, and smaller gatherings. Large storm events cause some minor erosion of the decomposed granite pathways. The setting and history do not lend itself to the installation of more active recreational features.

Recommendations:
Interpretive signage should be added to describe the history of the site and surrounding area. The decomposed granite could be updated to a less erosive pathway material. Maintain a clean and safe environment.

Feature		Condition	Description
Safety and Security	Lighting	Good	Two lights near plaza area.
Site Access	Bus stop	N/A	Located on Mission St.
	Pathway	Good	Decomposed paved pathways providing access from street to plaza area. Erosion occurs during large storm events.
	Entrance sign	Good	Three metal signs and one large wood sign with masonry structures.
Site Furnishings	Art	Good	Masonry rock structure with metal plaque to commemorate the Mission.
	Benches/Seating	Good	Seven wooden. Some show minor weathering and paint ware.
	Drinking fountain	Good	One.
	Flag pole	Good	Three flag poles.
	Garbage	Good	One.
	Recycle	N/A	One plastic toter.
	Plaza	Very good	Rose bushes, palm tree, water fountain and benches encircle water fountain.
	Event electrical hook-ups	Very good	Located in multiple locations in park.
	Water fountain	Very good	Masonry rim w/ concrete fountain head

Mitchell's Cove

Location: Beach area accessed from stairwell on West Cliff at the intersection of Sunset Ave. and West Cliff Dr.

Proposed Classification: Beach

Size: 0.4 acres

A stairway from West Cliff path provides access to the beach. Off-leash dog use is allowed before 10 a.m. and after 4 p.m. The beach is popular for beach and surf activities. This beach is the only legal off-leash dog use opportunity on a beach within the City limits. It is also the only off-leash dog use opportunity for the Lower Westside neighborhood. Consideration could be given to this off-leash dog use area if a future program is developed for moderate intensity and to reduce conflicts with general beach usage. Additional enforcement should be pursued to ensure beach goers on this small beach are not inundated with off-leash dog use during times when dog use is not allowed.

Recommendations:
Consider programs and enforcement to ensure that off-leash dog use does not overwhelm the small beach area.

Moore Creek Overlook

Location: Cypress St.

Proposed Classification: Neighborhood Park

Size: 0.12 acres

Moore Creek Overlook offers a scenic overlook of the Moore Creek Preserve and canyon. A concrete pathway encircles a small grass area and three benches overlook the scenic vista.

Recommendations:
None.

Moore Creek Preserve

Location: Accessed from Highway 1 near Shaffer Rd. and the terminus of Meder St. No parking is provided.

Proposed Classification: Open Space

Size: 263.75 acres

Master Plan: Moore Creek Preserve Interim Management Plan

Moore Creek Preserve has nearly three miles of hiking trails (no dogs are allowed) that wind through canyon, forest, and grassland natural settings. Many of the trails overlook the Pacific Ocean. Cattle graze the coastal prairie areas to help restore native plants and the Ohlone Tiger Beetle. Access to the site is limited. Visitors can park on Shaffer Road and cross Highway 1 to enter the southern entrance or park east of Western Drive to walk down Meter Street to enter the northeastern entrance. Highway 1 does not have a crosswalk and a mid-block crossing would likely not be supported by Caltrans at the location. A parking area could be established off of Highway 1 but would likely include retaining walls and other costly improvements. Park signage is worn-out and needs replacement. The signs are not highly visible from the public right-of way at either entrance. Large interpretive signs could help educate visitors on the unique resources and restoration effort. A small metal interpretive sign and four bike posts are located at each entrance.

Recommendations:

1. Consider developing a parking area off of Highway 1 to improve access to the property.
2. Provide more prominent entry signs and install new trail and interpretive signage.
3. Improve cattle grazing fencing.
4. Continue efforts to protect rare and endangered species.
5. Explore opportunities to enhance access and connectivity.

Museum of Natural History

Location: 1305 E. Cliff Dr.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 3,500 sq. ft.

The Museum of Natural History is located at Tyrrell Park. The museum is leased to the Santa Cruz Museum of Natural History which provides services, events, programs, exhibits, and other educational tools to inspire stewardship and connect people to nature and history.

Recommendations:
See Tyrrell Park.

Neary Lagoon Park

Location: 100 California St.

Proposed Classification: Neighborhood Park

Size: 1.27 acres

Neary Lagoon Park is located adjacent to the Neary Lagoon Wildlife Refuge, La Barranca Park, and the Wastewater Treatment Plant. It has two tennis courts, picnic tables, a playground, off-street parking, and restrooms. It is located at one of the three entrances to the Neary Lagoon Wildlife Refuge. The Monterey Bay Scenic Trail is planned on the railway right-of-way that separates Neary Lagoon Park from La Barranca Park.

Recommendations:
Consider lighting the tennis courts.

Feature		Condition	Description
Recreational Facilities	Playground	Very good	One large playground with a variety of features and sand play. Combination of rubber matting and sand surfacing
	Tennis court	Very good	Two tennis courts
Site Access	Pathway	Very good	Concrete
	Parking	Fair	Off-street parking.
	Entrance sign	Good	One entrance sign. It could be moved closer to street for improved visibility.
Site Furnishings	Art	Good	One mural.
	Benches/Seating	Very good	Eight benches.
	Bike parking	Very good	Three u-shaped.
	Drinking fountain	Good	One metal drinking fountain.
	Garbage	Good	Three garbage cans.
	Recycle	Good	One recycle container.
	Combination of garbage and recycling	Very good	One BearSaver saver can.
	Interpretive signs	Good	One panel.
	Picnic tables	Very good	Two picnic tables.
	Restroom	Fair	One restroom (one dual facility).

Neary Lagoon Wildlife Refuge

Location: Access at Neary Lagoon Park, the terminus of Chestnut St, and the terminus of Blackburn St.

Proposed Classification: Open Space

Size: 37 acres

Master Plan: Neary Lagoon Management Plan (1992)

Neary Lagoon Wildlife Refuge offers a boardwalk loop trail where visitors can bird watch and explore a variety of natural habitats such as riparian forest, freshwater marsh, mixed oak woodland, and open water. The floating walkway offers a truly unique experience within the City and region. Interpretive signs provide information about some of the wildlife that inhabit the refuge. An interpretive kiosk and group education area is located at the Chestnut Street entrance. The walkway is also a good connection between the Lower Westside and Downtown neighborhoods. A portion of the floating walkways was renovated in 2016, but there remains much more walkway in need of renovation. The Santa Cruz Museum of Natural History leads educational tours funded by Public Works. A new biological assessment should be conducted to evaluate the invasive species and provide recommendations for parks maintenance activities which consider timing and approach to limit disturbances to wildlife.

Recommendations:

1. Fund the replacement of the floating walkways.
2. Hire a biologist to evaluate parks maintenance activities and timing, and develop recommendations for natural restoration activities.

Feature		Condition	Description
Safety and Security	Gated and locked at night	Good	Gated at all entrances.
Site Access	Pathway	Fair	The new floating walkways are very good. The remaining wooden walkways will need to be replaced in the near future. The asphalt pathways are in need of resurfacing.
	Entrance sign	Good	Three wood signs. Entrance sign on Blackburn Street is small and weathered.
Site Furnishings	Benches/Seating	Very good	Twelve benches/seating areas.
	Bike parking	Very good	Three u-shaped at Blackburn St.
	Garbage	Good	Six garbage cans and one BearSaver can with garbage and recycling.
	Interpretive signs	Fair	Twelve interpretive panels. Some show defacing and fading and need panel replacement.
	Interpretive kiosk	Good	Six more interpretive panels under a shelter structure and seven benches form a group education area.

Ocean View Park

Location: 102 Ocean View Ave.

Proposed Classification: Neighborhood Park

Size: 3.06 acres

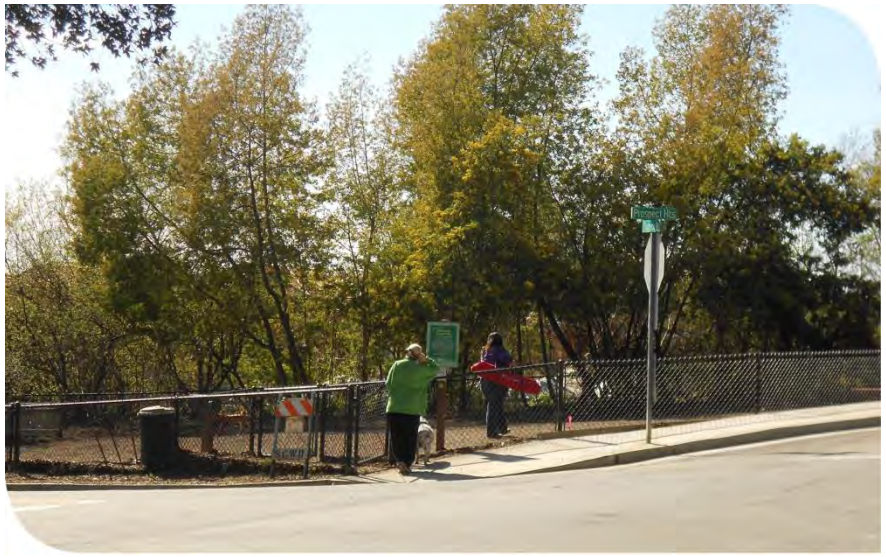
Ocean View Park is a popular family park with picnic tables, playgrounds, long slides and restrooms. Other facilities include a half-court basketball court as well as a grass field which accommodates legal, unfenced off-leash dog use when not being used for other recreational purposes. The proximity of the off-leash dog use area to the picnic, basketball, and playground areas is not optimal and uncontrolled dogs frequently create issues with other park users. Fencing the off-leash dog use area could help improve the situation, but it would also segment the park and limit the amount of activities that can take place. The playground equipment will need to be upgraded soon. Many of the pathways are comprised of decomposed granite. The site has poor drainage and the pathways often become difficult to pass. Replacing the decomposed granite with asphalt or a more decorative material could improve the walkability during the winter months. There is an overlook on the southern side of the park with an impressive view of the Boardwalk and San Lorenzo River. A pathway connects from S. Branciforte Avenue to Ocean View Avenue to E. Cliff Drive and Jessie Street Marsh. The closest crosswalk across E. Cliff Drive to the Santa Cruz Riverwalk is located at Jessie Street.

Recommendations:

1. Consider fencing-in the off-leash dog use area or relocating the off-leash dog use area to another location.
2. Upgrade the playground equipment and surfacing.
3. Create a paved surface road from S. Branciforte Avenue.
4. Add native gardens and more ornamental plantings.

Feature		Condition	Description
Recreational Facilities	Basketball court	Very good	Half court.
	Off-leash dog use	Fair	One off-leash dog use area w/ no fence. Grass field is saturated during winter.
	Playground	Good	One swing set, one large climbing structure, seven long slides. Rubber and fibar fill surfacing. Metal slides will need replacement soon.
	Tot-lot	Good	One structure with slides, bucket swing, and rubber and fibar fill.
Site Access	Pathway	Good	Dirt pathway towards S. Branciforte Ave can be improved. Asphalt is very good. Decomposed granite is in fair condition. Improvements to stairs down to E. Cliff from bluff should be pursued.
	Entrance sign	Very good	Three metal and one wood.
Site Furnishings	Art	Fair	Rock monument. Vandalism needs to be removed.
	Benches/Seating	Good	Thirteen wood benches, three recycled plastic, and five concrete formed benches.
	Drinking fountain	Good	One metal and one on restroom.
	Garbage	Very poor	Seven concrete. Showing rust and warping. Two plastic.
	Recycle	N/A	One toter.
	Picnic tables	Fair	Four concrete.
	Restroom	Good	One dual facility.

Pacheco Dog Park



Location: Pacheco Hts. @ Pacheco Ave.

Proposed Classification: Neighborhood Park

Size: 0.45 acres

Pacheco Dog Park is a popular fenced off-leash dog use area with wood chips as the surface. Wood benches and a picnic table are provided for seating. The park receives a lot of sun exposure and a small oak tree is not mature enough to provide adequate shading. A water spigot is also provided.

Recommendations:
Dog play features, shade structures, seating, or tables could be added to enhance the experience for dogs and/or owners.

Parks and Recreation Administration Building

Location: 323 Church St.

Size: 4,546 sq. ft.

Proposed Classification: Other

The Parks and Recreation Administrative Building is located within City Hall and currently houses the administrative staff for the Parks and Recreation Department. An ADA assessment was recently completed.

Recommendations:
Complete improvements identified within the ADA assessment.

Parks Maintenance Yard

Location: 300 Evergreen St.

Proposed Classification: Other

Size: 2,100 sq. ft. maintenance garage, 2,700 sq. ft. office, a 2,000 sq. ft. open equipment bay, and approximately 1,800 sq. ft. of sheds

The Parks Maintenance Yard is located at 300 Evergreen Street and includes offices and equipment storage and bays for parks maintenance operations.

Recommendations:
None.

Poets Park and Beach Flats Community Garden

Location: 200 Raymond St.

Proposed Classification: Neighborhood Park

Size: 0.13 acres

Poets Park is a small park which includes picnic tables, a drinking fountain, benches, play equipment, community garden plots, and artwork. It is adjacent to the Beach Flats Community Garden which is located on property which is leased by the City from the Santa Cruz Seaside Company. The City is currently searching for a permanent community garden space in the Beach Area neighborhood. A total of thirty-two combined plots are currently located at Poets Park and Beach Flats Community Garden.

Recommendations:
The City will continue to pursue a permanent community garden space for the Beach Area neighborhood.

Feature		Condition	Description
Recreational facilities	Community gardens	Good	Thirty-two combined total garden plots.
	Playground	Very good	Seesaw and climbing roundabout.
Site Access	Pathway	Very good	Concrete.
Site Amenities	Art	Very good	Concrete decorative balls and metal tree sculpture.
	Benches/Seating	Fair	Concrete formed bench shows minor wear and tear from skateboard grinding.
	Garbage	Fair	One concrete.
	Picnic tables	Very good	Two recycled plastic tables.

Pogonip Clubhouse

Location: Accessed from Golf Club Dr.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 8,000 sq. ft.

Master Plan: Pogonip Clubhouse Rehabilitation Plan (2000) and Pogonip Master Plan (1998)

The Pogonip Clubhouse was built in 1911 and was designed as a two-story Craftsman style clubhouse for the Casa del Rey Golf Course. In 1935, it was converted into a Polo Club. After World War II, the club remained a private social club until the 1980s when it was condemned. In 1988, the City acquired Pogonip and initiated efforts to mothball the building. The clubhouse is currently in a dilapidated state and remains closed to public access. The Pogonip Master Plan plans to restore the clubhouse and use it as a staging area for educational programs, a meeting and retreat center, and a site for special events.

Recommendations:

1. Conduct an assessment of the structure's current state and fund short-term mothballing improvements if necessary.
2. Restore and renovate the clubhouse for various uses (events, weddings, community center, winery, etc.).

Pogonip Open Space

Location: Accessed from Harvey West Park, the terminus of Golf Club Dr., Highway 9, Glen Coolidge Dr., and Spring St.

Proposed Classification: Open Space

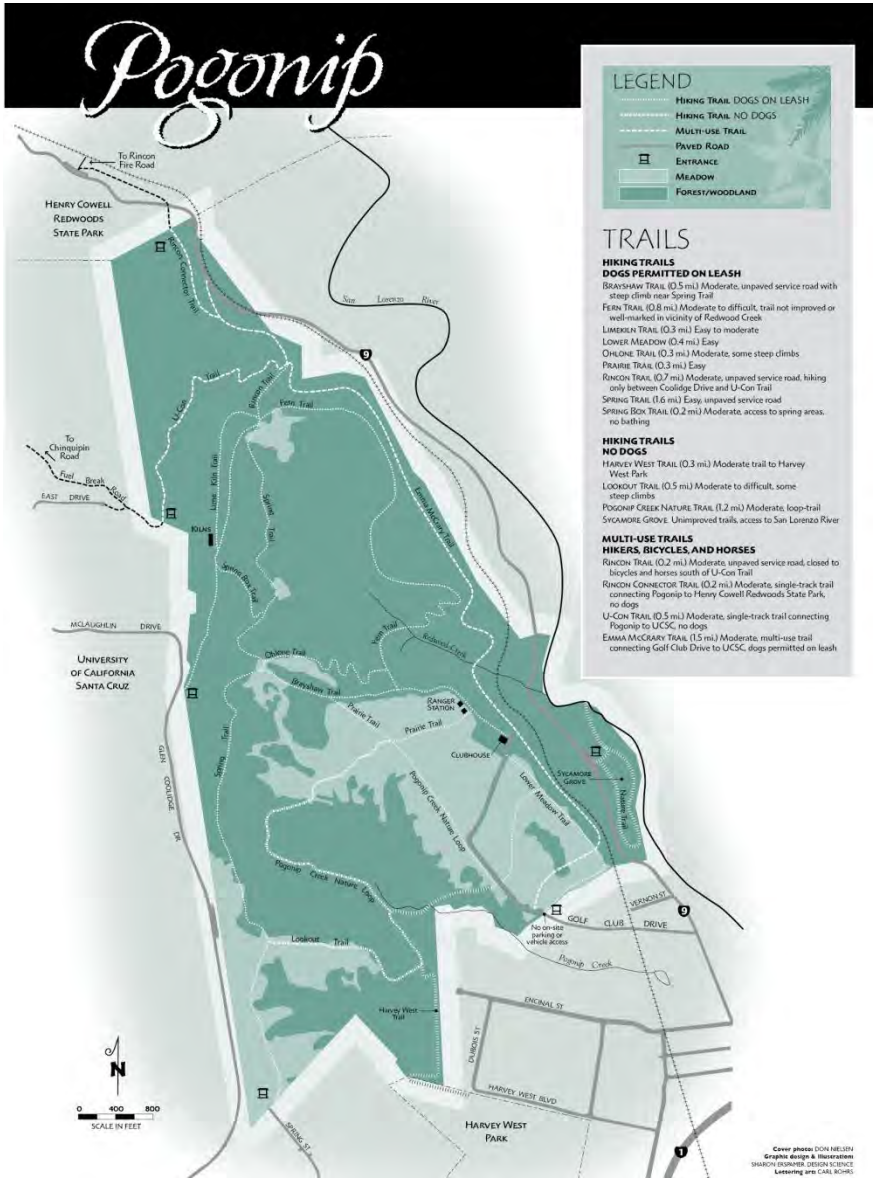
Size: 640 acres

Master Plan: Pogonip Master Plan (1998)

Pogonip Open Space contains approximately eight miles of hiking trails and three miles of multi-use (hiking, biking, and horseback riding) trails that weave through a variety of natural and historic sceneries. The open space is located adjacent to Harvey West Park, UCSC (which includes trails that connect to Wilder Ranch State Park), and Henry Cowell Redwoods State Park. The Emma McCrary Trail was constructed in 2013 with the help of volunteers and has become a very popular tail, especially for mountain biking. The Pogonip Master Plan envisioned a variety of recreational and educational activities for the open space. The Homeless Garden Project will be relocating in Pogonip. The Homeless Garden Project is a non-profit organization that provides programs and training to people who are or have previously been homeless. A 1,500 sq. ft. office/classroom building, parking area and an approximately 9 acre farm will be located in the Lower Main Meadow. The property includes the historic Pogonip Clubhouse which was constructed in 1911 as the Casa del Rey Golf and Country Clubhouse. The clubhouse is currently in a dilapidated condition and is closed-off from public access. The existing Pogonip Master Plan envisioned the restoration of the Pogonip Clubhouse as a staging area for educational programs, a meeting and retreat center, and a site for special events. The former tennis courts are also closed and the swimming pool has been filled-in. The Master Plan recommends replacing the tennis and pool area with event grounds and parking. The Master Plan also planned for an outdoor education camp across Golf Club Drive from the Homeless Garden Project and an interpretive trail through Sycamore Grove. The Sycamore Grove area is located to the east of Highway 9 along the San Lorenzo River and is currently closed as a result of illegal camping issues. No parking is currently provided onsite.

Recommendations:

1. Continue to implement the existing master plan.
   - Restore the Pogonip Clubhouse and use for events. Seek partnerships and grant opportunities to fund renovation.
   - Implement the Sycamore Grove interpretive trail.
   - Consider a caretaker residence or park host onsite.
   - Enhance restoration efforts. Renovate cattle grazing infrastructure and begin grazing. Develop and implement a work plan for invasive species removal and native plant restoration.
   - Install interpretive signage.
   - Construct road, parking lot, infrastructure, and other site improvements.
2. Explore modifications to the existing master plan:
   - Conduct a trails assessment to evaluate existing trail conditions and use issues and identify ways to improve access, recreational enjoyment, and connectivity. The assessment will help inform the determination of whether or not future trail modifications or improvements are appropriate and provide for a range of uses (hiking, horseback riding, mountain biking). As part of the process, the City would create clearer maintenance standards, identify use conflicts and solutions, develop a signage and educational program, assess long-term maintenance costs associated with any future improvements, and evaluate potential environmental impacts and mitigations through the CEQA process.
   - Consider adding a parking area near the Emma McCrary trail on Golf Club Dr. in the meadow immediately to the northwest of the vehicle access gate.



Rincon Park

Location: 601 Chestnut St.

Proposed Classification: Neighborhood Park

Size: 0.06 acres

Rincon Park is a small demonstration garden with pathways.

Recommendations:
None.

Riverside Gardens Park

Location: 258 San Lorenzo Blvd.

Proposed Classification: Neighborhood Park

Size: 0.52 acres

Riverside Gardens Park is the newest park in the system and was opened in 2014. A granitecrete pathway connects from Riverside Avenue to San Lorenzo Boulevard. Along the pathway there are picnic tables, benches, a playground, community garden plots, a small grass field, an arbor, and one piece of exercise equipment. A steel panel fence was specifically designed for the park and each panel was cut with a different floral design pattern. Fruit trees were planted as part of a community orchard project. The orchard is located in an area with limited recreational opportunity and will increase access to food. In addition, it will provide opportunities to learn about resource conservation and sustainable growing practices in a public setting.

Recommendations:
None.

Feature		Condition	Description
Recreational Facilities	Community gardens	Very good	Eleven plots.
	Exercise equipment	Very good	One piece (stairs).
	Playground	Very good	One wooden structure with plastic slides, swings, and bucket swings. Fibar fill.
Safety and Security	Lighting	Very good	Three light poles.
	Gate and locked at night	Very good	Steel panels.
	Security cameras	Very good	One security camera.
Site Access	Pathway	Good	Granitecrete pathway.
	Entrance sign	Very good	Two diecast cut metal signs and two metal park signs.
Site Furnishings	Arbor	Very good	Wooden arbor.
	Benches/Seating	Very good	Five recycled plastic.
	Bike parking	Very good	Two artistic metal bike racks.
	Garbage	Very good	Two metal cans.
	Both	Very good	Two BearSaver cans.
	Picnic tables	Very good	Six concrete tables.

Round Tree Park

Location: 305 Nobel Dr.

Proposed Classification: Neighborhood Park

Size: 0.28 acres

Round Tree Park is a small grass field that is infrequently used. The small size, coupled with public streets bordering three sides of the park, limits the type of recreational facilities that can be located there. There is currently no park signage or site furnishings. Smaller, well-designed recreational opportunities could be added such as an outdoor exercise area, swing set, gazebo, tot-lot, or community garden.

Recommendations:

1. Add park signage.
2. Consider additional recreational opportunities such as an outdoor exercise area, swing set, gazebo, tot-lot, or community garden.

San Lorenzo Park

Location: 137 Dakota Ave.

Proposed Classification: Community Park

Size: 11.12 acres

San Lorenzo Park is located along the eastern edge of the San Lorenzo River and is bordered by Water Street to the north; the Santa Cruz County Government Center, a hotel, and an apartment complex to the east; and Branciforte Creek to the south. The park is connected to downtown by a pedestrian bridge over San Lorenzo River. Public Works recently completed the construction of a pedestrian bridge across Branciforte Creek, linking the park to the Santa Cruz Riverwalk to the South. The benchlands area of the park is located within a flood plain for the river and any development is heavily regulated by the Army Corps of Engineers. San Lorenzo Park hosts multiple events throughout the year and parking is often provided at the County Government Center and in the benchlands area for the events. The park has a playground, a tot-lot, a portable pump track, nine disc golf baskets, the San Lorenzo Lawn Bowling facility, and a pond with a small stage. The play area has been completely fenced-in. The pond is a popular destination to bird watch. However, the pond does not recirculate water and needs to be upgraded. The stage is not frequently incorporated into events at the park. The restrooms are periodically closed as a result of illegal activity which is prevalent at the park. Cameras were installed in the park to create a safer environment and a Ranger is generally stationed at the park.

The park is located adjacent to the river and is in need of renovations and enhancements to create more use and deter misconduct. Consideration should be given to creating a larger draw for additional community use of the park when events are not being held. Future renovations of the park could focus on architectural elements, attractions, event infrastructure, and other improvements that separate the park from other destinations. Future renovation of the park should also consider how to increase usage of the Santa Cruz Riverwalk from neighborhoods along the river and Downtown.

Recommendations:

1. Consider a comprehensive renovation of the park. Examples include upgrading the playground, renovating or removing the pond, adding more colorful gardening displays, providing art, renovating or relocating the restrooms, expanding the number of recreational facilities, installing hidden infrastructure to support events, and constructing functional architectural elements such as entrances, plazas, art, stages, and arbors.
2. Increase programming of the park.
3. Hold more events and concerts in the park.
4. Consider as a location for a permanent or seasonal food truck court.
5. Partner with the County to provide recreational facilities on the parcel of County-owned land immediately to the north of the lawn bowling facility. Recreational facilities could include pickleball courts, exercise equipment, and/or amenities or features that could be incorporated into weddings or events.

Feature		Condition	Description
Recreational Facilities	Disc golf course	Very Good	Nine hole disc golf practice course.
	Large, grass field	Poor	Benchlands has no irrigation.
	Playground	Good	One structure w/ slides, climbing structure, and tire swing with sand and rubber matting. Concrete serpent.
	Pump track	Very good	One fiberglass and wood portable pump track course.
	Tot-lot	Good	Fenced-in with a structure with slides and bucket swings and sand and rubber fills.
Safety and Security	Lighting	Good	Twelve light poles.
	Security cameras	Very Good	Three security cameras on poles.
Site Access	Pathway	Fair	Asphalt and decomposed granite are in fair condition.
	Entrance sign	Good	Nine metal and one wooden entry sign.
Site Furnishings	Benches/Seating	Fair	Five wooden benches in poor condition. Four recycled plastic benches in good condition. One artistically painted concrete bench in a very good condition.
	Bike parking	Very good	Two U racks and eight metal bike posts.
	Drinking fountain	Good	Three metal.
	Flag pole	Very good	One flag pole.
	Garbage	Poor	Eight concrete garbage cans. Rusting and warping.
	Recycle	Fair	One can with slatted screen.
	Both	Very good	Three BearSaver cans.
	Pond and Stage	Poor	Pond does not recirculate water and is prone to pipes breaking. Stage is dated.
	Restroom	Fair	One dual facility.

San Lorenzo Park Lawn Bowling

Location: 137 Dakota St.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 18,000 sq. ft. outdoor lawn bowling area and 1,500 sq. ft. clubhouse

The San Lorenzo Park Lawn Bowling facility is located in San Lorenzo Park and operated by the Santa Cruz Lawn Bowling Club. The world class green was constructed with a well-drained, compacted substrate layer leveled to within 1/8" level for every ten foot of surface where the ball, when rolled upon the surface, travels at a specific speed to meet world standards for tournament play. Reservations or club memberships are required to use the facility. Used by the Santa Cruz Lawn Bowling Club, the clubhouse contains a kitchen and restrooms in addition to meeting space.

Recommendations:
None.

Santa Cruz Riverwalk

Location: Multi-use trail along the San Lorenzo River

Proposed Classification: Other

Size: N/A

Master Plan: San Lorenzo Urban River Plan (2003)

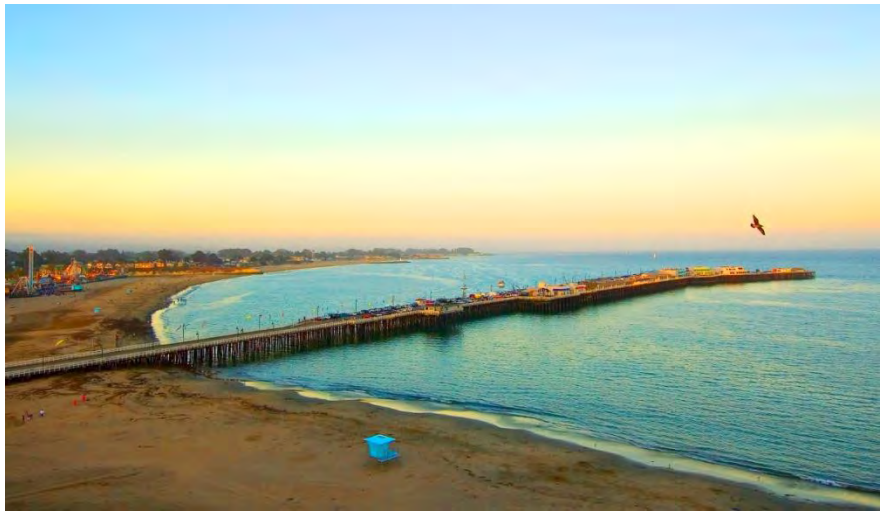
The Santa Cruz Riverwalk is a multi-use trail that encircles the San Lorenzo River south of Highway 1. On the west side of the river, the trail continues under Highway 1 to the Tannery Arts Center. The San Lorenzo Urban River Plan provides a number of recommendations for the locations and designs of plazas, unpaved nature loops, native planting treatments, interpretive signage, bird watching platforms, and art. The plan recognizes that the river is a habitat area for fish and wildlife and a passive recreational area for the enjoyment of the community. The Public Works Department recently added additional lighting along the Riverwalk, as well as exercise equipment on the west side of the river and south of Laurel Street. Exercise equipment is also located on the west side of the river south of Highway 1. Illegal activity, protecting the river and bird habitat, and increasing positive use of the area have been ongoing concerns along the river corridor.

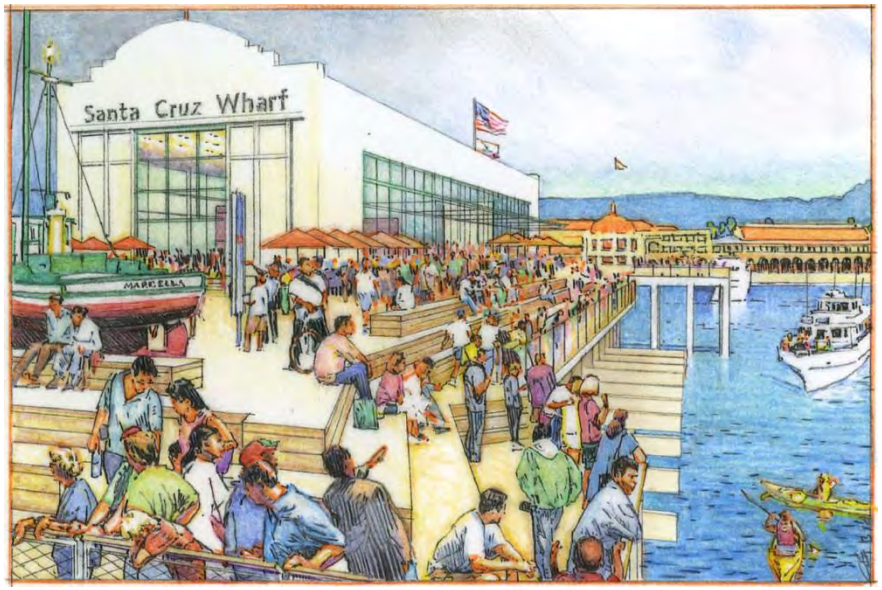
Recommendations:

1. Implement the San Lorenzo Urban River Plan as well as stakeholder recommendations developed through the Santa Cruz Riverwalk Summit and subsequent discussions.
2. Integrate multi-departmental and agency partnerships while enhancing the department's programming and safety efforts.
3. Install or coordinate improvements which include but are not limited to the installation of artwork, site furnishings, infrastructure and recreational amenities.

Feature		Condition	Description
Recreational Facilities	Exercise equipment	Very good	Two locations, nine pieces total.
Safety and Security	Lighting	N/A	Lighting along majority of pathway.
Site Access	Pathway	Fair	The majority is asphalt. Some sections concrete and permeable concrete.
	Entrance sign	Good	Fourteen metal signs.
Site Furnishings	Benches/Seating	Fair	One set of concrete blocks.
	Garbage	Good	Five garbage only BearSaver cans.
	Both	Fair	Twenty BearSaver cans. The majority are in good condition. A few are in fair condition due to wear and tear and continual remediation of vandalism.
	Interpretive Signs	Very good	Three signs.

Santa Cruz Wharf





Rendering from the Santa Cruz Wharf Master Plan Report (2014) of potential improvements and activities at the Bayward end of the Wharf.

Location: Entrance located at the intersection of Beach St. and Pacific Ave.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 8 acres

Master Plan: Santa Cruz Wharf Master Plan (2014)

The Santa Cruz Wharf was constructed in 1914 and, at one-half mile in length, is the longest timber pile-supported pier structure in the United States. The Wharf is a major tourist destination and is popular for wildlife viewing, fishing, boat tours, dining, and shopping. The Parks and Recreation Department operates the Wharf. The Economic Development Department is managing the Santa Cruz Wharf Master Plan process which is currently in the CEQA review process. The Santa Cruz Wharf Master Plan will guide the future restoration and expansion of the facility, and includes polices that recognize the importance of the visual and historic landmark and significance as a recreational, commercial, and open space resource. Among the many recommendations, the plan includes a landmark building, an events pavilion, a gateway entrance, a welcome center, a small boat landing area, and pedestrian and bicycle access along the western side. The Wharf Headquarters is located on the Wharf and the Maintenance Yard is leased from the Regional Transportation Commission and is located near Depot Park. In 2014, the Santa Cruz Green Wharf Project, a partnership between the City, UCSC, and other organizations and community members dedicated to reducing the environmental footprint of the wharf, received the Governor's Environmental and Economic Leadership Award.

Recommendations:

Work with the Planning and Community Development and Economic Development Departments to implement the Wharf Master Plan. Renew the lease for the Wharf Yard and consider facility improvements such as a workshop and storage structure.

Scope Park

Location: Pacific Ave. @ Mission St.

Proposed Classification: Neighborhood Park

Size: 0.1 acres

Scope Park is located across the street from the Town Clock and contains a mural. Scope Park and the Town Clock are gateways to downtown.

Recommendations:
Coordinate with the Arts Commission to restore or paint a new mural.

Senior Citizens Opportunity (222 Market Street)

Location: 222 Market St.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 5,400 square feet

The community center is leased to Senior Citizens Opportunity to provide senior arts and cultural services. The building has a large multi-use room with a stage at one end along with an adjoining kitchen and another small multi-use room. The City maintains the landscaping and exterior of the building.

Recommendations:
None.

Sgt. Derby Park

Location: 509 Woodland Wy.

Proposed Classification: Neighborhood Park

Size: 3.65 acres

Sgt. Derby Park has a large grass field, one of the first skate parks in California, two tennis courts (six pickleball courts are painted), three disc golf baskets, picnic tables, and a playground. The park does not contain frontage along a public street and is hidden from view behind residences from the public right-of-way on Woodland Avenue to the south. Park access is provided from the street by two narrow unpaved paths located between private residences. A fence was installed by the Santa Cruz City Schools District between Sgt. Derby Park and Natural Bridges School along the eastern property line. Industrial properties are located to the north. Residential properties are located along the west and south. Fence cutting has occurred along the fence-line between the industrial properties and the park for access to the park. There may be an opportunity for a joint-use agreement with the Santa Cruz City Schools District to construct a turf soccer field on their property. The proximity of the park to the recreational facilities is a great opportunity to explore a more detailed joint-use partnership to allow for public use during off-hours. Adjacent to the skate park, the remnants of a volleyball court exist. This court could be converted to another skateboarding area, possibly tailored for less experienced riders or incorporated into the existing skate park. The asphalt pathways are deteriorating and need resurfacing. There is room for expansion next to the adjacent playground to offer more variety for varying age groups. The tennis/pickleball court area could be expanded. A parcourse used to be located at the park and could be reestablished. The park is currently serviced by a porta-potty. Additional use related to more courts or a joint-use partnership for a turf field may necessitate the need for a permanent restroom. The drainage is poor for most of the site. A fenced off-leash dog use area could be located at the site. However, consensus with the surrounding neighbors has not been reached. Many residents do not want the open field segmented with fencing and prefer hours of off-leash dog use to be pursued. Many others have expressed concern that allowing off-leash dog use without a fenced area would create safety and cleanliness issues.

Recommendations:

1. The entrances could be improved to be more inviting, such as with the installation of awnings, landscaping, or other entry features.
2. Improved parking and access could occur through mutual parking agreements with adjacent industrial property owners to create access from Delaware Avenue or the Armory property off of Swift Street.
3. A more defined joint-use agreement with the Santa Cruz City Schools District could be pursued for use of the existing school recreational equipment and the development of an artificial turf field.
4. There is opportunity to expand the skate park and tennis/pickleball facilities to accommodate additional skate and court space.
5. A parcourse could be established along the pathway.
6. The pathways should be resurfaced in the near future.
7. The playground could be expanded to offer more variations for skill and age level.
8. The evaluation of adding a restroom facility should be conducted if facilities are expanded and the park receives a higher level of use.

Feature		Condition	Description
Recreational Facilities	Disc golf	Very good	Three practice baskets.
	Large, grass field	Poor	Large multi-use field. Drainage is poor.
	Pickleball court	Very good	Six pickleball courts are painted on the tennis court for shared use. Requires nets to be brought to the site and installed.
	Playground	Good	One swing set. One playground structure w/ slides and a bucket seat swing set for smaller children. Fibar fill.
	Skate park	Very good	Concrete. Graffiti is prevalent.
	Tennis court	Very Good	Two courts. Painted for shared use with pickleball.
Site Access	Pathway	Very poor	Asphalt needs to be resurfaced.
	Entrance sign	Good	Two wood, four metal signs.
Site Furnishings	Art	Very good	One rock w/ metal plaque and one metal sculpture commemorating Sgt. Derby.
	Benches/Seating	Fair	One wood, four recycled plastic, and two metal.
	Bike parking	Good	One U rack.
	Drinking fountain	Fair	One regular, one with dog bowl.
	Garbage	Fair	Five concrete.
	Recycle	Poor	Two wood slatted shells.
	Picnic tables	Fair	One wood and five concrete.
	Restroom/Porta-Potty	Fair	Screened porta-potty.

Star of the Sea Park

Location: 418 Darwin St.

Proposed Classification: Neighborhood Park

Size: 2.1 acres

Star of the Sea Park is approximately 2.1 acres. The City owns an approximately 1/3 acre parcel along Darwin Street and a joint-use agreement allows use of the adjacent field area which the City maintains. The properties contain very few amenities and the turf area needs enhancement. Additional facilities could be placed at this site. Consideration should be given to provide activities that are not provided at nearby Frederick Street Park. The Parks and Recreation Department could expand the joint use agreement to add signage and a walkway from Frederick Street to encourage more use of the site. Drainage is poor in the field area. The large grass field is large enough to accommodate a youth soccer field. However, this portion of the park is not owned by the City and the joint-use agreement would need to be expanded.

Recommendations:
Explore additional amenity opportunities with the surrounding neighborhood and Star of the Sea Church. The location has limited site furnishings and no recreational facilities. Consideration should be given to providing facilities which are not currently located at Frederick Street Park, which is a few blocks away. Some examples of what could be located there include a community garden and/or orchard, pickleball courts, a basketball court, a soccer field, exercise equipment, play equipment, or a small pump track.

Feature		Condition	Description
Recreational Facilities	Large, grass field	Very poor	Irrigation system needs work, gopher holes, uneven surfaces, and bare patches. Irrigation clock is located behind school's gate and could be relocated to be more accessible to City staff.
Site Access	Pathway	Poor	Decomposed granite, below level of grass and poor appearance.
	Entrance sign	Poor	One wooden near Church parking lot is in good condition. No sign on Darwin St.
Site Furnishings	Garbage	Very poor	Three concrete bins.
	Recycle	Very poor	One wooded w/ slat screening.
	Picnic tables	Very poor	Three (wooden).

Surfing Museum

Location: 701 W. Cliff Dr.

Proposed Classification: Community, Recreational, and Cultural Facility

Size: 630 sq. ft.

Located inside the iconic Mark Abbott Memorial Lighthouse on Lighthouse Point, the Surfing Museum overlooks the renowned surf break Steamer Lane and has a collection of photographs, surfboards, and other interesting artifacts tracing more than 100 years of surfing history in Santa Cruz. The museum shop specializes in surfing books and surfing related items.

Recommendations:
Update the collections. Consider removing the turf and replacing with native plant displays and/or a plaza/gathering area at the rear of the Surfing Museum.

Town Clock

Location: 101 Water St.

Proposed Classification: Neighborhood Park

Size: 0.19 acres

Town Clock is a plaza with benches, art, a water fountain, and is the site of a memorial plaque for the 1989 Loma Prieta Earthquake. The plaza is used as a gathering place and is home to the annual New Year's Eve countdown event.

Recommendations:
None.

Trescony Park

Location: Terminus of Trescony St.

Proposed Classification: Neighborhood Park

Size: 2 acres

Trescony Park has the largest community garden area in the City with fifty-four plots. The park also has a playground, tot-lot, and picnic tables. A pathway extends to Bay Street. A porta-potty could be provided.

Recommendations:

1. Provide a porta-potty.
2. Add signage along Bay Street.
3. Improve concrete pathway.

Feature		Condition	Description
Recreational Facilities	Community gardens	Good	Fifty-four plots.
	Playground	Good	One tower with slide. Fibar fill.
	Tot-lot	Good	One tower with slide. Fibar fill.
Safety and Security	Lighting	Fair	Four light poles.
Site Access	Pathway	Poor	Concrete pathway is not level.
	Entrance sign	Good	One wooden entrance sign, one metal, one wood. No sign on Bay St.
Site Furnishings	Benches/Seating	Good	Four recycled plastic benches.
	Bike parking	Good	One U bike rack.
	Drinking fountain	Good	One metal.
	Garbage	Fair	Two concrete toters used for garden area.
	Recycle	Fair	One recycle bin with slat screening.
	Picnic tables	Fair	Two concrete and one wood.

Tyrrell Park

Location: 1305 E. Cliff Dr.

Proposed Classification: Neighborhood Park

Size: 1.2 acres

Tyrrell Park is a small neighborhood park which contains a small group educational area, a grass field, benches, and a life-size gray whale sculpture. The whale is a popular backdrop for photographs taken by visitors of the Museum of Natural History, which is located onsite. The park is located across E. Cliff Drive from Seabright State Beach, and the surrounding streets receive a high amount of traffic from beach goers. Community members help maintain Pilkington Creek which runs along the eastern edge of the site. Monarch butterfly habitat is located onsite. The Santa Cruz Museum of Natural History has requested minor improvements to create a better connection between the park and the museum's programming and educational classes, including a small trail emphasizing native plants from Santa Cruz; replacement of front lawn with native/drought resistant demonstration gardens; natural art and activity zones where art and play make use of natural materials and kids can search for insects; natural play areas making use of stumps, rocks, and tree trunks; bird boxes and other wildlife enhancements; dark sky lighting to allow for star gazing; bicycle parking, and ADA enhancements. The Parks and Recreation Department is generally supportive of these requests but will need to ensure that future programming and activity areas are complementary, neighborhood-serving, and do not deter park use from neighbors or cause other impacts to the neighborhood.

Recommendations:
Convert landscaping to demonstrative gardens, add habitat features, bike parking, and dark sky lighting, improve ADA access, and rewire and upgrade plaster whale. Work with the Santa Cruz Museum of Natural History and surrounding neighbors to establish guidelines and locations for the outdoor activity and learning areas to ensure they are scaled appropriately for a neighborhood-serving park. The small amphitheater could be programmed with local events.

Feature		Condition	Description
Safety and Security	Lighting	Fair	Two light poles.
Site Access	Pathway	Good	Concrete, asphalt, and pervious concrete are good. Decomposed granite pathways are in fair condition.
Site Furnishings	Amphitheater	Fair	Small concrete amphitheater.
	Art	Fair	One whale.
	Benches/Seating	Good	Two wood showing minor cracking, three wood in very good condition, and one recycled plastic in very good condition.
	Bike parking	Good	Three bike posts.
	Flag pole	Very good	One flag pole.
	Trash and Recycling	Very good	Two BearSaver cans.
	Interpretive signs	Fair	Three plastic panels and one metal.

University Terrace Park

Location: Meder St. @ Nobel Dr.

Proposed Classification: Neighborhood Park

Size: 8.7 acres

University Terrace Park has a playground, large grass field, two tennis courts, picnic tables, and fenced-in off-leash dog use areas (one area is dedicated to dogs less than 25 pounds in size). The park is connected to the Arroyo Seco trail which connects to Grandview Street. The basketball court is popular for pick-up games. Youth soccer leagues occasionally use the field as a practice area. The park is frequently used and currently has a porta-potty. A permanent restroom facility with an attached maintenance shed is a necessary addition. The playground equipment is limited given the size of the park, though the original design planned more play areas. Additional features could be added. A mini soccer field (synthetic) could be added to the large grass area to reduce water use and increase opportunities for pick-up games.

Recommendations:

1. Add a permanent restroom with an attached maintenance shed.
2. Upgrade/add playground equipment for more age groups.
3. Consider a mini soccer field (synthetic).

Feature		Condition	Description
Recreational Facilities	Basketball court	Very good	One basketball court
	Large, grass field	Good	Very large multi-use grass field.
	Off-leash dog use	Good	Very large off-leash dog use area. Surface is dirt and becomes muddy during the rainy season.
	Playground	Good	One play structure with slides and a bucket swing set. Sand and rubber surfacing.
	Tennis court	Very good.	Two tennis courts.
Site Access	Pathway	Fair	Sections of asphalt are un-level from tree rooting and show dryness and crumbling and will need sealing and resurfacing.
	Entrance sign	Very good	Two wood and two metal.
Site Furnishings	Benches/Seating	Good	Seven recycled plastic, six wood, two concrete.
	Bike parking	Good	One four foot long bike rack near playground and two bike posts near Nobel Dr entrance.
	Drinking fountain	Good	Three drinking fountains. Two include a dog bowl feature. Paint chipping on drinking fountain in off-leash dog use area.
	Garbage	Good	Four concrete.
	Recycle	Good	One in recycled plastic, slatted shell.
	Picnic tables	Good	Three concrete, two recycled plastic, and one wood.
	Restroom/Porta-Potty	Fair	Porta-potty with wooden enclosure.

West Cliff

Location: Swanton Blvd. to Bay St.

Proposed Classification: Community Park

Size: 14.64 acres

West Cliff pathway and accents are located on a coastal bluff along West Cliff Drive, a multi-use path that extends from Natural Bridges State Park to Cowell Beach. Stairs provide access to popular surfing breaks and beaches. Coastal recreation on and around the bluff is abundant and includes but is not limited to ocean and wildlife viewing, relaxing, surfing, swimming, rock fishing, wind surfing, biking, walking, and exercising. The park has benches, landscape accents, a statue, artwork, and one turf field. Surf contests are held at Steamer Lane and marathons are held along the pathway. Multiple surf breaks are located along this section of coastline. The Surfing Museum is located at Lighthouse Point. Lighthouse Point offers an un-paralleled viewing opportunity of surfing. It is sometimes booked for special events such as weddings or food truck events. The pathway has overlook areas that provide opportunities to view sea lions, otters, dolphins, migrating whales, and marine birds. Natural Bridges State Park is located at the Western edge of West Cliff and Lighthouse Field State Park is located across the street from Lighthouse Point. The State Parks provide the only restroom facilities on West Cliff. The State also owns the western half of Its Beach. The Parks and Recreation Department maintains the landscaping, railings, and dirt pathways along the pathway. The proximity to the ocean leads to challenges with erosion and deterioration of infrastructure. As improvements take place over time, the appearance of some of the areas lacks continuity. Ice plant is very aggressive. There are varying opinions about the types of facilities that should be included on West Cliff. Exercise equipment was added to Mitchells Cove and receives regular use. The City Council provided direction to staff to hold off on installing additional recreational facilities until a future plan was in place. The City's Local Coastal Program has a planning item to develop a West Cliff Plan. The coastline is a recreational, natural, and scenic treasure that embodies the City's unique sense of place and identity. A master plan could be created to guide future improvements; help maintain a more cohesive, consistent identity; and improve the long-term coordination and management.

Recommendations:
Partner with other stakeholder departments to develop and implement an integrated design, land-use, recreation, cliff stabilization, and landscape plan for West Cliff and East Cliff Drives to enhance public access, safety, preservation, and recreational enjoyment along the coastline.

Feature		Condition	Description
Recreational Facilities	Exercise equipment	Very good	One dip and one sit-up station.
Safety and Security	Lighting	N/A	Street lights are along W. Cliff Dr.
	Gate and locked at night	N/A	Lighthouse Point Parking lot is gated.
Site Access	Pathway	Very Good to Poor	Asphalt was redone south of David Way. Pavement is eroding and cracking north of David St.
	Parking	N/A	Parking lots and spaces along W. Cliff.
Site Amenities	Art	Very good	One obelisk sculpture, one surfer statue.
	Benches/Seating	Fair	Fifty-nine wooden benches and two recycled plastic benches. Approximately 60 percent of the benches metal supports have deteriorated and will need replacement.
	Bike parking	Good	Ten ft. long bike structure and three U bike racks.
	Drinking fountain	Good	One metal and one metal with bottle feature. Needs to be painted.
	Flag pole	Good	Flag pole is in front of Surfing Museum.
	Garbage	Very good	19 Bearsaver cans for both trash and recycle and five metal cans.
	Recycle	Very good	Three recycle cans in addition to 19 Bearsaver cans for both trash and recycle.
	Both	Good	Eleven BearSaver cans. Some will need to be repainted due to weathering.
	Interpretive signs	Good	Four panels and one brick structure and metal plaque.

Westlake Park

Location: Bradley Dr. @ Spring St.

Proposed Classification: Neighborhood Park

Size: 6.03 acres

Westlake Park is picturesque and offers great opportunities to relax and bird watch. It contains a large grass field, tot-lot and playground equipment, benches, and picnic tables adjacent to a drainage basin which visually looks like a small lake. The park is somewhat hidden within a residential neighborhood. Youth soccer league and UCSC students sometimes use the field for practice. Fishing is allowed for youth 16 years and younger and seniors 65 years and older. Tule growth and the aeration and circulation system require continual maintenance. The pathways currently do not accommodate access around the lake.

Recommendations:

1. This park is a larger neighborhood park within our parks system and a restroom could accommodate visitors who do not live within walking distance to the park which would encourage longer visits.
2. A small walking loop could be installed to allow for visitors to walk around the lake.

Feature		Condition	Description
Recreational Facilities	Fishing	N/A	Allowed for youth sixteen years and younger and seniors 65 years and older.
	Large, grass field	Good	Very large multi-use playing field on east side of park. Sometimes used by youth soccer groups as a practice area.
	Playground	Good	One tower structure w/slides and a swing set. A combination of sand and rubber fill.
Site Access	Pathway	Good	Decomposed granite pathways provide access along the western edge of the lake and to the play structure and picnic tables on the east side of the park.
	Entrance sign	Good	Large, engraved wooden sign and one metal.
Site Furnishings	Benches/Seating	Good	Seven wooden and six recycled plastic.
	Bike parking	Very good	Four metal bike posts.
	Drinking fountain	Good	Two.
	Garbage	Good	Three concrete garbage cans. No recycle.
	Interpretive signs	Good	One wooden and two recycled plastic.

Westside Pump Track

Location: Western Dr. @ Highway 1

Proposed Classification: Neighborhood Park (Leased)

Size: N/A

The Westside Pump Track is located on land the City has leased for a short-term basis. The land will be returned to the property owner when the lease is discontinued.

Recommendations:
Consider asphalt paving of pump track to reduce long-term maintenance needs.

Feature		Condition	Description
Recreational Facilities	Pump track	Very good	The pump track recently underwent a renovation to improve the pumps and berms.
Safety and Security	Gate and locked at night	Very good	New fencing.
Site Access	Pathway	Very good	Entrance to pump track is concrete.
	Entrance sign	Very good	One metal.
Site Furnishings	Benches/Seating	Very good	One metal bleacher.
	Bike parking	Very good	Two bike parking posts.
	Garbage	Very good	One concrete.
	Recycle	Fair	One plastic slatted screen.
	Restroom/Porta-potty	Poor	Unscreened and located in a visible location.

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SECTION 4.3: FUNDING STRATEGIES

A. Introduction
B. City Fiscal Setting
C. Funding Strategies
D. Costs for Future Projects

A. INTRODUCTION

The *Santa Cruz Parks Master Plan 2030* (Parks Master Plan 2030) identifies numerous goal, policies, actions, and recommendation items for implementation, relating not only to specific parks, facilities, open spaces and recreation areas, but also to citywide programs and administration. Full implementation of the Parks Master Plan 2030 will require significant staff and financial resources over the life of the Plan. Given the inherent limitations of the City's financial resources, many implementation projects will need to be prioritized and phased-in in ways that allow for existing staff and budgetary resources to address the projects over time. Furthermore, many of the recommendations are conceptual in detail, and future planning efforts will need to be pursued to flesh out the project-specific details and figure total costs. Finally, costs related to larger, community assets, such as the Santa Cruz Wharf and Civic Auditorium, will require larger funding sources beyond the Department's operating budget or developer fees that are currently collected. That said, this section provides a broader overview of the City's fiscal setting, existing funding strategies, and potential funding strategies that will or could be explored further to help implement components of the plan.

B. CITY FISCAL SETTING

For fiscal year 2017-2018 (FY 2018), the City's total budget is $263.2 million, of which $106.1 million is in the General Fund. The Parks and Recreation Department has a total budget of $17.2 million, of which $14.9 million is funded through the General Fund. In FY 2018, the City has appropriated $47.1 million for capital projects, but unlike prior years, none of these projects are supported with new General Fund monies. The City has identified $299.4 million in unfunded capital projects.

The 2018 budget's fiscal projections anticipate budget shortfalls in the General Fund over the next several fiscal years with a modest recovery beginning in 2022. Despite strong revenue growth, pension, health care, and infrastructure maintenance/replacement costs are increasing. In order to avoid reactive cuts during the shortfall years, it is necessary to reserve revenue now to help the City offset the forecasted deficits.

C. FUNDING STRATEGIES

EXISTING SOURCES

The City has several existing sources of funds to pay for capital projects.

Park Land and Open Space Dedication.

The City requires new residential subdivisions to dedicate land, or pay an in-lieu fee, for parks and open space, as authorized by the Quimby Act (California Government Code Sec. 66477). For subdivisions greater than 50 units, the development is required to either dedicate 4.5 acres per 1,000 population or pay an in-lieu fee. For smaller subdivisions, only the fee is required. The 4.5 acre requirement is divided into two acres for neighborhood parks and 2.5 acres for community parks. The in-lieu fee is set at $3.00/sq. ft. of building space or $4,780 per undeveloped parcel. Use of the fee revenue is restricted to the development of new parks or the rehabilitation of existing parks. Santa Cruz allocates its Quimby Act fee revenue into separate funds representing four quadrants of the City. Fees collected from new residential development within each quadrant must be spent on parks within that quadrant. In the City Budget for Fiscal Year 2018, the four park fee funds are projected to have an ending balance of approximately $800,000.

Park and Recreation Facilities Tax

While the Quimby Act fees are intended primarily to fund acquisition and development of park land, the City has also adopted an excise tax on residential construction to help fund parks and recreation facilities. The

tax, which is paid at the issuance of a building permit, covers development or expansion of all types of residential units, including mobile homes. The tax is charged at the same level as the Quimby Act fees, $3.00 per sq. ft. of new construction. The City has established a separate budgetary fund to account for the excise tax, but as a practical matter the City handles the expenditures of the funds in the same way as it does for the Quimby Act funds. The excise tax revenues are transferred into the four quadrant fee accounts for use on park projects within each of these service areas. Therefore, the fee balance of $800,000 projected for the end of FY 2017-18 indicated above also includes revenues from the excise tax. Future in-lieu fee studies could assess if the quadrant areas could be updated to reflect trends in growth in specific areas of the City and the corresponding impacts on facility needs and demands.

Growth Impacts on Funding

These types of impact fees and taxes on new construction are intended to mitigate the impact of new population growth on the parks and recreation system, although the revenues can be used to upgrade or renovate existing parks to account for usage of those parks by new residents. It has been about ten years since the City established the fee level for the Quimby fees, based on a nexus study completed at that time. With the adoption of the new Parks Master Plan 2030, it would be appropriate to conduct a new nexus study to incorporate current costs for park land acquisition and development. Similarly, the level of the residential tax should be evaluated to determine if the current tax rate adequately addresses the impacts of new development on park facilities.

The level of future revenues from these sources will also depend on the rate of growth Santa Cruz experiences during the life of the Parks Master Plan 2030. The Association of Monterey Bay Area Governments (AMBAG) is the Metropolitan Planning Organization (MPO) for the Santa Cruz region and has prepared growth projections for each jurisdiction to aid in regional transportation and land use planning. AMBAG's most recent projections were adopted in 2014 and cover the 2010 to 2035 time period. These projections show the City of Santa Cruz gaining 6,039 new residential units between 2010 and 2035, of which 4,231 units would occur by 2020. However, as of December 2016, Santa Cruz had added 437 new units since 2010. It is likely the recovery in the housing market from the recession has been much slower than anticipated.

In order to estimate potential future funding available from these City sources, consultant Applied Development Economics (ADE) has prepared a low and high residential growth projection based on the AMBAG data but calibrated to the actual dwelling unit count in Santa Cruz in 2016 (Table 4.3-1). The low projection assumes that the pace of development in the City between 2010 and 2016 continues until 2020 and then follows the AMBAG projections for each of the subsequent five year periods out to 2035. Under this scenario, Santa Cruz would add 2,684 units between 2016 and 2035 but fall short of the total 29,335 units originally projected by AMBAG for 2035. The high projection assumes development activity accelerates and the City does achieve the original AMBAG projection, adding 5,720 new units between 2016 and 2035.

Table 4.3-1 shows both the Quimby Act fees and the residential tax potentially generated in each future five year period. The residential tax would also be levied on residential remodels if they add square footage to the home, but this is not estimated in Table 4.3-1. The low growth scenario would generate about $25.7 million over the 20 year period, while the higher growth scenario would generate $54.8 million. If the City resets the fee and tax levels to account for new costs identified in the Parks Master Plan 2030, the revenues would likely be higher than shown. As such, it appears that these revenues could fund many of the projects. It is important to note that construction costs will escalate each year, so the further out in time projects are completed, the higher the total cost will be. The City's fee and tax levels are not currently set up to escalate each year automatically, so the revenues could fall short of costs over time.

Table 4.3-1 Projected Residential Development and Related Quimby Act Fees and Park and Recreation Tax Revenues

	2016	2020	2025	2030	2035
Projected Housing					
Low – Total Units	23,635	23,954	24,611	25,261	26,319
5- Yr. Growth		319	657	650	1,058
High – Total Units	23,635	25,422	26,515	27,596	29,355
5-Yr Growth		1,787	1,093	1,081	1,759
Low Growth Revenues					
Quimby Fees		$1,524,820	$3,140,460	$3,107,000	$5,057,240
Cumulative		$1,524,820	$4,665,280	$7,772,280	$12,829,520
Residential Tax		$1,531,200	$3,153,600	$3,120,000	$5,078,400
Cumulative		$1,531,200	$4,684,800	$7,804,800	$12,883,200
Combined Total		$3,056,020	$9,350,080	$15,577,080	$25,712,720
High Growth Revenues					
Quimby Fees		$8,541,860	$5,222,592	$5,166,948	$8,410,201
Cumulative		$8,541,860	$13,764,452	$18,931,399	$27,341,600
Residential Tax		$8,577,600	$5,244,443	$5,188,567	$8,445,390
Cumulative		$8,577,600	$13,822,043	$19,010,610	$27,456,000
Combined Total		$17,119,460	$27,586,495	$37,942,009	$54,797,600

ADDITI0NAL FUNDING STRATEGIES

Grant Funding

Similar to most cities, Santa Cruz accesses state and federal grant programs when available to help fund parks and recreation facilities. Periodically, voters of the state have approved park, water and natural resources bonds that the State Department of Parks and Recreation has used to grant funds to local agencies through its Office of Grants and Local Assistance (OGALS). Most recently, a statewide park bond was passed in 2006. Additionally, OGALS administers annual Land & Water Conservation Fund (LWCF) funds from the National Park Service, the Habitat Conservation Fund ($2 million/yr) and the Recreational Trails Program (up to $4 million, depending on Congressional action). The City may also access funds and technical assistance directly from the Federal Government. For example, the United States Fish and Wildlife Service offers a Coastal Program that provides direct technical assistance and financial assistance in the form of cooperative agreements to coastal communities and land owners to restore and protect fish and wildlife habitat on public and private lands.

The City receives Community Development Block Grant (CDBG) funds directly from the Federal Government, which may be used for a variety of purposes such as affordable housing, community facilities or economic development. In the past several years, the City has received between $500,000 and $900,000 per year and has used the funds for the operation of the teen center as well as other capital improvement projects. For large projects it is frequently necessary to assemble several grants from sources which may have different purposes but which can contribute to portions of a larger project. In addition to state and federal grant sources, there are a number of private foundations, major corporations and non-profit groups that offer funding for specific purposes appropriate to the types of projects in the Parks Master Plan 2030. Appendix 9 provides a selected list of such grant programs that have offered funds in the past year. In some cases these programs are offered on an annually recurring basis and sometimes they are one time opportunities, or offered on a less frequent basis. If not already, the City may consider subscribing to a service such as Grantstation Insider (www.grantstation.com) in order to monitor upcoming grant opportunities. However, in general grant funds are limited and usually allocated on a competitive basis, which makes it difficult to incorporate them in specific ways into long-term capital improvement programs.

Potential Additional Funding Sources

The City may consider a variety of other financing mechanisms and funding sources to help close the gap on parks and recreation facilities costs and ongoing operations and maintenance. Some of these programs are most appropriate in relation to major new development projects and others are designed to increase funding from existing

residents and property owners. This latter category usually requires voter approval, but may also include efforts to promote corporate sponsorships and community donations for specific community facilities.

Community Benefits Program

In addition to impact fees, another potential approach to developer funding for recreation facilities would be to establish a community benefits program, in which development bonuses are offered in exchange for developer contributions to desired community facilities, which may include recreation related improvements. This approach would need to be coordinated with the City overall land use and development policies. Typically, allowable community benefits are defined broadly and may include a range of improvements from transportation to affordable housing to specific community facilities. A key aspect of the program is that the City would need to be prepared to offer higher development intensities under certain circumstances than are otherwise allowed by zoning in order to create workable incentives that would induce developers to make community benefit contributions. Such programs are gaining wide acceptance in a number of the areas within the San Francisco Bay Area, but their success depends on a vibrant real estate market where development demand is sufficient to support the higher costs associated with the developer exactions.

Bonds

The City may also consider financing programs that include existing residents and development in the City. With approval of the voters, the City can levy bonds or impose parcel assessments that would raise money both for parks related capital improvements and also for operations and maintenance costs. In his budget message in the FY 2017-18 City Budget, the City Manager mentioned that considerations are underway to seek approval for a "Quality of Life" bond that could help fund improvements to the City's economic, cultural, recreational, and public facilities.

New or Expanded Local Taxes

The City levies a number of local taxes that can be increased with approval of the voters. In the past ten years, voters in the City have approved increases to the sales and use tax, the Transient Occupancy Tax (TOT), and the Utility Users tax. The voters have also approved establishment of water, sewer and refuse franchise taxes and a parcel tax dedicated to protecting public health and wildlife habitat in the San Lorenzo River, the bay and ocean. In addition to these taxes, Santa Cruz also levies an Admission Tax, a Cannabis Tax and a Property Transfer tax. Cities in California have used these types of local taxes to fund parks and recreation services, among other service costs. Taxes used for general purposes are subject to approval by a simple majority of voters while taxes levied for specific purposes require a two-thirds majority vote.

Land-Based Financing

In addition to general obligation or revenue bonds, cities also employ more limited land based financing programs such as Community Facilities Districts (Mello Roos), Landscape and Lighting Districts, special assessment districts, and maintenance assessment districts. These types of financing districts can be established citywide, but more typically are employed for major subdivisions where infrastructure or service costs for the new neighborhood cannot otherwise be funded by developer or city sources. While impact fees can be used only to build new public facilities CFDs and maintenance assessment districts can help fund operations and maintenance costs as well.

Enhanced Infrastructure Financing District (EIFD)

The State legislature recently approved major modifications to a long standing local financing program called an infrastructure financing district. Under the new program, cities may allocate their own property tax increment within an established district to help finance a wide range of public facilities and improvements, including parks and recreation. This is essentially a limited form of redevelopment tax increment financing, but only public agencies that agree to participate would allocate their tax increment to the EIFD. Multiple agencies can participate, however, so for projects of regional significance, such as the

San Lorenzo Riverwalk, the Santa Cruz Wharf and perhaps the Civic Auditorium, the County or other special districts could agree to participate. Establishing an EIFD, however, would mean that tax increment generated as new development occurs and property values rise would be diverted away from the City General Fund, so this mechanism would also need to be considered within the context of the City's overall long-term budget strategy.

Charitable Contributions and Donor Campaigns

The City maintains a budgetary fund for public contributions to the parks system. Citizens and businesses alike often recognize the vital importance of the City's parks and recreation system to the community's quality of life and wish to contribute financially. For major projects, cities often mount donor campaigns, which may include major corporate support, to fund high profile facilities, such as the Civic Auditorium. However, this approach can also be helpful for neighborhood projects as well where the community may be willing to conduct funding raising activities and donate volunteer efforts to provide or maintain a recreation, cultural, or open space amenity in their neighborhood.

D. COSTS FOR FUTURE IMPROVEMENTS

Decisions on priorities for spending will depend on many factors: need, public desires, new trends, safety, compliance with current regulations and codes, infrastructure required, environmental impact, personnel required and available funding. One major factor will be potential costs and funding available to meet that cost. Table 4.3-2 lists typical costs in 2017 dollars that can aid in decision-making as projects move forward. Variations in size, land constraints, permitting requirements, access or condition of existing infrastructure, design, and the need for consulting or contractor services are some of the factors that affect overall project costs. The costs are intended to give a general sense of scale per type of improvement.

Table 4.3-2 Typical Project Costs Per Type of Improvement

	Facility	Description	**Construction Costs in 2017 per square foot or unit costs** including design fees, necessary prep work, contingencies and soft costs	**Approximate Area**	**Unit**	**Total Construction Costs in 2017** including design fees, necessary prep work, contingencies and soft costs
1	**Basic small park Improvements per acre**	Grading, drainage, utilities including connections, paving, planting & irrigation, site furnishings	$650,000	1	acre	$650,000
2	**Basic large parks (over 1 acre) Improvements per acre**	Grading, drainage, utilities including connections, paving, planting & irrigation, site furnishings	$600,000	1	acre	$600,000
3	**Restrooms**					
a.	*Small*	Prefabricated single restroom with sink and toilet. Water supply and sewer, limited storage. Assumes easy access to water and sewer	$1,450	120	sf	$174,000
b.	*Medium*	Prefabricated single stall women, single stall men with urinal. Water supply and sewer. Assumes easy access to water and sewer	$765	600	sf	$459,000
c.	*Large with concessions*	Prefabricated three stall women, one stall men with two urinal, level 3 concessions. Water supply and sewer. Assumes easy access to water and sewer	$1,100	1,070	sf	$1,177,000
4	**Playground**					
	Large					
a.	*Tot Structure*	Some custom structures, platform structure, double tot swing, 3 independent elements, rubberized matting, concrete perimeter curb, fencing, 2 benches	$115	4,000	sf	$460,000
b.	*School age*	Some custom features, large platform structure, 2 swings on single beam, five independent elements, surfacing- half rubberized/half engineered wood fiber, 2 benches, no fencing	$110	6,000	sf	$660,000

Table 4.3-2 Typical Project Costs Per Type of Improvement

	Facility	Description	Construction Costs in 2017 per square foot or unit costs including design fees, necessary prep work, contingencies and soft costs	Approximate Area	Unit	Total Construction Costs in 2017 including design fees, necessary prep work, contingencies and soft costs
	Small					
a.	*Tot Structure*	Small platform structure, double tot swing, 2 independent elements, rubberized matting, concrete perimeter curb, fencing, 2 benches	$110	1,500	sf	$165,000
b.	*School age*	Large platform structure, 2 swings on single beam, five independent elements, surfacing- half rubberized/half engineered wood fiber, 2 benches, no fencing	$102	2,000	sf	$204,000
5	**Multi- use small turf sports field**	140' x 200' irrigated turf, soil prep, portable goals	$2.25	28,000	sf	$63,000
6	**Artificial turf regulation soccer field**	Artificial turf with Brock sub base, drainage, irrigation to cool fields, goals, buffer areas	$40	72,000	sf	$2,880,000
7	**Lighting for soccer field**	Sports field lighting similar to Musco fixtures including transformer, panel, wiring, fixtures	$350,000	1	ea	$350,000
8	**Basketball court**	Full size court including paving, striping, hoops, lighting. 2 benches	$56,000	1	ea	$56,000
9	**Tennis Court**	Double court, asphalt, fenced, net and posts, paving and striping, 2 benches	$81,000	2	ea	$162,000
10	**Bocce Ball**	Wood surround, crushed shell surfacing, 1 bench	$10,000		ea	$10,000
11	**Bike pump track**	concrete structures, fencing	$47.50	8,000	sf	$380,000
12	**Dog Park**	Surfacing- 1/2 decomposed granite paving and 1/2 turf, entry plaza, 6' high fencing, 2 benches, drinking fountain with dog bowl, trash with bag dispenser, shade trees	$303,000	25,000	sf	$303,000
13	**Group Picnic Area**	6 Tables, decomposed granite surfacing, 2 grills, trash, water spigot, (4) trees	$175,000	2,000	sf	$175,000
14	**Picnic Shelter**	20 x 20 prefabricated shelter	$42,000	1	ea	$42,000
15	**Demonstration garden**	Shrub and tree planting, irrigation, signage	$11.20	4,000	sf	$44,800

Table 4.3-2 Typical Project Costs Per Type of Improvement

	Facility	Description	**Construction Costs in 2017 per square foot or unit costs** including design fees, necessary prep work, contingencies and soft costs	**Approximate Area**	**Unit**	**Total Construction Costs in 2017** including design fees, necessary prep work, contingencies and soft costs
16	**Community Garden**	30,000sf garden with raised beds, soil, irrigation, fencing, decomposed granite paths, 175 sf storage building	$455,000	30,000	sf	$455,000
17	**Bicycle Trail Improvements**	8' wide 2" depth asphalt path with 6" road base with 2' decomposed granite shoulders each side	$10	1	lf	$10
18	**Pickleball**					
a.	*Net/court tape*				1	$300
b.	*Court resurfacing*				1	$3,500 - $5,000
c.	*New court construction*					
d.	*Basic*				1	$10,000 - $15,000
e.	*Basic plus lighting/fencing*				1	$20,000 - $35,000
f.	*8 court community complex w/ fencing but no lighting*				8	$110,000 - $150,000
g.	*8 court community complex w/ fencing, lighting and stadium seating*				8	$300,000 +

SECTION 4.4: ONGOING PLANNING & UPDATES

A. Implementation
B. Summary & Conclusions

A. IMPLEMENTATION

The City of Santa Cruz recognizes park, recreational facilities, beaches, and open spaces are essential to the community's quality of life. The *Santa Cruz Parks Master Plan 2030* (Parks Master Plan 2030) is a means to guide future park improvements and to accommodate emerging needs to continue to provide a quality parks system. It is envisioned as a living document that continues to evolve and progress over time. The community profile, existing conditions, emerging trends, and community input received has informed the recommendations in this plan.

As described in the previous chapter, the City is heading into a funding shortfall in the near term. It is necessary to reduce spending now in order to help offset the gap between revenues and expenditures which is projected to begin to close after 2022. The likelihood of funding becoming available for capital projects in the upcoming years is unknown.

It is necessary to set priorities for the implementation of the many action items that evolved out of the community outreach process. Many action items will be ongoing or can be accomplished in a shorter time frame with available resources. Others will require long-term planning. Given the uncertainty of funding streams, it is unnecessary to plot out the step-by-step framework to implement the plan, as the specific steps, costs, and funding allocation will need to change as conditions change.

ACTION PLAN

The guiding priorities need to remain focused to achieve results, and yet flexible enough to address new challenges and to capitalize on new opportunities. An Action Plan will be maintained to help guide broader priorities and actions and will be based on an assessment of the value of specific actions to the parks system, community, and environment. The Action Plan will remain separate but complementary to the Parks Master Plan 2030. It will be updated and maintained with input from the Parks and Recreation Commission and direction from the City Council. The Action Plan will include actions that are the highest priority for the department to pursue. Staff will use the Action Plan to help guide future departmental decision-making, seeking projects and programs to implement components of the plan on an ongoing and incremental basis. One approach is for staff to meet with the Parks and Recreation Commission to discuss the progress, needs, opportunities, and next steps on an annual basis in preparation for the City's annual budget process.

ENVIRONMENTAL IMPACT

Many policies and actions are aimed at improving environmental quality within the parks system. Other actions will require additional study of potential environmental impacts before being implemented. Many of the recommendations are conceptual in detail and additional efforts are necessary to determine if the projects should be pursued. During future processes, additional environmental review may be necessary to ensure that final designs do not create a significant impact to the environment. Additionally, some recommendations involve the consideration of additional recreational opportunities within an open space which has an existing master plan in place. The Parks Master Plan 2030 process identified needs which emerged through the process and opportunities to meet those needs at a community level. The Parks Master Plan 2030 neither replaces nor overrides the existing plans. If future projects are pursued to meet those needs that were not already identified within an existing park master plan, then the master plan for the specific park would need to be amended and CEQA review would be necessary.

MOVING LARGER PROJECTS FORWARD

Funding for actions will require strategic thinking. Many of the recommendations within the Parks Master Plan 2030 have the potential to be funded through grants. However, many grant awards required to be project ready, and efforts will need to be taken to work through project designs and permitting to ensure that the project is competitive. Also, larger projects may require long-term staffing levels and costs which need to be sustainable over time. These projects will likely need to

be postponed until the City's funding levels are more sustainable. Some community assets, such as the Santa Cruz Wharf and Civic Auditorium, will require creative funding strategies which could involve multiple sources and project phasing over time.

RESPONSIVE TO COMMUNITY NEEDS

As the community continues to evolve and parks system improvements are made, it will be necessary to continually update the plan to remain current. The Parks Master Plan 2030 will need to be updated periodically in five-year intervals. These updates will be less comprehensive but should provide a meaningful opportunity to receive feedback from the community and reassess the condition of the parks. A larger, more comprehensive update should occur concurrently or shortly after the next General Plan update.

The long-term funding strategy will need to be updated to reflect changes in the conditions to ensure that priorities can be realigned and could include:

- Review of existing City financing and facility development
- Future demand and capital improvement costs
- Maintenance and operations costs
- Changes or adaptations to the City's approach to cost mitigation
- Funding alternatives
- Financing strategies
- Maintenance contracts and agreements
- Update Park-in – lieu Fee Schedule

B. SUMMARY & CONCLUSIONS

This document should serve as a planning tool for decision-making regarding recreation in the City of Santa Cruz. Timely updates to the document and the process are necessary to reflect the community's changing needs and desires.

ABOUT US

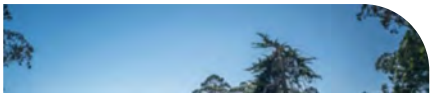
Current Projects

County Parks is constantly working to improve our parks, coastal access points, trails and facilities to maximize community benefit, recreational opportunity, and stewardship of natural resources! Parks projects include grant applications, master plans, environmental review and design and construction of capital projects including new playgrounds, restrooms, trails and other park amenities!

Due to COVID-19, information on this page is subject to change.
Please check for updates.

COVID-19 UPDATES

Projects Underway at County Parks



Moran Lake County Park ↗

County Parks is working with a consultant team to prepare a restoration and public access plan for Moran Lake County Park. The project will evaluate and continue with previous draft park improvement plans prepared by the Redevelopment Agency in 2010 and include community outreach and development and assessment of restoration goals as well as public access improvements at the park. The planning project is funded in part by the State Coastal Conservancy, including funding from Prop 1, and is expected to be completed by the end of 2023!

Community Meetings were completed at the park in summer 2021:
Thursday, August 19, 2021 3PM – 6PM
Sunday, August 22, 2021 11AM – 2PM

Comments received at community meetings and through the online survey were summarized and shared with the Parks and Recreation Commission on October 4, 2021. To attend this meeting via video conference, or to see the agenda packet containing the written summary before or after the meeting, use this link.

Join the project email list for updates. Previous Park Plans & Studies:

- 2010 Draft Moran Lake County Park Site Plan for Moran PDF
- 2010 Moran Lake Monarch Butterfly Habitat Management Plan PDF
- 2005 Moran Lake Water Quality Study & Conceptual Restoration Plan PDF

Chanticleer Avenue County Park ↗

Chanticleer Avenue County Park is a 4.5-acre neighborhood park in the Live Oak community. Construction of phase 1 is complete. The park opened on January 18th, 2020. During fall 2020 Parks staff held a series of community meetings to get input on phase 2 park improvements at Chanticleer Park to include in the Prop 68 Statewide Park Program application. Based on the input received at these meetings, the Draft Phase 2 Site Plan has been developed.

- Chanticleer County Park Draft Phase 2 Site Plan PDF

Hidden Beach County Park ↗

Hidden Beach County Park has two upcoming improvements: playground replacement and the installation of a permanent restroom. The County Parks Department is working with consulting firm SSA Landscape Architects to design a permanent restroom facility at the park. The restroom will be accessible to people with mobility impairments and provide flush toilets and running water for handwashing. Preliminary planning has the facility sited between the existing playground and the service road.

Live Oak Library Annex at Simpkins Swim Center

The Live Oak Library Annex vision is to provide multi-use learning spaces accessible to all. Specific goals include creating a learning environment which serves all ages and provides gathering spaces which encourage intergenerational activities, provide learning facilities not available at the Existing Live Oak Library branch that are free to the public, locate the facility in a central location accessible to the Live Oak Community, design the facility to function in partnership with other community organizations maximizing the opportunities for collaborative and engaging programming as well as providing the most efficient use of resources and personnel.

- Community Meeting Presentation (English) PDF
- Community Meeting Presentation (Spanish) PDF

Completed Projects ↗

View some of our recently completed projects!

Contact Us

Phone: (831) 454-7901

Monday – Friday 9:00 AM to 4:00 PM, except holidays

Email: parksinfo@scparks.com

Our physical office is open, but staff availability is limited as most staff members are working remotely.

979 17th Avenue, Santa Cruz, CA 95062

Monday-Friday, 9:00 a.m. - 4:00 p.m.

(831) 454-7901

parksinfo@scparks.com

Be the first to know about news & events.

Sign Up for our Newsletter!

+ COVID-19
Virtual Recreation
+ Advisory Bodies
+ Civic Auditorium
Current Job Openings
+ Event Permits
+ Facilities
+ How Do I...
+ Louden Nelson Community Center
- Parks, Beaches & Open Spaces
Beaches
Dog Off Leash Areas
+ Open Spaces
+ Parks
Parks Master Plan
Recreation Events
+ Reservations
+ Senior Programs
+ Sports
+ Teach a Class With Us!
Teen Center and Teen Programs
+ Youth Programs

Parks, Beaches & Open Spaces

Last Updated 9/25/2020

Park Closures
Due to financial impacts of the COVID-19 pandemic, the Parks and Recreation Department has seen a temporary reduction in staffing levels. To mitigate this reduction the following parks have been temporarily closed:
- Lower DeLaveaga Park and George Washington Grove (Trails at DeLaveaga remain open)
- Laurel Park
- San Lorenzo Park Benchlands

Park restrooms will be replaced by portable restrooms and handwashing stations at Grant Park, San Lorenzo Park, Frederick St. Park, Ocean View Park, Neary Lagoon, and Garfield Park.

Public Notice: New Dog Park hours for Frederick Street Park

Under guidance from the County, City of Santa Cruz playgrounds are open. While we are excited to announce this, please remember to follow the recommended guidelines to help keep everyone safe:
- Practice social distancing and wear face coverings following State guidance.
- Wash hands or use a hand sanitizer regularly, especially after playing with/on shared equipment and after using the restrooms.
- Be prepared for limited access to public restrooms.
- Stay home if you are not feeling well or showing symptoms.
- Playground equipment is not sanitized.

Guidance PDF on playgrounds

Report a Park Issue

01/29/2021 9:00 AM

Arana Gulch Experimental Outplanting of Santa Cruz Tarplant

400 Santa Cruz tarplants ourplanted to increase species in Arana Gulch

List of All County Parks

-click to get directions-

Abbott Square - 110 Cooper St, Santa Cruz

Aldridge Lane Park - 20 Aldridge Lane, Corralitos

Anna Jean Cummings Park - 461 Old San Jose Rd, Soquel

Aptos Village Park - 100 Aptos Creek Road, Aptos

Ben Lomond Park - 9525 Mill Street, Ben Lomond

Bert Scott Estate - 301 Eagle Ridge, Watsonville

Brommer Street Park - 1451 30th Avenue, Live Oak

Chanticleer Park - 1975 Chanticleer Ave, Live Oak

Coffee Lane Park - End of Coffee Lane, Live Oak

Davenport Landing - Highway 1, Davenport

Dolphin/Sumner Beach - Dolphin/Sumner Intersection, Aptos

The Farm Park - Northwest corner of Soquel Drive and Cunnison Lane

Felt Street Park- 1904 Felt Street, Live Oak

Felton Covered Bridge - Graham Hill Rd at Mount Hermon Rd, Felton

Floral Park - 656 38th Avenue, Live Oak

Freedom Lake - located along Freedom Blvd in Freedom, CA

Greyhound Rock - Highway 1, Davenport

Heart of Soquel - 4740 Soquel Drive behind Soquel Village Post Office

Hestwood Park - 1230 Harper Street, Santa Cruz

Hidden Beach Park - End of Cliff Drive, Aptos

Highlands Park - 8500 Highway 9 Ben Lomond, CA

Jose Avenue Park - 1435 Jose Ave, Live Oak

Mesa Village Park - 790 Green Valley Road, Watsonville

Michael Gray Memorial Field - 3650 Graham Hill Road, Felton

Miller Property - located along Kings Creek Road in Boulder Creek

Moran Lake Park - East Cliff Drive by 26th Avenue, Live Oak

Old Jail/Octagon - 118 Cooper St, Santa Cruz

Pace Family Wilderness - located along Newell Creek Road in Boulder Creek

Pajaro Dunes - Shell Road, Watsonville

Pinto Lake Park - 757 Green Valley Road, Watsonville

Place Del Mer - East of Hillview Way in Watsonville

Pleasure Point Park - Pleasure Point Dr. and East Cliff Dr, Capitola

Polo Grounds - 2255 Huntington Avenue, Aptos

Quail Hollow Ranch - 800 Quail Hollow Road, Felton

Richard Vessey - Victory Ln./Maplethorpe, Soquel

Santa Cruz Gardens - Katherine Lane, Santa Cruz

Scott Creek Beach - Highway 1, Davenport

Scott Park - 3101 Freedom Blvd, Watsonville

Seacliff Village Park (McGregor) - 120 Canterbury Dr., Aptos

Seascape Park - End of Sumner Ave, Aptos

Simpkins Family Swim Center - 979 17th Avenue, Santa Cruz

Soquel Lions - Main/E. Walnut, Soquel

Sunny Cove Beach - End of Johans Beach Drive and Sunny Cove Drive Veteran's Building

Twin Lakes Park - 520 7th Avenue, Live Oak

Valencia Hall - 2555 Valencia Road, Aptos

Wilder Hall - 9527 Mill St, Ben Lomond

Willowbrook Park - 2950 Willowbrook Lane, Soquel

Winkle Farm - 3201 Winkle Ave.

Veteran's Memorial Building - 846 Front Street, Santa Cruz

Santa Cruz County Department of Parks, Open Space and Cultural Services
979 17th Avenue, Santa Cruz, CA 95062
General Information (Monday-Friday, 9:00 a.m. - 4:00 p.m.)
Phone: (831) 454-7901 • PRCweb@santacruzcounty.us

Santa Cruz County Parks

	Ballfields	Basketball	Beach Access	Comm. Room	Dog Park	Hiking	Horseshoe Pit	Parking	Picnicking	Play Element	Restrooms	Skate Park	Soccer	Swimming	Tennis	Volleyball	Public Art
Aldridge Lane		*					*	*	*	*	*				*		
A.J. Cummings	*					*		*	*	*	*		*				*
Aptos				*				*	*		*						*
Ben Lomond		*							*	*	*						
Brommer Street	*	*						*	*	*	*				*		*
Coffee Lane		*						*	*	*							
Felton Covered Bridge								*	*	*	*					*	*
Floral									*	*							*
Freedom Lake																	
Hestwood									*	*	*						*
Hidden Beach			*					*	*	*	*						
Highlands	*			*		*		*	*	*	*	*	*		*	*	
Jose Ave.		*					*	*	*	*	*	*				*	*
Mesa Village		*							*	*	*						
Michael Grey	*							*	*		*						
Moran Lake			*			*		*	*		*						
Pinto Lake	*				*	*		*	*	*	*		*				
Polo Grounds	*				*			*	*		*		*				*
Quail Hollow Ranch				*		*		*	*		*						
Richard Vessey									*	*	*						
Santa Cruz Gardens										*							
Scott								*	*	*	*					*	
Seascape			*					*	*	*	*						*
Simpkins Swim Center				*				*			*			*			*
Soquel Lions									*	*	*						
Twin Lakes		*							*	*	*				*		*
Valencia Hall				*													
Willowbrook		*							*	*	*				*		*
Winkle Farm									*	*							

Revised October 2010

SANTA CRUZ COUNTY DOG PARKS

Polo Grounds County Park,
2255 Huntington Dr., Aptos

Pinto Lake County Park,
757 Green Valley Rd., Watsonville

Dog parks can be a great place for you and your dog to enjoy, but there are rules to follow and etiquette to respect.

Use the poop bag dispensers and pick up after your pet.

Obey the **Leash Law** until you have brought your dog inside the enclosed dog park area.

Dogs must be at least 4 months old.

Dogs must be vaccinated, and you should carry your dog's rabies certificate with you.

Please exercise caution when bringing small children inside the dog park.

Don't pick up another dog without the owner's consent.

Don't bring an aggressive or unsocialized dog into the dog park area.

Please, no dogs in heat.

COUNTY OF SANTA CRUZ
Parks, Open Space & Cultural Services
979 17th Avenue
Santa Cruz, CA 95062

COUNTY OF SANTA CRUZ DEPARTMENT OF
PARKS, OPEN SPACE AND CULTURAL SERVICES

A DOG OWNER'S GUIDE

to enjoying the parks of Santa Cruz County

Santa Cruz County
Department of Parks, Open Space and Cultural Services

979 17th Avenue
Santa Cruz, CA 95062
831-454-7901
www.scparks.com

WHY SHOULD YOU BOTHER TO LEASH YOUR DOG?

IT'S THE LAW!

The fines for an unleashed dog can be over $240, depending on the charges that may be included for violation of one or more of the following:

- Dog is not on a leash;
- Dog harasses, kills or maims deer, birds, or other wildlife protected by law;
- Requirements for licensing, vaccination, and display of tags not followed;
- Dog is not spayed or neutered;
- Dog waste not properly disposed of.

LEASHING YOUR DOG CAN HELP PREVENT A VARIETY OF ISSUES!

- An unleashed dog may dart into traffic causing an accident.

Fact: Unleashed dogs cause over 1,500 car accidents and fatalities per year. Drivers trying to avoid hitting an unleashed dog end up paying the price simply because the dog was not responsibly handled.

- Dogs trespass from the park onto private property.
- Protects you from costly medical bills, should your dog harm a child or jump up on a frail or elderly person, causing injury.
- Fighting with other dogs; a loose dog can be difficult to restrain.
- Court bills: lawsuits can arise from a dog biting someone and it may be required that the dog be euthanized.

- Protects the environment from dogs harassing, killing or maiming wildlife.
- A dog may be lost or stolen.
- It's the right thing to do! While an owner likes their dog, others may not.

Leashed dogs are allowed in all county parks and beaches, ***except*** *for Quail Hollow Ranch and Scott Creek Beach.* These areas have sensitive habitats and dogs are prohibited.

To prevent children from coming into contact with feces and urine, ***dogs are not allowed in playground areas or athletic fields.***

For information about the many animal services provided in Santa Cruz County please call the Santa Cruz County Animal Services Authority at (831) 454-7303.

THE 3 SIMPLE RULES = IT'S THE LAW!

1 - License Your Dog

License your dog for your dog's protection. If an Animal Control Officer finds a licensed dog, they have a commitment to reunite the owner with the dog. A license tells an officer that a dog has a home and is not a stray.

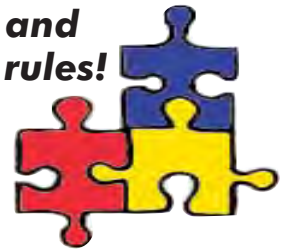
2 - Leash Your Dog

Leashing your dog protects everyone, and can help prevent many problems and costly bills. Dogs must be leashed in all County-owned parks and beaches, unless the dog is in a specified, fenced dog area.

3 - Leave No Unpleasant Waste

Always carry a dog bag; dog waste is your responsibility. When you fail to clean up after your dog, it affects the experience of other park visitors and their pets. The waste left may have parasites that can spread disease to other dogs and to people. We all know what an unpleasant experience it is to step in dog waste! Left on the ground, dog waste can be transported by rain and washed into storm drains. Remember, storm drains are not connected to any type of treatment plant and flow directly into our streams, lakes, and bays.

Put the pieces together and follow the rules!



SANTA CRUZ COUNTY PARKS STRATEGIC PLAN

FINAL
AUGUST 6TH, 2018

FORWARD

County of Santa Cruz

DEPARTMENT OF PARKS, OPEN SPACE & CULTURAL SERVICES

979 17TH AVENUE, SANTA CRUZ, CA 95062

(831) 454-7901 FAX: (831) 454-7940 TDD: (831) 454-7978

JEFF GAFFNEY
DIRECTOR

Dear Friends and Partners,

The Santa Cruz County Parks Department is pleased to present to you our first Strategic Plan. This document represents a year-long process of assessment, inquiry, and outreach to our community, partner organizations, public officials, staff, and supporters. We are proud of the comprehensive and collaborative nature of the document as well as the process which created it.

Our goal was twofold: first, provide a ten-year roadmap for the department that will assist us in adapting and growing our support for a healthy, connected, and culturally vibrant Santa Cruz County. Second, to create a resource for understanding of what we do and how we serve the community, as well as guidance for partnering and collaboration.

The premise of this document is that our system of parks, open spaces, beaches, and recreation and cultural services represent one of our county's most valuable investments. The department's primary role is to ensure that this investment is well-managed, relevant and accessible to all, regardless of age, cultural background, physical ability, or income. We also must see that it is preserved and enhanced for generations to come.

Thank you for your contribution and dedication to our amazing park system and the public value we provide. We hope you will find this plan useful; it is the beginning of a relationship and an open conversation about community priorities.

Sincerely,

Jeff Gaffney
Parks Director

The Mission of the Santa Cruz County Parks, Open Space and Cultural Services is to provide safe, well designed and maintained parks and a wide variety of recreational and cultural opportunities for our diverse community

ACKNOWLEDGEMENTS

This plan would not have been possible without the assistance and participation of a great number of individuals. We would like to thank all the members of the public who participated in the public process that created this Strategic Plan, and to all the staff and volunteers who contributed.

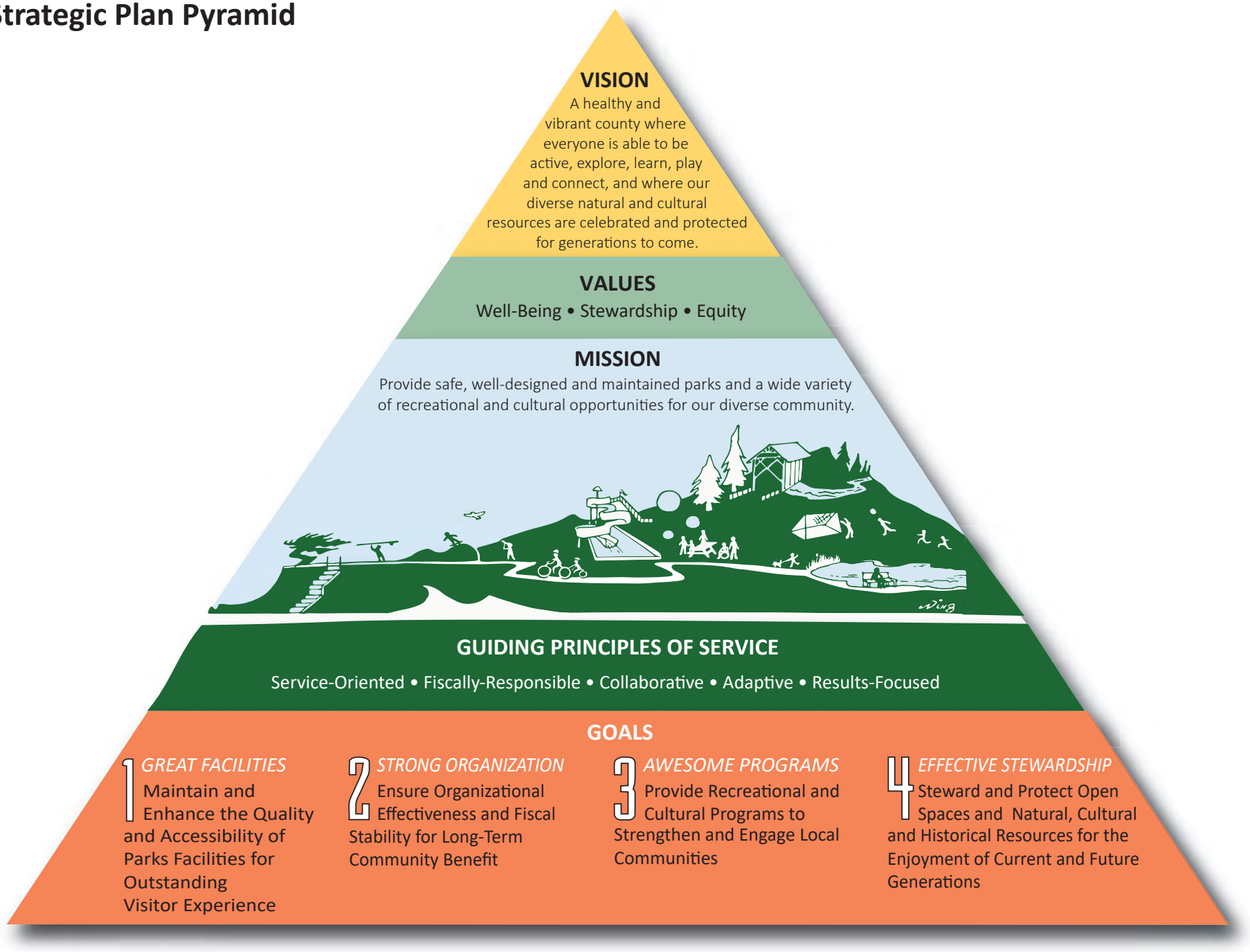
Working Group Members:
- Dena Loijos
- Mariah Roberts
- Jim Rapoza
- Tess Fitzgerald
- Judy Stabile
- Terry Corwin
- Melodye Sereno
- Brad Blachly
- Isabelle Kornberg
- Micaela Lopez

Parks and Recreation Commission Members:
- Mariah Roberts
- Kate Minott
- Alexandra Sibille
- Steven Bennett
- Jim Rapoza

Strategic Plan Project Team:
- Jeff Gaffney, Parks Director
- Kim Namba, Administrative Services Manager
- Will Fourt, Park Planner
- Jessica Wolf, Program Coordinator

With Consultant:
- Meetings that Matter

Strategic Plan Pyramid



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PART I:
THE COUNTY PARKS STRATEGIC PLAN

CHAPTER 1: INTRODUCTION

This Strategic Plan represents the first comprehensive and collaborative planning effort between the County Parks Department and the local community in Santa Cruz County. The Strategic Plan seeks to articulate the vision and strategic priorities for the future of the County Parks system in a ten-year timeframe. The vision and priorities established through this process reflect the strong value that Santa Cruz County places on parks, coastal access, open space, programs and the events and activities that bring us together as a community.

The Strategic Plan addresses the County's existing park system, including its strengths and challenges, and identifies the necessary areas of improvement to remain responsive to the changing needs of our community. Ultimately, the plan will serve as the basis for future department work plans (operational plans) and as a roadmap for the department.

OUR VISION FOR THE FUTURE:

A healthy and vibrant county where everyone is able to be active, explore, learn, play and connect, and where our diverse natural and cultural resources are celebrated and protected for generations to come.

WHY A STRATEGIC PLAN?

The Santa Cruz County Department of Parks, Open Space and Cultural Services (County Parks Department or County Parks) has grown in both the size of its holdings and its importance in the lives of county residents since its inception in 1979. Over the course of the last 38 years, the department has undergone many changes, while the County Parks system has grown into a large network of parks, open spaces, facilities, trails and coastal access points throughout the unincorporated portions of the county.

Some highlights of the department's history:

- **1979 - 2002**: Established in 1979, the County Parks system grew for two decades in the number of parks, programs and employees. By 2002 there were 55 County Parks facilities, parks and coastal access points.
- **2002 - 2011**: The number of full time permanent budgeted department staff positions declined from 68 funded full time or equivalent staff positions in 2002/03 to only 35 in 2011/12, along with a decline in program offerings. At the same time, the number of park facilities steadily increased.
- **2011 - 2014**: In the wake of the economic downturn, the Parks Department was temporarily dissolved into the County Department of Public Works from 2011 to 2014.

- **2014 - 2018**: Some limited additional funding for County Parks was established through the passing of Measure F in 2014. The County Parks Department was re-established as an independent department in 2014 and a new director was hired in 2015.

The Parks Department provides both local and regional parks and programs. Santa Cruz County is unique in having such a large portion of the population living outside of incorporated cities (about 130,000 people, or 49 percent according to the 2010 Census). The County Parks Department provides typical county regional parks and open spaces serving the entire county population. The Department also has a role similar to a city parks department in providing local neighborhood and community parks and event facilities in these unincorporated areas, despite having a smaller relative tax apportionment and ability to leverage funding than other counties and cities (see Chapter 7 for more explanation).

Working within the current framework of the County's General Plan, the County Parks Strategic Plan represents the current vision of the community, and identifies opportunities for leveraging funding and resources to move the department towards this vision. The Strategic Plan does not create or change any County policy, but provides a framework to assist us in working more effectively within existing policies.

HOW THE STRATEGIC PLAN WILL BE USED

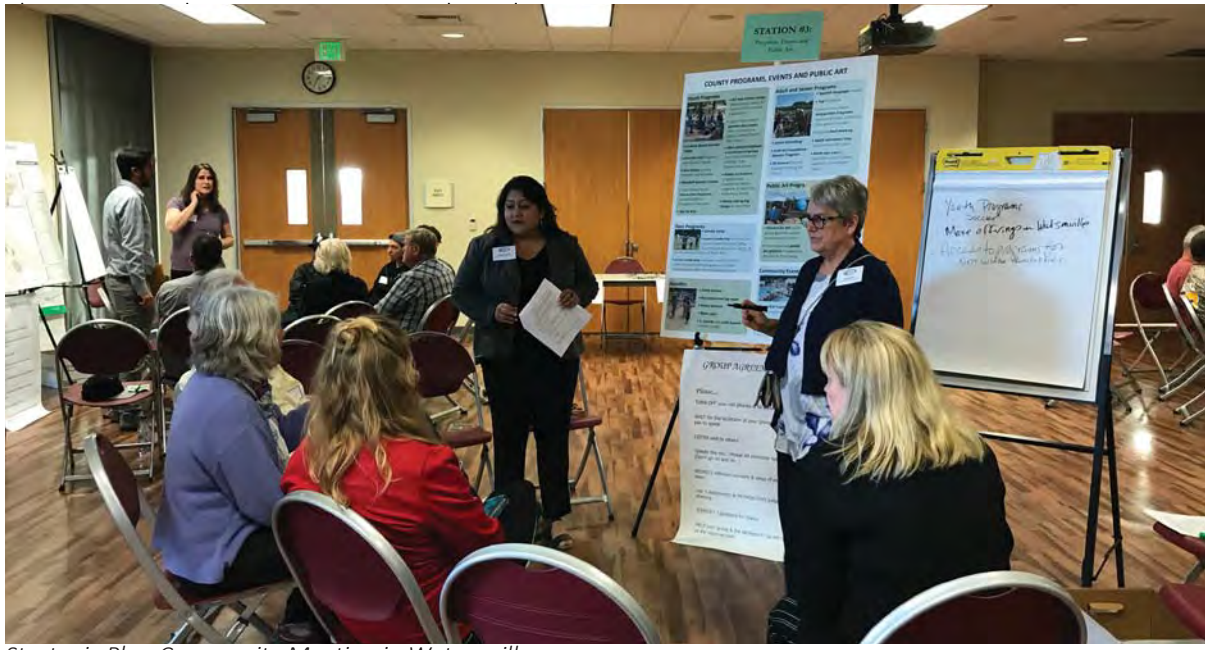
This document consolidates background information, community feedback, key findings and other information that was used to develop the vision, values, goals, objectives and strategies contained in this Strategic Plan. County Parks has gained a wealth of information about the community and the environment through this process, and this summary will be used by staff, community stakeholders, the County Administrative Office, and the Board of Supervisors as the County moves forward to carry out the vision outlined in this Strategic Plan. Much of this information will be referenced or serve as a jumping-off point for strategic decision-making. Additionally, this Strategic Plan will serve as the basis for future operational plans for the department, which will contain performance measures, more time-specific priorities, and detailed actions to implement the Strategic Plan and achieve our goals.

Simpkins Family Swim Center in Live Oak

RELATIONSHIP TO THE COUNTYWIDE STRATEGIC PLAN 2018-2024

The County Administrative Office developed its first-ever countywide strategic plan in 2018. This plan establishes a common vision and set of goals that will be implemented by all the County departments and will contain broad, inter-departmental goals. The goals and objectives in the County Parks Strategic Plan will work together and align with the countywide goals, while being more specific to the provision of parks and recreation in the county.

The Parks Department is not the only County department to undergo its own strategic planning process. Under the direction of our County's new Chief Administrative Officer, all County departments will be asked to develop plans and to align those plans with the overarching County plan.



Strategic Plan Community Meeting in Watsonville

STRATEGIC PLAN VOCABULARY

Throughout the Strategic Plan, the following terms will be used frequently and have a specific meaning within the context of this Strategic Plan.

Vision: A brief statement articulating the desired future state, describing ***why*** the department does the work that it does.

Values: Core ***motivators*** reflecting community ideals that drive the work of the Parks Department and relate directly to the vision.

Mission: A brief statement describing ***what*** the department does.

Goals: Broad statements of ***how*** we pursue our vision.

Objectives: Specific ***ways*** we plan to achieve our goals and impact our community.

Strategies: The ***approach*** we plan to take to achieve our objectives.

CHAPTER 2: VISION, MISSION AND VALUES

VISION

The vision for the future of Santa Cruz County Parks describes the desired end state of the work that we do and articulates the biggest 'why' for the County Parks Department's existence. Our vision statement was created with extensive input from the staff, the community, and partners during the Strategic Plan process.

MISSION

The County Parks mission states what the department does to serve the community. The mission statement was adopted for the department prior to this Strategic Plan process, and represents the department's most essential purpose.

OUR VISION:

A healthy and vibrant county where everyone is able to be active, explore, learn, play and connect, and where our diverse natural and cultural resources are celebrated and protected for generations to come.

OUR MISSION:

The Mission of the Santa Cruz County Parks, Open Space and Cultural Services is to provide safe, well designed and maintained parks and a wide variety of recreational and cultural opportunities for our diverse community.

VALUES

The values listed in this section represent the core motivators that drive the work of the Parks Department to serve the community, as identified through the strategic planning process. The values directly support the new Parks Department vision and have been used to identify and define department priorities and our goals and objectives in the Strategic Plan.

The three core values are ***Well-Being, Stewardship and Equity.***

WELL-BEING

Creating a happier and healthier Santa Cruz County and improving quality of life by promoting physical activity, safe and welcoming public spaces, positive community interactions, and relief from everyday stress.

STEWARDSHIP

Sustaining natural systems and conserving resources throughout the parks system for future generations, including education and learning opportunities, and chances for people to appreciate and connect with the natural world.

EQUITY

Serving communities throughout the county with a focus on those most in need, to ensure that parks and programming are inclusive, welcoming and accessible to all.

Aptos Village County Park

Parks Department Core Values

GUIDING PRINCIPLES OF SERVICE

The following principles describe the strong value the parks department places on ***service.*** These principles were identified by staff and the community during the strategic planning process, and reflect how the department operates to increase the values of well-being, stewardship, and equity.

Service-Oriented: We work as a team to provide a consistent high level of service to our community.

Fiscally-Responsible: We allocate and use resources responsibly and pursue sustainable funding that meets the needs of the system of parks and parks services.

Collaborative: The department works together with other agencies, organizations, businesses, volunteers, community members and staff to provide the highest possible level of service and to create new opportunities.

Adaptive: The department remains nimble and creative as it responds and adapts its parks and programs to the changing needs of the community.

Results-focused: We establish community driven goals, measure our performance, and communicate with the public our progress in meeting long-range goals in support of community well-being, stewardship and equity.

CHAPTER 3: GOALS, OBJECTIVES AND STRATEGIES

For the purposes of articulating the vision of the Parks Department, specific means for implementing the plan are described through Strategic Plan goals, objectives and strategies. These means are intended to describe the direction and priorities for the department for the next 10 years. These statements respond to the key issues and themes that emerged during the strategic planning outreach process.

Definitions for goals, objectives and strategies are described in the text box to the right. A summary table of goals and objectives is shown in Table 1. Strategic goals are not ranked and are numbered only for reference. Note that these strategies do not include specific measurable actions. Actions to implement the Strategic Plan will be developed in future operational plans for the department (see Chapter 4).

Objectives and strategies are organized into categories of "core" and "stretch." These categories illustrate what the department can pursue with existing staffing and resources, and what will require additional resources, according to definitions on the right.

All the goals, objectives, and strategies were developed with extensive input from the community and staff as part of the strategic planning process.

Goals:
Broad statements of how we pursue our vision

Objectives:
Specific ways we plan to achieve our goals and impact our community

Core Objectives:
Objectives that: 1) are essential to the Department's existence and function, 2) may be pursued with existing staffing and resources, and 3) have been core areas of focus for the department in the past.

Stretch Objectives:
Objectives that: 1) have been identified as important by the community, 2) will require us to leverage new resources and to increase department capacity, and 3) expand the services provided by the Department

Strategies:
The approach we plan to take to achieve our objectives

Miller Property County Park in Boulder Creek

COUNTY PARKS STRATEGIC GOALS AND OBJECTIVES

Goal 1: Great Facilities

MAINTAIN AND ENHANCE THE QUALITY AND ACCESSIBILITY OF PARKS FACILITIES FOR OUTSTANDING VISITOR EXPERIENCE

CORE OBJECTIVES:

1.1 Maintain and update parks facilities, and the accessibility of parks facilities, to a consistent standard

1.2 Ensure safety and cleanliness of parks facilities

STRETCH OBJECTIVES:

1.3 Increase accessibility of parks facilities to people of all abilities, ages, backgrounds and financial resources

1.4 Create and implement a plan to address deferred maintenance throughout the parks system

1.5 Upgrade parks in alignment with parks master plans and add additional parks facilities in underserved areas

Goal 2: Strong Organization

ENSURE ORGANIZATIONAL EFFECTIVENESS AND FISCAL STABILITY FOR LONG-TERM COMMUNITY BENEFIT

CORE OBJECTIVES:

2.1 Ensure department efficiency and effectiveness

2.2 Invest in staff development and promote innovation and excellence in service

2.3 Develop sources of sustained funding for operations and enhanced services

STRETCH OBJECTIVES:

2.4 Institute improved systems for departmental management and operations planning

2.5 Lead and partner with other departments, agencies and organizations to better serve the community

Goal 3: Awesome Programs

PROVIDE RECREATIONAL AND CULTURAL PROGRAMS TO STRENGTHEN AND ENGAGE LOCAL COMMUNITIES

CORE OBJECTIVES:

3.1 Provide recreational programs and events to meet community needs

3.2 Cultivate the arts and strengthen the culture of the county through public art programs and events

3.3 Conduct community outreach and offer regular opportunities for diverse groups to engage with and learn about their county parks department

STRETCH OBJECTIVES:

3.4 Provide additional recreational programs and events to address areas of unmet need

3.5 Enhance our support of local families and youth by expanding after school and summer offerings

3.6: Increase the department's understanding of parks customers through increased outreach, data collection and research

Goal 4: Effective Stewardship

STEWARD AND PROTECT OPEN SPACES AND NATURAL, CULTURAL AND HISTORICAL RESOURCES FOR THE ENJOYMENT OF CURRENT AND FUTURE GENERATIONS

CORE OBJECTIVES:

4.1 Partner with other agencies, organizations, and land owners in an integrated regional approach to resource management

4.2 Protect cultural and historical resources throughout the parks system

4.3 Provide interpretive programs and opportunities to increase awareness and appreciation of natural, cultural and historical resources

4.4 Provide opportunities for volunteers in parks, facilities and programs

STRETCH OBJECTIVES:

4.5 Establish a natural resources and open space management program in the parks department to maximize environmental benefits throughout the parks system

4.6 Increase interpretive programs and opportunities to increase awareness and appreciation of all natural, cultural and historical resources

4.7 Increase volunteer opportunities in parks, facilities and programs

Table 1: Summary of Goals and Objectives

GOAL 1: GREAT FACILITIES

MAINTAIN AND ENHANCE THE QUALITY AND ACCESSIBILITY OF PARKS FACILITIES FOR OUTSTANDING VISITOR EXPERIENCE

CORE OBJECTIVES

OBJECTIVE 1.1: MAINTAIN AND UPDATE PARKS FACILITIES, AND THE ACCESSIBILITY OF PARKS FACILITIES, TO A CONSISTENT STANDARD

STRATEGIES:

a. Continue to establish consistent park maintenance standards and staff levels throughout the parks system

b. Determine and communicate staffing needs based on department goals and the number of properties, facilities and programs, and pursue appropriate staff levels

c. Assess the anticipated operational costs for potential new parks projects and budget for projected staffing levels and maintenance costs

d. Regularly inventory and prioritize system-wide needs for deferred maintenance projects

e. Continue to increase accessibility of parks to all people as parks are upgraded

OBJECTIVE 1.2: ENSURE SAFETY AND CLEANLINESS OF PARKS FACILITIES

STRATEGIES:

a. Pursue resources to increase professional staff presence in parks

b. Increase volunteer presence in parks under direction of staff

c. Engage community and volunteers in supporting safe and clean parks

d. Partner with law enforcement to enhance security in parks and facilities

e. Improve and expand system for tracking and responding to citizen reports of maintenance and safety issues

f. Increase staff input in identifying and prioritizing maintenance needs

STRETCH OBJECTIVES

OBJECTIVE 1.3: INCREASE THE ACCESSIBILITY OF PARKS FACILITIES TO PEOPLE OF ALL ABILITIES, AGES, BACKGROUNDS AND FINANCIAL RESOURCES

STRATEGIES:

a. Conduct physical accessibility assessments of existing parks facilities, identifying and prioritizing needed improvements

b. Increase relevance of parks to youth and aging populations and to families with young children, and ensure that all demographics are served by parks

OBJECTIVE 1.4: CREATE AND IMPLEMENT A PLAN TO ADDRESS DEFERRED MAINTENANCE THROUGHOUT THE PARKS SYSTEM

STRATEGIES:

a. Identify needs and determine priority projects

b. Develop budget and timeframes for deferred maintenance projects, and identify potential funding sources

c. Secure funding for deferred maintenance

d. Implement the deferred maintenance plan in stages to maintain investments in parks

e. Anticipate and schedule upgrades as projects are completed

OBJECTIVE 1.5: UPGRADE PARKS IN ALIGNMENT WITH PARKS MASTER PLANS AND ADD ADDITIONAL PARKS FACILITIES IN UNDERSERVED AREAS

STRATEGIES:

a. Inventory and develop a system to prioritize planned park projects

a. With input from the community, identify new park uses for existing parklands, including both active and passive recreation opportunities

b. Pursue park acquisitions in areas that lack access to parks

c. Pursue resources to develop additional amenities to serve the community

GOAL 2: STRONG ORGANIZATION

ENSURE ORGANIZATIONAL EFFECTIVENESS AND FISCAL STABILITY FOR LONG-TERM COMMUNITY BENEFIT

CORE OBJECTIVES

OBJECTIVE 2.1: ENSURE DEPARTMENT EFFICIENCY AND EFFECTIVENESS

STRATEGIES:

a. Provide exceptional customer service to park users and the wider community
b. Provide resources and systems to ensure effective staff communication throughout the department
c. Engage and deploy volunteers effectively to augment departmental capacity
d. Upgrade technology where it makes the most difference to staff effectiveness
e. Regularly survey staff regarding department priorities and effectiveness, and solicit ideas for improving department functionality

OBJECTIVE 2.2: INVEST IN STAFF DEVELOPMENT AND PROMOTE INNOVATION AND EXCELLENCE IN SERVICE

STRATEGIES:

a. Create and maintain a variety of opportunities for staff training and leadership development
b. Encourage collaboration across the department and promote ways for staff to learn from each other and share expertise
c. Increase regular communication between staff and supervisors
d. Track and recognize staff performance
e. Pursue opportunities for networking and staff development with other agencies

OBJECTIVE 2.3: DEVELOP SOURCES OF SUSTAINED FUNDING FOR OPERATIONS AND ENHANCED SERVICES

STRATEGIES:

a. Pursue new opportunities for revenue generation
b. Collaborate for the creation of a parks funding measure or other sustainable source of park funding
c. Evaluate park dedication fees and update as needed
d. Work with the County Administrative Office and Board of Supervisors to assess department operations and capital projects budgets and secure adequate funds

STRETCH OBJECTIVES

OBJECTIVE 2.4: INSTITUTE IMPROVED SYSTEMS FOR DEPARTMENTAL MANAGEMENT AND OPERATIONS PLANNING

STRATEGIES:

a. Develop metrics and performance measures for Strategic Plan Objectives and share compelling data with stakeholders and potential funders
b. Develop and annually update an Operational Plan, integrated with the Capital Improvement Program and department budget
c. Regularly track and report progress on Strategic Plan Objectives and Strategies through implementation of the department's strategic management cycle
d. Work to align the Parks Department's Strategic Plan with the County's Strategic Plan

OBJECTIVE 2.5: LEAD AND PARTNER WITH OTHER DEPARTMENTS, AGENCIES AND ORGANIZATIONS TO BETTER SERVE THE COMMUNITY

STRATEGIES:

a. Partner with other public land owners to provide increased recreational access to existing public open spaces
b. Partner with school districts, land trusts, non-profit groups, community organizations, and public agencies to provide additional public access to existing facilities
c. Collaborate to develop an interagency vision for the countywide network of trails

GOAL 3: AWESOME PROGRAMS

PROVIDE RECREATIONAL AND CULTURAL PROGRAMS TO STRENGTHEN AND ENGAGE LOCAL COMMUNITIES

CORE OBJECTIVES

OBJECTIVE 3.1: PROVIDE RECREATIONAL PROGRAMS AND EVENTS TO MEET COMMUNITY NEEDS

STRATEGIES:

a. Continue to offer free and low-cost programs and events to the community

b. Sponsor and co-sponsor a variety of events for families & diverse audiences

c. Promote program scholarships offered by non-profit partner organizations based on individuals' financial need

OBJECTIVE 3.2: CULTIVATE THE ARTS AND STRENGTHEN THE CULTURE OF THE COUNTY THROUGH PUBLIC ART PROGRAMS AND EVENTS

STRATEGIES:

a. Continue to work with the County Arts Commission and partners to: a) fund arts programs, b) include public art components in public projects, c) provide art in public spaces, d) develop new public art programs and e) conserve existing public art

b. Continue to offer opportunities to engage in rich, hands-on arts curriculum through arts-based summer camps and class offerings

OBJECTIVE 3.3: CONDUCT COMMUNITY OUTREACH AND OFFER REGULAR OPPORTUNITIES FOR DIVERSE GROUPS TO ENGAGE WITH AND LEARN ABOUT THEIR COUNTY PARKS DEPARTMENT

STRATEGIES:

a. Conduct meaningful outreach to the county's diverse communities to increase access to and knowledge of parks facilities and programming

b. Regularly engage community members and other agencies and organizations in assessing community needs

STRETCH OBJECTIVES

OBJECTIVE 3.4: PROVIDE NEW AND INNOVATIVE RECREATIONAL PROGRAMS AND EVENTS THAT ADDRESS AREAS OF UNMET NEED

STRATEGIES:

a. Regularly assess needs and inventory priorities for classes, programs, and events, especially in underserved areas

b. Pursue partnerships and develop programs where most needed

c. Add additional programming targeted to and relevant for high-need and underserved groups

d. Increase relevance of programs to youth, elders, and families with young children, and ensure that all demographics are served by programs

OBJECTIVE 3.5: ENHANCE OUR SUPPORT OF LOCAL FAMILIES AND YOUTH BY EXPANDING AFTER SCHOOL AND SUMMER OFFERINGS

STRATEGIES:

a. Pursue resources for expanding programs and classes for youth, especially in underserved areas

b. Regularly survey youth, parents, teachers and school administrators to identify current gaps in services and areas of unmet need

c. Partner with other agencies and non-profits to expand the cultural, recreational, educational and interpretive program options available to families and youth countywide

d. Expand the Junior Volunteer Program and Junior Lifeguard programs to support job and life skills development and opportunities for mentoring

OBJECTIVE 3.6: INCREASE THE DEPARTMENT'S UNDERSTANDING OF PARKS CUSTOMERS THROUGH INCREASED OUTREACH, DATA COLLECTION AND RESEARCH

STRATEGIES:

e. Conduct an equity analysis including a survey to help the department focus on key areas of need

f. Regularly conduct surveys of park and program users to determine how parks facilities and programs are used and how they can be improved

GOAL 4: EFFECTIVE STEWARDSHIP

STEWARD AND PROTECT OPEN SPACES AND NATURAL, CULTURAL AND HISTORICAL RESOURCES FOR THE ENJOYMENT OF CURRENT AND FUTURE GENERATIONS

CORE OBJECTIVES

OBJECTIVE 4.1: PARTNER WITH OTHER AGENCIES, ORGANIZATIONS, AND LAND OWNERS IN AN INTEGRATED REGIONAL APPROACH TO RESOURCE MANAGEMENT

STRATEGIES:

a. Regularly meet with local conservation partners to assess opportunities to lead and/or provide support for stewardship projects

b. Provide ongoing educational and interpretive opportunities related to natural resources

OBJECTIVE 4.2: PROTECT CULTURAL AND HISTORICAL RESOURCES THROUGHOUT THE PARKS SYSTEM

STRATEGIES:

a. Inventory and assess priority projects to enhance preservation of cultural and historical resources in the parks system

OBJECTIVE 4.3: PROVIDE INTERPRETIVE PROGRAMS AND OPPORTUNITIES TO INCREASE AWARENESS AND APPRECIATION OF NATURAL, CULTURAL AND HISTORICAL RESOURCES

STRATEGIES:

a. Continue to provide interpretive programs led by staff and volunteers in the parks system

b. Continue to provide interpretive signage and information with all appropriate new parks projects

OBJECTIVE 4.4: PROVIDE OPPORTUNITIES FOR VOLUNTEERS IN PARKS, FACILITIES AND PROGRAMS

STRATEGIES:

a. Provide a variety of types of opportunities for volunteering in the parks system

b. Establish regional and neighborhood-based Adopt-A-Park programs to encourage community engagement in parks

STRETCH OBJECTIVES

OBJECTIVE 4.5: ESTABLISH A NATURAL RESOURCES AND OPEN SPACE MANAGEMENT PROGRAM IN THE PARKS DEPARTMENT TO MAXIMIZE ENVIRONMENTAL BENEFITS THROUGHOUT THE PARKS SYSTEM

STRATEGIES:

a. Pursue additional resources to increase department's available expertise, staff capacity, and leadership in natural resource management projects on park properties

b. Create a natural resources program with staff and volunteers dedicated to developing and implementing resource management goals

c. Create a parks natural resources management plan to improve ecological outcomes and pursue multiple long-term environmental benefits

OBJECTIVE 4.6: INCREASE INTERPRETIVE PROGRAMS AND OPPORTUNITIES TO ENHANCE AWARENESS AND APPRECIATION OF ALL NATURAL, CULTURAL AND HISTORICAL RESOURCES

STRATEGIES:

a. Develop an interpretive plan for the parks system

b. Pursue resources to increase interpretive staff presence at appropriate parks throughout the county to run programs, manage volunteers, and engage with park users

c. Develop additional interpretive facilities and amenities throughout the parks system

OBJECTIVE 4.7: INCREASE VOLUNTEER OPPORTUNITIES IN PARKS, FACILITIES AND PROGRAMS

STRATEGIES:

a. Grow the volunteer and intern programs to provide experiential learning opportunities and promote land stewardship throughout the parks system

b. Increase involvement, collaboration, communication and coordination with "friends of" groups to pursue the department mission

CHAPTER 4: PLAN IMPLEMENTATION

DEPARTMENT STRATEGIC MANAGEMENT SYSTEM & OPERATIONAL PLANNING

THE STRATEGIC MANAGEMENT SYSTEM

Implementing the Strategic Plan will require future cooperation and planning. The strategic management cycle illustrates how the plan will be implemented (Figures 1 and 2) including the phases of planning, implementing and monitoring, evaluating, and adjusting. These phases will help keep the department on track with the Strategic Plan goals, will set regular times to engage the community, and will help continually improve efficiency and effectiveness.

The Strategic Plan lays the groundwork and sets the framework for future operational plans which will serve to implement the Strategic Plan and help manage department staff work plans and budgets. Together, the Strategic Plan and these future operational plans make up this strategic management system. This is the framework for managing the department and steering us towards our vision and the realization of our Strategic Plan goals.

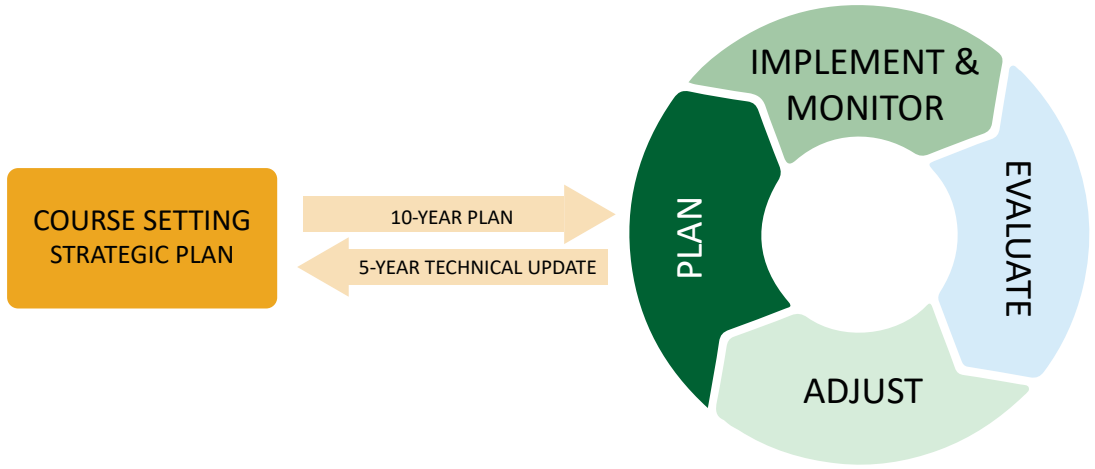
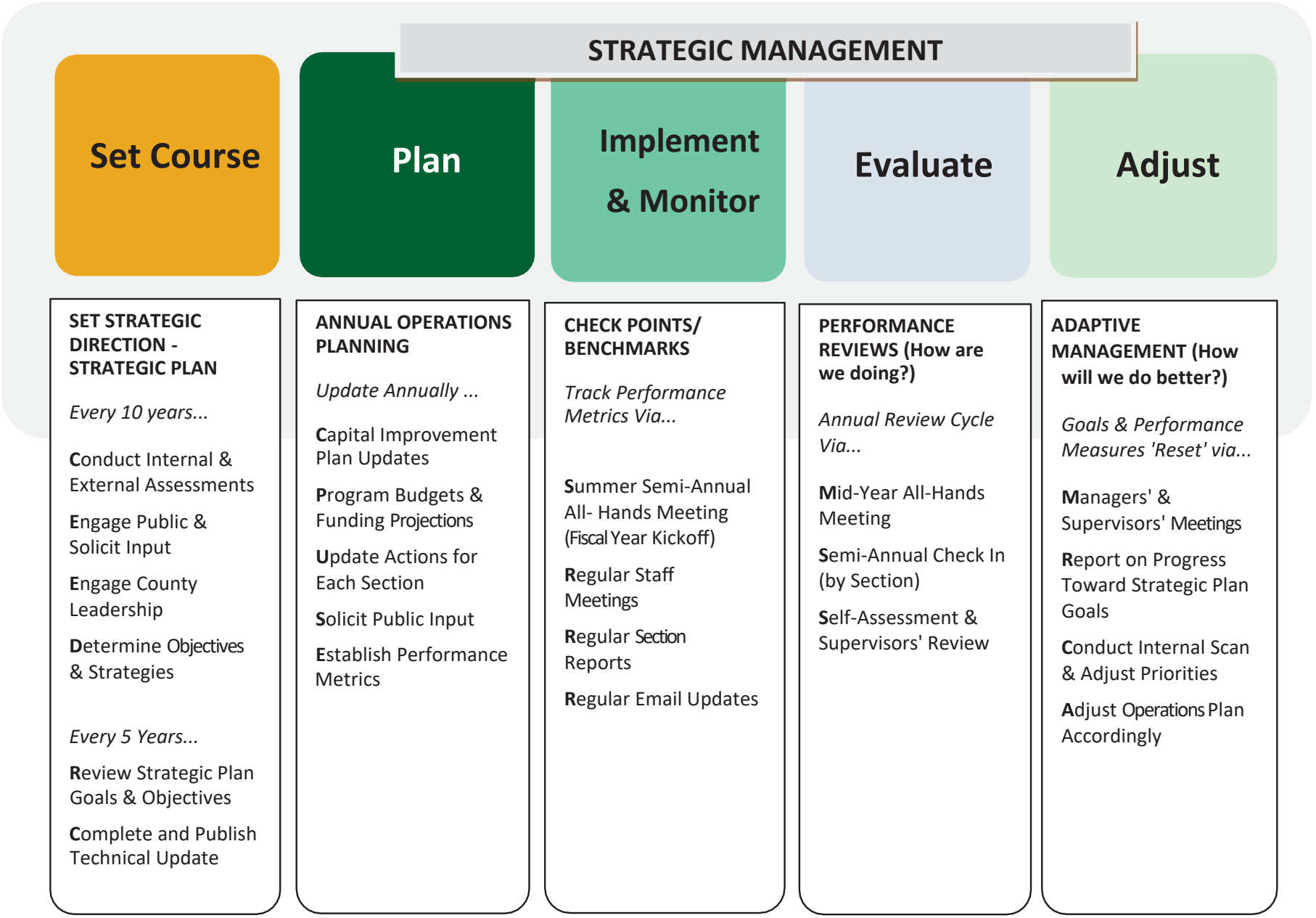


Figure 1: Strategic Improvement Cycle

Figure 2: Strategic Management System



THE OPERATIONAL PLAN

The Operational Plan is a tool we will use to implement this Strategic Plan. The Operational Plan will be updated regularly and will identify shorter-term (1-2 year) actions that will flow from Strategic Plan goals and objectives and support department priorities. Each operational plan will identify the concrete steps that the County Parks Department will take to assign resources and staff toward achieving the strategic priorities and goals laid out in the Strategic Plan.

The heart of these operational plans will be the formulation and tracking of actions and performance measures. Operational plan actions are specific, measurable, achievable steps to be taken to implement Strategic Plan objectives. In each operational plan, priority will be given to specific actions that further multiple goals and objectives identified in the Strategic Plan. Performance measures will be established and tracked on an annual basis.

CRITERIA FOR PRIORITIZING ACTIONS

With finite staffing levels and budget, the Parks Department must prioritize. In order to determine which actions take priority, the following set of criteria will be used to maximize the potential to achieve the goals, objectives and strategies in this Strategic Plan. Since each goal and objective will require additional resources and needs to build on additional progress, the emphasis is on actions that set the stage and overcome initial barriers, enabling the department to work towards multiple Strategic Plan goals.

Actions should address the following criteria:

1. Lay the groundwork for implementing the long-term goals
2. Work towards fulfilling multiple goals and objectives as identified in the Strategic Plan
3. Create additional resources and enable pursuit of additional goals and objectives identified in the Strategic Plan
4. Be readily achievable in the short-term, with existing funding and staff levels.
5. Capitalize on previous momentum and continue previous progress

THE STRATEGIC PLAN WILL EVOLVE

Over the 10-year horizon for the County Parks Strategic Plan, the priorities and context will evolve in response to changing circumstances. To succeed, we must revisit our Strategic Plan goals regularly and refine our course by adjusting the actions in the Operational Plan. Every five years, the Strategic Plan should undergo a technical update to ensure that the priorities articulated reflect the changing environment, economy, and department and community needs.

KEYS TO MAKING PROGRESS

Mesa Village County Park

FOCUSING

Priority Actions for the first Operational Plan have been selected based on the criteria stated above, as applied to the goals, objectives and strategies included in this Strategic Plan. Based on this approach, the first and highest priorities identified for the Parks Department include the following:

1. Clearly articulate the funding needs of the department through creation of a deferred maintenance plan (Objective 1.4), a system to prioritize capital projects (Objective 1.5), and an assessment of appropriate staff levels needed to operate and maintain the existing parks system (Objective 1.1).

2. Pursue additional funding for the department through potential collaboration on a funding measure, working with the Board of Supervisors and County Administrative Office on department budget allocations, pursuing additional revenue sources, and evaluating park dedication fees (Objective 2.3).

3. Develop metrics and performance measures with the first operational plan (Objective 2.4) for Strategic Plan goals and objectives, and begin to share compelling data with stakeholders and potential funders.

We hope that the focus objectives named here will help the Parks Department achieve the goals, objectives and strategies identified in this Strategic Plan by increasing the capacity and organization of the department.

FUTURE FUNDING

The improvement and growth of the County Parks Department will require investment. This investment is expected to yield a wide range of recreational, environment and socio-economic returns to the community. To realize the goals articulated in this plan, additional department resources and revenue must be pursued.

Before other goals and objectives can be realized, we will need to first develop sources of sustained funding for operational and enhanced services (Objective 2.3). Strategies to meet that objective are detailed below.

Scotts Creek County Beach

Willowbrook Park in Soquel

PURSUE NEW OPPORTUNITIES FOR REVENUE GENERATION

The County Parks Department currently generates revenue through user fees and reservations of facilities. There may be future opportunities to generate new revenue sources through increased services such as providing additional facilities available for reservation.

COLLABORATE FOR THE CREATION OF A PARKS FUNDING MEASURE OR OTHER SUSTAINABLE SOURCE OF PARK FUNDING

The County Parks Department is not the only agency providing parks and recreation services in the county, and is not the only agency that requires additional funding to meet community needs for parks and recreation. Working together, the various parks agencies and the community may pursue a ballot measure to fund parks in the county. This could be in the form of a dedicated parcel tax or a sales tax, which could be used to fund projects identified by the community as important, and could help us implement the goals and objectives of this Strategic Plan. The Parks Department could also individually pursue a ballot measure to secure a sustainable funding source for County Parks.

EVALUATE PARK DEDICATION FEES AND UPDATE AS NEEDED

The Park Dedication Fees are required for residential development in the unincorporated county, and are used locally to provide additional park facilities proportionally to serve increased demand resulting from new development. Fees are based on the standard provision of acres of parkland for every 1,000 new residents, and fees are adopted by the Board through resolution. These fees were last evaluated and updated based on market conditions in 1998, and should be assessed for appropriate levels for current economic conditions.

WORK WITH COUNTY ADMINISTRATIVE OFFICE AND BOARD OF SUPERVISORS TO ASSESS DEPARTMENT OPERATIONS AND CAPITAL PROJECTS BUDGETS AND SECURE ADEQUATE FUNDS

The largest source of funding for the County Parks Department is the County General Fund. The General Fund contribution to the department budget has decreased from its pre-recession level, while operational costs and the size and demands on the County Parks system have increased. The Parks Department should work cooperatively with the Board of Supervisors and the County Administrative Office to develop a sustainable source of revenue that is commensurate with the long term needs identified in this plan.

THE NEED FOR COMMUNITY PARTNERSHIPS

This Strategic Plan represents a collaborative vision developed with the Parks Department and the community at large. The County Parks Department cannot implement the goals of this plan alone. Realizing this vision will require the leadership of other organizations and agencies as well as increased participation and support from the community. New partnerships will be needed to pursue strategies identified in this plan that will improve the County Parks system, and that the community sees as important, but which are currently outside the scope of the department to implement (such as improving neighborhood bike and pedestrian infrastructure and connections to parks). Community support will be especially important to help us generate new resources and additional funding, as many goals of this plan simply will not be realized without it.

By focusing on collaboration and partnership, this department intends to foster and to amplify the leadership and innovation in this community, to implement this plan, and to support community values. Working together, County Parks will strive to create a healthier and more vibrant Santa Cruz County for all.

Volunteers at Quail Hollow Ranch County Park

PART II:
THE COUNTY PARKS DEPARTMENT

CHAPTER 5: THE PARKS NETWORK AND SERVICES

SANTA CRUZ COUNTY'S PARKS & OPEN SPACE NETWORK

The County Parks Department is one of several entities that provide parks, open space, cultural services and recreation facilities and programs in the county, along with several other public agencies, organizations, and private landholders. Together, these various entities provide a network of parks and open space that serves the entire county. Generally, local urban-type neighborhood and community parks are provided by the cities, County Parks, and the four park and recreation districts. Larger regional-serving parks are provided by State Parks, County Parks, and other entities. Local park-provider jurisdictional lines are shown in Figure 3. Parklands and protected lands are shown in Figure 4.

COUNTY PARKS

Generally, the County Parks Department provides two broad categories of services: local neighborhood and community parks and programs in the unincorporated portions of the county (areas outside one of the four city limits), and larger regional-serving parks and facilities that serve the entire county. In Santa Cruz County, there are many urban neighborhoods that are not within a city limit, including the communities of Live Oak, Soquel, and Aptos, and the County provides neighborhood parks in these areas.

CITY PARKS

There are four incorporated cities in the county, including Capitola, Santa Cruz, Scotts Valley and Watsonville. Each of these four cities has their own city parks department providing local neighborhood-serving parks and recreation services within that city's limits.

INDEPENDENT RECREATION AND PARK DISTRICTS

The four independent park and recreation districts of Alba, Boulder Creek, La Selva Beach and Opal Cliffs are responsible for providing local neighborhood and community parks to urban and rural neighborhoods within their independent jurisdiction boundaries.

OTHER PARKS AND OPEN SPACE AGENCIES & LANDHOLDERS

In addition to the local parks provided by the County Parks Department, the four city parks departments, and the four recreation and park districts, California State Parks also provides several large parks and beaches in the county. State Parks provide important recreational opportunities for local county residents as well.

There are also recreational facilities and open space provided by other agencies in the county including local school districts, the Bureau of Land Management, the California Department of Fish and Wildlife, the City of Santa Cruz Water Department, the San Lorenzo Valley Water District, the Land Trust of Santa Cruz County, and the Midpeninsula Regional Open Space District.

Figure 3: Neighborhood-Park-Providing Jurisdictions

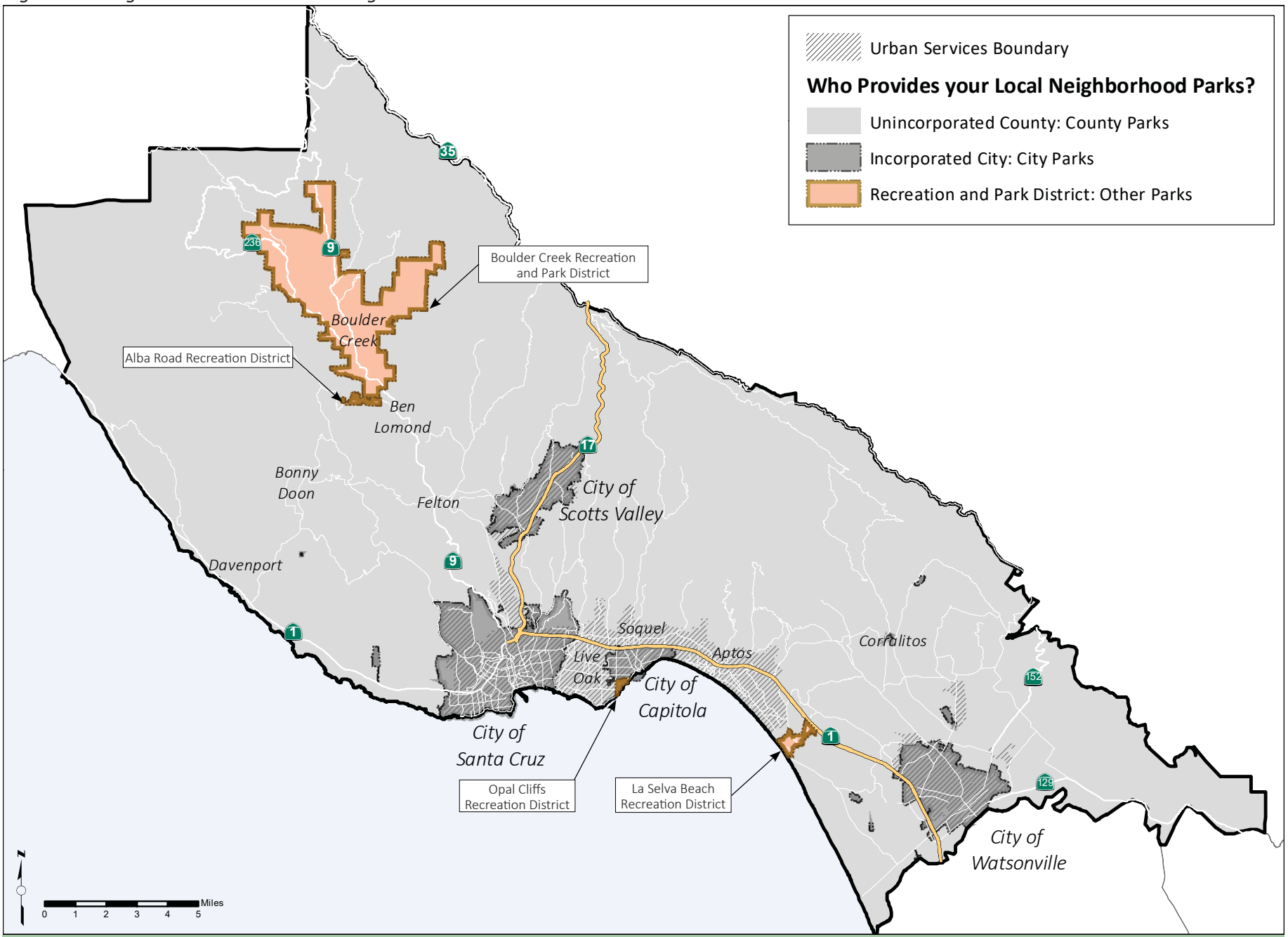
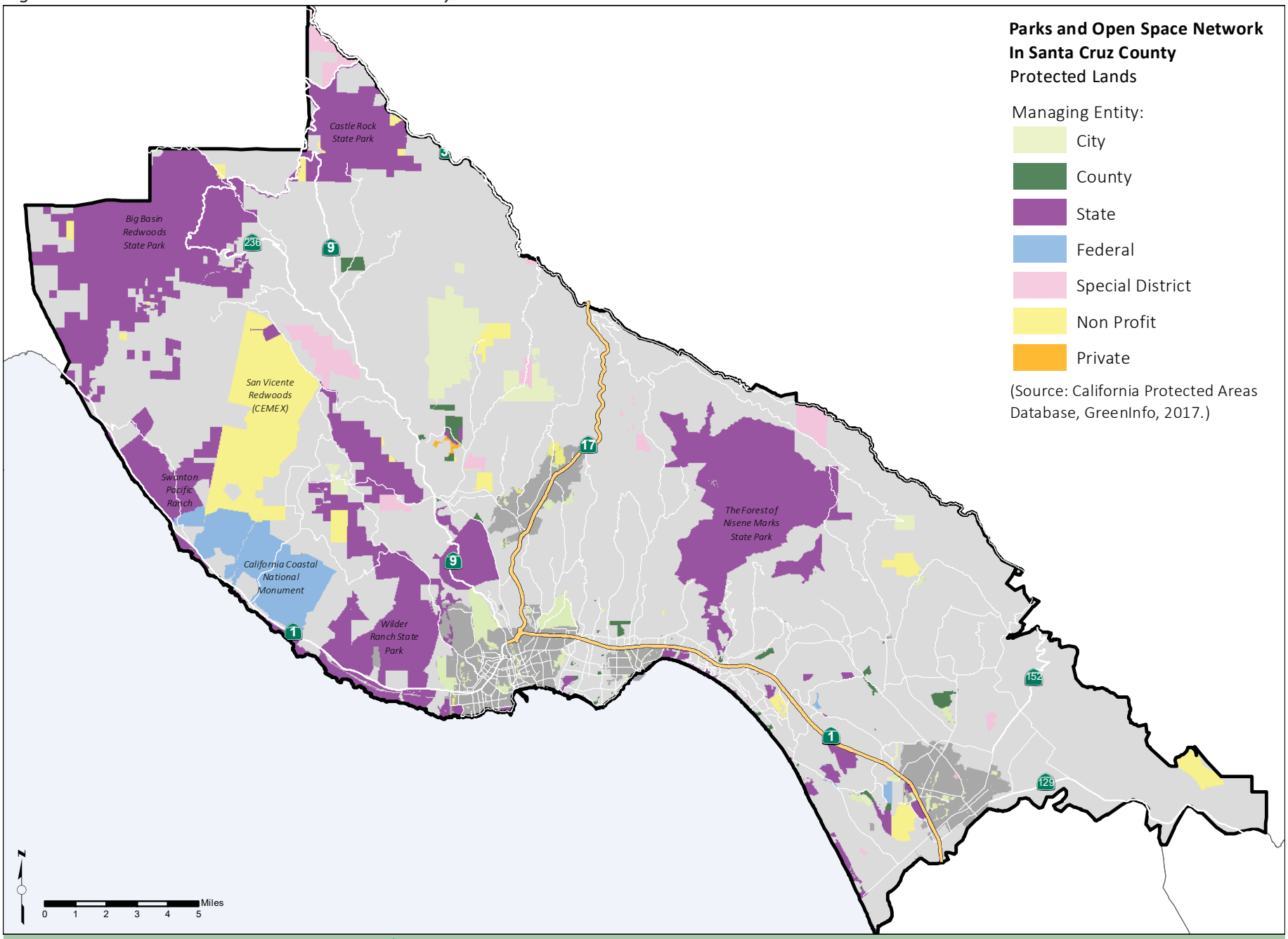


Figure 4: Protected Lands in Santa Cruz County



Today the County Parks Department manages:

- 1,593 acres of parkland including 883 acres of parks and 710 acres of open space
- 38 neighborhood, community, regional or rural parks
- 27 coastal access points
- 23 playgrounds
- 6 parks with sports fields
- 8 parks with basketball courts
- 5 parks with tennis courts
- 5 parks with community rooms
- 1 regional swim center with aquatics and fitness programs and special events throughout the year. Swim Center visits exceed 180,000 per year
- Recreational, cultural and youth programs throughout the unincorporated county
- 4 parks with wedding event facilities

COUNTY PARKS SERVICES

Since 1979, the County Parks Department has managed a diverse parks system including neighborhood, community, regional, and rural parks, coastal access points, trails, and cultural and recreational programs and activities for all ages throughout the unincorporated county. County Parks facilities' locations and amenities are shown in Figure 5.

The County Parks Department also provides financial support to community arts and recreational programs provided by other organizations such as the Museum of Art and History, the Davenport Teen Center and local school district facilities and programs in various locations around the county.

The Parks Department provides the following services.

Seascape County Park in Aptos

Photo by Mary Chavez

REGIONAL PARKS

Regional parks, located throughout the county, include Quail Hollow Ranch in the San Lorenzo Valley, Polo Grounds in Aptos, and Pinto Lake in Watsonville. These parks and their facilities have unique geographic features, draw people from a wide area, and provide a wide variety of public amenities such as trails, sports fields, dog parks, and rental facilities.

NEIGHBORHOOD AND COMMUNITY PARKS

Among the County's 29 neighborhood and community parks are Highlands Park in Ben Lomond, Brommer Park in Live Oak, Seascape Park in Aptos, and Aldridge Lane in Corralitos. These parks serve the surrounding communities and provide amenities such as places to picnic and hold gatherings, play structures for children to explore, benches to rest on, community art for visitors to enjoy, community gardens, skate parks and bike pump tracks, and facilities for community events and weddings.

SIMPKINS FAMILY SWIM CENTER

The Swim Center, also a regional park, is located in Live Oak. Among the aquatic programs offered are swim lessons, recreation and lap swim, water exercise, and water polo, as well as the popular Pool Jr. Guards and Little Guards summer camps. It is the primary public pool in the area and provides services for every age group 363 days a year.

COMMUNITY EVENTS

The County Parks Department puts on events such as the Parks & Rex pool party, where dogs can take a dip in the pool, the Holiday Art & Craft Faire and the Floating Pumpkin Patch.

TEEN PROGRAMS

Zombie Camp (pictured), for ages 11-14, is held at Aptos Park. Teens can gain valuable job skills while having fun by volunteering as a Junior Leader at County Parks youth summer camps, as well as assisting with after-school programs.

COASTAL ACCESS POINTS

Coastal access points include Scott Creek Beach near Davenport, Sunny Cove Beach in Live Oak, and Hidden Beach in Aptos. County Parks, together with State Parks and other entities, provides and maintains coastal access points in the unincorporated portions of the county. These coastal access points sometimes include restroom facilities, trash receptacles, natural plantings, and infrastructure such as stairs and fencing to protect sensitive areas and species.

YOUTH PROGRAMS

School-age youth can enjoy a variety of camps and programs, including Nature Adventure and Science Sleuths at Quail Hollow Ranch, Kreative Kids at Wilder Hall, and art and science camps at Aptos Park. Afterschool programs are held at Mar Vista Elementary and La Selva Beach clubhouse.

ADULT AND SENIOR PROGRAMS

Programs for adults and seniors include local day trips (pictured, trip to Harley Farms), water and dry-land exercise classes at the Swim Center, Spanish language and tap classes, interpretive hikes and workshops at Quail Hollow Ranch, and a popular Mall Walk Program.

ARTS

The Percent for the Arts Program, art exhibitions at the Government Center, Artist of the Year, and Outside the Box are just a few of County Parks art-related programs. Arts programming for youth is provided through summer camps and is integrated into parks after school programs. County Parks-sponsored public art can be enjoyed at locations throughout Santa Cruz County. The department also supports the Arts Council and the Museum of Art and History.

Jose Avenue County Park in Live Oak

Recreational Trip to Suisun Marsh Natural History Cruise

Mar Vista Kinder Enrichment Program

DEPARTMENT STRUCTURE & STAFFING

The County Parks Department is made up of five sections with distinct functions.

ADMINISTRATION AND RESERVATIONS

Administration staff provides support and customer service to all Parks staff and customers, and oversees the department budget, finances, human resources, and office operations. Reservations staff administers the use and rental of all park buildings, beaches and park sites; manages concessionaires and the rentals of private houses in county park sites; provides oversight of community gardens and horse-boarding facilities; and works closely with maintenance staff to maximize the use and enjoyment of public facilities.

AQUATICS

Aquatics staff manages the Simpkins Family Swim Center and the extensive aquatics programs offered there. Swim Center visits exceed 180,000 a year. Staff continues to develop new program opportunities to meet the needs of the community and increase participation at the Swim Center.

MAINTENANCE AND OPERATIONS

Maintenance staff provides maintenance to all park locations, beaches and facilities. In addition, staff maintains the landscaping around all County government facilities. A partial list of responsibilities include mowing, minor construction projects, trash pick-up, restoration of natural resources, building maintenance, and pool maintenance at the Simpkins Family Swim Center. Maintenance staff also assists Reservations staff in preparation, set up and clean up for events.

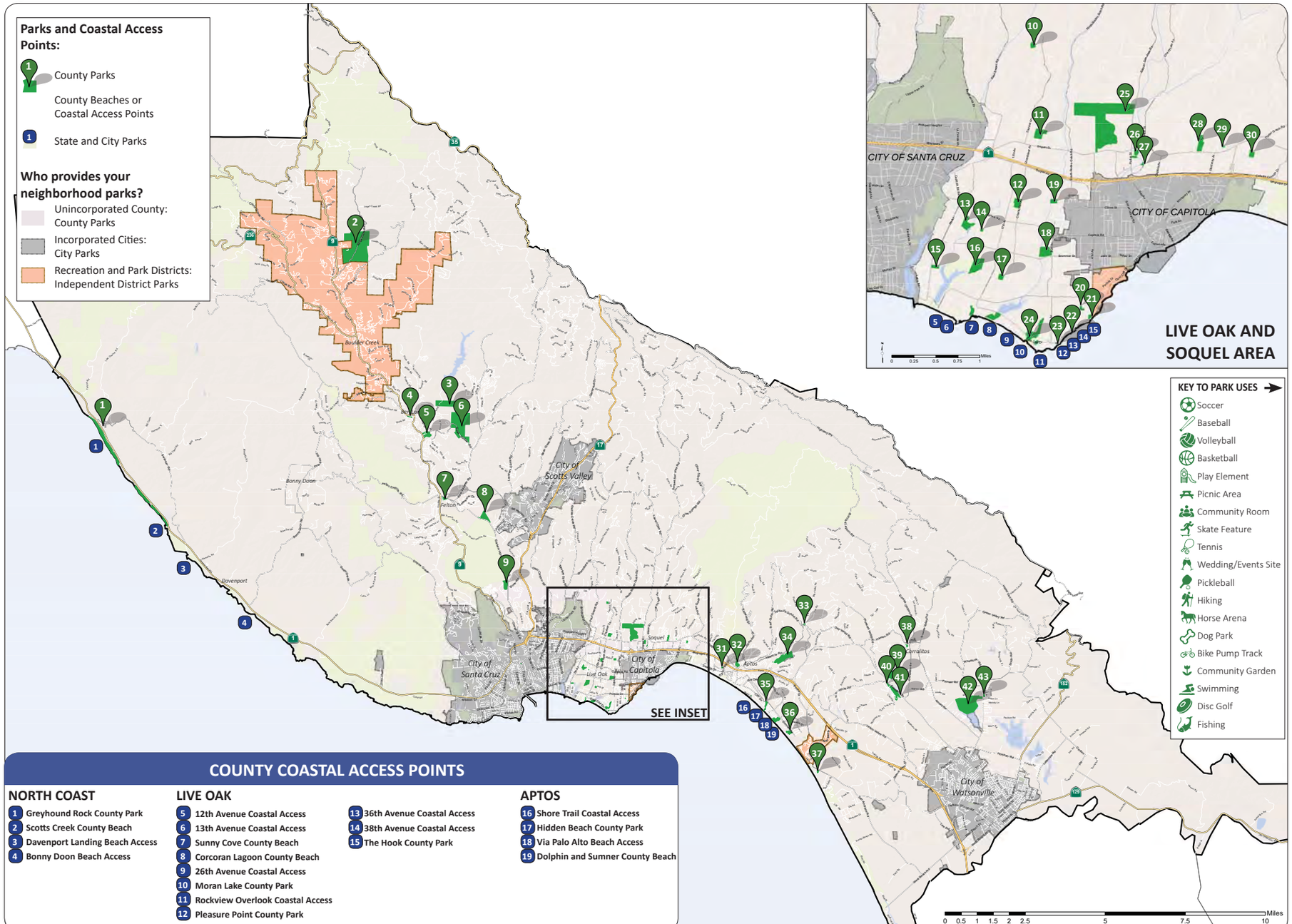
PLANNING AND DEVELOPMENT

Planning staff oversees the implementation of the Parks Capital Improvement Program (CIP) projects, develops plans and studies for components of the County Parks system, and oversees park construction projects. The Planning and Development section works with specialists from a variety of disciplines and members of the public to develop short, medium and long term plans such as feasibility studies, acquisition studies, park master plans, environmental review documents, design and construction documents, and permits for park projects. Staff leads the submission and administration of grant applications for County Parks projects. The planning section also reviews plans for projects led by other agencies for potential impacts on the County Parks system.

RECREATION & CULTURAL SERVICES

Recreational Program staff administers an extensive list of programs including youth programs, interpretive nature programs centered at Quail Hollow Ranch, adult and senior programs, cultural services and arts programs. Recreation and Cultural Services staff also conducts annual special events, such as the Holiday Art and Craft Fair.

Figure 5: County Parks, Facilities, and Coastal Access Points



COUNTY COASTAL ACCESS POINTS

NORTH COAST

1. Greyhound Rock County Park
2. Scotts Creek County Beach
3. Davenport Landing Beach Access
4. Bonny Doon Beach Access

LIVE OAK

5. 12th Avenue Coastal Access
6. 13th Avenue Coastal Access
7. Sunny Cove County Beach
8. Corcoran Lagoon County Beach
9. 26th Avenue Coastal Access
10. Moran Lake County Park
11. Rockview Overlook Coastal Access
12. Pleasure Point County Park
13. 36th Avenue Coastal Access
14. 38th Avenue Coastal Access
15. The Hook County Park

APTOS

16. Shore Trail Coastal Access
17. Hidden Beach County Park
18. Via Palo Alto Beach Access
19. Dolphin and Sumner County Beach

COUNTY PARKS AND USES

NORTH COAST

1. Greyhound Rock

SAN LORENZO VALLEY

2. Miller Property
3. Pace Property (Currently no public access)
4. Ben Lomond Park
5. Highlands Park
6. Quail Hollow Ranch
7. Felton Covered Bridge
8. Michael Gray Field
9. Graham Hill Showgrounds

LIVE OAK/UNINCORPORATED SANTA CRUZ

10. Santa Cruz Gardens
11. Winkle Farm
12. Chanticleer
13. Jose Avenue
14. Hestwood
15. Twin Lakes
16. Simpkins Family Swim Center
17. Felt Street
18. Brommer
19. Coffee Lane
20. Floral
21. The Hook
22. East Cliff Parkway
23. Pleasure Point
24. Moran Lake

SOQUEL

25. Anna Jean Cummings
26. Heart of Soquel
27. Soquel Lions
28. The Farm
29. Richard Vessey
30. Willowbrook

APTOS

31. Seacliff Village
32. Aptos Village
33. Valencia Hall
34. Polo Grounds
35. Hidden Beach
36. Seascape
37. Place De Mer

WATSONVILLE AND CORRALITOS

38. Aldridge Lane
39. Bert Scott Estate (currently no public access)
40. Scott Park
41. Freedom Lake
42. Pinto Lake
43. Mesa Village

CHAPTER 6: OVERSIGHT AND FUNDING

PUBLIC OVERSIGHT

As with all County departments, the Parks Department is overseen by the Board of Supervisors. In addition, it is supported by two Commissions: the Arts Commission and the Parks and Recreation Commission. These commissions are appointed by the Board of Supervisors, make recommendations to the Board of Supervisors for park-related actions, and assist in coordinating between the public, the department, and the Board.

THE PARKS AND RECREATION COMMISSION

The mission of the Santa Cruz County Parks and Recreation Commission is to advise and support the Board of Supervisors in its work to provide excellent and accessible parks, open spaces, recreational programs and facilities that promote health and enhance the quality of life for all.

THE ARTS COMMISSION

The mission of the Santa Cruz County Arts Commission is to promote, expand and plan for the cultural life of Santa Cruz County and to bring artists and arts organizations together with government for the benefit of all residents of the county.

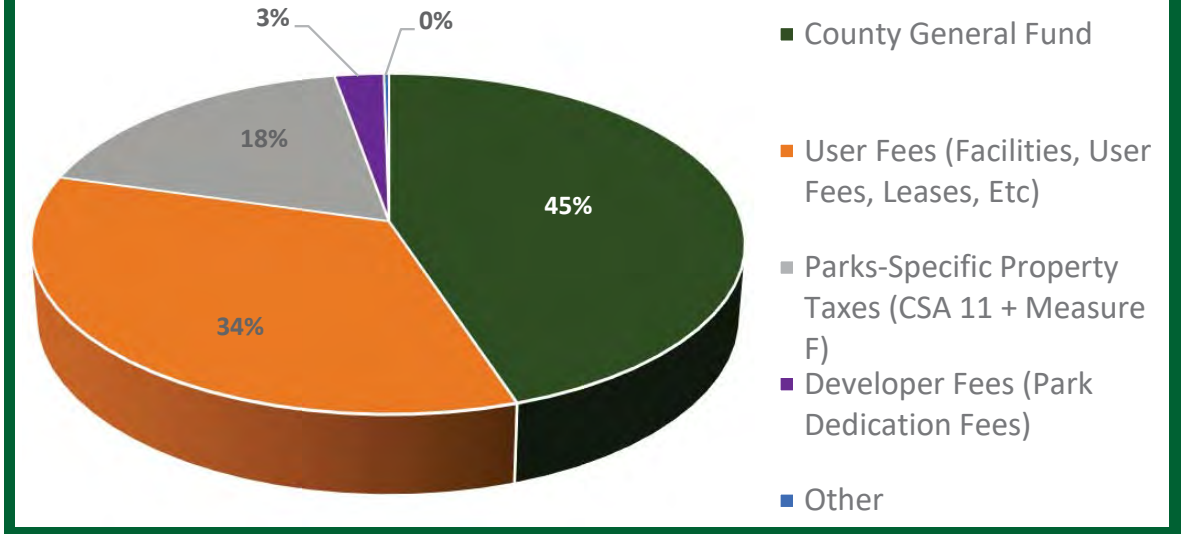


Figure 6: Parks Revenue Sources in Fiscal Year 2016/17

DEPARTMENT FUNDING

County Parks funding comes from a variety of sources including the County General Fund, property taxes, recreation and park facility user fees, grants, and developer fees (for capital projects only) as shown in Figure 6. The amount of each of these sources varies by year depending on specific grants and several other factors. Property tax money includes funds associated with County Service Area (CSA) 11, which exists to provide funding specifically for County Parks.

Generally, the budget can be divided into two categories. First, the operating budget includes the costs associated with operations and maintenance of the existing parks facilities and programs. Second, the capital projects budget includes costs associated with the acquisition of new park properties, development of new or additional park facilities on park properties, and deferred maintenance.

The Parks Department budget, including both the operating budget and the capital projects budget, has not remained proportional to the growing size, demands and costs of operating the parks system (see Figure 7).

OPERATING BUDGET

The sources of funds used for department operations generally include the County General Fund, park user fees, CSA 11, and Measure F.

The overall department operating budget decreased with the recession in 2008, and has only recently (in 2015/16) returned to the pre-2008 level. Additionally, costs associated with staff, supplies and services have increased over the same time period. To illustrate both of these points, Figure 7 shows that there were 68 funded full time or equivalent staff positions in 2002/03, and only 46 in 2016/17. While staff numbers have decreased, the number of parks and facilities for which the department is responsible has increased from 55 in 2002/03 to 64 in 2016/17.

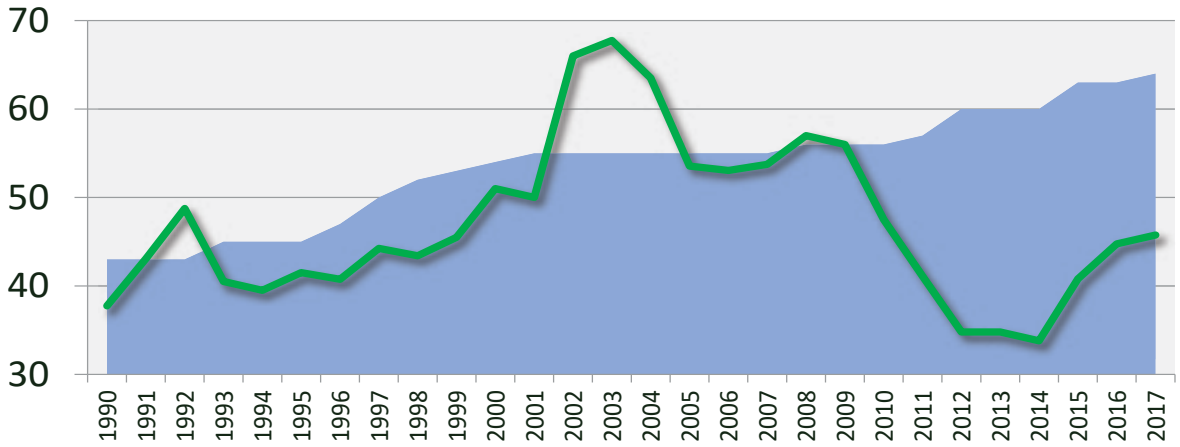
COUNTY GENERAL FUND CONTRIBUTION

Each fiscal year, the County Board of Supervisors approves the department budget which includes a contribution from the County General Fund. This General Fund contribution generally has increased slightly each year proportionate to rising costs of operating the department. However, in the economic downturn of 2008, with the fiscal crisis and the dissolving of the County Parks Department into the Department of Public Works, the General Fund contribution to the Parks Department was reduced significantly, from $4.3 million in 2007/08 to $2.1 million in 2012/13. Although the total operating budget has partially recovered – due to increasing program participation, user fees and Measure F – in 2016/17 the General Fund contribution was $3.7 million, and has still not returned to pre-recession levels.

COUNTY SERVICE AREA 11

County Service Area (CSA) 11 is a special district that covers the entire unincorporated county (outside the four cities) except areas that are within one of the four distinct recreation and park districts. This service area was created in 1971 to provide additional property tax funds in an effort to address the gap between needed parks services and available funding. This relatively small fund has been essential to the department in maintaining the most important

Figure 7: Number of Parks and Number of Parks Department Staff



Valencia Hall

department services. Because the Santa Cruz County Parks Department provides an urban level of service in some areas while collecting proportionally fewer taxes than a city, this was a necessary step.

MEASURE F

Measure F was approved by the voters of CSA 11 in 2014, to include a specific per-parcel property tax within CSA 11 that provides a small additional amount of funding to the County Parks Department. Measure F provides less than 4 percent of the annual department budget.

CAPITAL PROJECTS BUDGET

There is no consistent source of funding allocated to capital projects in the County Parks system for upgrades to park infrastructure, deferred maintenance, planning and construction of new park uses and facilities, and acquisition of new park properties. These types of projects must be funded through unique combinations of funding sources such as grants, park dedication (developer) fees, one-time individual funding sources such as property sales, and public-private funding partnerships.

The Hook County Park at Pleasure Point

REDEVELOPMENT AGENCY

Throughout the past 30 years, the Redevelopment Agency provided the largest amount of capital funding for parks projects. Since the agency was dissolved in 2011, this source of funding is no longer available for development of the County Parks system. Redevelopment Agency funding was only available for parks within the Redevelopment Project Area, which included Live Oak and Soquel. The parks throughout the rest of the County Parks system were not eligible to receive these significant contributions of capital project funds.

PARK DEDICATION FEES

New residential development in the unincorporated portions of the county requires either dedication of new public park land or paying an in-lieu fee to offset additional demand for parks created by the residential development. In-lieu fees go to the County Parks Department and are used to fund capital projects or acquisition of new parkland. The intent of these funds is to allow the parks system to grow proportionally with the increased demand created by new residential development. These fees have not been adjusted to reflect inflation or the increase in property values since 1998.

CHAPTER 7: KEY CHALLENGES

A number of key challenges face this county and this department. Understanding these challenges is critical to creating a way forward that is strategic, holistic, and proactive, rather than reactive. Understanding these challenges will also help the department focus on the big picture rather than responding individually to specific circumstances in a way that is at best piecemeal or partial. The following issues have been identified by staff during the strategic planning process.

LARGE URBANIZED UNINCORPORATED AREAS

The passage of Proposition 13 in 1978 locked in the apportionment rate for each county in California in addition to establishing a maximum property tax rate of one percent statewide. The apportionment rate determines the percentage of property taxes that go to the County as opposed to other local agencies such as cities and special districts. Since that time, Santa Cruz County has been locked into a lower property tax apportionment, on average 13 cents of each tax dollar, than many other counties and cities in California, some of which may receive about twice that for each tax dollar. At the same time, about half (49%) of Santa Cruz County's population lives in the unincorporated area (e.g. outside the cities of Capitola, Scotts Valley, Santa Cruz or Watsonville) compared to the median of 19% living in unincorporated areas in all California counties with populations over 200,000. This means that our parks facilities experience high use and many urban-type challenges, and that the County Parks Department is responsible for providing more urban-type parks than would typically be provided by a county. At the same time, the County has fewer financial resources to meet those challenges.

DECLINE IN AVAILABLE FUNDING

In the wake of the economic downturn of 2008, available funding for parks and services was reduced dramatically in favor of directing funds toward other essential services such as fire and policing. The General Fund contribution to the department has still not returned to pre-recession levels, while costs have risen. Despite passage of Measure F in 2014, staffing has still not returned to pre-2008 levels despite significant new demands on the department such as new properties and facilities. The number of funded full time or equivalent staff positions has dropped from 68 in 2002/03, to 41 in 2015, and is up only to 46 in 2016/17 (see Figure 7). In addition, in response to our state's budget crisis,

The Shore Trail in Aptos

in 2011 California's Redevelopment Agencies were shuttered. Redevelopment was previously the primary funding source for almost all parks development and capital projects in the Redevelopment Area of Live Oak and Soquel. The only other source of funding currently available to help us meet community demand for new or improved parks and facilities is Park Dedication Fees, and these haven't been adjusted for inflation since 1998 and are limited due to the small amount of new development in the county.

DEFERRED MAINTENANCE

The Parks Department estimates that there are approximately $100 million in deferred maintenance projects needed to address critical or primary maintenance needs within the County Parks system. These deferred maintenance projects include critical upkeep and routine maintenance such as roof replacements, repairs to the Simpkins Family Swim Center, and replacement of facilities such as playground equipment that has reached the end of its usable lifespan. There is a strong potential for 'cascading' effects and permanent negative impacts if we don't address these issues in the near term.

COUNTY LAND AND HOUSING COSTS

Santa Cruz County is now one of the least affordable places to live in the world based on median house price and median household income.[1] Considering the cost of living there's a great need for low and no-cost programs and facility access. Many residents are housing insecure, and a growing number are currently experiencing homelessness. Impacts of increased homelessness on parks include use of parks property to meet basic human needs (for sleeping, bathing, storage, etc.), which puts additional environmental and maintenance demands on parks-owned facilities and open spaces. Additionally, the high cost of land means it is much more expensive to purchase and develop new parks facilities.

CHANGING DEMOGRAPHICS

The demographics and needs of the community in our county continually evolve, causing changes in the demands on the parks system. The parks system must continually adjust its services as needed to meet these changing demographics. Most significantly, over the past two decades, the county's median age has increased and the percentage of the population identifying as Latino has increased.[2] These two demographic groups, as well as other groups, may be disproportionally underserved by the parks system. Each community has unique needs, and the department strives to understand and address these needs as they continue to evolve.

PARK ACCESS CHALLENGES

Transportation difficulties exacerbate County Parks' challenges in providing accessible park facilities and programs throughout the county. The county's population is spread out, with many residents commuting long distances to jobs. There are few functional alternatives to private automobile use for residents and visitors to access many of the county parks. The one primary transportation corridor is narrow and heavily impacted. This increases the cost of doing business in a number of important ways such as increased construction and shipping costs, and increased travel time for parks field staff who travel between facilities. Transportation challenges also increase the need to provide local parks within close proximity to all neighborhoods, to make parks more accessible to more people.

Felton Covered Bridge County Park

1. 13th Annual Demographia International Housing Affordability Survey, 2017.

2 "Profile of General Population and Housing Characteristics: 2010," for Santa Cruz County, US Census, 2017.

PART III: CREATING THE PLAN

CHAPTER 8: PROJECT APPROACH

The Strategic Plan was developed through a collaborative process that sought to be both geographically and culturally inclusive. Input was solicited through meetings with staff, community members and the Strategic Plan Working Group. Generally, the process is illustrated in Figure 8, and includes outreach, visioning and goal-setting.

GUIDANCE & OVERSIGHT

The Strategic Plan was instigated and the process was led by a Strategic Planning Team which consisted of two lead project designers from the department along with parks leadership. In addition, a Strategic Plan Working group was formed in December of 2016 for the distinct purpose of helping with the County Parks Strategic Plan process. It was composed of ten outside members of varying backgrounds with diverse interests, expertise, experience and partnerships. A list of Working Group members is included in the Acknowledgements section at the beginning of this document.

The Working Group met periodically, for a total of six times over the course of developing the Strategic Plan, to review and give input into all Strategic Plan materials and project phases. This review included project outreach and public engagement, creation of the parks vision and values, and the framing of the goals and objectives for the department. The Working Group also helped implement the public meetings.

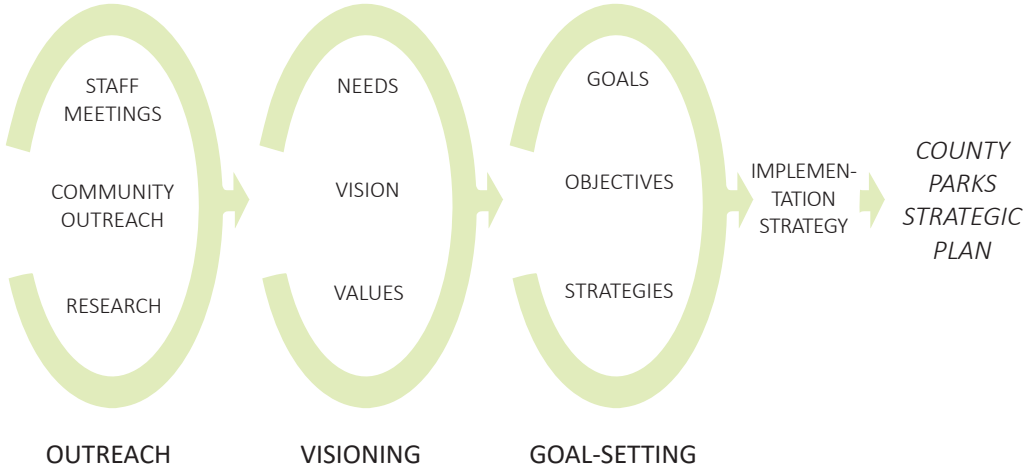


Figure 8: Strategic Plan Flow Chart

STAFF INVOLVEMENT

In Spring 2017 the Parks Department hosted a series of three meetings for staff across the department to solicit their input and engage them in the strategic planning process. Each meeting drew a mix of attendees from various sections, and a total 48 staff members provided input. Ultimately, all sections of the department were represented: maintenance and operations, recreation and cultural services, administration and reservations, aquatics, and planning and development.

These initial meetings included a series of visioning and brainstorming exercises aimed at gathering ideas on how the department can improve and evolve to meet the needs of the community and continue to be a great place to work. Through this process we sought also to identify what changes were needed to both enhance the department's ability to serve the public and to improve job satisfaction for Parks employees.

These meetings generated a wide range of specific ideas and feedback – all of which have been valuable to this process and will be important to the department in future planning. Staff input was synthesized and used to populate a large graphic (see Figure 10 in Chapter 9).

Just as staff input was vital to developing the Parks Vision and Values, it contributed foundationally to establishing the department's priorities. An additional 'All-Hands' meeting took place later in the process to generate specific goals and objectives for the Strategic Plan.

Internal feedback about what is missing, and what can improve the department will continue to be gathered on a regular basis from staff as part of the new Strategic Improvement Cycle.

COMMUNITY INVOLVEMENT

Community input was an integral part of the Strategic Plan process. The people that live in Santa Cruz County care deeply about their parks system; in total over 1,000 people participated in the Strategic Plan process through completing online surveys, attending one or more of the community meetings about the project, or providing comments or feedback in other ways. Strategic Plan outreach included engagement of County communications staff, Board of Supervisors' staff, department staff and members of the Strategic Plan Working Group for assistance in personally contacting various groups of stakeholders, key community organizations and interested community members to solicit their input via the survey and to publicize the community meetings.

Our personal outreach included over 5,000 people at over 200 local organizations with a wide geographic and demographic reach with materials in English and Spanish. Feedback from the community members was the most important consideration in developing each component of the Strategic Plan.

Strategic Plan Staff Meeting

STAKEHOLDER OUTREACH/ONLINE SURVEY

As part of the outreach process, the Parks Department created an open online survey and distributed it widely through the official County website, on Nextdoor in neighborhoods throughout the county, and personal contacts via our distribution lists. The survey was available in both English and Spanish for anyone interested in giving input from April 8 through June 2, 2017. In that time, 802 people responded to the survey. The survey was not intended to statistically represent the county; rather, it was made available to anyone who wanted to participate. Survey responses were completed from all parts of the county.

Figure 9: Words used in the responses to the survey about favorite aspects of Santa Cruz County Parks

Survey objectives included:

- Gauge general knowledge of the County Parks system and inform survey respondents about County Parks' services
- Assess satisfaction with existing County Parks system
- Determine people's priorities for types of improvements to the County Parks system
- Learn generally how survey respondents use, and would like to use, parks facilities, coastal access points, and programs
- Hear people's perceptions of gaps in services/facilities
- Involve the community and help people feel invested in the Strategic Plan process, and in the future of the Parks Department

COMMUNITY MEETINGS

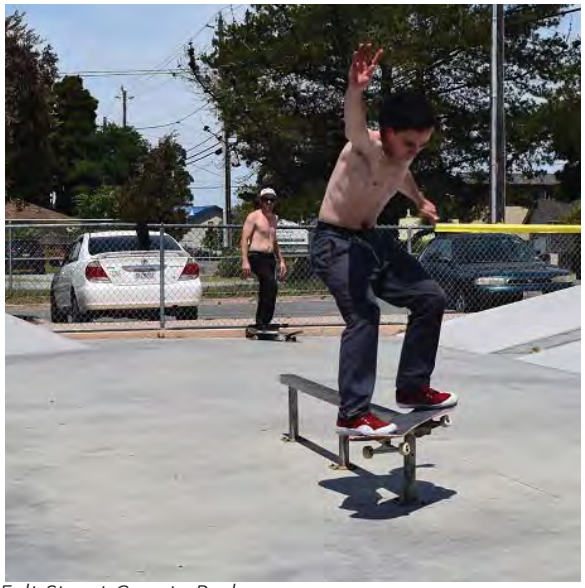
The heart of the engagement process was a series of five community meetings throughout the county on the topic of vision and priorities for the department's Strategic Plan. Over 190 people participated in these meetings, and participants shared a variety of perspectives on their vision and values and their goals for the department. Meetings were held in Ben Lomond, Watsonville, Davenport, Aptos and Live Oak.

The meetings were publicized through individual letters and emails to over 200 stakeholder groups and their membership, publishing in each of the Board of Supervisors' newsletters, posting on both the County's and the Parks Department's website and social media, posting on Nextdoor, posting in the Parks Activity Guide and at parks and community bulletins, distributing flyers to school districts where feasible, and a press release which generated several articles in local media. Outreach materials were provided in English and Spanish.

Community meetings included about an hour and fifteen minutes for public comments. Participants were split into four groups for the comment period, and each group rotated through a series of four stations. Each station was facilitated by staff and/or volunteers and focused on one of four topics, including vision and values, parks and facilities, programs and events, and priorities. Facilitators asked a series of prompts and led a series of exercises with each small group, and all comments were recorded. Spanish translation services were available at each meeting.

Strategic Plan Community Meeting in Live Oak

Polo Grounds County Park in Aptos



Felt Street County Park

CHAPTER 9: KEY FINDINGS

KEY DEPARTMENT NEEDS

Community members and parks staff have provided significant contributions during the Strategic Plan process, describing the needs of the parks system and the needs of the department. Funding constraints are a key limiting factor in the ability to meet these needs. For a discussion on needed funding, see Chapters 6 and 7. This chapter summarizes key findings from staff and the community that identifies the needs for the County Parks Department. These needs form the basis for the development of the goals, objectives and strategies in Chapter 3.

All staff members in the County Parks Department were given the opportunity to give input into the strategic planning process through an initial series of three staff meetings, additional written comments and interviews, and as part of a follow-up mid-year 'All-Hands' meeting, where they were able to prioritize their ideas on ways to improve the department's functioning.

In the course of the initial internal strategic planning meetings, staff was asked to consider both the internal needs of the department and what the community most wants and needs—from the perspective of those who are on-the-ground directly serving the public.

DEPARTMENT NEEDS

Parks staff identified the following most important staff needs:

- **More financial resources to maintain the growing number of parks and facilities:** It has been increasingly challenging for the small number of staff—particularly maintenance staff—to do their jobs while being given increasingly more responsibilities with less time.

- **More training and support:** Staff sees great value in participating in training to develop new skills as well as cross-train and share knowledge within the department. These opportunities could increase staff capacity and efficiency, allow for personal growth and career advancement, and allow the department to retain skilled employees with experience and knowledge.

- **Improved internal communication:** Increasing and improving communications between parks management and staff, and between individual parks staff members, has been a consistent key need raised by staff as part of this process. Ideas for improving communication include technological upgrades for staff such as email and network access, as well as improved communications planning and disseminating information throughout the department.

COMMUNITY NEEDS

Parks staff considered the most important community needs as follows:

- Safe, clean and well-maintained parks facilities
- More programs for youth, especially in underserved communities
- Expanded volunteer opportunities and community involvement
- Better awareness of what the Parks Department offers

The input collected in the course of these meeting was used to fill in a large graphic summarizing the key themes and ideas received from staff (see Figure 10).

Many of the specific actions identified as priorities at the internal staff meetings will be incorporated into our first operational plan and will continue to be referenced as the department moves forward.

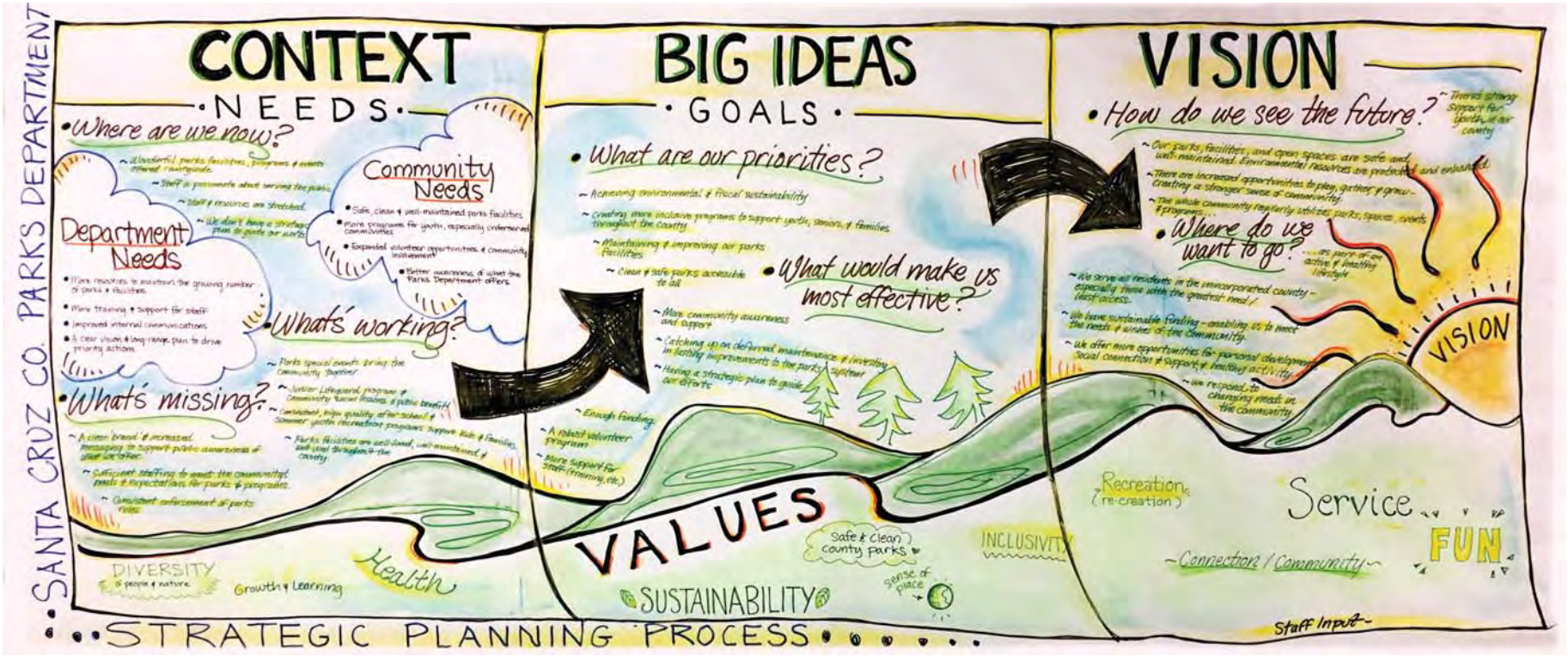


Figure 10: Key Themes and Ideas Received from Staff

Highlights from Graphic Text (Figure 10)

CONTEXT
Needs

Where are we now?

- Wonderful parks facilities, programs & events offered countywide
- Staff is passionate about serving the public
- Staff & resources are stretched

What's working?

- Parks special events bring the community together
- Junior Lifeguard program and community swim lessons a real public benefit
- Consistent, high quality after school & summer youth recreation programs support kids & families
- Parks facilities are well-loved, well-maintained (for the most part) & well-used throughout the county

What's missing?

- Sufficient staffing to meet the community's needs & expectations for parks & programs
- Consistent enforcement of parks rules

BIG IDEAS
Goals

What are our priorities?

- Achieving environmental & fiscal sustainability
- Creating more inclusive programs to support youth, seniors & families throughout the county
- Maintaining & improving our parks facilities
- Clean & safe parks accessible to all

What would make us most effective?

- More community awareness & support
- Catching up on deferred maintenance & investing in lasting improvements to the parks system
- Having a strategic plan to guide our efforts
- Having a robust volunteer program
- More support for staff development

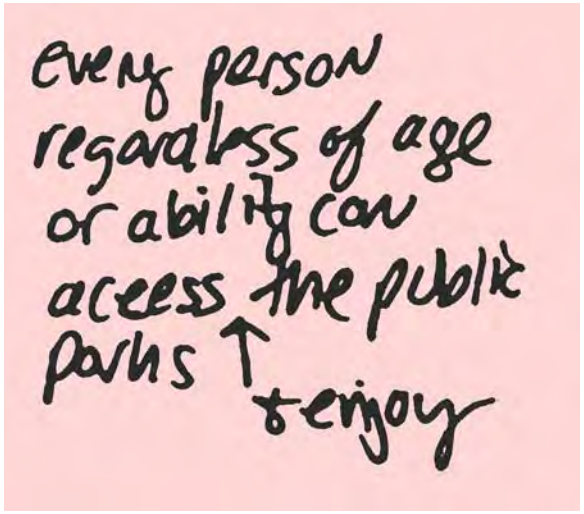
VISION

How do we see the future?

- Our parks, facilities & open spaces are safe & well-maintained. Environmental resources are protected & enhanced
- There are increased opportunities to play, gather & grow – creating a stronger sense of community
- The whole community regularly accesses/utilizes our parks, outdoor spaces, events & programs… as part of an active & healthy lifestyle
- There's strong support for all youth in our County of Santa Cruz

Where do we want to go?

- We serve all residents in the unincorporated county—especially those with the greatest need/least access
- We have sustainable funding—enabling us to meet the needs & wishes of the community… while maintaining what we have
- County residents have more opportunities for personal development, social connection & support & healthy activity
- We respond to changing needs in the community



Vision Statement from Public Meeting

COMMUNITY RESPONSE

The outreach process provided valuable insight into community needs that could be addressed by the County Parks Department. It also clarified priorities and hopes for the future of parks in the county.

In the community conversations, five general themes emerged as being important to community members. These themes include 1) the quality of park experience; 2) opportunities for outdoor recreation; 3) stewardship and protection of open space and natural, cultural and historical resources; 4) accessibility of parks and programs; and 5) engagement of the local community. Generally, these themes are well represented by the number of comments, as shown in Figure 11. However, the most common theme overall was engagement of the local community, which included interest from the community in topics such as programs, outreach, volunteers, events and educational opportunities. Themes are explained below, and the most prominent themes, topics, and comments are summarized in Table 2.

QUALITY OF PARK EXPERIENCE

The community consistently emphasized the need for maintaining and improving the quality of the existing park experience for park visitors. Essential to a positive park experience, things like improving ***safety*** for park users, improving the ***cleanliness*** and availability of restrooms, and ***maintaining aging parks infrastructure*** are of upmost importance. Community members also expressed a need for allocating additional and consistent levels of resources to the parks system to allow improvements and consistent levels of service in times of economic downturn.

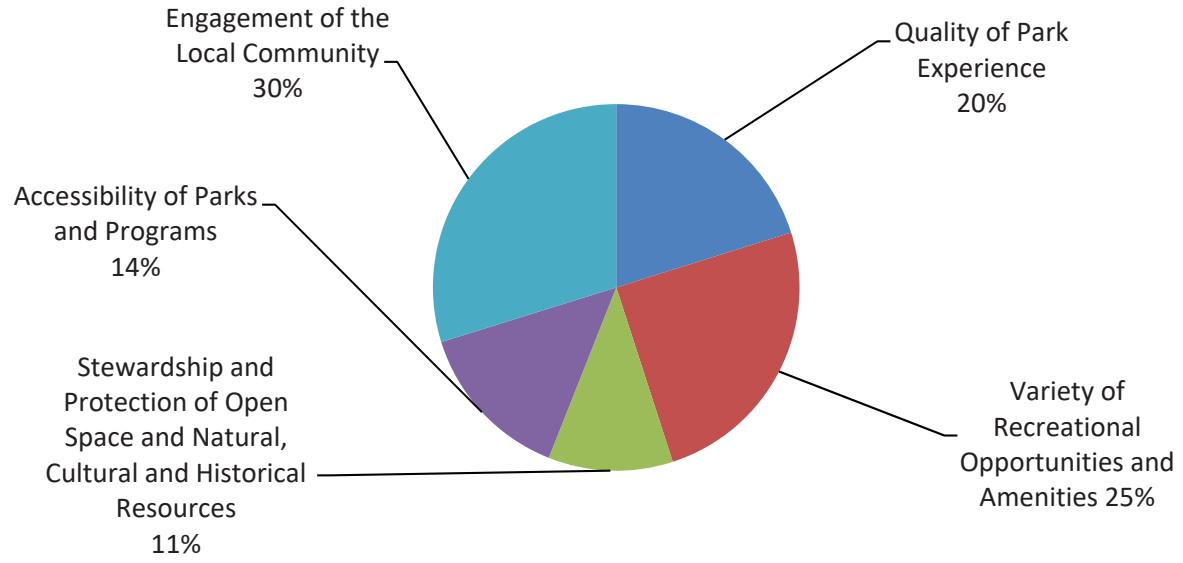
VARIETY OF RECREATIONAL OPPORTUNITIES AND AMENITIES

The parks system needs to provide adequate and appropriate opportunities for both active and passive recreation, and common outdoor spaces and facilities for group activities. Community members expressed a need for a variety of specific activities and new facilities they wished to see within the parks system. These facilities and uses included ***sports facilities, trails, community centers, natural open areas, places to take dogs, additional amenities for youth,*** and other types of parks uses. The range of suggestions reflects the community's diverse needs and their vision for what a healthy lifestyle and improved quality of live mean to them.

STEWARDSHIP AND PROTECTION OF OPEN SPACE AND NATURAL, CULTURAL AND HISTORICAL RESOURCES

Santa Cruz County residents feel strongly about the importance of protecting the natural environment and cultural and historical resources. Particularly, in the parks system, there is a need to ***preserve natural open space*** and to balance the development of recreational facilities with the protection of the environment. There also is a need to improve the ***management*** of natural areas and to restore and enhance natural habitats within the parks system. There is a strong desire to preserve our historical and cultural buildings, sites, landscapes and resources.

Figure 11: Percent of topics raised in comments during public meetings



Greyhound Rock County Park

ACCESSIBILITY OF PARKS AND PROGRAMS

People find accessibility of parks and programs to all people and geographic areas in the county to be a key need. Many comments related to increasing ***equity in park and program distribution*** and access. Another consistent topic is ***universal access*** to facilities for people with various types of abilities. Improving ***connections*** between and to parks to make them more accessible to local neighborhoods is another key need.

ENGAGEMENT OF THE LOCAL COMMUNITY

Locals expressed a desire for more opportunities to engage with and learn about the Parks Department, the parks system and parks programs. The department needs to increase ***outreach*** about offerings, and especially outreach to ***underrepresented communities***. People would like to see more programs, events and volunteer opportunities in the parks and to have better and more accessible information about these opportunities. This would increase individuals' and the community's connection to the parks system. Educational opportunities and particularly ***interpretive programs*** and facilities are important throughout the parks system.

REGIONAL DIFFERENCES

There are specific needs and unique gaps in the park network in each part of the county, and in each of the five meetings, topics that were most important to participants varied. Prominent themes by region are summarized in more detail in Appendix 2.

Table 2: Key Needs Summary

THEME: ***QUALITY*** OF PARK EXPERIENCE

PROMINENT TOPICS:

Safety of park users

Cleanliness of park restrooms and facilities

Local stewardship of parks

Updating and maintaining aging park infrastructure

Adequate and sustainable funding for parks system

Working with other park agencies to provide consistent facilities, hours and regulations

OTHER FREQUENT COMMENTS:

Keeping park facilities operational

Upgrading park facilities to accommodate increases in use

Enforcing park rules

Appropriate resources for maintenance and operations of existing facilities

Consistent park funds that are not significantly reduced in times of economic downturn such as the recession of 2008

Restroom and Concession Building at Polo Grounds County Park in Aptos

THEME: VARIETY OF RECREATIONAL ***OPPORTUNITIES*** AND AMENITIES

PROMINENT TOPICS:

Providing a variety of types of community-serving park amenities

Adapting to provide opportunities for current and future trends in recreation

Opportunities for active and healthy lifestyles

Shared Pickleball, Tennis and Basketball Courts at Brommer County Park in Live Oak

Adding new uses and improvements to existing park properties

Opportunities for people to access open spaces and natural landscapes in the parks system

Partnering with other parks agencies to provide new facilities

OTHER FREQUENT COMMENTS:

Additional sports facilities such as soccer, baseball and softball fields, and basketball, tennis and pickleball courts

Additional pool facilities and programs in underserved areas

Additional trail connections for all types of trail users

Spaces to take dogs

Community centers for programs and events

Youth facilities such as bike jumps and pump tracks, skate parks, adventure courses and climbing walls

Joint use agreements with schools and other agencies to provide public access to park-like facilities during off hours

Table 2: Key Needs Summary (Continued)

THEME:

STEWARDSHIP AND PROTECTION OF OPEN SPACE AND NATURAL, CULTURAL AND HISTORICAL RESOURCES

PROMINENT TOPICS:

Balancing the development of recreational facilities with protection and enhancement of natural, cultural and historical resources

Functional habitat for native flora and fauna

Protecting sensitive biological communities

Protecting natural open spaces in parks

Working with other park agencies to provide consistent facilities, hours and regulations

OTHER FREQUENT COMMENTS:

Connectivity between open spaces and natural areas to maximize benefits to wildlife

Conserving long-term viability of the variety of ecosystems within the county

Allowing natural biological processes to occur and biological systems to adapt to future conditions

Pinto Lake Regional County Park in Watsonville

THEME:

ACCESSIBILITY OF PARKS AND PROGRAMS

Future Site of LEO's Haven, an Inclusive Playground at Chanticleer County Park

PROMINENT TOPICS:

Equitable opportunities for access to parks and programs for all county residents and people with varying economic resources

Universal accessibility to built infrastructure for people of all abilities

Additional neighborhood parks within walking distance of people's homes, especially in underserved areas

Increasing youth programs and bringing them to new locations

OTHER FREQUENT COMMENTS:

Safe pedestrian and bicycle routes to access parks

Public transportation to parks and programs

Signs and materials in both English and Spanish

Shuttle services or other forms of transportation to people who need it to access parks and programs

THEME:

ENGAGEMENT OF THE LOCAL COMMUNITY

PROMINENT TOPICS:

Outreach to all demographics, particularly underrepresented communities

More volunteer opportunities

Additional programs and events

Partnering with community organizations and local cities

Educational opportunities

OTHER FREQUENT COMMENTS:

Relevant publicity of parks, programs and events

Coordination with school districts in publicizing parks and programs

Events for families with activities for multiple age groups

Interpretive programs

Working with neighbors and being respectful to local residents

Strategic Plan Community Meeting in Watsonville

Santa Cruz County Parks
979 17th Avenue
Santa Cruz CA, 95062
Ph: (831) 454-7901 – Fax (831) 454-7940
www.scparks.com

Adopt-A-Beach Permit Application

Please print all information

Thank you for your participation in the Adopt-A-Beach program. Please review this packet, then fill out and sign the application. When the application has been approved, you will receive written confirmation.

Applicant/ Contact Person: _____

Organization Name (if applicable): _____

Address _____

City _____ State _____ Zip Code_____

Day Phone (_____)_____ Cell Phone (_____)_____

Email Address _____ Fax (_____)_____

Requested beach or beach access location(s):

_____

Requested beach clean-up date(s) and times:

_____

Requested materials and quantity needed for beach clean-up (trash and/or recycle bags, gloves, etc.):

_____

Please return the following documentation to the Facilities office after the beach clean-up:

___ Adopt-A-Beach Group Participation Agreement and Indemnification Form (if applicable)
___ Adopt-A-Beach Waiver of Liability and Express Assumption of Risk
(to be signed by all participants, or parent/guardian if under 18)

For more information about the California Coastal Commission's Adopt-A-Beach program, please refer to their website: www.coastal.ca.gov/publiced/aab/aab1.html. Save Our SHores provides additional information about local beach cleanups on their website: http://saveourshores.org/volunteer/adopt-a-beach/.

Disclaimer:

The undersigned states: The information I have provided to Parks is true and correct; If this Permit is issued to a group or entity, I am the authorized representative of the group or entity, and I am empowered to make this agreement on its behalf; I have received a copy of the Terms and Conditions and Assumption, Waiver, and Indemnity documents, and have read and understand them. Both individually and on behalf of the group or entity, I agree to them, and will comply with them as well as all laws and ordinances of the County of Santa Cruz, the State of California, and the United States.

_____ _____
Permitee Signature Date

Department Use Only

Parks Department Approval: _____
Confirmed Date: _____ Contract #_____

ADOPT-A-BEACH GROUP PARTICIPATION AGREEMENT

AND INDEMNIFICATION FORM

WHEREAS_____, and the California

(Group/School Name)

Adopt-A-Beach Program recognize the need and the desirability of litter-free beaches; and

WHEREAS, the California Adopt-A-Beach Program recognizes our group as an adopting school or organization for _____, and

(Adopted Beach)

WHEREAS, our group recognizes the potentially hazardous nature of beach cleanup activities, and desires to protect the health and safety of ie cleanup participants:

Now, therefore, our group agrees to inform cleanup participants of safe methods to use in carrying our beach cleaning activities; and

FURTHER, _____

(Name of Participating Group/School)

agrees to indemnify and hold harmless, the State of California, the California Coastal Commission, the California State Parks, the California State Parks Foundation, all other organizers or sponsors or property owners involved in the Adopt-A-Beach program, and any of their respective employees, officers, agents, or assigns (hereafter collectively referred to as "Released Parties") from any claim of liability for personal injury, property damage, or wrongful death, arising out of, or connected with the group's participation in Adopt-A-Beach activities however caused, including but not limited to the negligence of the released parties, whether passive or active.

FURTHER, our group is aware that during the scheduled beach cleanups, volunteers from outside our groups may be assigned to our group's section of beach, and

FURTHER, our group accepts the responsibility of caring for the beach and promoting awareness in our community of the problems caused by marine debris and the need for protecting coastal and ocean resources for a period of one year, beginning _____, 20 _____, with cleanups scheduled on the following dates:

1st _____ 2nd _____ 3rd _____

Signed_____

(Authorized Group Leader/School Official)

GENERAL INFORMATION

Name of Group _____

Contact Person _____

Address _____

Phone (w) _____ (h) _____

Approximate number of people in the group _____

Beach Manager _____

ADOPT-A-BEACH WAIVER OF LIABILITY AND EXPRESS ASSUMPTION OF RISK

(PLEASE READ CAREFULLY)

I, _____, HEREBY CERTIFY THAT IAM AWARE OF THE INHERENT HAZARDS OF A BEACH CLEANUP.

I agree as follows: 1. I am volunteering my services for the Adopt-A-Beach program ("the Event") on a voluntary basis without ant of payment of any kind; 2. I will perform assigned tasks that are within my physical capability to the best of my ability, and I will not undertake tasks that are beyond my ability; 3. I am familiar with the safe operation and use of equipment and tools that I may utilize in connection with this volunteer activity, and I will not undertake to use any equipment or tools with which I am unfamiliar or do not know how to operate safely; 4. I acknowledge that I have received and read appropriate instruction regarding this Event, including appropriate safety and emergency procedures, and that I fully understand those instructions and that I agree, after proper inspection, to use only the supplies, tools and equipment provided by the Event organizers; 5. 1 will perform only those tasks assigned, observe all safety rules, and use care in the performance of my assignments; 6. I specifically acknowledge that I am engaging in this activity as a volunteer, at my own request and risk, and not as a State of California or Foundation employee, agent, official, officer or representative, and further acknowledge that I am not entitled to any compensation, benefit or insurance coverage from the State of California, the Department of Parks and Recreation, the California Coastal Commission, the California State Parks Foundation, the County of Santa Cruz Parks, or any Event promoter or sponsor, nor will I make any such claim,

I understand and agree that neither the State of California, California Coastal Commission, California Department of Parks and Recreation, California State Parks Foundation, the County of Santa Cruz Parks, nor any other organizers or promoters or sponsors or property owners involved in this event, nor any of their respective employees, officers, agents or assigns, (hereinafter collectively referred to as "Released Parties"), may be held liable or responsible in any way for any injury, death or other damages to me or my family, heirs, or assigns that may occur as a result of my participation in this activity, or as a result of product liability or the negligence of any party, including Released Parties, whether passive or active.

I understand that cleaning up beaches and waterfront areas involves certain inherent risks, 'including but not limited to, the risks of possible injury, infection or loss of life as a result of contact with needles, condoms, metal objects, burning embers or other hazardous materials found on the bench, or from over-exertion or environmental conditions. Despite these risks, I still choose to proceed in such activity. I know of no physical limitation which should keep me from undertaking the activities associated with this Event. In Consideration for being allowed to participate in this activity, I hereby personally assume all risks in connection with the Event for any harm, injury or damage that may befall me as a participant, including all risks connected therewith, whether foreseen or unforeseen. I further save and hold harmless said activity and Released Parties from any claim or lawsuit for personal injury, property damage, or wrongful death, by me, my fa state, heirs, or assigns, arising out of participation in this activity, including both claims arising during the activity and after I complete the activity.

If I should become injured while participating in the Event, I authorize any physician or surgeon licensed in the State of California to perform emergency or surgical treatment as in his or her sole judgment may be necessary. I further declare that I am eighteen and legally competent to sign this liability release, or that I have acquired the written consent of my parent or guardian. I understand that the terms herein are contractual and not a mere recital, that this instrument is a legally binding, and that I have signed this document of my own, free act.

BY THIS INSTRUMENT I DO HEREBY EXEMPT AND RELEASE ALL "RELEASED PARTIES," AS DEFINED ABOVE, FROM ALL LIABILITY OR RESPONSIBILITY WHATSOEVER FOR PERSONAL INJURY, PROPERTY DAMAGE OR WRONGFUL DEATH, HOWEVER CAUSED, INCLUDING NEGLIGENCE OF THE RELEASED PARTIES, WHETHER PASSIVE OR ACTIVE.

I HAVE FULLY INFORMED MYSELF OF THE CONTENTS OF THIS LIABILITY RELEASE AND ASSUMPTION OF RISK BY READING IT BEFORE I SIGNED IT ON BEHALF OF MYSELF AND MY HEIRS.

_____	_____	_____	_____
Spelling of Participant's Name	Date	Address	Phone
_____		_____	
Signature of Participant		Address	

IF PARTICIPANT IS UNDER 18, THE PARENT(S) (OR GUARDIAN(S), IF ANY) MUST SIGN.

The above participant has my permission to participate in the Adopt-A-Beach program. I have read and agree to the provisions stated above. I know of no health limitations which may restrict this volunteer's participation in this activity.

_____	_____	_____	_____
Signature of Parent(s) or Legal Guardian(s)	Date	Phone	Address
_____	_____	_____	_____
Signature of Parent(s) or Legal Guardian(s)	Date	Phone	Address

Santa Cruz County Parks
979 17th Avenue
Santa Cruz CA, 95062
Ph: (831) 454-7901 – Fax (831) 454-7940
www.scparks.com

Outdoor Facility Conditions of Use

Hours: Parks facilities may be reserved daily between 10:00 AM - Dusk. Outdoor facilities must be reserved for a minimum of 2 hours Monday through Friday, and 8 hours Saturday, Sunday and Holidays. The hourly rate may be applied to reservations made within 21 days of the desired date.

Reservations: Reservations are made on a first come, first served basis and can be made up to one year in advance. Minors are not eligible to reserve facilities. Full payment is required when the reservation is made.

Alcohol: Alcohol consumption is not permitted in the County Parks outdoor facilities.

Sound Permit: Public address systems, electronic equipment, live music and amplification are subject to certain restrictions determined by individual facilities. A Sound Permit is required for any event using these devices.

Time Limits: Entrance to the facility is limited to the time approved on the permit. If time limits are exceeded, the permittee will be charged an overtime rate of 1-1/2 times the hourly rental rate.

Cancellations: Reservations may be cancelled in person or in writing not less than 14 days prior to the scheduled event, with a permit processing fee of $100.00 or 50% of the permit fee, whichever is less. Cancellations of less than 14 days receive no refund of fees. Refunds are not given for inclement weather.

Damage: Permittee is responsible for damage or injury to County facilities and equipment. Damage or injury not covered by the amount of the deposit will be invoiced. Labor to repair the facility is charged at current maintenance staff hourly rate. Bills unpaid after 30 days are sent to collections.

Set-up and Clean-up: Permittee is responsible for set-up and clean up of the premises. Please leave facilities and grounds free of debris and other refuse from use. Trash and recyclables must be placed in appropriate containers. The facility must be restored to pre-use conditions.

Decorating: Poster tape and florist wire are the only fasteners permitted. No staples, tacks, nails, or stakes longer than 6 inches please! Release of balloons, birds or butterflies is prohibited by Parks policy. Biodegradable confetti only; no rice throwing.

Activities for Minors: Groups comprised predominately of participants under 21 years of age must be chaperoned at a ratio of one adult (over 21 years) to 12 minors.

No Overnight Storage: If you choose to bring rental equipment, you must arrange for it to be delivered and removed the same day as your reservation.

Flammable Materials: Flammable materials, including candles, are not permitted. Fuels and hazardous materials are not permitted in the park buildings and facilities. Fires must be confined to fireplaces and barbecue areas.

Smoking: Smoking and tobacco products are prohibited in Santa Cruz County Parks.

Checks and Charge Backs: Credit card charge backs and checks returned for insufficient funds will be charged at the current processing fee. Please note that credit cards are charged by Santa Cruz County.

Changes to the Permit: Any changes to the permit must be made in writing by the permittee only. Changes may result in a change in the permit fee. Date changes are subject to a $50.00 change of date fee. No changes will be made with less than one week notice.

Sub-Lease: Permittee shall not assign or sub-lease any portion of the premises, or any rights under approved permit, without prior written approval of the Department.

Special Conditions: For large, special or unique events, the department may require Permittee to provide additional services, including security, traffic control, first aid services, fire control, special trash collection, and sanitary facilities beyond those available by the Department.

Concessions: The County reserves sole right to control all concessions in and about department buildings and park facilities through separate agreements. Please inquire about concessions agreements if you are planning on selling items or food in the Parks.

Insurance Requirements: Groups charging admission and/or selling alcoholic beverages must furnish the department with a Certificate of General Liability and Property Damage Insurance (one million dollars per occurrence) holding the County as additionally insured. The department may also require insurance for activities that it deems to be high risk.

Deposits: Deposits may be required. If facilities are left in pre-use conditions, the full deposit will be returned. If facility/equipment is damaged, costs to return facility to pre-use condition will be subtracted from the deposit. Refunds will be mailed approximately four weeks following the event.

Public Use: You are reserving a space at a County Park and the park will remain open for use by others. At some parks there may be other events happening at the same time as yours.

Lost Items: The Parks Department is not responsible for items left.

Thank You For Choosing Santa Cruz County Parks

ASSUMPTION OF LIABILITY, WAIVER and INDEMNITY

1. ASSUMPTION OF LIABILITY

Permitee, whether individual, group, or entity, is solely responsible for any and all liabilities to persons or property resulting from use of the Park Facility, including damage to any County property or structures. Permittee will indemnify, defend and hold harmless the County of Santa Cruz, its elected and appointed Boards, Commisions, Officers, Agents, and Employees from any claims, suits, losses or damages for injury to persons or property arising from or connected to this use of the Park Facility.

2. AGREEMENT TO ABIDE BY TERMS AND CONDITIONS

Permittee, whether individual, group, or entity, represents that he/she/it has read these Terms and Conditions, agrees to make them known to persons attending the function or activity, and agrees that no violation of such shall be allowed to occur on the premises or facilities. Permittee understands that permission to use of the Park Facility is contingent upon compliance with these Rules and Regulations (Terms and Conditions) and that permission may be revoked at any time upon failure of persons attending the function or activity to fully comply with these Rules and Regulations (Terms and Conditions).

3. PERMITTEE, OR REPRESENTATIVE, TO BE PRESENT

Permittee, or the group or entity individual named in the Permit, will be present during the entire period of use of the facility.

Coastal Access

NORTH COUNTY:
Greyhound Rock(pictured above) - On HWY1 north of Scott Creek, it has a paved pedestrian access to beach, picnic tables, a large parking lot, memorial benches and a disabled accessible view platform.
Scott Creek Beach - Snowy Plover nesting habitat area.
Davenport Landing(pictured above) - Disabled accessible ramp to beach and restrooms, improved shoulder parking.
Bonny Doon - On HWY1 where Bonny Doon Road ends it has 45 parking spaces, a bus stop and an improved trail head.

MID COUNTY:
Pleasure Point - At the end of 41st Ave "The Hook" is a popular surfing spot, it has picnic tables, a parking lot and restrooms.
Rockview Drive - Near end of 30th Ave, has a picnic table.
12th Avenue - Has coastal stairway.
13th Avenue - Has coastal stairway.
20th Avenue - Has coastal stairway.
21st - 23rd Avenue - Access only
26th Avenue - Access only
35th Avenue - Has coastal stairway.
38th Avenue - Has coastal stairway.

SOUTH COUNTY:
Hidden Beach- Also a park, has paved pedestrian access to beach.
Via Concha Ave. - Has coastal stairway.
Via Gaviota Ave. - Has coastal stairway.
Via Palo Alto Ave. - Has coastal stairway.
Dolphin at Sumner - One of the most beautiful access spots, this access trail leads under a train tressel to a stairway leading to the beach.

Garden Plots

Garden plots are located at Jose Avenue Park, Felt Street Park, the future park site of Chanticleer Park, which are located in Live Oak, and The Farm Park in Soquel. Garden plot contracts are annual and currently cost (effective July 1, 2018) $65 resident / $70 non-resident for the year (fees are subject to change). Availability varies per park. If there are no garden plots currently available to rent, your name can be added to a waitlist and will be selected in the order of sign-up in the Spring as plots become available. Email waitlist requests may be sent to reservations@scparks.com which should include your name, address and contact information. When new community garden parks open we will select from a lottery of the existing waitlist. Our brochure is attached below for more information.

Garden Plot Brochure

Santa Cruz County Department of Parks, Open Space and Cultural Services
979 17th Avenue, Santa Cruz, CA 95062
General Information (Monday-Friday, 9:00 a.m. - 4:00 p.m.)
Phone: (831) 454-7901 • PRCweb@santacruzcounty.us

Surf Schools

Learn to surf in iconic Pleasure Point!

Santa Cruz County Parks is pleased to offer surf lessons through the Surf School Concessionaire Program, where you can learn to surf with permitted, professional, local surf schools.

Club Ed
www.club-ed.com
(831) 464-0177
surf@club-ed.com

Richard Schmidt Surf School Inc.
www.richardschmidt.com
(831) 423-0928
surf@richardschmidt.com

Surf School Santa Cruz
www.surfschoolsantacruz.com
(831) 428-3647
bud@surfschoolsantacruz.com

Surf School Concessionaire Program
East Cliff Parkway in Live Oak

A permit is required to conduct surf instruction at designated beaches and coastal access points along East Cliff Parkway at Pleasure Point, 36th Avenue, 38th Avenue, and The Hook, per Santa Cruz County Code Section 10.80.010.

The three permitted surf schools provide services that preserve public safety, maximize recreational use by all beach visitors, and maintain quality surfing instruction opportunities for the public.

All surf schools are required to have their students and instructors wear colored uniform shirts or vests while conducting surf school instruction. Permitted surf school with their vest colors are as

Search & Select Map | Recorded Maps & Docs | Select & Query Layers | Measure & Lat/Long | Draw & Print | Links & Help

APN | Address | Street | Intersection

005-152-30, 005-152-31, 005-152-32, 005-152-33

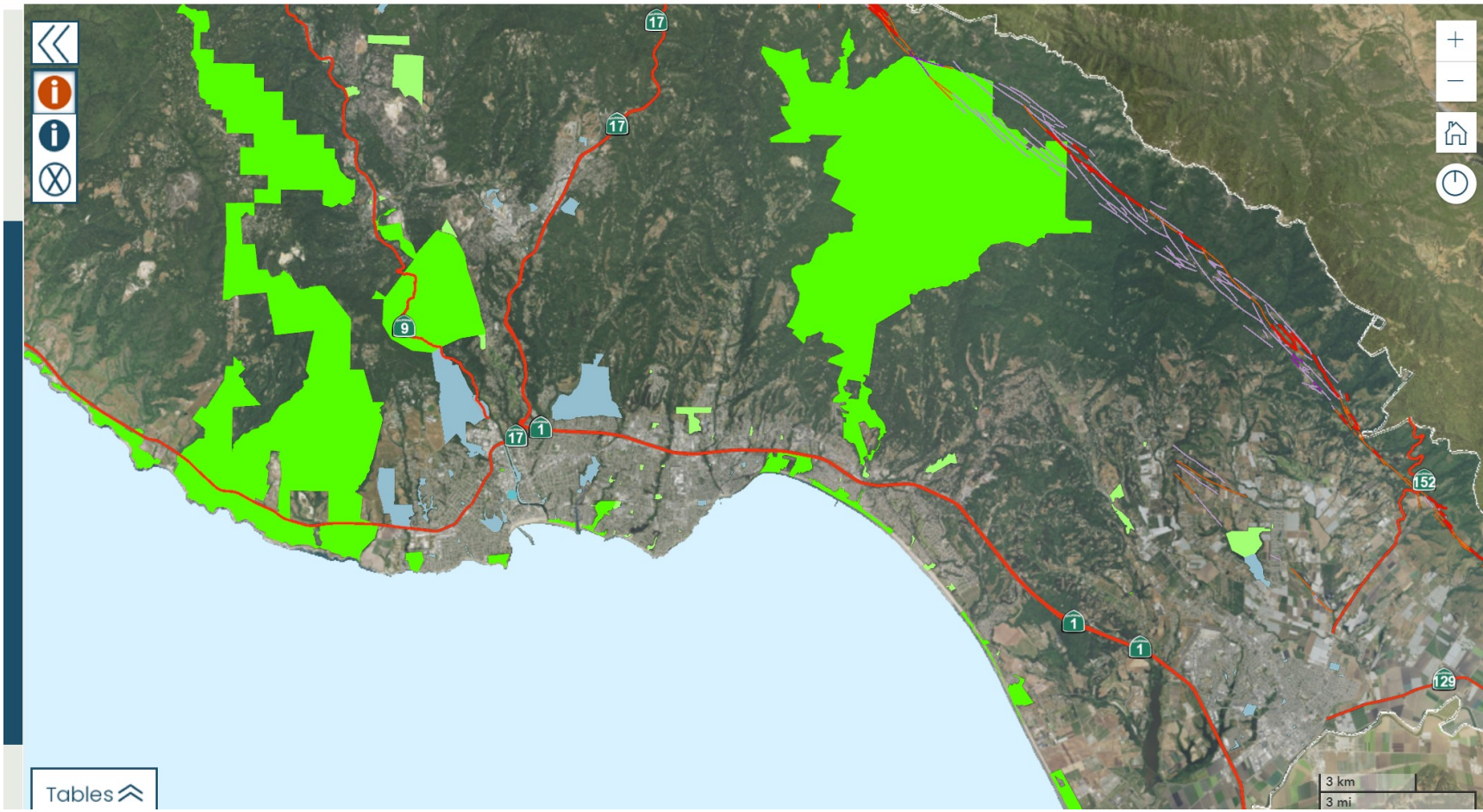
Select Overlay | Select Base Map | Property Report | Zoning Report

- ADU parking exemption for transit proximity
- Rodeo Gulch Cannabis Overlay – SCCC 7.128/13.10
- Dispensary Exclusion Areas
- Vacation and Hosted Rentals
- Designated Areas Blocks (Vacation and Hosted Rentals)
- Designated Areas (Vacation and Hosted Rentals)
- Airport Safety Compatibility Zones
- Archeologic Reports
- Archeologic Resources
- Ag Resource Area
- Parks
  - City Park
  - County Park
  - State Park
- Important Farmlands
- Special Design Review
- No Shoot Areas
- Assessors Land Use

General Plan

Special Districts

Jurisdictional, Elections, Census



parks

Results

Grant Park
4.1 ★★★★☆ (250)
Park · ♿ · 150 Grant St
Neighborhood spot for picnics & play
Open · Closes 8 PM

Frederick Street Park
4.5 ★★★★½ (510)
Park · ♿ · 168 Frederick St
Community space with a playground
Open · Closes 7 PM

Jose Avenue County Park
4.4 ★★★★½ (183)
Park · ♿ · Jose Ave
Open · Closes 10 PM

Ocean View Park
4.6 ★★★★½ (515)
Park · ♿ · 102 Ocean View Ave
Open · Closes 7:30 PM

San Lorenzo Park
3.9 ★★★★☆ (414)
Park · ♿ · 137 Dakota Ave

Update results when map moves

Rating · Hours · All filters

Search this area

Grant Park
Neighborhood spot for picnics & play

Harvey West Park
Park with pools, ball fields & play area

DeLaveaga Park

Chaminade Resort & Spa

Anna Jean Cummings County...
Big recreational area with a playground

Winkle Farm County Park

Dignity Health – Dominican Hospital

John Franks Park

Soquel

Soquel Dr

Soquel Ave

Chanticleer Ave County Park

Coffee Lane County Park

Star of the Sea Park

San Lorenzo Park

Santa Cruz

SEABRIGHT

Hestwood County Park

Frederick Street Park
Community space with a playground

Capitola

Capitola State Beach

Brommer Street County Park

Ocean View Park

Twin Lakes County Park

Twin Lakes

Felt Street County Park

Tyrrell Park

Chestnut Park

Santa Cruz Wharf

Pleasure Point

OPAL CLIFFS

Layers

Street View

Santa Cruz
California
36.980581, -122.019406

About the Santa Cruz Police Department

The Santa Cruz Police Department is dedicated and proud to serve the residents of and visitors to our city. A team of 119 employees, 94 budgeted sworn officers and 25 non-sworn civilian staff, serve a population of 63,789 residents in a city of 12.7 square miles. Members of the Department work diligently to meet the unique challenges of public safety in a city that plays host to a large tourist population, special events, and seasonal attractions. With a finite amount of resources, the city is divided into five patrol beats: West, East, Beach, Central, and Downtown. The beats are designed to maximize coverage and provide efficient response to calls for service.

Police Chief Bernie Escalante

Mission

Values

Priorities

Santa Cruz Police Directory

Santa Cruz Police Department
155 Center St.
Santa Cruz, CA 95060
831-420-5800

Requesting Police Services: 911
It is appropriate to call 911 for calls which involve a crime, accident or incident requiring a uniformed police officer to respond. Please do not hesitate to call 911 for anything that requires a police response.

Administration Division: (831) 420-5810

Investigations Section: (831) 420-5820

Operations Division: (831) 420-5850

Property Section: (831) 420-5900

Property Release times are Tuesdays and Thursdays from 12:30 pm-2:30 pm
Property release times are subject to change. The Property Section is closed on holidays.

Records Section: (831) 420-5870

Sergeant's Office: (831) 420-5960

Outside Police Agency Directory

PD Org Chart 4-11-16 Example 6

REPORT A CRIME

Wastewater System

Our short video provides an important reminder to help prevent unsanitary sewer overflows during the current pandemic and always: in English; en español.

Our **Santa Cruz Wastewater Treatment Facility** provides quality of life service to the community while helping to reduce the City's carbon footprint and protecting the environment as demonstrated in this video. We welcome you to a 2020 virtual tour of our facility led by our Operations staff in English or español. You can also learn more about us in our latest edition of Neighborhood News.

The Santa Cruz Wastewater Treatment Facility is proud to have been awarded 2020 Collection System of the Year (Small) from the California Wastewater Environment Association-Monterey Bay Section. Previous honors include 2013 Best in State Plant of the Year (Medium) and four 2017 California Water Environment Association-Monterey Bay Section awards: Overall Plant of the Year, Plant of the Year (Medium), Collections Person of the Year and Operator of the Year. We received second place for California Wastewater Environment Association 2017 Best in State Plant of the Year (Medium).

Santa Cruz Plant Honored as Best Wastewater Treatment Facility in California. This award honors exceptional California treatment plants and collection systems. It is based on a review of infrastructure, management practices and compliance records.

We have also been honored for our energy-saving achievements:
EPA Recognizes Santa Cruz Wastewater Treatment Facility for Its Green Power Accomplishments

The history and processes of the Wastewater Treatment Facility and our use of recycled wastewater are outlined in this presentation by Public Works Director Mark Dettle.

Purpose and Functions (37 Employees)
Organization chart [PDF]

Wastewater Treatment Facility
Operates and maintains a regional wastewater treatment and disposal facility. Wastewater treatment and ocean outfall disposal are provided for the City of Santa Cruz and the Santa Cruz County Sanitation District (includes Live Oak, Capitola, Soquel and Aptos). Ocean outfall disposal is provided for the City of Scotts Valley.

Wastewater Source Control
Provides inspection, sampling and monitoring of business and industrial establishments to limit discharge of harmful constituents into the sanitary sewer system and storm drain system. Issues wastewater discharge permits to industrial discharges. Issues citations and levies fines for code violations. This program is a requirement of the State of California and U.S. Environmental Protection Agency.

The City of Santa Cruz has been treating sewage at the Wastewater Treatment Facility near Neary Lagoon and disposing of the effluent in the ocean since 1928. Treatment capacity has been expanded several times to accommodate the growth of the city and the addition of flows from the Santa Cruz County Sanitation District. The current rated design capacity is 17 MGD (millions of gallons per day) and with an average daily flow of less than 10 MGD. Design for wet weather flow is 81 MGD.

Pure Water Soquel Project: The City of Santa Cruz Wastewater Treatment Facility continues to expand its production and use of recycled water through a regional partnership which will provide source water to the Pure Water Soquel Project.

The project will provide a reliable supplemental water supply for the community and prevent seawater from contaminating groundwater. It includes the installation of about eight miles of pipeline under various streets between Santa Cruz and Aptos. These pipelines will carry recycled water from our regional Santa Cruz Wastewater Treatment Facility to the Chanticleer Water Purification Center (to be built) in the Live Oak area; and, will carry purified water from the new Center to three Seawater Intrusion Prevention (SWIP) wells where it will be pumped into the groundwater basin.

This project will also provide an increased capacity to produce Title 22 tertiary water at the Wastewater Treatment Facility. Read more.

Major Accomplishments Over the Last 5 Years:

- WWTF Energy and Environmental Summary

- Completion of 50 Kw photovoltaic system
- Integration of 1.3 megawatt cogeneration system into facility power grid
- Implementation of staffing reorganization to optimize plant efficiency
- Adoption of revised Sewer Use Ordinance
- Adoption of Storm Water Ordinance
- Adoption of Extended Producers Responsibility Ordinance

Wastewater Treatment Facility brochure: Page 1 - Page 2

Information on Sewer Rates and Sewer Rate Table

Water Pollution Control Facility Annual Reports

2019 [PDF] 2015 [PDF] 2011 [PDF] Archives 2006-10

Pretreatment Program Annual Reports

2019 [PDF] 2015 [PDF] Archives 2006-10

California Integrated Water Quality System Reports

Annual Dye Study Report 2016 [PDF]
Annual Dye Study Report 2013 [PDF]

Additional Reports are filed online at the **Electronic Self-Monitoring Report** website of the California Integrated Water Quality System. You can find the reports that have been filed at this web link:

For more information contact:

Anne Hogan
Wastewater System Manager
831-420-5425
831-420-6489 (fax)
email

Communication & Engagement Plan

Background

Santa Cruz County's Buena Vista Landfill is projected to reach capacity by 2028. Buena Vista is the only remaining landfill in Santa Cruz County serving residents and businesses in the unincorporated county. As a result of the pending landfill closure, the County and its residents need to develop other waste management facilities to ensure adequate waste disposal capacity to efficiently manage the 157,700 tons of trash, recycling, and organic waste that county residents and businesses in the unincorporated county dispose annually. The County has spent over 30 years in collaboration with city jurisdictions and the public through its Integrated Waste Management Task Force to identify the right mix of facilities and available property to provide ongoing waste disposal services to residents and businesses in the unincorporated county.

The County's Integrated Waste Management Task Force (Task Force) was established in 1990, as required by State law, to serve as a commission reporting to the Santa Cruz County Board of Supervisors. The Task Force's membership includes elected officials and public works staff engaged in waste management activities for each of the local jurisdictions (cities and county) within Santa Cruz County. The Local Task Force holds quarterly meetings, which are open to the public, to discuss and address important waste management issues.

The Task Force completed a siting study in 2000 that identified two major findings: (1) County residents do not want to develop a new landfill at a new location and (2) redevelopment of property at the Buena Vista Landfill for on-site waste management and off-site waste disposal is preferable to permitting a new landfill. As a result of these findings, County Public Works staff developed the Buena Vista Landfill Redevelopment Project (project) to build waste transfer stations, an organics diversion facility, a redesigned recycling facility, and other facility upgrades at the Buena Vista Landfill site to serve County waste management needs. If waste management facilities are not developed locally, the costs for waste disposal and climate impacts from waste transfer emissions will increase.

Communication Goals

1. Bilingual public awareness and comprehension campaign regarding the necessity for sufficient waste disposal infrastructure to handle the waste produced by residents and businesses in the County.

2. Public and stakeholder support for development of the necessary waste management infrastructure at the Buena Vista Landfill site.

3. Foster community participation and collaboration in waste reduction initiatives through effective communication strategies.

Objectives

Through workshops, events, online engagement, and print materials, the public will understand:

1. The Buena Vista Landfill is nearing the end of its functional life as a landfill.

2. The role of the County Integrated Waste Management Task Force in developing policy recommendations to the County Board of Supervisors.

3. The need to provide adequate waste management facilities within the County that support our environmental values.

4. The problems that will result if adequate waste management facilities are not developed.

5. The suggested measures for local waste management include the establishment of a compost facility, utilization of biochar, implementation of biogas systems, and similar initiatives.

Audiences/Stakeholders

This Communication and Engagement Plan is intended for the Audience/Stakeholders identified in the table below. The table also identifies the engagement purpose and contact strategies.

Category of Interest	Stakeholder Groups	Engagement Objective	Contact Strategies
General Public Business Owners	- County Residents - Chambers of Commerce	Inform to improve public awareness of landfill closure and new facility development	Traditional media, social media, presentations to community groups, website, press releases, and outreach meetings.
Commercial Waste Haulers	- GreenWaste Recovery - Keith Day Company - NERO Dropbox Haulers - Garbage Disposal Services	Involve and inform to avoid negative impacts to these users, inform about the need for operational changes, and collect input on facility changes.	Direct messaging via email, direct mailing at place of business, signboards and handouts at landfill, website, press releases, and outreach meetings.
Local Residents	- Property Owners within 1,000 feet (or 2,500) feet of the Buena Vista Landfill property	Inform and involve to avoid negative impacts to neighboring landowners.	Direct mailing to home address, traditional media, social media, presentations to community/homeowner groups, website, press releases, and outreach meetings.
Local Businesses	- Waste Works account holders - Regular business facility users	Inform and involve to avoid negative impacts to businesses.	Traditional media, social media, presentations to community groups, website, press releases, and outreach meetings.

Local Jurisdictions	- Watsonville, Santa Cruz, Capitola, Scotts Valley	Inform and involve to support a stable economy.	
Local Stakeholders	Watsonville Wetlands Watch Watsonville Pilots Association		Direct messaging via email, website, press releases, and targeted outreach meetings.
Resource Managers and Environmental groups	-State and Federal agencies (e.g., Fish & Wildlife Service) -Wetland managers -Local environmental groups -Local land trust(s) -California Native American Tribe(s) traditionally and culturally affiliated with the geographic area	Collaborate to ensure that local environmental, archaeological, and historical resources are properly considered and effectively protected.	Direct messaging via email, website, press releases, and targeted outreach meetings.
Integrated Waste Managers	- Public works departments - Santa Cruz County Integrated Waste Management Task Force	Inform, involve and collaborate to improve regional waste management.	Facilitate social media, advertising and other outreach strategies.

Additionally, the Audience/Stakeholders will be notified of the environmental impact report (EIR) being prepared for the project in compliance with the California Environmental Quality Act (CEQA) and the opportunities for communication and engagement in the CEQA EIR process. These include: 1) distribution of the EIR Notice of Preparation (NOP) and opportunity to provide input on the scope of the EIR, including environmental issues to be addressed and project alternatives to be consider; 2) distribution of the Draft EIR and the opportunity to provide comments on the analysis therein; and 3) notification of the Final EIR and Santa Cruz County Board of Supervisors meeting(s) to certify the EIR and make a decision on the project.

Key Messages

1) The County is responsible for waste management in the unincorporated area and provides additional vital waste services to residents throughout Santa Cruz County.

2) The County's Buena Vista Landfill is nearing capacity.

3) The County must continue to provide waste management services after the landfill's closure.

4) Zero Waste strategies have not reduced waste generation within the County; and although waste diversion has improved, the volume of waste requiring management continues to increase.

5) A variety of strategies are required to manage waste to limit impacts on air and water resources.

6) To be successful, waste management efforts require the development of necessary infrastructure to process organics for transformation to compost, sort recyclable materials for reuse, and transfer trash to a new disposal site.

Venues for Engagement

Task Force Meetings:

Santa Cruz County has worked closely with its local jurisdictions through ongoing meetings of the Task Force. The County continues to collaborate with local jurisdictions to develop waste management programs that support County residents and businesses. Over its 30-year history, the Task Force has prepared plans that identify strategies to reduce waste, divert recyclable from the landfill, and process organic materials for reuse as compost and mulch.

A large part of the Task Force's work is to plan for the time when the County's landfills reach full capacity. The Task Force submits a plan review report to the State every five (5) years. State law requires the review report to identify jurisdictions that no longer have 15 years of remaining permitted landfill capacity.

Communication Strategies

Media Toolkit:

- Bilingual media toolkit for social media and newsletters that can be shared with the public, District Supervisors, Collaborative Partners (i.e. Green Waste and Environmental Innovations)
    - This will ensure all messaging is aligned with what we are putting out there.

Newsletter:

- CDI newsletter
    - Target audience: Public-facing subscribers, Board of Supervisors, Key DPW staff
- Board of Supervisors Newsletter
    - Target audience: Constituents of Santa Cruz County
- GreenWaste Newsletter
    - Target audience: Engaged community members take an active role in proactively participating in eco-friendly waste management practices, including recycling and composting.
- Environmental Innovations Newsletter
    - Target audience: Green Certified Businesses
- Chamber of Commerce Newsletter
    - Target audience: Members and potential stakeholders

Note: Newsletters will have a link to a public facing media kit so readers can share on their social media.

Op-ED:

- Draft an Op-Ed to attract interest and awareness for the project.

Social Media:

- Bilingual County/CDI Facebook posts
- Bilingual County/CDI Nextdoor post
- Bilingual County/CDI Instagram posts
- Bilingual CDI Instagram

Flyers:

- Flyers displayed at events (i.e. Earth Day, other environmentally centric events)

Calendaring:

- Calendar workshops on news outlet calendars (GoodTimes, Lookout Santa Cruz, Santa Cruz Sentinel)

County's Project Website:

1) Background and basic information about the problem and the plan to redevelop the Buena Vista property

2) Summary of the services provided at the Buena Vista Landfill site

3) Identify gaps in information that we are presenting

4) Recording of webinar workshop

Stakeholder Meetings

• Plan at least 2 workshops per year for Stakeholders.

Community Events:

• Table with informational handouts at fun community events to engage people who may not come to a meeting.

• Participate at events like Earth Day, the County Fair, and Farmer's Markets to inform the public.

• Connecting the Drops.

Phased Approach Implementation Timeline

County should prepare a phased approach to outreach that can be implemented should community concerns exceed those anticipated by staff and County consultants.

Phase 1: Ongoing Efforts

• Buena Vista Landfill Redevelopment Project Website, Buena Vista Landfill Project (santa-cruz.ca.us) (regular updates and project documents)

• Media toolkit for social media and newsletters

• Distribute media toolkit to stakeholders

• Key press releases and social media information (ongoing as needed)

• Project Op-Ed

• Mailings (ongoing as needed)

• Record workshops and have them available on project website

• Flyer design and print, have it ready for events

Phase 2: Engagement and Outreach

The purpose is to provide additional information about County's Buena Vista Landfill Redevelopment Project plans.

Tasks for Phase 2:

1) Review and update draft stakeholder engagement plan with assistance from County communications staff
2) Consider including more text about existing waste management programs and need for redevelopment at Buena Vista,
3) Consider adding a survey to determine how to better message project benefits,
4) Consider multiple phased approach to outreach.
5) Workshops (ongoing in relation to EIR and as needed)

Phase 3 CEQA EIR Process:

The purpose is to engage the public and stakeholders in the process as the County prepares the EIR for the project, as required by CEQA. Roll out draft then final Environmental Impact Report (EIR), gather/respond to feedback, send project to BOS for decision on the project.

Tasks for Phase 3:

1) Release EIR Notice of Preparation (NOP) for 30-day public review via project website, email distribution, mailings, and press releases to obtain input on the scope of the EIR and notify of public scoping meeting.
2) Hold public scoping meeting during 30-day NOP review period to present the project and purpose of CEQA EIR.
3) Release Draft EIR for 45-day public review via project website, email distribution, mailings, and press releases to obtain public and agency feedback on Draft EIR and notify of Draft EIR public meeting.
4) Hold public meetings on Draft EIR to summarize the findings and collect verbal comments.
5) Release Final EIR (with response to comments on the Draft EIR and any modifications to the EIR) via project website, email distribution, mailings, and press releases to notify the public of the Final EIR availability and Final EIR public hearing.
6) Hold County Board of Supervisors public hearing(s) to certify the Final EIR and decide on the project (maybe at the same meeting or separate meetings).
7) County project permits

Evaluation and Assessment of Communication & Engagement Plan

By taking a phased approach to outreach, we allow ourselves opportunities to assess the outreach program and evaluate how the plan is performing against our goals and objectives by asking:

- What worked well
- What didn't work as planned
- Meeting recaps with next steps
- What are the gaps in citizen knowledge that we should focus our outreach towards?
- How to modify outreach materials to fill any identified gaps.

Buena Vista Landfill

Redevelopment Project

Meeting the needs of local residents and businesses

Public Comment

The Buena Vista Recycling and Solid Waste Facility is the backbone of Santa Cruz County's waste diversion and disposal system, processing 450 tons of refuse on a daily basis.

With the landfill nearing capacity in the upcoming years, the facility is undergoing renewal to meet the next generation of County residents' and businesses' waste disposal needs. Funded through a Recycling and Solid Waste Services Infrastructure charge added to property tax bills, the project will help reduce greenhouse gas emissions, increase waste diversion through a new organics processing facility that helps support local farmers, and meets state environmental protection mandates. Once completed, Buena Vista will serve a dual role – as a transfer station for commercial haulers and residents, and as an organics processing facility that diverts yard waste, food scraps and other methane-producing compostables from the waste stream.

The Buena Vista Project will help ensure that the County can meet the needs of local residents and businesses, now and into the future. In doing so, we will assure Santa Cruz County maintains its leadership when it comes to waste reduction and recycling.

Project Documents

Environmental Documents

Recycling & Trash

Track Progress

Frequently Asked Questions

How will the County use the recycling and solid waste infrastructure charge?

- [ ] Why does the County need to construct two new transfer stations?
- [ ] How do County residents benefit from this charge?
- [ ] Will residents still be able to use Buena Vista to drop off excess household waste?
- [ ] How will the composting facility operate?
- [ ] Has the County explored alternative sites?
- [ ] What are the costs of these three proposed infrastructure projects?
- [ ] Who will pay the proposed charge?
- [ ] How much is the Bond amount and what are the terms?
- [ ] How much money will be collected from the proposed Recycling and Solid Waste Infrastructure Charge?
- [ ] What happens to this proposed charge after 2026-2027?
- [ ] When will construction of the proposed transfer stations and compost facility begin?
- [ ] Why is the proposed charge being implemented now, when the Buena Vista Landfill still has a few years of remaining capacity?
- [ ] Can the County charge a reduced fee for people on low and fixed incomes?

Will the proposed charge end in 2027 as shown in the Cost of Service Report?

County Home DPW Home Flood Control & Stormwater + Permits + Projects + Recycling & Trash + Sewer & Water + Transportation & Roads +

Ben Lomond Diversion Guide
Buena Vista Diversion Guide
Buena Vista Project ›
Composting ›
COVER YOUR LOAD - IT'S THE LAW!
Curbside Recycling Guide
Drop-Box Haulers
Franchise Hauler ›
FY 2024 Rate Sheet
Green Business Program
Green Schools Program
Household Hazardous Waste(HHW) ›
Illegal Dumping
Public Notices
Quick Links ›
Recycling ›
Recycling and Disposal Facilities
Treated Wood Waste
Universal Service
Virtual Waste Facilities Tour
What Goes Where
Wood Waste
Zero Waste Plan ›

Recycling and Disposal Facilities

Buena Vista Landfill
(1 Mile South of Highway 1)
1231 Buena Vista Drive Watsonville, CA
(831) 454-2430 (831) 454-5153

Ben Lomond Transfer Station
(1 Mile North of Glen Arbor Road)
9835 Newell Creek Road Ben Lomond, CA
(831) 454-2430 (831) 454-3951

The Solid Waste Disposal and Recycling Facilities are open
Open every Mon.,Tues., Thurs.,
Fri., & Sat. 7:30 am - 3:30 pm
Open every Wed.,
7:30 am - 2:30 pm
Closed for Thanksgiving, Christmas and New Year's Day.
Hours of operation on Christmas Eve are 7:30 a.m. to 11:30 a.m.
Household Hazardous Waste
Identification required to use facilities.

The County of Santa Cruz accepts over 450 tons of refuse on a daily basis. The Buena Vista Landfill accepts an average of 350 tons, while the Ben Lomond Transfer Station accepts 100 tons of refuse daily which is trucked to Buena Vista Landfill.

The Buena Vista Landfill is a Class III landfill operating under State of California Solid Waste Facilities Permit from CalRecycle (California Department of Resources Recycling and Recovery). The Ben Lomond Transfer Station also operates under State of California Solid Waste Facilities Permit from CalRecycle. The Buena Vista Landfill is equipped with an environmental liner system exceeding Federal Subtitle D and State of California standards,

2024 Holiday Schedule

Buena Vista Location

1231 Buena Vista Dr., Watsonville, CA
(831) 454-2430 or
(831) 454-5153

County Landfill
Open every Mon., Tues., Thurs., Fri., & Sat.
7:30 am - 3:30 pm
Open every Wed.,
7:30 am - 2:30 pm

Buena Vista Household Hazardous Waste
Open every Wed.,
7:30 am - 2:30 pm
Open every Fri., & Sat.
7:30 am - 3:30 pm

(831) 454-2606

Ben Lomond Location

9835 Newell Creek Rd., Ben Lomond, CA
(831) 454-2430 or
(831) 454-3951

County Transfer Station
Open every Mon., Tues., Thurs., Fri., & Sat.
7:30 am - 3:30 pm
Open every Wed.,
7:30 am - 2:30 pm

Ben Lomond Household Hazardous Waste
Open every Thurs.
7:30 am - 3:30 pm

(831) 454-2606

Other Household Hazardous Waste

City of Santa Cruz Resource Recovery Facility
Open every Sat.
7:30 am - 3:30 pm

605 Dimeo Lane Santa Cruz, CA
(831) 420-6270

Santa Cruz County Solid Waste & Recycling

including a leachate collection and removal system and a 4 layer composite liner.

The Buena Vista Landfill is a recipient of the Solid Waste Association of 1997 Silver Award for Landfill Excellence. The Ben Lomond Transfer Station is a recipient of the Solid Waste Association of North America 1998 Bronze Award for Transfer Station Excellence. In 2013 Santa Cruz County was awarded the Governor's Environmental and Economic Leadership Award (GEELA) for waste reduction.

Materials accepted at the Buena Vista Landfill are Class III non-hazardous residential, commercial and industrial waste, dewatered sewage sludge and low-level petroleum contaminated soils.

Materials accepted at the Ben Lomond Transfer Station are Class III non-hazardous residential, commercial and industrial waste.

Main Office

701 Ocean St., Room 410
Santa Cruz, CA 95060
(831) 454-2160

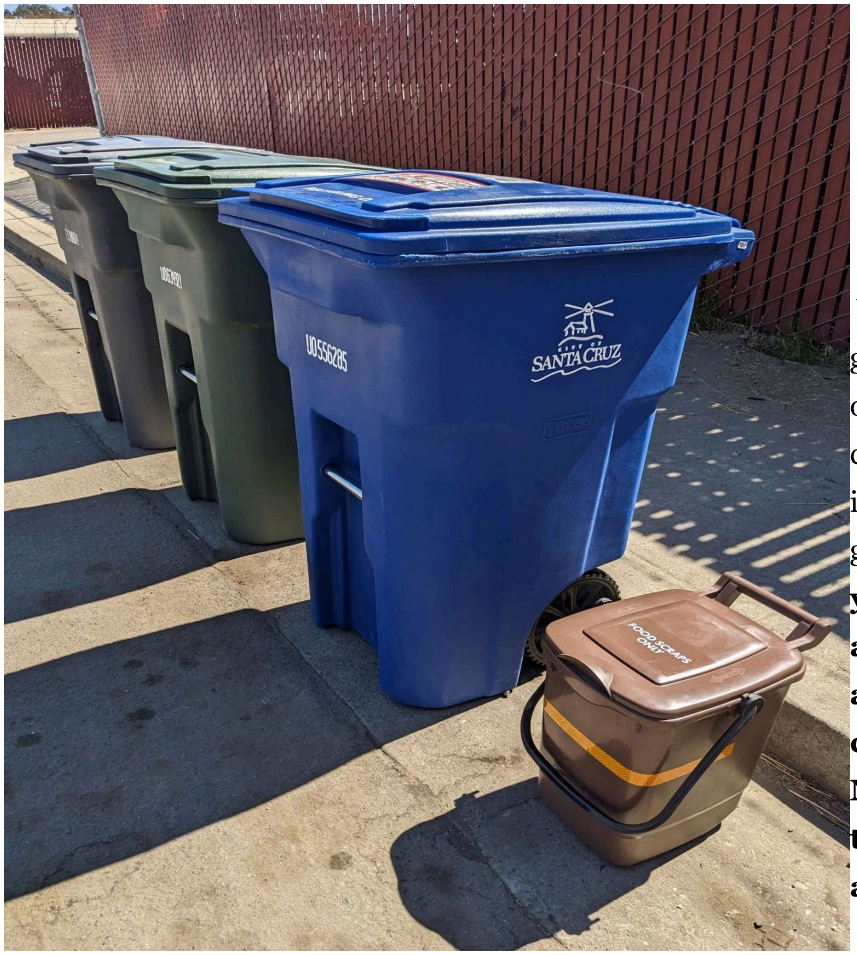
Email Public Works

Residential Resource Recovery Services

Note: COLLECTION SERVICE AND SCHEDULES REMAIN THE SAME DURING ALL HOLIDAYS.

Curbside Collection

The City of Santa Cruz collects all residential waste streams once a week.



Recycling, Yard Waste, and Food Scrap Collection

Your refuse bill is based on the size of your garbage cart. The City provides weekly collection of mixed recyclable materials in blue recycling carts, yard waste in green carts, and food scraps in the brown 6 gallon pail to help you reduce the garbage being sent to landfill. Be sure to **place your refuse, recycling, yard waste carts and food scrap pail at the curb by 5:00 a.m. on your collection day. Take your carts in after they have been serviced. NOTE: A fee will be accessed for requests to return for service if carts were set out after 5:00AM**

Note: Bag and secure small loose material such as cat litter, vacuum cleaner debris, polystyrene packing peanuts and shredded paper before placing it in your **trash** cart. **Extra bags on top of or next to refuse carts will only be collected if pre-scheduled with Customer Service. 831-420-5220.**

Quick Links

Right Size Your Trash Cart [PDF] **Refuse Service Options**

Change Refuse Cart Size **Easy Recycle Guide [PDF]**

Food Scrap Collection Program **Refuse Rates [PDF]**

NOTE: Place Food Scrap Pail on leading edge of cart line up with at least 2 ft between pail and first cart.

More Resources

Rent a Zero Waste Party Kit

Reduce the waste going to landfill from your event

The City of Santa Cruz wants to help you reduce waste during special events!

The Zero Waste Party Kit includes durable, washable and reusable cups, plates, bowls and utensils. *We can even add in cloth napkins if you like.*

**Each Kit contains enough for 25 people. Multi kits (up to 4) may be rented based on availability.*

FREE TO ALL CITY RESIDENTS

(Proof of address required)

77% of all litter is disposable food and beverage packaging. Make your next small event Waste Free to protect

For more information contact Waste Reduction Staff

420-5594 or 420– 5591

Appliance and Bulky Item Pick Up

Holiday Tree Collection

Backyard Compost Bin Rebate Program

Recycle Right!

Dori Poles (PDF)

Resource Recovery Facility

Household Hazardous Waste [PDF]

Pitch In Santa Cruz County

If your carts were out by 5AM but they were missed for Pick-up Call Customer Service at 831-420-5220.

Street Cleaning

The City provides regular sweeping to remove refuse and debris from streets and bike paths within the commercial and residential areas of the City in order to reduce litter, rodents and water pollution, and to promote safety.

- Street Cleaning

For more information please contact:
Superintendent of Resource Recovery - Collections
831-420-5575
email

Buena Vista Landfill Redevelopment Projects

What?

Two transfer stations to consolidate waste into transfer trucks and transport to the Monterey Peninsula Landfill in Marina.

- One transfer station will serve the public and commercial haulers.
- The other will serve the franchise hauler.

Compost facility

- Receive yard waste and food waste from the public and the franchise hauler.
- Process on site to make mulch, wood chips, and compost products.

Why?

- **Landfill will reach capacity in 6-8 years (2027-2029).**
- **Continue to provide solid waste disposal to residents.** Currently 18 daily curbside trash trucks and 340 daily self haulers bring average of 283 tons/day of waste to Buena Vista Landfill. The Transfer Stations will reduce the amount of trucks traveling to Marina by 67% (12 trips/day).
- **AB1383** mandates statewide diversion goals for food waste and organic material.

How?

Recycling and Solid Waste Infrastructure Service Charge will pay for projects

- Approved by County Board of Supervisors June 7, 2022.
- Cost of Service study used to develop charges available upon request.
- Fiscal Year 2022-23 cost: $110/year, or $9.17/month.

When?

- Environmental Impact Report (EIR) in progress: Spring 2022- Summer 2023: Notice of Preparation late 2022. ***Public outreach and comment Spring 2023***
- Coastal Development Permit: Spring 2024-Spring 2025. ***Includes public noticing and comment.***
- Building Permit: Fall 2025
- Construction: Winter 2025-Spring 2027

More Questions?

Contact Kasey Kolassa at (831)454-2377 or kasey.kolassa@santacruzcounty.us

7/18/22

Proyectos de Renovación del Vertedero Buena Vista

¿Qué?

Dos estaciones de transferencia para consolidar los desechos en camiones de transferencia y transportarlos al Vertedero de la Península de Monterey en Marina.

- Una estación de transferencia atenderá a los transportistas públicos y comerciales.
- La otra estacion servirá al transportista de la franquicia.

Instalación de abono compuesto

- Recibir desechos de jardín y alimentos del público y del transportista de la franquicia.
- Procesar en el sitio para hacer mantillo, astillas de madera y productos de abono compuesto.

¿Por Qué?

- **El vertedero alcanzará su capacidad en 6-8 años (2027-2029).**
- **Continuar brindando eliminación de desechos sólidos a los residentes.** Actualmente, 18 camiones de basura diarios y 340 autotransportadores diarios traen un promedio de 283 toneladas/día de desechos a el Vertedero de Buena Vista. Las Estaciones de Transferencia reducirán la cantidad de camiones que viajan a Marina por un 67% (12 viajes/día).
- **AB1383** exige objetivos de desvío en todo el estado para el desperdicio de alimentos y material orgánico

¿Cómo?

El cargo por servicio de infraestructura de reciclaje y residuos sólidos pagará los proyectos

- Aprobado por la Junta de Supervisores del Condado el 7 de junio del 2022.
- Estudio de Costo de Servicio utilizado para desarrollar cargos disponibles a pedido.
- Costo del año fiscal 2022-23: $110/año o $9.17/mes.

¿Cuándo?

- Informe de impacto ambiental (IPA/EIR) en progreso: primavera del 2022 - verano del 2023: Aviso de preparación a fines del 2022. **Divulgación pública y comentarios en la primavera del 2023**
- Permiso de La Comición Costera: primavera del 2024 - primavera del 2025. **Incluye notificación pública y comentarios.**
- Permiso de construcción: otoño del 2025
- Construcción: invierno del 2025 - primavera del 2027

¿Más preguntas?

Comuníquese con Kasey Kolassa al (831)454-2377 o kasey.kolassa@santacruzcounty.us

7/18/22

Buena Vista Landfill
Proposed Transfer Station
Opportunities and Constraints Analysis

SEPTEMBER 9, 2020

TABLE OF CONTENTS

Location Map

Acknowledgments

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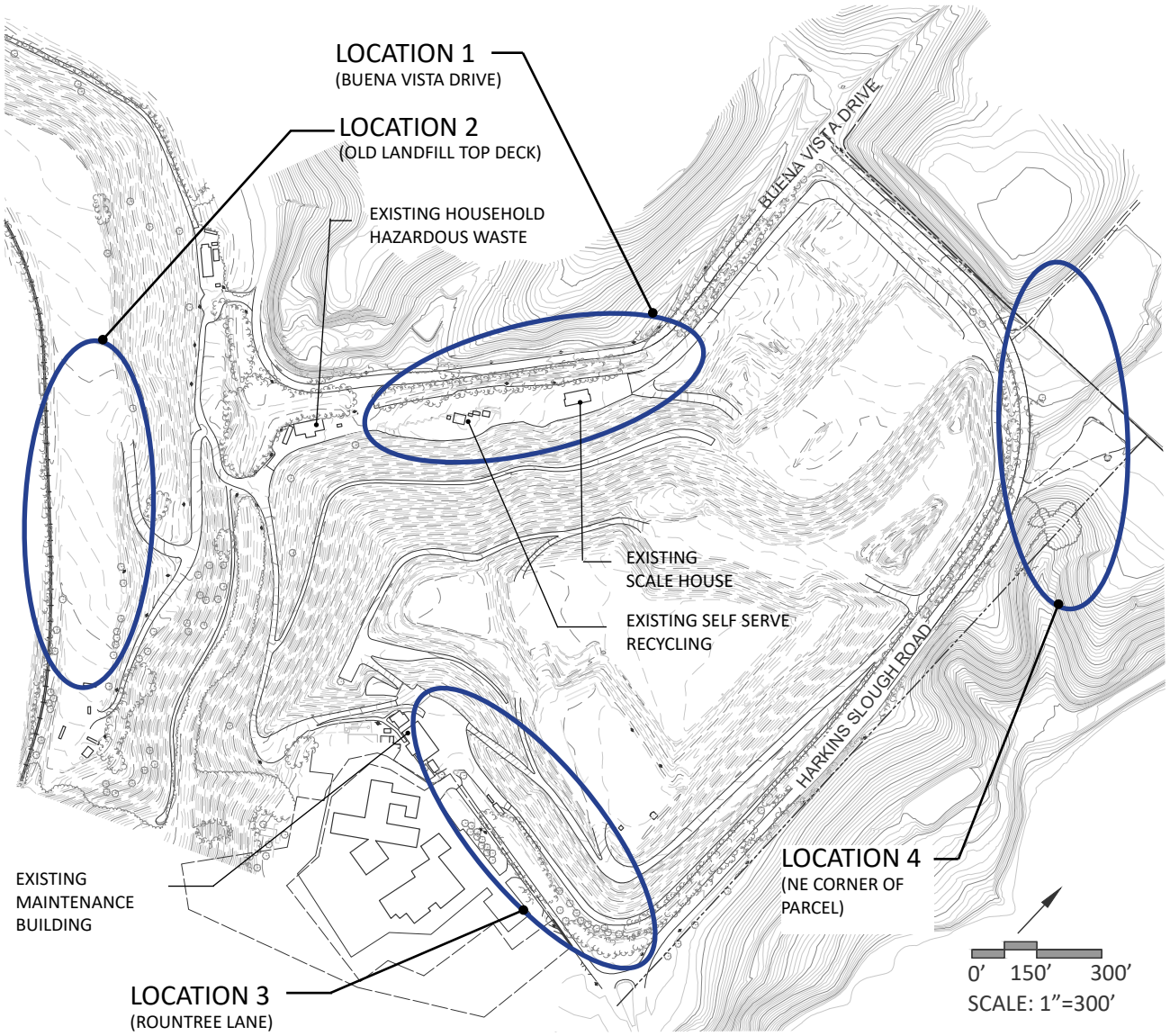
Kasey Kolassa, Recycling and Solid Waste Services Manager
Travis Cary, Director of Capital Projects
Tim Goncharoff, Resource Planner IV
Beau Hawksford, Public Works Administrative Analyst
Nicole Steel, Capital Projects Project Manager

SCS Engineers:
Ken Armentrout, PE
Sean Sullivan, PE Project Professional

I. INTRODUCTION

By 2030 the Buena Vista Landfill, which is the primary solid waste facility for the County of Santa Cruz, is expected to reach capacity. The County of Santa Cruz Department of Public Works (DPW) hired SCS Engineers to provide Master Planning services to assist the County in selecting a location within the landfill to build a transfer station. The future transfer station will allow for self-haulers and commercial haulers within the County to continue bringing recyclable materials and solid waste to a County site. Solid waste will be transported to the Monterey Peninsula Landfill or other location. SCS Engineers has developed conceptual plans at the locations identified by the County.

Throughout this document there are references to a potential compost processing facility. DPW is concurrently evaluating the development of a facility to process organics and yard waste. Location 2, on the top deck of the old landfill, has been identified as the only location at the Buena Vista Landfill that can accommodate a proposed compost facility.



*LOCATION 5 involves various options for construction of a new facility off-site as detailed on pages 21-22.

Context Plan

I. INTRODUCTION

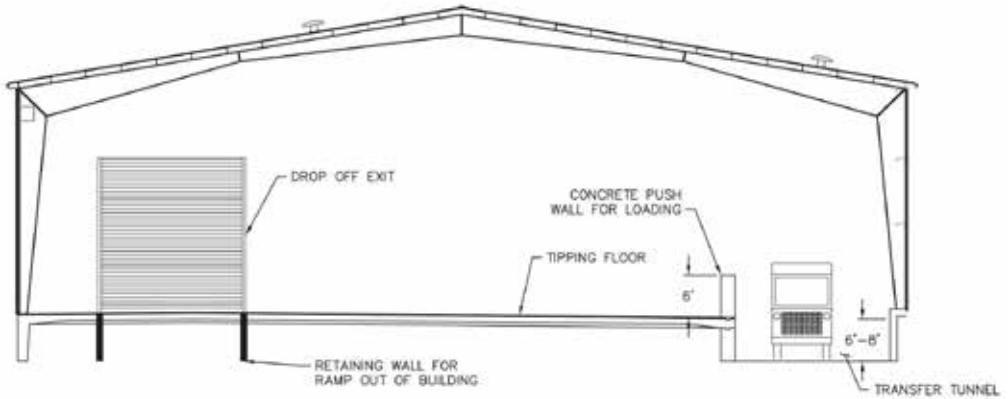
Transfer station sizes shown in the various options are based on SCS's "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS used data provided by DPW to develop the following design capacity to process 600 tons/day:

- Tipping Floor Storage= 2 days
- Partial Depth Tunnel
- 9 hours of operation per day for 310 days/ year

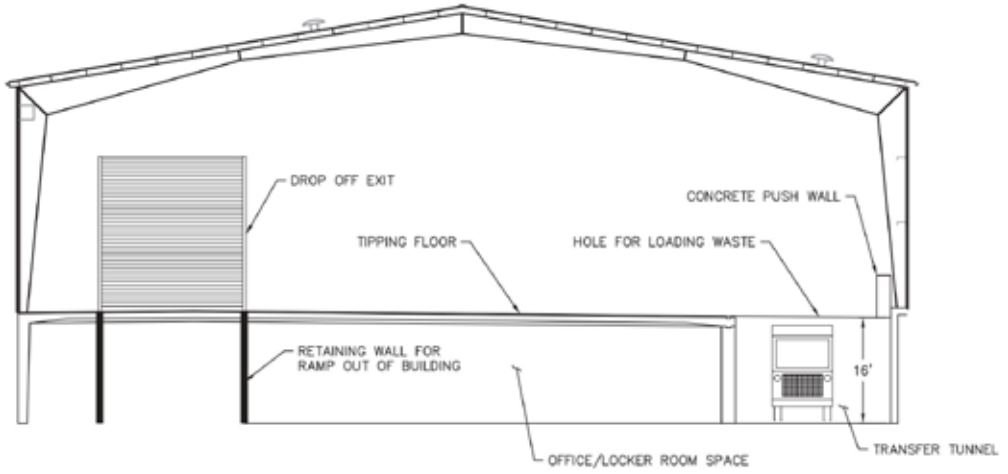
Based on the established criteria, SCS calculated the ideal transfer station size to be:

- Transfer Station: 44,400 square feet (120'x370')
- Bulk storage: 7,500 square feet (75'x100')
- Queueing distance: 1,035' to accommodate peak traffic.

Each location has unique challenges and associated impacts to operations. This document summarizes the opportunities and constraints of each potential site to assist in evaluation of the alternatives. This document was prepared by internal DPW staff using data from SCS's "Draft Buena Vista Landfill Transfer Station Design Report" (March 12, 2020), design options and discussions between DPW staff and SCS Engineers, and preliminary review of code requirements.



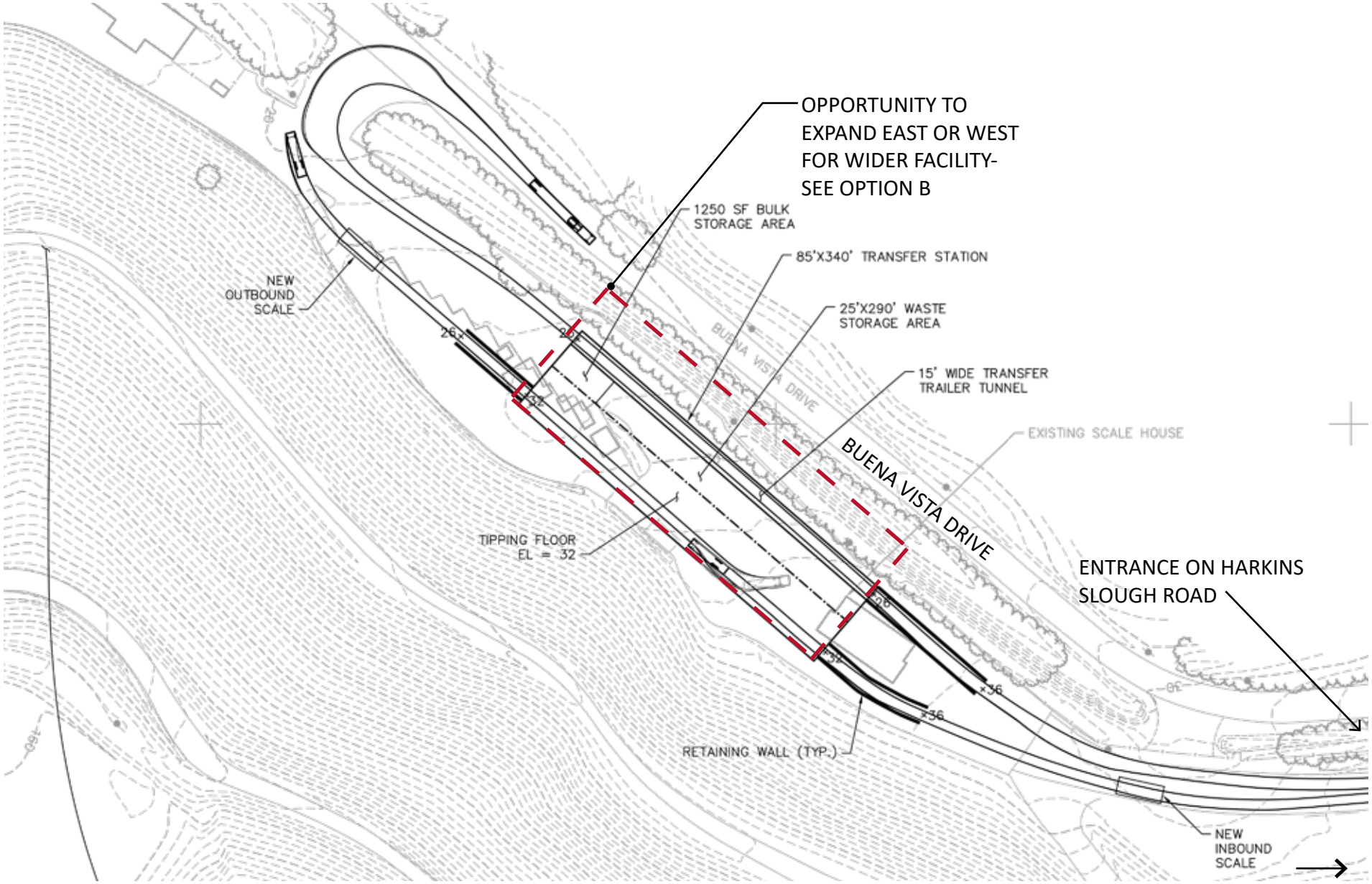
TRANSFER STATION EXIT HALF DEPTH TUNNEL
NOT TO SCALE



TRANSFER STATION EXIT FULL DEPTH TUNNEL
NOT TO SCALE

Conceptual sections of transfer station, SCS Engineers March 12, 2020

II. LOCATION 1- OPTION A (BUENA VISTA DRIVE)



II. LOCATION 1- OPTION A (BUENA VISTA DRIVE)

Option A includes construction of new facility 85'x340' (28,900 square feet) at the location of the existing scale house and self-serve recycle.

Opportunities

- No disturbance to closed landfill.
- Stable ground for construction.
- Minimal to no environmental impacts.

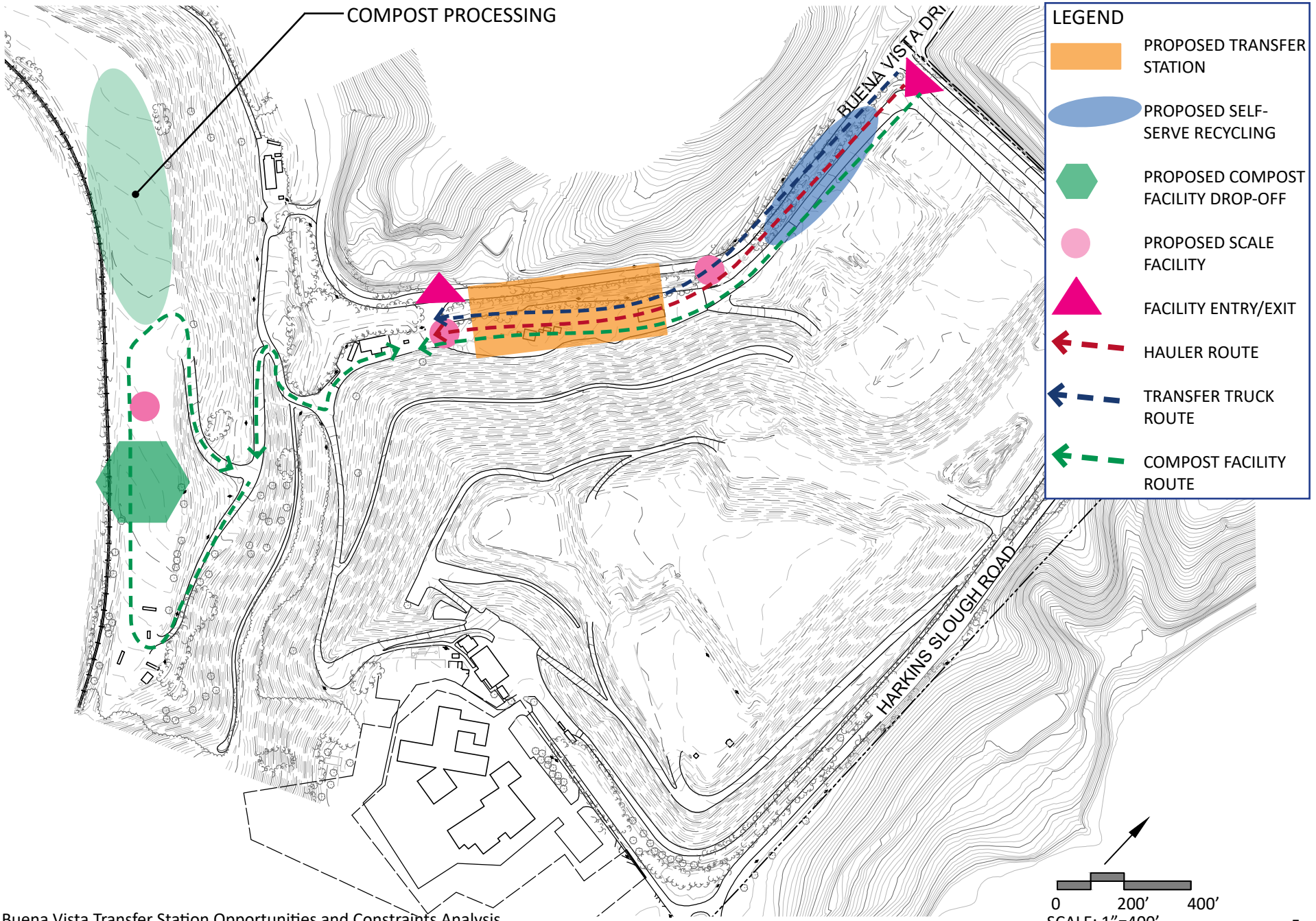
Constraints

- The 70' wide tipping floor is very narrow to be functional. Refuse to be loaded as soon as it hits tipping floor and limited capacity for bulk storage.
- New inbound/outbound scales required.
- New self-serve recycling area to be constructed if continue to offer service.
- Location of new entrance off Harkins Slough Road/Buena Vista Drive could pose traffic/safety concerns.
- Existing services would be disrupted during construction or require temporary re-route.
- Drop offs to compost facility would travel through transfer station unless new scale house/entrance at Harkins Slough Road/Rountree Lane.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$10,500,000*		
New scale facility	Yes	$1,000,000		Inbound and outbound
New entrance	Yes	$50,000		
Accommodates bulk waste	No			
Self-serve recycling center	Yes	$500,000		New recycling area push into existing closed landfill
TOTAL		**$12,050,000**		

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 1- OPTION B (BUENA VISTA DRIVE)



II. LOCATION 1- OPTION B (BUENA VISTA DRIVE)

Option B includes construction of new facility 120'x445' (53,400 square feet) at the location of the existing scale house and self-serve recycle and expands east into the closed landfill and/or west towards Buena Vista Drive.

Opportunities

- Mostly on stable ground, with expansion to the east, pushing into the closed landfill.
- Potential for expansion to the west to coordinate with DPW Road Operations project on Buena Vista Drive, benefitting both projects with potential re-alignment of road and shared costs.

Constraints

- Critical timing to coordinate with Buena Vista Drive improvement project with Road Operations to not cause delays to Road project.
- Expansion to the west, would trigger environmental clearances and mitigation due to impacts to the riparian area along Buena Vista Drive.
- Buena Vista Drive is a scenic road, as designated by the County General Plan, and will require visual considerations.
- Location of new entrance off Harkins Slough Road/Buena Vista Drive could pose traffic/safety concerns.
- Reduction in 200' agricultural setback with Agricultural Policy Advisory Committee (APAC) required.
- Expansion to the east will require building foundation on waste and re-closure of that section of landfill.
- No space for self-serve recycling center (unless new area built into Module 5 or by Maintenance Building).
- Drop offs to compost facility would travel through transfer station unless new scale house/entrance at Harkins Slough Road/Rountree Lane.
- Existing services would be disrupted during construction or require temporary re-route.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$12,800,000*		
New scale facility	Yes	$1,000,000		(inbound and outbound)
New entrance	Yes	$50,000		
Accommodates bulk waste	Yes			
Self-serve recycling center	Yes	$500,000		New recycling area push into existing closed landfill
If expand east- re-close landfill	Yes	$100,000	+6-12 months	State Water Resource Control Board
If expand west- environmental mitigation will be required	Yes	$200,000	+12-24 months	USFW
TOTAL		**$14,650,000**	**+12-24 months**	

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

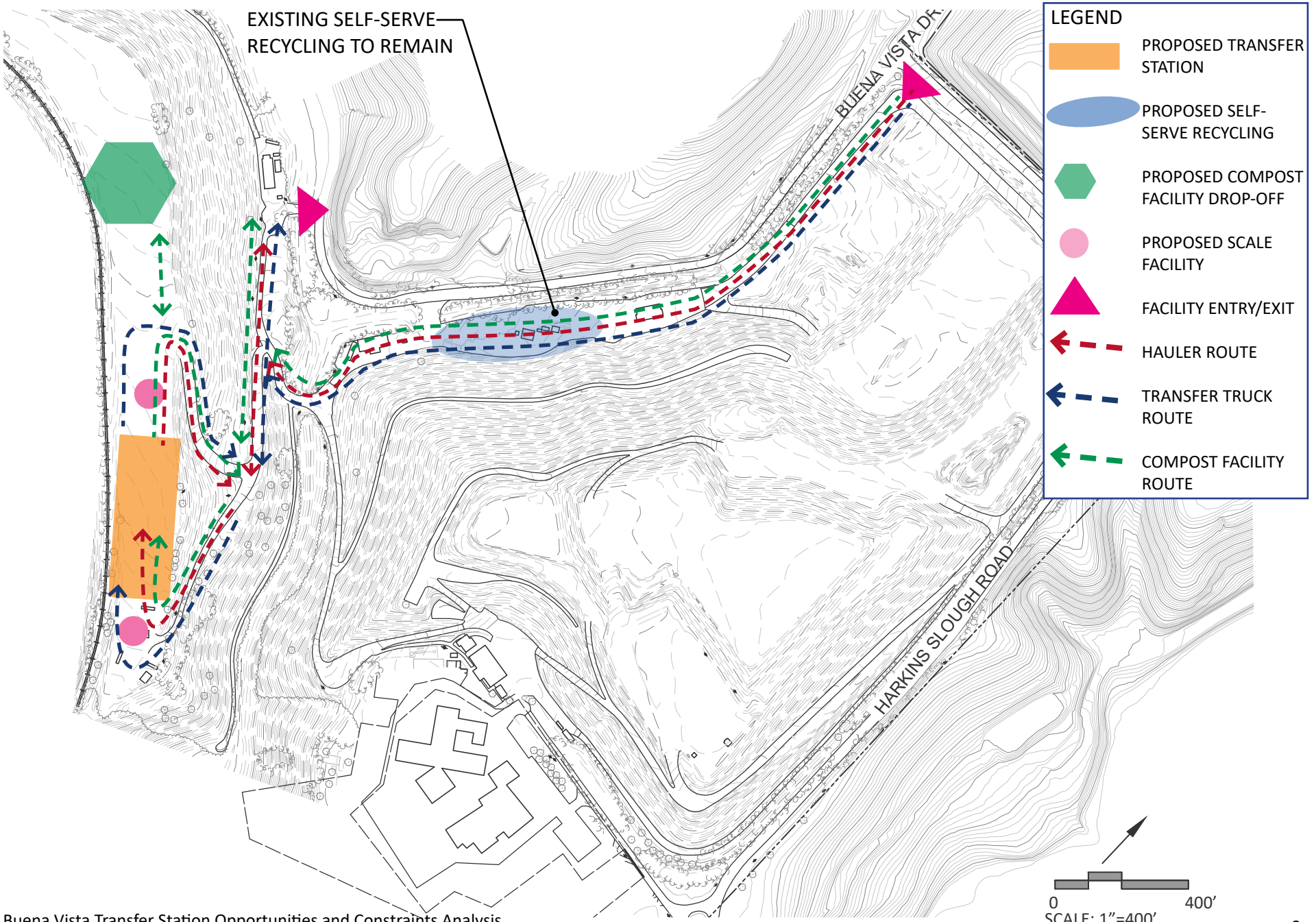
II. LOCATION 1 (BUENA VISTA DRIVE)

Harkins Slough Road and Buena Vista Drive intersection

Existing self-serve recycle area, looking south

Buena Vista Drive looking south

II. LOCATION 2- OPTION A (OLD LANDFILL TOP DECK)



II. LOCATION 2- OPTION A (OLD LANDFILL TOP DECK)

Option A includes construction of new facility totaling 53,400 square feet on the top deck of the old landfill.

Opportunities

- Includes transfer station 120'x370' (44,400 sf), bulk storage 75'x100' (7,500 sf), office 50'x30' (1,500 sf) and tipping floor width of 105' will allow for efficient operations.
- Larger flat, open space.
- Connection to rail line for potential transport to landfill.
- Existing self-serve recycling to remain.
- Existing services would not be disrupted during construction or require temporary re-route.

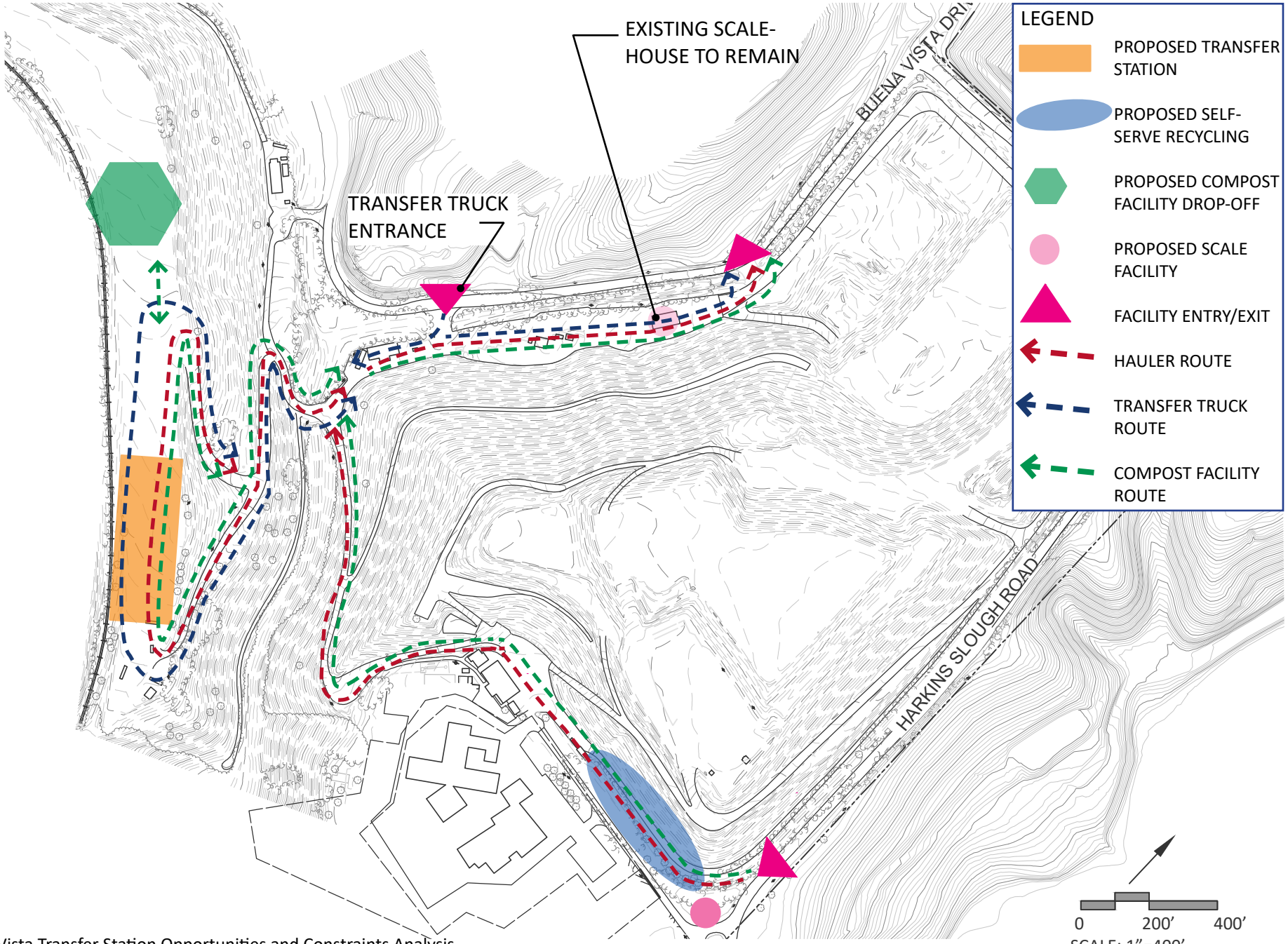
Constraints

- Smaller or different location would be needed for compost facility. If compost rows located on top of newer closed landfill, would require landfill closure prior to facility being constructed. Facility requires roof and concrete working surface. Would cut the landfill capacity short.
- Unknown foundation requirements on old landfill until Geotechnical investigation done.
- Load out tunnel may not be possible on top of waste- may need to use Grappler (higher building ceiling and additional equipment).
- Improvements to road leading to old landfill required.
- Location of new entrance off Harkins Slough Road/Buena Vista Drive could pose traffic/safety concerns.
- Highly visible from Buena Vista Drive (scenic road).

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$12,800,000*	+6-12 months	CalRecycle & State Water Resource Control Board
New scale facility	Yes	$1,000,000		(inbound and outbound)
New entrance	Yes	$50,000		
Accommodates bulk waste	Yes			
Self-serve recycling center	Yes			Existing to remain
Road improvements to transfer station	Yes	$1,500,000		
TOTAL		**$15,350,000**	**+6-12 months**	

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 2- OPTION B (OLD LANDFILL TOP DECK)



II. LOCATION 2- OPTION B (OLD LANDFILL TOP DECK)

Option B includes construction of new facility totaling 53,400 square feet on the top deck of the old landfill with new entrance off Rountree Lane.

Opportunities

- Includes transfer station 120'x370' (44,400 sf), bulk storage 75'x100' (7,500 sf), office 50'x30' (1,500 sf) and tipping floor width of 105' will allow for efficient operations.
- Minimize cross traffic of transfer trucks and haulers with transfer trucks entering on Buena Vista Drive and haulers entering on Rountree Lane.
- Larger flat, open space.
- Connection to rail line for potential transport to landfill.
- Existing services would not be disrupted during construction or require temporary re-route.

Constraints

- New self-serve recycling area to be constructed.
- Smaller or different location would be needed for compost facility. If compost rows located on top of newer closed landfill, would require landfill closure prior to facility being constructed. Facility requires roof and concrete working surface. Would cut the landfill capacity short.
- Unknown foundation requirements on old landfill until Geotechnical investigation done.
- Load out tunnel may not be possible on top of waste- may need to use Grappler (higher building ceiling and additional equipment).
- Additional improvements to road leading to old landfill and "back road" required.
- Increased potential for collisions with maintenance activities and increased traffic.
- Increased traffic on Harkins Slough Road/Rountree Lane may not be compatible with other County uses.
- Highly visible from Buena Vista Drive (scenic road).

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$12,800,000*	+6-12 months	CalRecycle & State Water Resource Control Board
New scale facility	Yes	$1,000,000		(inbound)
New entrance	Yes	$50,000		
Accommodates bulk waste	Yes			
Self-serve recycling center	Yes	$500,000		New at Harkins Slough Road entrance
Road improvements to transfer station	Yes	$2,300,000		
TOTAL		**$16,650,000**	**+6-12 months**	

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

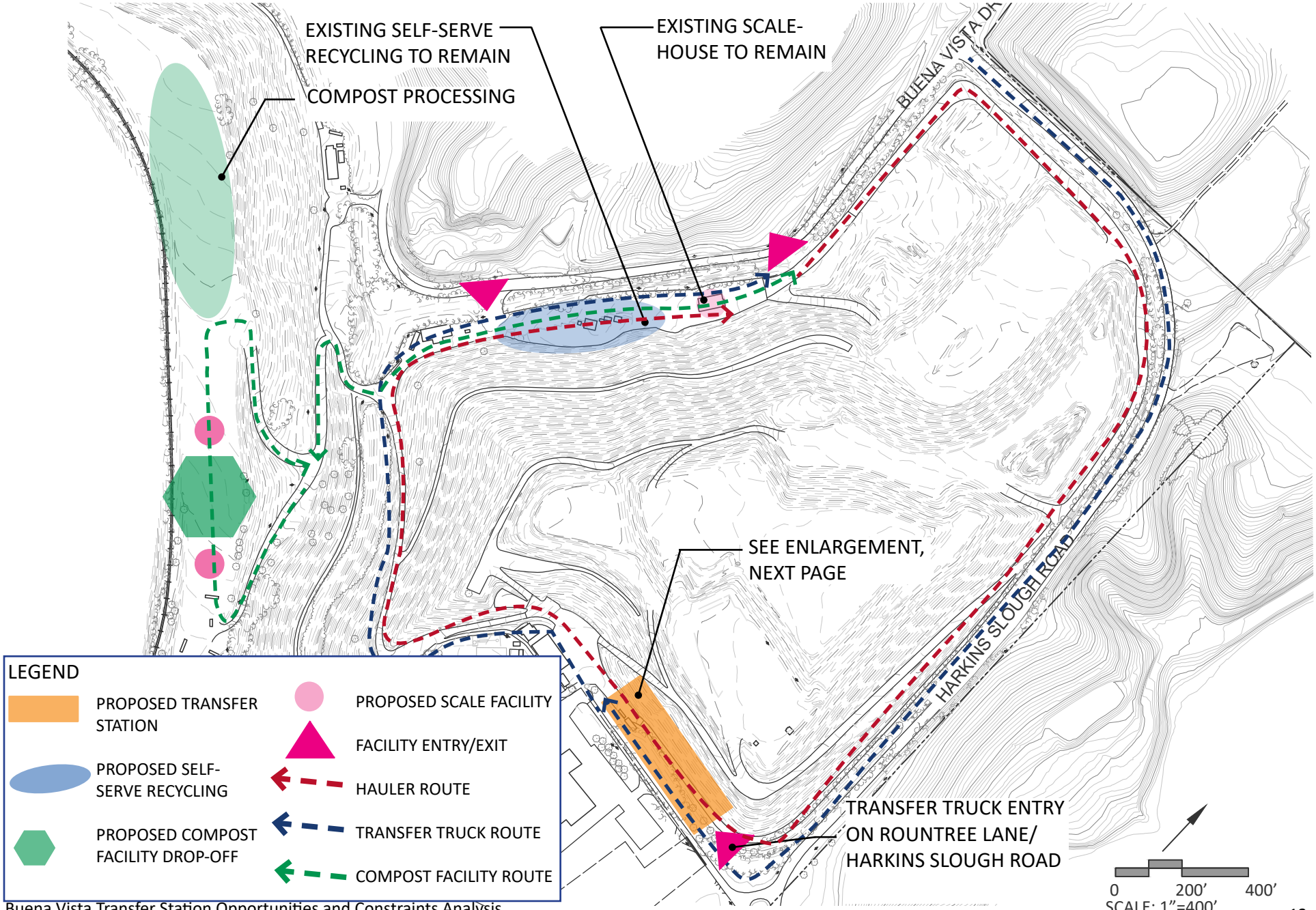
II. LOCATION 2 (OLD LANDFILL TOP DECK)

Existing road down from top deck of old landfill

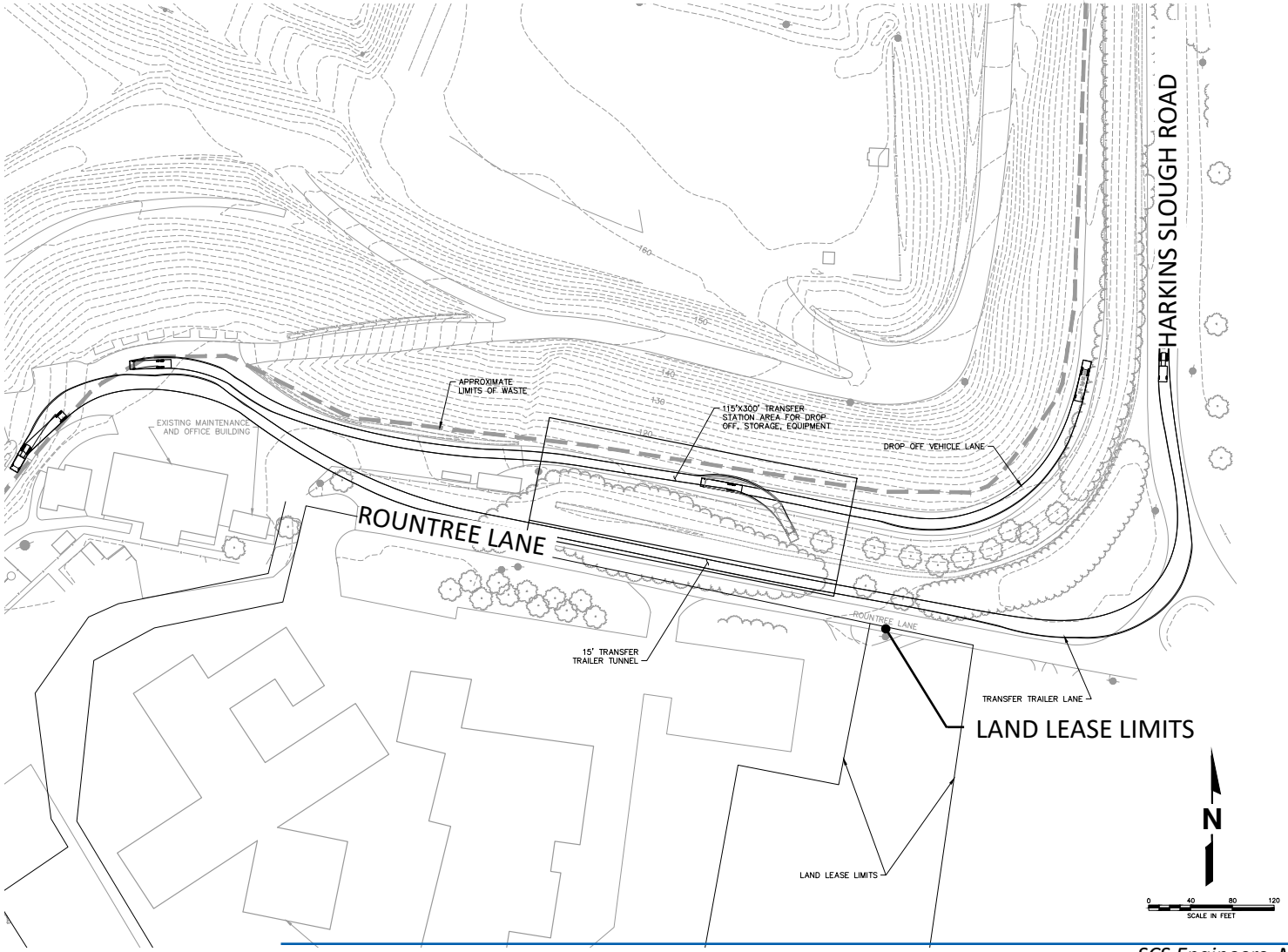
Harkins Slough Road and Buena Vista Drive intersection

Potential exit shown in Option A

II. LOCATION 3 (ROUNTREE LANE)



II. LOCATION 3- ENLARGEMENT (ROUNTREE LANE)



II. LOCATION 3 (ROUNTREE LANE)

Location 3 includes construction of new facility 115'x300' (34,500 square feet) near the existing maintenance building, adjacent to Rountree Lane.

Opportunities

- Larger flat, open space with stable ground for building foundation.
- Current services would not be disrupted during construction.
- Continue to use existing scale house.
- Self-serve recycling maintained.

Constraints

- Does not accommodate bulk waste storage.
- Increased traffic on Harkins Slough Road/Rountree Lane may not be compatible with other County uses.
- "Back Road" will need improvements to accommodate traffic flow.
- Existing ground lease with State located in center of Rountree Lane. If improvements encroach, would need to amend ground lease. This process could take 12-24 months.
- Increased potential for collisions with maintenance activities and increased traffic.
- Existing maintenance building and offices to be relocated during construction.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$11,000,000*		
New scale facility (inbound and outbound)	No			
New entrance	No			
Accommodates bulk waste	No			
Self-serve recycling center	Yes			Existing maintained
Road improvements to transfer station	Yes	$1,800,000		
TOTAL		**$12,800,000**		

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 3 (ROUNTREE LANE)

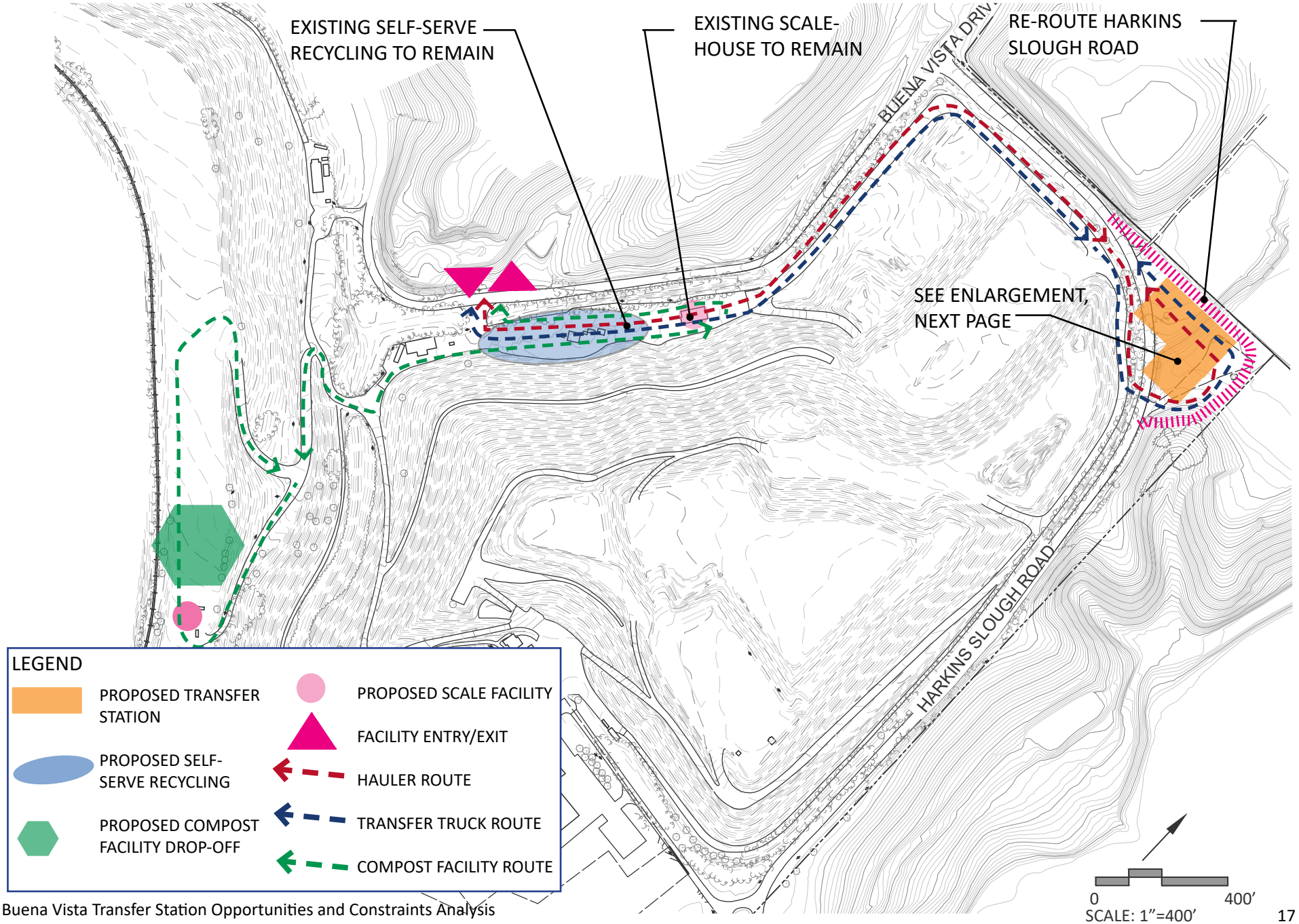
Harkins Slough Road and Rountree Lane intersection

View from Rountree Lane towards proposed facility location

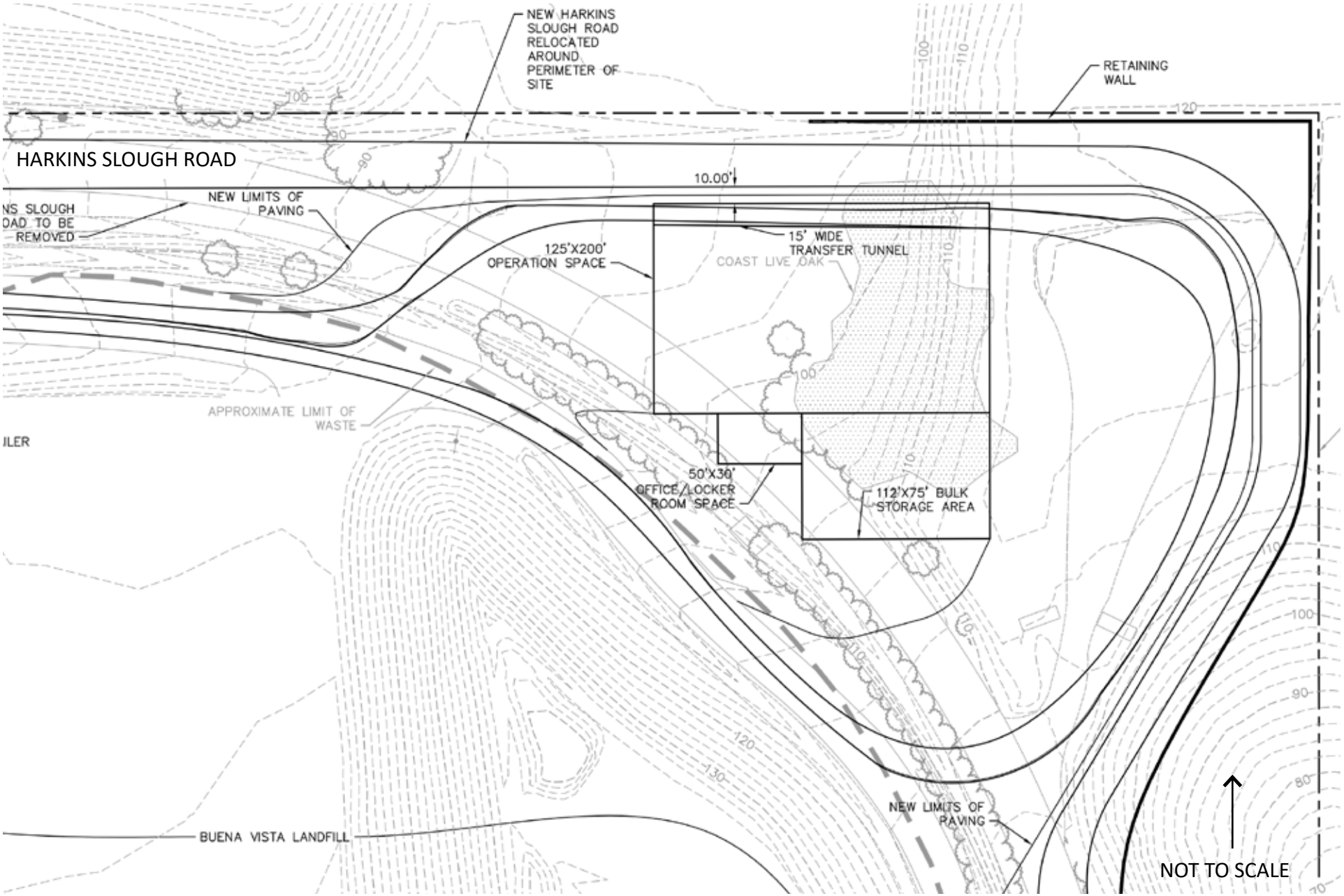
Existing maintenance building area

Existing "Back Road"

II. LOCATION 4 (NE CORNER OF PARCEL)



II. LOCATION 4- ENLARGEMENT (NE CORNER OF PARCEL)



II. LOCATION 4 (NE CORNER OF PARCEL)

Location 4 includes construction of new facility totaling 34,900 square feet on undeveloped land in the north east corner of the landfill property.

Opportunities

- Building configuration efficient for operations with the transfer station 125'x200' (25,000sf); bulk storage 112'x75' (8,400sf), and office 50'x30' (1,500sf).
- Re-route Harkins Slough Road to increase facility size and keep public road outside of the facility.
- Stable ground for construction.
- Current services would not be disrupted during construction.
- Continue to use existing scale house.
- Self-serve recycling maintained.
- No passive venting of landfill gases required.

Constraints

- Adjacent to the USFW Ellicott Slough National Wildlife Refuge (long-toed salamander) and existing oak trees on site.
- Scenic considerations from Buena Vista Drive.
- Reduction in 200' agricultural setback with Agricultural Policy Advisory Committee (APAC) required.

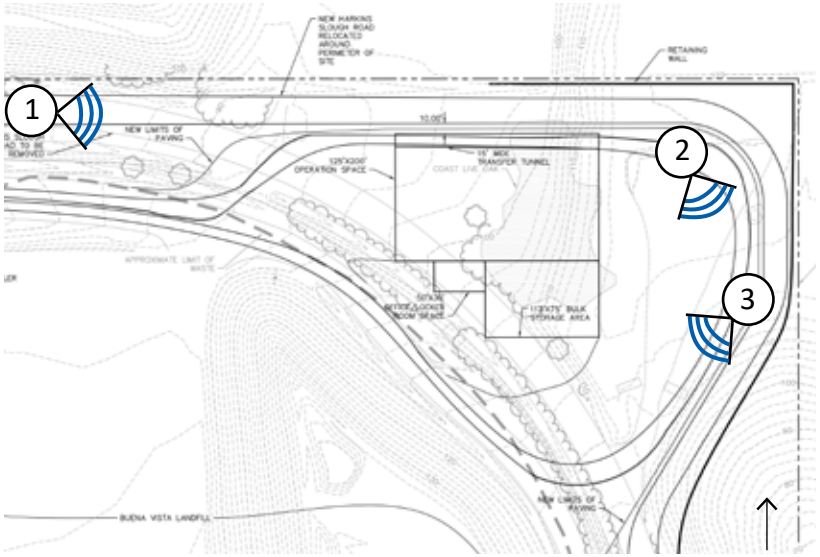
Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$11,000,000*	+6-12 months	CalRecycle & State Water Resource Control Board
New scale facility	No			
New entrance	No			
Accommodates bulk waste	Yes			
Self-serve recycling center	Yes			Existing maintained
Harkins Slough Road re-route	Yes	$850,000		
Retaining wall for Harkins Slough Road re-route	Yes	$3,000,000		
TOTAL		**$14,850,000**	**+6-12 months**	

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 4 (NE CORNER OF PARCEL)

1 *View from Harkins Slough Road towards proposed facility location*

2 *View towards Ellicott Slough and Monterey Bay*



Key Map

3 *View southwest towards landfill*

II. LOCATION 5- OPTION A (ALTERNATE SITE)

Option A includes construction of new facility on County property other than the Buena Vista Landfill.

Opportunities

- Potential to design without many constraints.
- Current services would not be disrupted during construction.

Constraints

- County would need to purchase or develop property other than Buena Vista Landfill.
- Lack of available sites adequately zoned.
- Significant public review required and potential opposition.
- Increased ancillary costs to operate two sites while Buena Vista Landfill operational.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$13,000,000*		CalRecycle & State Water Resource Control Board
Property acquisition	Yes	$4,000,000	+12 months	
TOTAL		**$17,000,000**	**+12 month**s	

*Cost extrapolated from SCS “Draft Buena Vista Landfill Transfer Station Design Report”, dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 5- OPTION B (ALTERNATE SITE)

Option B is to partner with another agency to provide a regional transfer station at location other than the Buena Vista Landfill.

Opportunities

- Possibility of industrial areas zoned appropriately outside of County.
- Shared cost of building and operating facility.
- Potential to design without many constraints.
- Current services would not be disrupted during construction.

Constraints

- Politically challenging.
- Less control over timing.
- Depending on location, could result in increased illegal dumping, additional traffic to Ben Lomond Transfer Station or to the Monterey Peninsula Landfill in Marina.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Schedule**	**Notes**
Transfer station	Yes	$10,000,000*		CalRecycle & State Water Resource Control Board; Shared cost
Property acquisition	Yes	$4,000,000	+24-36 months	Develop agreement
TOTAL		**$14,000,000**	**+24-36months**	

*Cost extrapolated from SCS “Draft Buena Vista Landfill Transfer Station Design Report”, dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc. with +/- 20% cost savings with shared costs.

III. SUMMARY

Each of the locations have unique challenges where the cost, schedule, impacts, and long term functionality of the facility need to be weighed. The table below highlights the high level conceptual costs projected for each option, as well as additional time for the permitting that would be required above the baseline schedule for development of plans, specifications, estimates, bidding, and construction. It will likely take 12-18 months to award a bid and 18-24 months for construction, depending on the selected option.

Option	**Cost**	**Additional Schedule Impacts**	**Opportunities**	**Constraints**
Location 1-Option A *(Buena Vista Drive)*	$12,050,000		✓ Stable ground for construction. ✓ No disturbance to closed landfill. ✓ Minimal environmental impacts.	- Too narrow to be functional. - Existing services disrupted during construction. - Difficult to accommodate self-serve recycling.
Location 1-Option B *(Buena Vista Drive)*	$14,650,000	+12-24 months	✓ Coordination with Roads project to re-align Buena Vista Drive and provide adequate sized facility. ✓ Minimal internal road improvements required.	- Expanding west trigger environmental mitigations - Existing services disrupted during construction. - Difficult to accommodate self-serve recycling.
Location 2-Option A *(Old landfill top deck)*	$15,350,000	+6-12 months	✓ Existing services not disrupted during construction. ✓ Potential for rail line connection for future transport.	- Does not accommodate full compost processing facility. - Major landfill road improvements required. - Building foundation may be difficult on top of old waste. - Load out tunnel may not be possible on top of old waste. - Highly visible from Buena Vista Drive (scenic road).

III. SUMMARY

Location 2-Option B *(Old landfill top deck)*	$16,650,000	+6-12 months	✓ Minimize cross traffic between transfer trucks and haulers. ✓ Existing services not disrupted during construction. ✓ Potential for rail line connection for future transport.	- May not be compatible with adjacent County uses. - Does not accommodate full compost processing facility. - Major landfill road improvements required. - Building foundation may be difficult on top of old waste. - Load out tunnel may not be possible on top of old waste. - Highly visible from Buena Vista Drive (scenic road).
Location 3 *(Adjacent to existing maintenance building)*	$12,800,000		✓ Existing public services not disrupted during construction.	- May not be compatible with adjacent County uses. - Too narrow to be functional without amending State ground lease with Rountree facility. - Major landfill road improvements required. - Existing maintenance building activities and offices relocated during construction.
Location 4 *(NE corner of landfill)*	$14,850,000	+6-12 months	✓ Most efficient for operations. ✓ Accommodates desired services. ✓ Existing services not disrupted during construction. ✓ Keeps truck traffic on flatter roads, for improved safety and easier long term maintenance.	- Adjacent to USFW Ellicott Slough National Wildlife Refuge. - Existing oak trees to be removed. - Re-route Harkins Slough Road.

III. SUMMARY

Location 5-Option A *(Other County property)*	$17,000,000	+12 Months	✓ Potential to design with minimal constraints. ✓ Existing services not disrupted during construction.	- County would need to purchase or develop property other than Buena Vista Landfill. - Lack of available sites zoned with require zoning. - Significant public review and potential opposition.
Location 5-Option B *(partner with other agency)*	$14,000,000	+24-36 Months	✓ Potential to share costs and resources. ✓ Potential to design with minimal constraints. ✓ Existing services not disrupted during construction.	- Politically challenging. - Less control over timing. - Potential to result in increased traffic to other facilities or illegal dumping.

Conclusion

The County team evaluated each of the options based on operations, construction feasibility and impacts, permitting, and cost to determine Location 4 is the preferred option. The building configuration provides adequate space for bulk storage and maintains the existing self-serve recycling and household hazardous waste receiving areas. The circulation allows for a simple loop, utilizing the existing entrance on Buena Vista Drive and keeps traffic off the steeper facility roads, providing a safer route and reducing cost of construction and long term maintenance. In addition, there will be minimal impacts to operations during construction, allowing the landfill to maintain services and reach full capacity. Location 4 provides the greatest number of opportunities for the County to maximize the use of the Buena Vista Landfill in serving the public for both the short and long term.

Resource Recovery Facility

General Information about the Dimeo Lane Resource Recovery Facility

The **Resource Recovery Facility** (RRF) includes a sanitary landfill, recycling center, yard waste drop-off, construction & demolition (C&D) drop-off and Household Hazardous Waste Drop-Off. The facility is for the processing and disposal of material generated within the City of Santa Cruz City limits. Click **here** to see the boundary map we use to determine eligibility to use the facility. **Be prepared to show proper ID or documentation as noted below. Learn more about this requirement** here (**Mas information** aqui)

Location:

The City of Santa Cruz Resource Recovery Facility and Recycling Center is located at 605 Dimeo Lane, 3 miles north of the City limits off of Highway 1.

The RRF is open to City of Santa Cruz residents and businesses. North County residents may use the facility but must pay a 28% surcharge above the established rates.

Residents of the City of Santa Cruz who need to self-haul materials from their home to the landfill **must be prepared to provide proof of residency (driver's license and municipal utility bill or similar document with a City address**) to the gate house attendant.

Businesses hauling materials which were generated within the City of Santa Cruz may use the RRF/landfill. Businesses must be prepared to provide proof that the materials came from within the City limits. A typical way to provide proof would be to present a signed and dated letter or contract from the property owner or manager where the materials were generated or a copy of the Work Permit, indicating that the business has been hired to haul those materials.

Hours:

The Resource Recovery Facility and Recycling Center are open Monday through Saturday 7:30 a.m. to 3:30 p.m. and closed on Sundays, and the following holidays:

Days and times RRF is closed

Closed	Sundays
Closed	Thanksgiving Day
Closed	12 noon • December 24 (Christmas Eve)
Closed	December 25 (Christmas Day)
Closed	12 noon • December 31 (New Year's Eve)
Closed	January 1 (New Year's Day)

FEES:

Resource Recovery Facility Fees -PDF

Note: City residents and businesses are permitted to use the County of Santa Cruz-Buena Vista Landfill and Ben Lomond Transfer Station. A surcharge of 28% will be added to regular county disposal fees. City residents may drop-off "non-fee" recyclable material without charge and use Household Hazardous Waste Drop-off centers at County facilities.

Treated Wood Waste (TWW)

On August 31, 2021, Governor Newsom signed Assembly Bill 332 and the bill takes effect immediately. AB332 adopts new Alternative Management Standards (AMS) for treated wood waste that are codified in Health and Safety Code section 25230. As a result of the chaptering of the bill, all treated wood waste variances issued by DTSC since March 2021 are now inoperative and have no further effect. The variances are no longer necessary because they have been replaced by the AMS. The new AMS are similar to the rules that applied under the variance program, except that no variance is required.

Assembly Bill 332 (AB 332) restores the alternative management standards for treated wood waste. As a result variances are no longer needed for disposal facilities, handlers, and generators of treated wood waste. A link to the new statute language is found below:

- AB 332 Text

Fact Sheet and Other Information

DTSC has developed a fact sheet to help generators and handlers understand what the new requirements are for the alternative management standards for treated wood waste. A link to the new fact sheet and list of landfills approved to accept TWW are found below:

- Requirements for Generators and Handlers of Treated Wood Waste – September 2021 Fact Sheet
- List of Landfills approved by the Waterboard to accept TWW- The City of Santa Cruz Landfill is on the list approved by the Waterboard

For Questions on Treated Wood Waste: Call 831-420-6108

Household Hazardous Waste - Drop-Off Center:

Household Hazardous Waste is accepted only on Saturdays from 7:30 a.m. to 3:30 p.m. Click here for Alternative HHW Drop-Off Locations and Times**.**

Trash Disposal

The City operates and maintains the sanitary landfill for use by City refuse operations and private individuals and businesses. The City ensures that the landfill meets all state and federal regulatory requirements, and operates and performs field maintenance on equipment and pumps used at the landfill.

Recycling Center Processing

The City operates and maintains the recycling drop-off and processing center at the Dimeo Lane Resource Recovery Facility. Recyclable items such as mixed paper, cardboard, plastic, metal, glass, used oil, E waste and appliances are accepted, sorted and processed. All recycled material is sold to commercial markets.

Recycling Center - Drop Off

Yard Waste

Mattress Recycling

Carpet Recycling [PDF]

Household Hazardous Waste [PDF]

Roll Off Box Rental [PDF]

Questions?

- For questions regarding curbside recycling or trash collection call City of Santa Cruz Customer Service at 831-420-5220 or email.

For more information please contact:

Superintendent of Resource Recovery Facility
831-420-6273

Communication & Engagement Plan

Background

Santa Cruz County's Buena Vista Landfill is projected to reach capacity by 2028. Buena Vista is the only remaining landfill in Santa Cruz County serving residents and businesses in the unincorporated county. As a result of the pending landfill closure, the County and its residents need to develop other waste management facilities to ensure adequate waste disposal capacity to efficiently manage the 157,700 tons of trash, recycling, and organic waste that county residents and businesses in the unincorporated county dispose annually. The County has spent over 30 years in collaboration with city jurisdictions and the public through its Integrated Waste Management Task Force to identify the right mix of facilities and available property to provide ongoing waste disposal services to residents and businesses in the unincorporated county.

The County's Integrated Waste Management Task Force (Task Force) was established in 1990, as required by State law, to serve as a commission reporting to the Santa Cruz County Board of Supervisors. The Task Force's membership includes elected officials and public works staff engaged in waste management activities for each of the local jurisdictions (cities and county) within Santa Cruz County. The Local Task Force holds quarterly meetings, which are open to the public, to discuss and address important waste management issues.

The Task Force completed a siting study in 2000 that identified two major findings: (1) County residents do not want to develop a new landfill at a new location and (2) redevelopment of property at the Buena Vista Landfill for on-site waste management and off-site waste disposal is preferable to permitting a new landfill. As a result of these findings, County Public Works staff developed the Buena Vista Landfill Redevelopment Project (project) to build waste transfer stations, an organics diversion facility, a redesigned recycling facility, and other facility upgrades at the Buena Vista Landfill site to serve County waste management needs. If waste management facilities are not developed locally, the costs for waste disposal and climate impacts from waste transfer emissions will increase.

Communication Goals

1. Bilingual public awareness and comprehension campaign regarding the necessity for sufficient waste disposal infrastructure to handle the waste produced by residents and businesses in the County.

2. Public and stakeholder support for development of the necessary waste management infrastructure at the Buena Vista Landfill site.

3. Foster community participation and collaboration in waste reduction initiatives through effective communication strategies.

Objectives

Through workshops, events, online engagement, and print materials, the public will understand:

1. The Buena Vista Landfill is nearing the end of its functional life as a landfill.

2. The role of the County Integrated Waste Management Task Force in developing policy recommendations to the County Board of Supervisors.

3. The need to provide adequate waste management facilities within the County that support our environmental values.

4. The problems that will result if adequate waste management facilities are not developed.

5. The suggested measures for local waste management include the establishment of a compost facility, utilization of biochar, implementation of biogas systems, and similar initiatives.

Audiences/Stakeholders

This Communication and Engagement Plan is intended for the Audience/Stakeholders identified in the table below. The table also identifies the engagement purpose and contact strategies.

Category of Interest	Stakeholder Groups	Engagement Objective	Contact Strategies
General Public Business Owners	- County Residents - Chambers of Commerce	Inform to improve public awareness of landfill closure and new facility development	Traditional media, social media, presentations to community groups, website, press releases, and outreach meetings.
Commercial Waste Haulers	- GreenWaste Recovery - Keith Day Company - NERO Dropbox Haulers - Garbage Disposal Services	Involve and inform to avoid negative impacts to these users, inform about the need for operational changes, and collect input on facility changes.	Direct messaging via email, direct mailing at place of business, signboards and handouts at landfill, website, press releases, and outreach meetings.
Local Residents	- Property Owners within 1,000 feet (or 2,500) feet of the Buena Vista Landfill property	Inform and involve to avoid negative impacts to neighboring landowners.	Direct mailing to home address, traditional media, social media, presentations to community/homeowner groups, website, press releases, and outreach meetings.
Local Businesses	- Waste Works account holders - Regular business facility users	Inform and involve to avoid negative impacts to businesses.	Traditional media, social media, presentations to community groups, website, press releases, and outreach meetings.

Local Jurisdictions	- Watsonville, Santa Cruz, Capitola, Scotts Valley	Inform and involve to support a stable economy.	
Local Stakeholders	Watsonville Wetlands Watch Watsonville Pilots Association		Direct messaging via email, website, press releases, and targeted outreach meetings.
Resource Managers and Environmental groups	-State and Federal agencies (e.g., Fish & Wildlife Service) -Wetland managers -Local environmental groups -Local land trust(s) -California Native American Tribe(s) traditionally and culturally affiliated with the geographic area	Collaborate to ensure that local environmental, archaeological, and historical resources are properly considered and effectively protected.	Direct messaging via email, website, press releases, and targeted outreach meetings.
Integrated Waste Managers	- Public works departments - Santa Cruz County Integrated Waste Management Task Force	Inform, involve and collaborate to improve regional waste management.	Facilitate social media, advertising and other outreach strategies.

Additionally, the Audience/Stakeholders will be notified of the environmental impact report (EIR) being prepared for the project in compliance with the California Environmental Quality Act (CEQA) and the opportunities for communication and engagement in the CEQA EIR process. These include: 1) distribution of the EIR Notice of Preparation (NOP) and opportunity to provide input on the scope of the EIR, including environmental issues to be addressed and project alternatives to be consider; 2) distribution of the Draft EIR and the opportunity to provide comments on the analysis therein; and 3) notification of the Final EIR and Santa Cruz County Board of Supervisors meeting(s) to certify the EIR and make a decision on the project.

Key Messages

1) The County is responsible for waste management in the unincorporated area and provides additional vital waste services to residents throughout Santa Cruz County.

2) The County's Buena Vista Landfill is nearing capacity.

3) The County must continue to provide waste management services after the landfill's closure.

4) Zero Waste strategies have not reduced waste generation within the County; and although waste diversion has improved, the volume of waste requiring management continues to increase.

5) A variety of strategies are required to manage waste to limit impacts on air and water resources.

6) To be successful, waste management efforts require the development of necessary infrastructure to process organics for transformation to compost, sort recyclable materials for reuse, and transfer trash to a new disposal site.

Venues for Engagement

Task Force Meetings:

Santa Cruz County has worked closely with its local jurisdictions through ongoing meetings of the Task Force. The County continues to collaborate with local jurisdictions to develop waste management programs that support County residents and businesses. Over its 30-year history, the Task Force has prepared plans that identify strategies to reduce waste, divert recyclable from the landfill, and process organic materials for reuse as compost and mulch.

A large part of the Task Force's work is to plan for the time when the County's landfills reach full capacity. The Task Force submits a plan review report to the State every five (5) years. State law requires the review report to identify jurisdictions that no longer have 15 years of remaining permitted landfill capacity.

Communication Strategies

Media Toolkit:

- Bilingual media toolkit for social media and newsletters that can be shared with the public, District Supervisors, Collaborative Partners (i.e. Green Waste and Environmental Innovations)
    - This will ensure all messaging is aligned with what we are putting out there.

Newsletter:

- CDI newsletter
    - Target audience: Public-facing subscribers, Board of Supervisors, Key DPW staff
- Board of Supervisors Newsletter
    - Target audience: Constituents of Santa Cruz County
- GreenWaste Newsletter
    - Target audience: Engaged community members take an active role in proactively participating in eco-friendly waste management practices, including recycling and composting.
- Environmental Innovations Newsletter
    - Target audience: Green Certified Businesses
- Chamber of Commerce Newsletter
    - Target audience: Members and potential stakeholders

Note: Newsletters will have a link to a public facing media kit so readers can share on their social media.

Op-ED:

- Draft an Op-Ed to attract interest and awareness for the project.

Social Media:

- Bilingual County/CDI Facebook posts
- Bilingual County/CDI Nextdoor post
- Bilingual County/CDI Instagram posts
- Bilingual CDI Instagram

Flyers:

- Flyers displayed at events (i.e. Earth Day, other environmentally centric events)

Calendaring:

- Calendar workshops on news outlet calendars (GoodTimes, Lookout Santa Cruz, Santa Cruz Sentinel)

County's Project Website:

1) Background and basic information about the problem and the plan to redevelop the Buena Vista property

2) Summary of the services provided at the Buena Vista Landfill site

3) Identify gaps in information that we are presenting

4) Recording of webinar workshop

Stakeholder Meetings

• Plan at least 2 workshops per year for Stakeholders.

Community Events:

• Table with informational handouts at fun community events to engage people who may not come to a meeting.

• Participate at events like Earth Day, the County Fair, and Farmer's Markets to inform the public.

• Connecting the Drops.

Phased Approach Implementation Timeline

County should prepare a phased approach to outreach that can be implemented should community concerns exceed those anticipated by staff and County consultants.

Phase 1: Ongoing Efforts

• Buena Vista Landfill Redevelopment Project Website, Buena Vista Landfill Project (santa-cruz.ca.us) (regular updates and project documents)

• Media toolkit for social media and newsletters

• Distribute media toolkit to stakeholders

• Key press releases and social media information (ongoing as needed)

• Project Op-Ed

• Mailings (ongoing as needed)

• Record workshops and have them available on project website

• Flyer design and print, have it ready for events

Phase 2: Engagement and Outreach

The purpose is to provide additional information about County's Buena Vista Landfill Redevelopment Project plans.

Tasks for Phase 2:

1) Review and update draft stakeholder engagement plan with assistance from County communications staff
2) Consider including more text about existing waste management programs and need for redevelopment at Buena Vista,
3) Consider adding a survey to determine how to better message project benefits,
4) Consider multiple phased approach to outreach.
5) Workshops (ongoing in relation to EIR and as needed)

Phase 3 CEQA EIR Process:

The purpose is to engage the public and stakeholders in the process as the County prepares the EIR for the project, as required by CEQA. Roll out draft then final Environmental Impact Report (EIR), gather/respond to feedback, send project to BOS for decision on the project.

Tasks for Phase 3:

1) Release EIR Notice of Preparation (NOP) for 30-day public review via project website, email distribution, mailings, and press releases to obtain input on the scope of the EIR and notify of public scoping meeting.
2) Hold public scoping meeting during 30-day NOP review period to present the project and purpose of CEQA EIR.
3) Release Draft EIR for 45-day public review via project website, email distribution, mailings, and press releases to obtain public and agency feedback on Draft EIR and notify of Draft EIR public meeting.
4) Hold public meetings on Draft EIR to summarize the findings and collect verbal comments.
5) Release Final EIR (with response to comments on the Draft EIR and any modifications to the EIR) via project website, email distribution, mailings, and press releases to notify the public of the Final EIR availability and Final EIR public hearing.
6) Hold County Board of Supervisors public hearing(s) to certify the Final EIR and decide on the project (maybe at the same meeting or separate meetings).
7) County project permits

Evaluation and Assessment of Communication & Engagement Plan

By taking a phased approach to outreach, we allow ourselves opportunities to assess the outreach program and evaluate how the plan is performing against our goals and objectives by asking:

- What worked well
- What didn't work as planned
- Meeting recaps with next steps
- What are the gaps in citizen knowledge that we should focus our outreach towards?
- How to modify outreach materials to fill any identified gaps.

Buena Vista Landfill

Redevelopment Project

Meeting the needs of local residents and businesses

Public Comment

The Buena Vista Recycling and Solid Waste Facility is the backbone of Santa Cruz County's waste diversion and disposal system, processing 450 tons of refuse on a daily basis.

With the landfill nearing capacity in the upcoming years, the facility is undergoing renewal to meet the next generation of County residents' and businesses' waste disposal needs. Funded through a Recycling and Solid Waste Services Infrastructure charge added to property tax bills, the project will help reduce greenhouse gas emissions, increase waste diversion through a new organics processing facility that helps support local farmers, and meets state environmental protection mandates. Once completed, Buena Vista will serve a dual role – as a transfer station for commercial haulers and residents, and as an organics processing facility that diverts yard waste, food scraps and other methane-producing compostables from the waste stream.

The Buena Vista Project will help ensure that the County can meet the needs of local residents and businesses, now and into the future. In doing so, we will assure Santa Cruz County maintains its leadership when it comes to waste reduction and recycling.

Project Documents

Environmental Documents

Recycling & Trash

Track Progress

Frequently Asked Questions

How will the County use the recycling and solid waste infrastructure charge?

- [ ] Why does the County need to construct two new transfer stations?
- [ ] How do County residents benefit from this charge?
- [ ] Will residents still be able to use Buena Vista to drop off excess household waste?
- [ ] How will the composting facility operate?
- [ ] Has the County explored alternative sites?
- [ ] What are the costs of these three proposed infrastructure projects?
- [ ] Who will pay the proposed charge?
- [ ] How much is the Bond amount and what are the terms?
- [ ] How much money will be collected from the proposed Recycling and Solid Waste Infrastructure Charge?
- [ ] What happens to this proposed charge after 2026-2027?
- [ ] When will construction of the proposed transfer stations and compost facility begin?
- [ ] Why is the proposed charge being implemented now, when the Buena Vista Landfill still has a few years of remaining capacity?
- [ ] Can the County charge a reduced fee for people on low and fixed incomes?

Will the proposed charge end in 2027 as shown in the Cost of Service Report?

County Home DPW Home Flood Control & Stormwater + Permits + Projects + Recycling & Trash + Sewer & Water + Transportation & Roads +

Ben Lomond Diversion Guide
Buena Vista Diversion Guide
Buena Vista Project ›
Composting ›
COVER YOUR LOAD - IT'S THE LAW!
Curbside Recycling Guide
Drop-Box Haulers
Franchise Hauler ›
FY 2024 Rate Sheet
Green Business Program
Green Schools Program
Household Hazardous Waste(HHW) ›
Illegal Dumping
Public Notices
Quick Links ›
Recycling ›
Recycling and Disposal Facilities
Treated Wood Waste
Universal Service
Virtual Waste Facilities Tour
What Goes Where
Wood Waste
Zero Waste Plan ›

Recycling and Disposal Facilities

Buena Vista Landfill
(1 Mile South of Highway 1)
1231 Buena Vista Drive Watsonville, CA
(831) 454-2430 (831) 454-5153

Ben Lomond Transfer Station
(1 Mile North of Glen Arbor Road)
9835 Newell Creek Road Ben Lomond, CA
(831) 454-2430 (831) 454-3951

The Solid Waste Disposal and Recycling Facilities are open
Open every Mon.,Tues., Thurs.,
Fri., & Sat. 7:30 am - 3:30 pm
Open every Wed.,
7:30 am - 2:30 pm
Closed for Thanksgiving, Christmas and New Year's Day.
Hours of operation on Christmas Eve are 7:30 a.m. to 11:30 a.m.
Household Hazardous Waste
Identification required to use facilities.

The County of Santa Cruz accepts over 450 tons of refuse on a daily basis. The Buena Vista Landfill accepts an average of 350 tons, while the Ben Lomond Transfer Station accepts 100 tons of refuse daily which is trucked to Buena Vista Landfill.

The Buena Vista Landfill is a Class III landfill operating under State of California Solid Waste Facilities Permit from CalRecycle (California Department of Resources Recycling and Recovery). The Ben Lomond Transfer Station also operates under State of California Solid Waste Facilities Permit from CalRecycle. The Buena Vista Landfill is equipped with an environmental liner system exceeding Federal Subtitle D and State of California standards,

2024 Holiday Schedule

Buena Vista Location

1231 Buena Vista Dr., Watsonville, CA
(831) 454-2430 or
(831) 454-5153

County Landfill
Open every Mon., Tues., Thurs., Fri., & Sat.
7:30 am - 3:30 pm
Open every Wed.,
7:30 am - 2:30 pm

Buena Vista Household Hazardous Waste
Open every Wed.,
7:30 am - 2:30 pm
Open every Fri., & Sat.
7:30 am - 3:30 pm

(831) 454-2606

Ben Lomond Location

9835 Newell Creek Rd., Ben Lomond, CA
(831) 454-2430 or
(831) 454-3951

County Transfer Station
Open every Mon., Tues., Thurs., Fri., & Sat.
7:30 am - 3:30 pm
Open every Wed.,
7:30 am - 2:30 pm

Ben Lomond Household Hazardous Waste
Open every Thurs.
7:30 am - 3:30 pm

(831) 454-2606

Other Household Hazardous Waste

City of Santa Cruz Resource Recovery Facility
Open every Sat.
7:30 am - 3:30 pm

605 Dimeo Lane Santa Cruz, CA
(831) 420-6270

Santa Cruz County Solid Waste & Recycling

including a leachate collection and removal system and a 4 layer composite liner.

The Buena Vista Landfill is a recipient of the Solid Waste Association of 1997 Silver Award for Landfill Excellence. The Ben Lomond Transfer Station is a recipient of the Solid Waste Association of North America 1998 Bronze Award for Transfer Station Excellence. In 2013 Santa Cruz County was awarded the Governor's Environmental and Economic Leadership Award (GEELA) for waste reduction.

Materials accepted at the Buena Vista Landfill are Class III non-hazardous residential, commercial and industrial waste, dewatered sewage sludge and low-level petroleum contaminated soils.

Materials accepted at the Ben Lomond Transfer Station are Class III non-hazardous residential, commercial and industrial waste.

Main Office

701 Ocean St., Room 410
Santa Cruz, CA 95060
(831) 454-2160

Email Public Works

Buena Vista Landfill Redevelopment Projects

What?

Two transfer stations to consolidate waste into transfer trucks and transport to the Monterey Peninsula Landfill in Marina.

- One transfer station will serve the public and commercial haulers.
- The other will serve the franchise hauler.

Compost facility

- Receive yard waste and food waste from the public and the franchise hauler.
- Process on site to make mulch, wood chips, and compost products.

Why?

- **Landfill will reach capacity in 6-8 years (2027-2029).**
- **Continue to provide solid waste disposal to residents.** Currently 18 daily curbside trash trucks and 340 daily self haulers bring average of 283 tons/day of waste to Buena Vista Landfill. The Transfer Stations will reduce the amount of trucks traveling to Marina by 67% (12 trips/day).
- **AB1383** mandates statewide diversion goals for food waste and organic material.

How?

Recycling and Solid Waste Infrastructure Service Charge will pay for projects

- Approved by County Board of Supervisors June 7, 2022.
- Cost of Service study used to develop charges available upon request.
- Fiscal Year 2022-23 cost: $110/year, or $9.17/month.

When?

- Environmental Impact Report (EIR) in progress: Spring 2022- Summer 2023: Notice of Preparation late 2022. ***Public outreach and comment Spring 2023***
- Coastal Development Permit: Spring 2024-Spring 2025. ***Includes public noticing and comment.***
- Building Permit: Fall 2025
- Construction: Winter 2025-Spring 2027

More Questions?

Contact Kasey Kolassa at (831)454-2377 or kasey.kolassa@santacruzcounty.us

7/18/22

Proyectos de Renovación del Vertedero Buena Vista

¿Qué?

Dos estaciones de transferencia para consolidar los desechos en camiones de transferencia y transportarlos al Vertedero de la Península de Monterey en Marina.

- Una estación de transferencia atenderá a los transportistas públicos y comerciales.
- La otra estacion servirá al transportista de la franquicia.

Instalación de abono compuesto

- Recibir desechos de jardín y alimentos del público y del transportista de la franquicia.
- Procesar en el sitio para hacer mantillo, astillas de madera y productos de abono compuesto.

¿Por Qué?

- **El vertedero alcanzará su capacidad en 6-8 años (2027-2029).**
- **Continuar brindando eliminación de desechos sólidos a los residentes.** Actualmente, 18 camiones de basura diarios y 340 autotransportadores diarios traen un promedio de 283 toneladas/día de desechos a el Vertedero de Buena Vista. Las Estaciones de Transferencia reducirán la cantidad de camiones que viajan a Marina por un 67% (12 viajes/día).
- **AB1383** exige objetivos de desvío en todo el estado para el desperdicio de alimentos y material orgánico

¿Cómo?

El cargo por servicio de infraestructura de reciclaje y residuos sólidos pagará los proyectos

- Aprobado por la Junta de Supervisores del Condado el 7 de junio del 2022.
- Estudio de Costo de Servicio utilizado para desarrollar cargos disponibles a pedido.
- Costo del año fiscal 2022-23: $110/año o $9.17/mes.

¿Cuándo?

- Informe de impacto ambiental (IPA/EIR) en progreso: primavera del 2022 - verano del 2023: Aviso de preparación a fines del 2022. **Divulgación pública y comentarios en la primavera del 2023**
- Permiso de La Comición Costera: primavera del 2024 - primavera del 2025. **Incluye notificación pública y comentarios.**
- Permiso de construcción: otoño del 2025
- Construcción: invierno del 2025 - primavera del 2027

¿Más preguntas?

Comuníquese con Kasey Kolassa al (831)454-2377 o kasey.kolassa@santacruzcounty.us

7/18/22

Buena Vista Landfill
Proposed Transfer Station
Opportunities and Constraints Analysis

SEPTEMBER 9, 2020

TABLE OF CONTENTS

Location Map

Acknowledgments

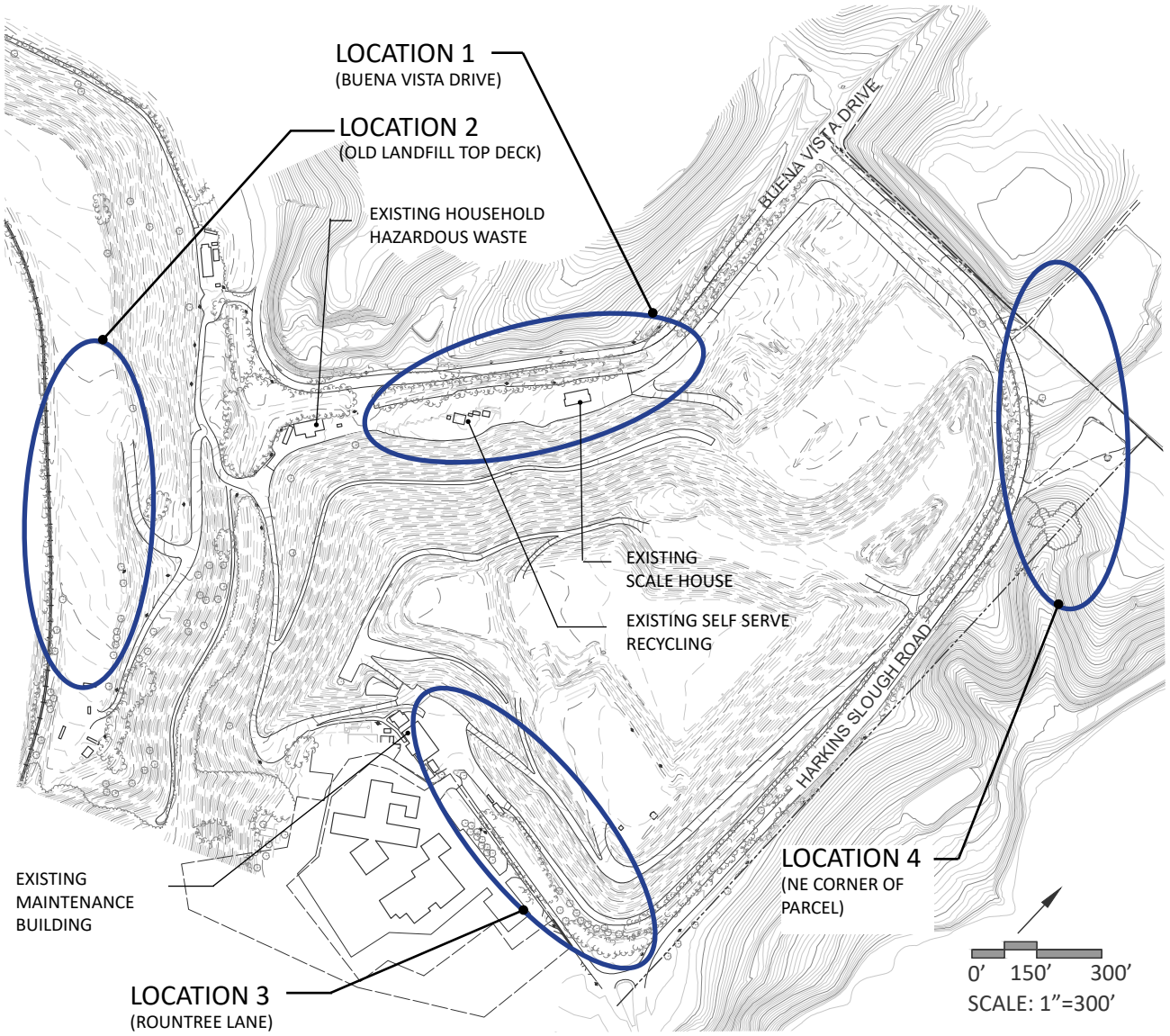
County Team:
Matt Machado, Deputy CAO/Public Works Director
Kent Edler, Assistant Director of Public Works- Special Services
Kasey Kolassa, Recycling and Solid Waste Services Manager
Travis Cary, Director of Capital Projects
Tim Goncharoff, Resource Planner IV
Beau Hawksford, Public Works Administrative Analyst
Nicole Steel, Capital Projects Project Manager

SCS Engineers:
Ken Armentrout, PE
Sean Sullivan, PE Project Professional

I. INTRODUCTION

By 2030 the Buena Vista Landfill, which is the primary solid waste facility for the County of Santa Cruz, is expected to reach capacity. The County of Santa Cruz Department of Public Works (DPW) hired SCS Engineers to provide Master Planning services to assist the County in selecting a location within the landfill to build a transfer station. The future transfer station will allow for self-haulers and commercial haulers within the County to continue bringing recyclable materials and solid waste to a County site. Solid waste will be transported to the Monterey Peninsula Landfill or other location. SCS Engineers has developed conceptual plans at the locations identified by the County.

Throughout this document there are references to a potential compost processing facility. DPW is concurrently evaluating the development of a facility to process organics and yard waste. Location 2, on the top deck of the old landfill, has been identified as the only location at the Buena Vista Landfill that can accommodate a proposed compost facility.



*LOCATION 5 involves various options for construction of a new facility off-site as detailed on pages 21-22.

Context Plan

I. INTRODUCTION

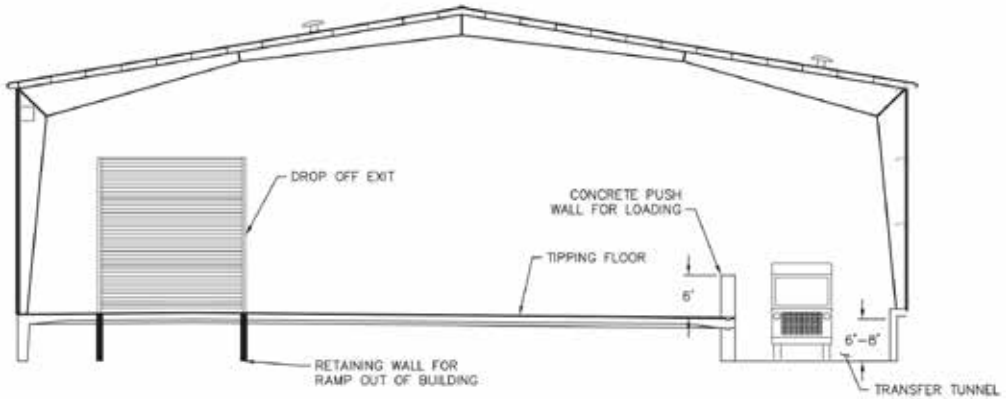
Transfer station sizes shown in the various options are based on SCS's "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS used data provided by DPW to develop the following design capacity to process 600 tons/day:

- Tipping Floor Storage= 2 days
- Partial Depth Tunnel
- 9 hours of operation per day for 310 days/ year

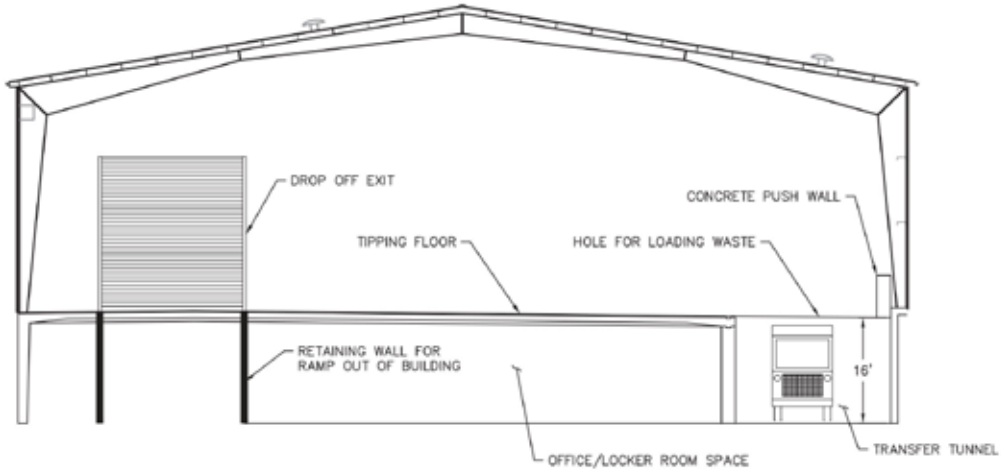
Based on the established criteria, SCS calculated the ideal transfer station size to be:

- Transfer Station: 44,400 square feet (120'x370')
- Bulk storage: 7,500 square feet (75'x100')
- Queueing distance: 1,035' to accommodate peak traffic.

Each location has unique challenges and associated impacts to operations. This document summarizes the opportunities and constraints of each potential site to assist in evaluation of the alternatives. This document was prepared by internal DPW staff using data from SCS's "Draft Buena Vista Landfill Transfer Station Design Report" (March 12, 2020), design options and discussions between DPW staff and SCS Engineers, and preliminary review of code requirements.



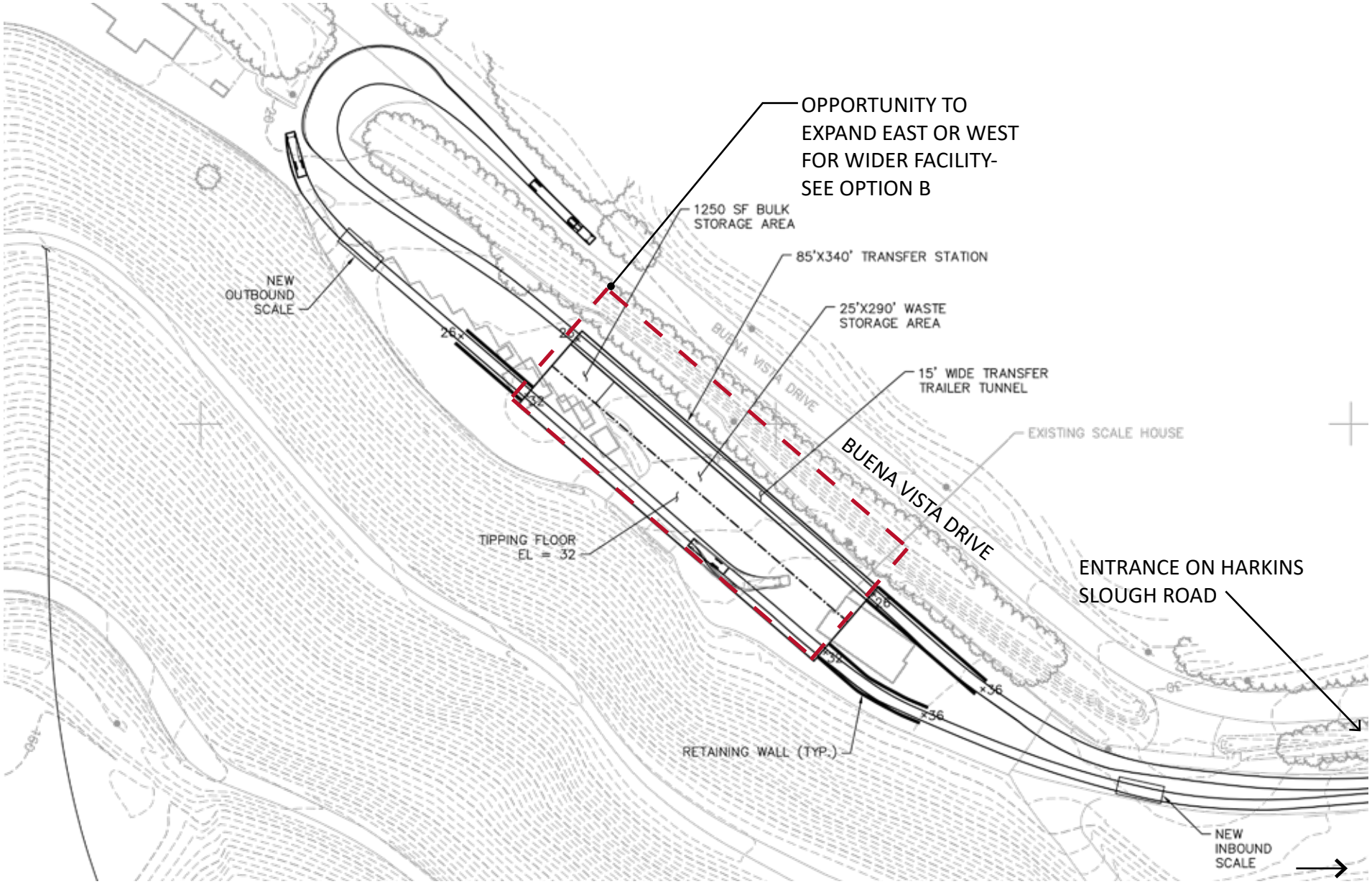
TRANSFER STATION EXIT HALF DEPTH TUNNEL
NOT TO SCALE



TRANSFER STATION EXIT FULL DEPTH TUNNEL
NOT TO SCALE

Conceptual sections of transfer station, SCS Engineers March 12, 2020

II. LOCATION 1- OPTION A (BUENA VISTA DRIVE)



II. LOCATION 1- OPTION A (BUENA VISTA DRIVE)

Option A includes construction of new facility 85'x340' (28,900 square feet) at the location of the existing scale house and self-serve recycle.

Opportunities

- No disturbance to closed landfill.
- Stable ground for construction.
- Minimal to no environmental impacts.

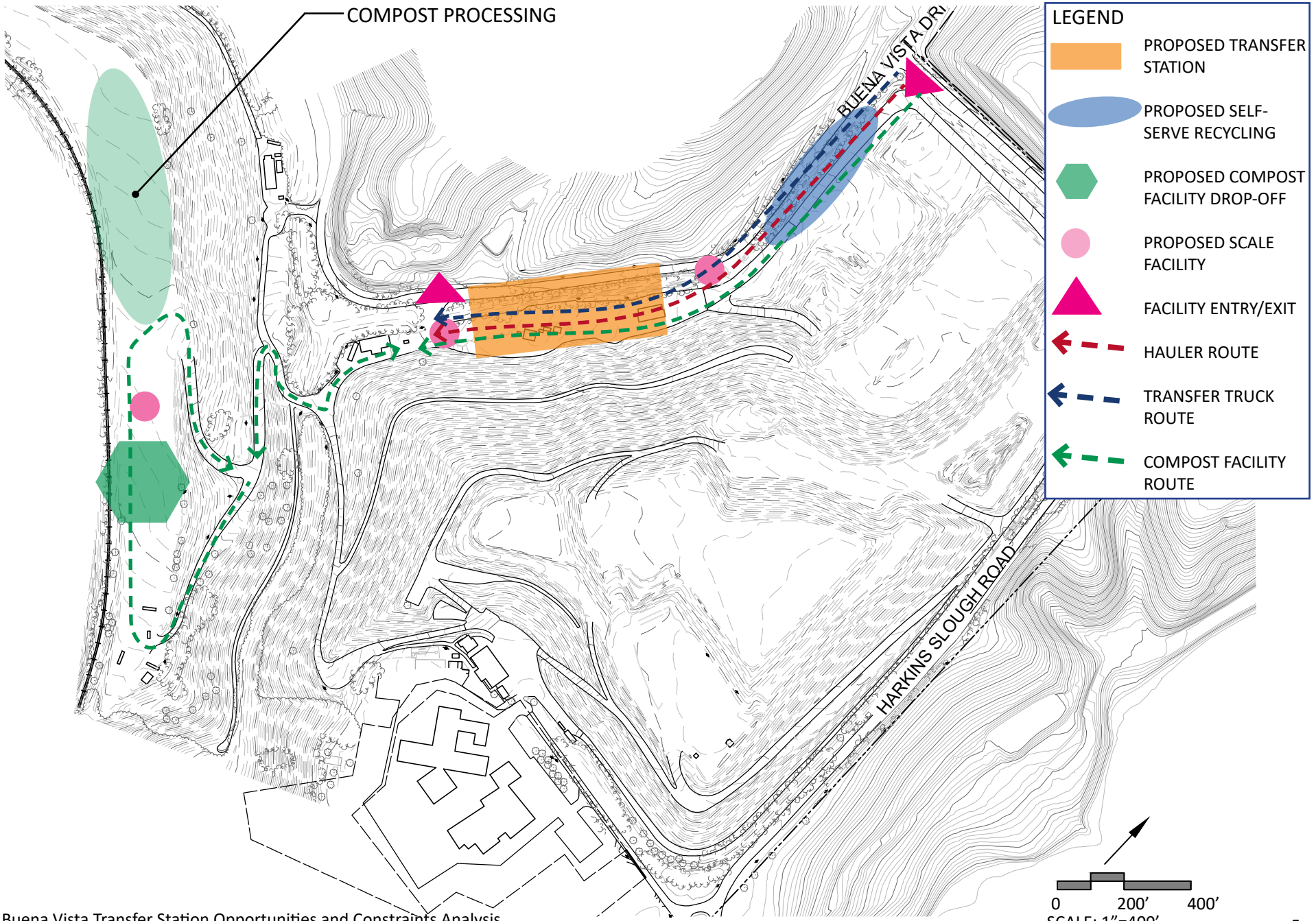
Constraints

- The 70' wide tipping floor is very narrow to be functional. Refuse to be loaded as soon as it hits tipping floor and limited capacity for bulk storage.
- New inbound/outbound scales required.
- New self-serve recycling area to be constructed if continue to offer service.
- Location of new entrance off Harkins Slough Road/Buena Vista Drive could pose traffic/safety concerns.
- Existing services would be disrupted during construction or require temporary re-route.
- Drop offs to compost facility would travel through transfer station unless new scale house/entrance at Harkins Slough Road/Rountree Lane.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$10,500,000*		
New scale facility	Yes	$1,000,000		Inbound and outbound
New entrance	Yes	$50,000		
Accommodates bulk waste	No			
Self-serve recycling center	Yes	$500,000		New recycling area push into existing closed landfill
TOTAL		**$12,050,000**		

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 1- OPTION B (BUENA VISTA DRIVE)



II. LOCATION 1- OPTION B (BUENA VISTA DRIVE)

Option B includes construction of new facility 120'x445' (53,400 square feet) at the location of the existing scale house and self-serve recycle and expands east into the closed landfill and/or west towards Buena Vista Drive.

Opportunities

- Mostly on stable ground, with expansion to the east, pushing into the closed landfill.
- Potential for expansion to the west to coordinate with DPW Road Operations project on Buena Vista Drive, benefitting both projects with potential re-alignment of road and shared costs.

Constraints

- Critical timing to coordinate with Buena Vista Drive improvement project with Road Operations to not cause delays to Road project.
- Expansion to the west, would trigger environmental clearances and mitigation due to impacts to the riparian area along Buena Vista Drive.
- Buena Vista Drive is a scenic road, as designated by the County General Plan, and will require visual considerations.
- Location of new entrance off Harkins Slough Road/Buena Vista Drive could pose traffic/safety concerns.
- Reduction in 200' agricultural setback with Agricultural Policy Advisory Committee (APAC) required.
- Expansion to the east will require building foundation on waste and re-closure of that section of landfill.
- No space for self-serve recycling center (unless new area built into Module 5 or by Maintenance Building).
- Drop offs to compost facility would travel through transfer station unless new scale house/entrance at Harkins Slough Road/Rountree Lane.
- Existing services would be disrupted during construction or require temporary re-route.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$12,800,000*		
New scale facility	Yes	$1,000,000		(inbound and outbound)
New entrance	Yes	$50,000		
Accommodates bulk waste	Yes			
Self-serve recycling center	Yes	$500,000		New recycling area push into existing closed landfill
If expand east- re-close landfill	Yes	$100,000	+6-12 months	State Water Resource Control Board
If expand west- environmental mitigation will be required	Yes	$200,000	+12-24 months	USFW
TOTAL		**$14,650,000**	**+12-24 months**	

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

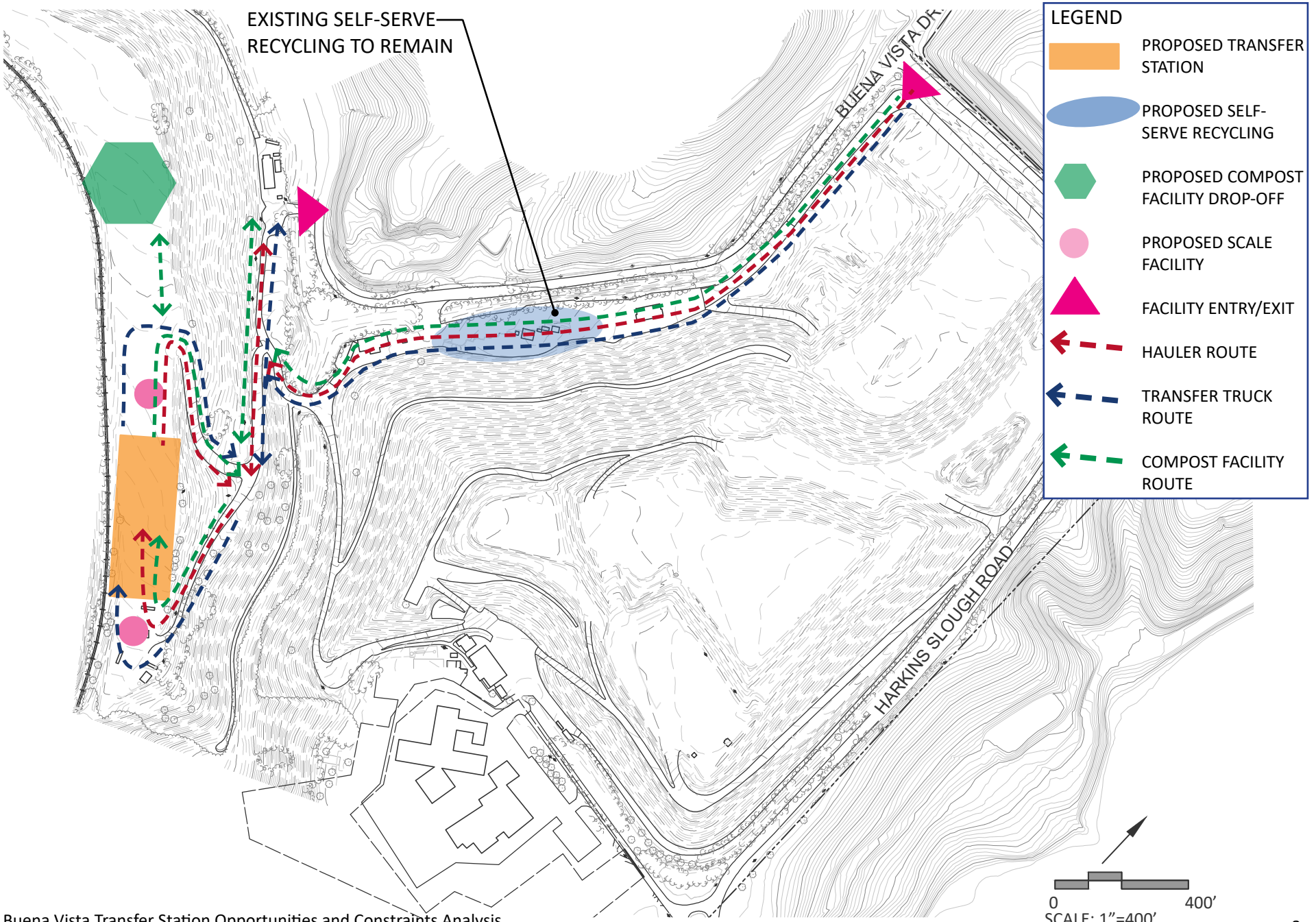
II. LOCATION 1 (BUENA VISTA DRIVE)

Harkins Slough Road and Buena Vista Drive intersection

Existing self-serve recycle area, looking south

Buena Vista Drive looking south

II. LOCATION 2- OPTION A (OLD LANDFILL TOP DECK)



II. LOCATION 2- OPTION A (OLD LANDFILL TOP DECK)

Option A includes construction of new facility totaling 53,400 square feet on the top deck of the old landfill.

Opportunities

- Includes transfer station 120'x370' (44,400 sf), bulk storage 75'x100' (7,500 sf), office 50'x30' (1,500 sf) and tipping floor width of 105' will allow for efficient operations.
- Larger flat, open space.
- Connection to rail line for potential transport to landfill.
- Existing self-serve recycling to remain.
- Existing services would not be disrupted during construction or require temporary re-route.

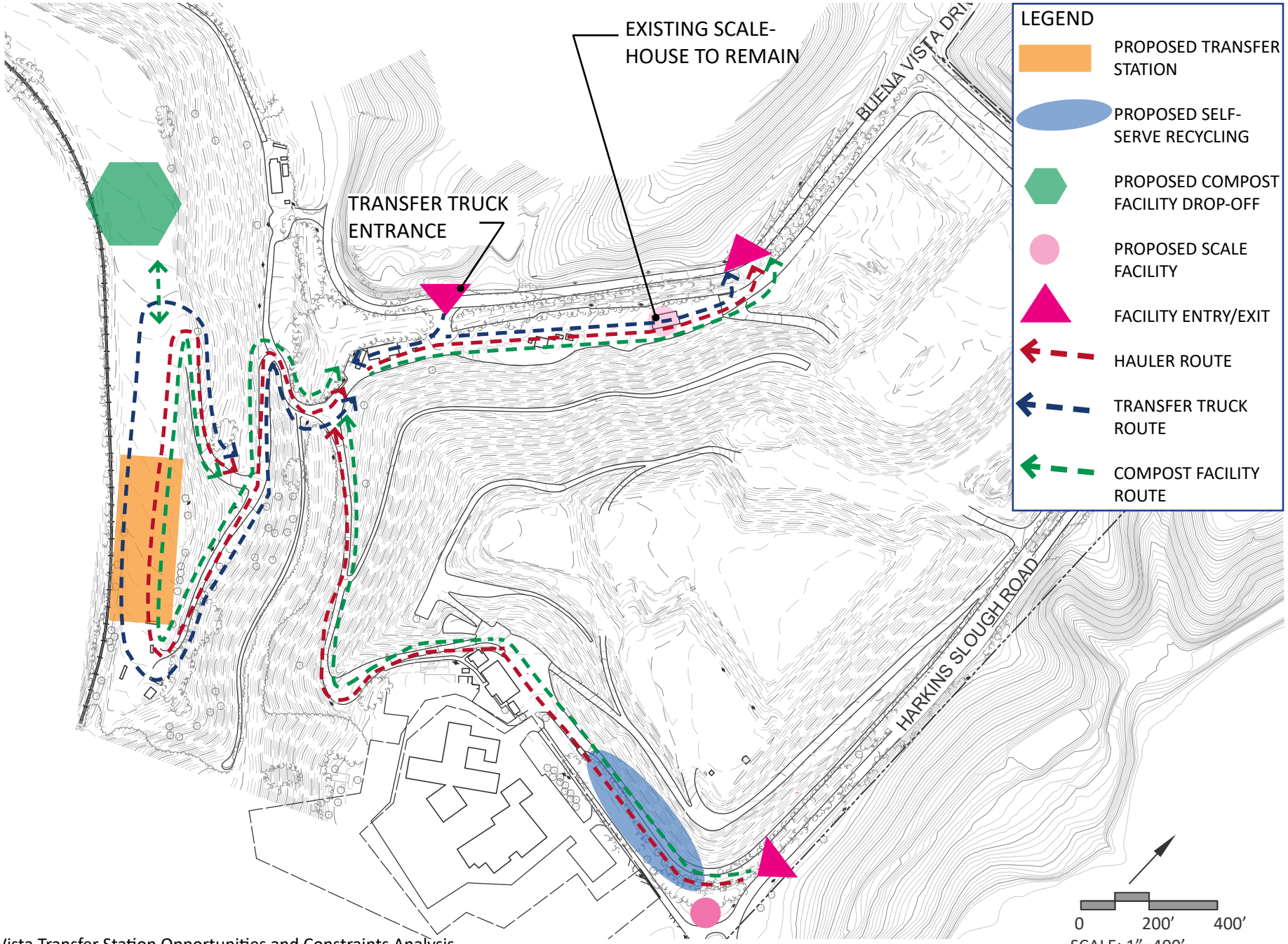
Constraints

- Smaller or different location would be needed for compost facility. If compost rows located on top of newer closed landfill, would require landfill closure prior to facility being constructed. Facility requires roof and concrete working surface. Would cut the landfill capacity short.
- Unknown foundation requirements on old landfill until Geotechnical investigation done.
- Load out tunnel may not be possible on top of waste- may need to use Grappler (higher building ceiling and additional equipment).
- Improvements to road leading to old landfill required.
- Location of new entrance off Harkins Slough Road/Buena Vista Drive could pose traffic/safety concerns.
- Highly visible from Buena Vista Drive (scenic road).

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$12,800,000*	+6-12 months	CalRecycle & State Water Resource Control Board
New scale facility	Yes	$1,000,000		(inbound and outbound)
New entrance	Yes	$50,000		
Accommodates bulk waste	Yes			
Self-serve recycling center	Yes			Existing to remain
Road improvements to transfer station	Yes	$1,500,000		
TOTAL		**$15,350,000**	**+6-12 months**	

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 2- OPTION B (OLD LANDFILL TOP DECK)



II. LOCATION 2- OPTION B (OLD LANDFILL TOP DECK)

Option B includes construction of new facility totaling 53,400 square feet on the top deck of the old landfill with new entrance off Rountree Lane.

Opportunities

- Includes transfer station 120'x370' (44,400 sf), bulk storage 75'x100' (7,500 sf), office 50'x30' (1,500 sf) and tipping floor width of 105' will allow for efficient operations.
- Minimize cross traffic of transfer trucks and haulers with transfer trucks entering on Buena Vista Drive and haulers entering on Rountree Lane.
- Larger flat, open space.
- Connection to rail line for potential transport to landfill.
- Existing services would not be disrupted during construction or require temporary re-route.

Constraints

- New self-serve recycling area to be constructed.
- Smaller or different location would be needed for compost facility. If compost rows located on top of newer closed landfill, would require landfill closure prior to facility being constructed. Facility requires roof and concrete working surface. Would cut the landfill capacity short.
- Unknown foundation requirements on old landfill until Geotechnical investigation done.
- Load out tunnel may not be possible on top of waste- may need to use Grappler (higher building ceiling and additional equipment).
- Additional improvements to road leading to old landfill and "back road" required.
- Increased potential for collisions with maintenance activities and increased traffic.
- Increased traffic on Harkins Slough Road/Rountree Lane may not be compatible with other County uses.
- Highly visible from Buena Vista Drive (scenic road).

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$12,800,000*	+6-12 months	CalRecycle & State Water Resource Control Board
New scale facility	Yes	$1,000,000		(inbound)
New entrance	Yes	$50,000		
Accommodates bulk waste	Yes			
Self-serve recycling center	Yes	$500,000		New at Harkins Slough Road entrance
Road improvements to transfer station	Yes	$2,300,000		
TOTAL		**$16,650,000**	**+6-12 months**	

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

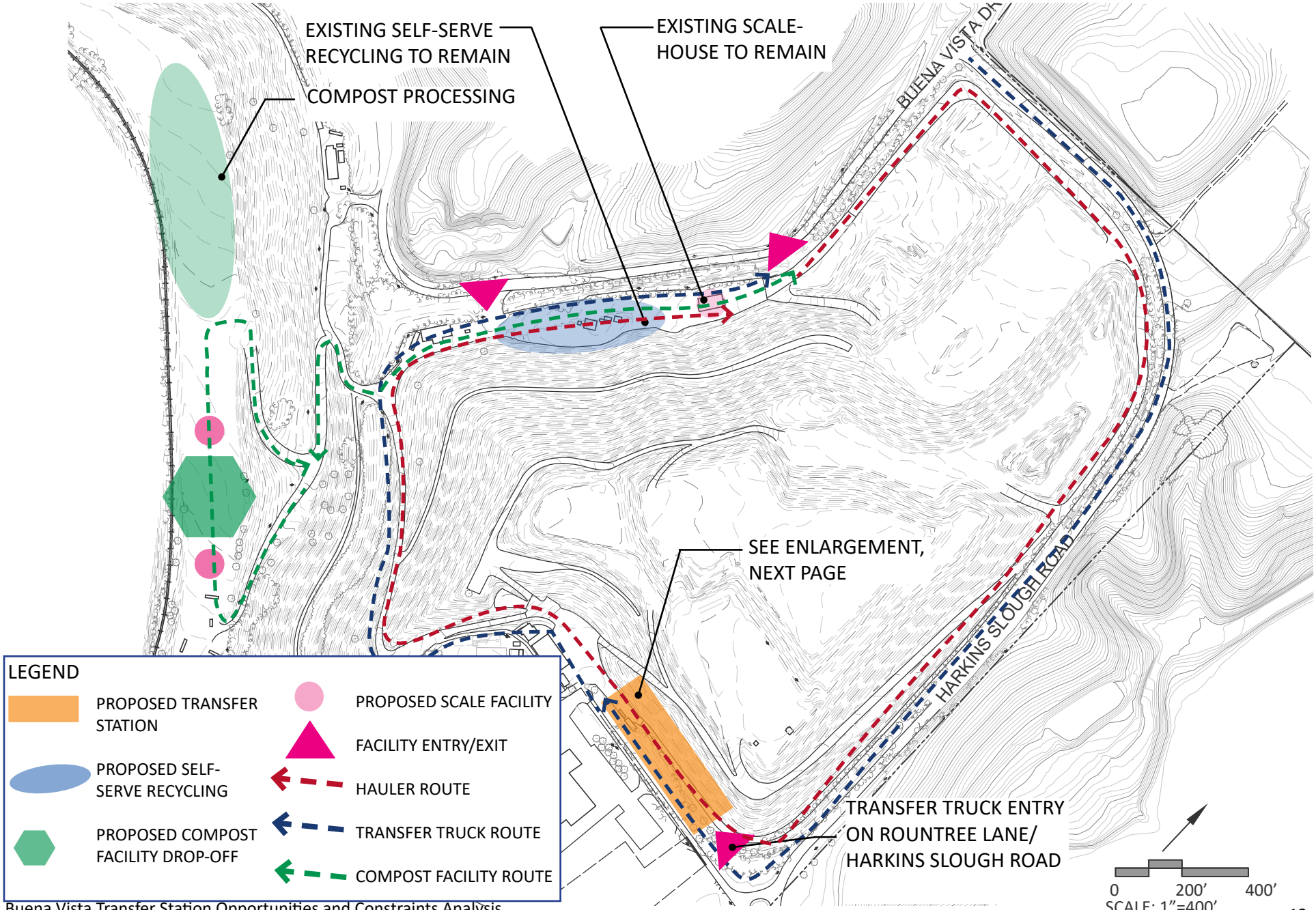
II. LOCATION 2 (OLD LANDFILL TOP DECK)

Existing road down from top deck of old landfill

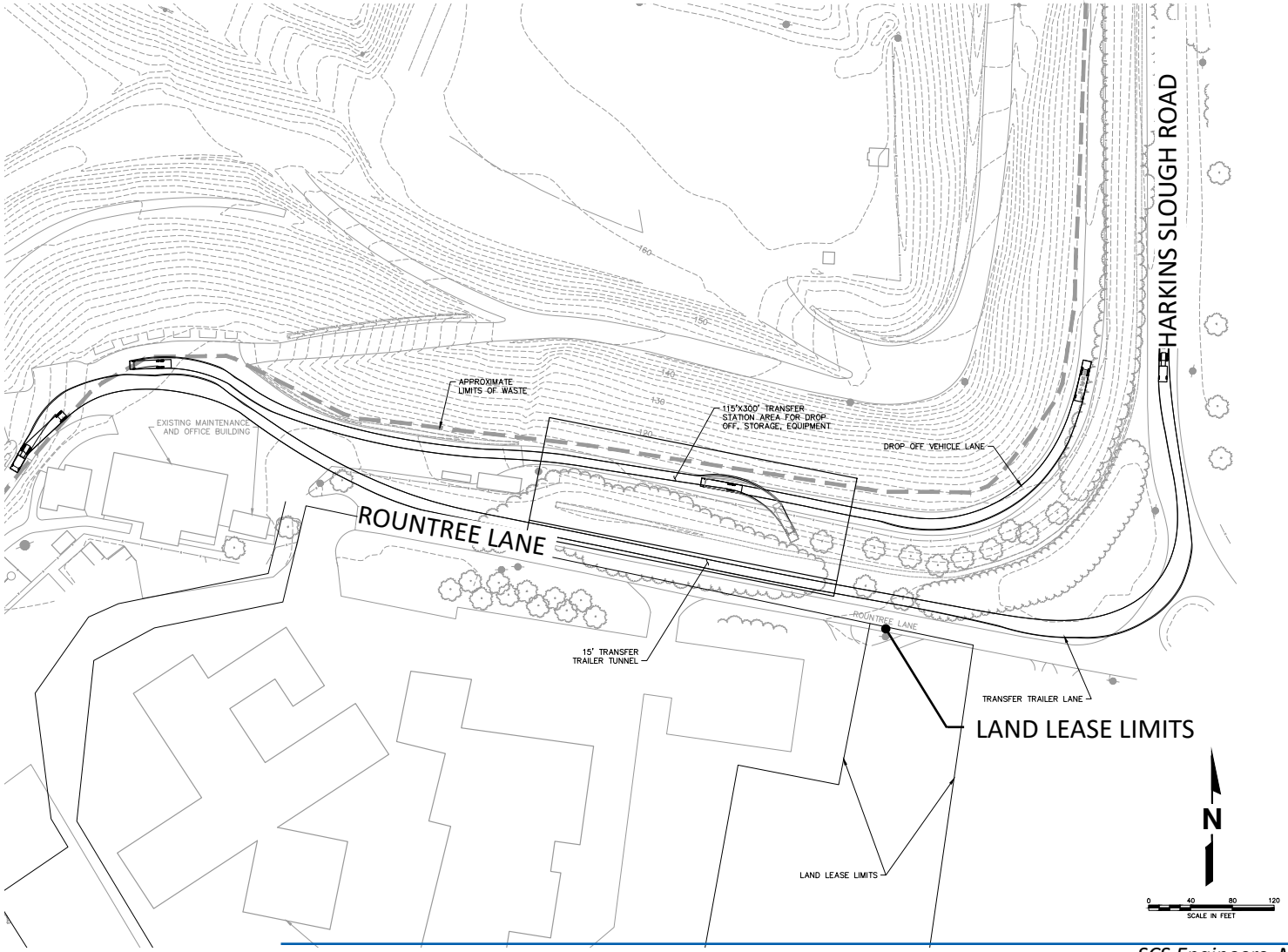
Harkins Slough Road and Buena Vista Drive intersection

Potential exit shown in Option A

II. LOCATION 3 (ROUNTREE LANE)



II. LOCATION 3- ENLARGEMENT (ROUNTREE LANE)



II. LOCATION 3 (ROUNTREE LANE)

Location 3 includes construction of new facility 115'x300' (34,500 square feet) near the existing maintenance building, adjacent to Rountree Lane.

Opportunities

- Larger flat, open space with stable ground for building foundation.
- Current services would not be disrupted during construction.
- Continue to use existing scale house.
- Self-serve recycling maintained.

Constraints

- Does not accommodate bulk waste storage.
- Increased traffic on Harkins Slough Road/Rountree Lane may not be compatible with other County uses.
- "Back Road" will need improvements to accommodate traffic flow.
- Existing ground lease with State located in center of Rountree Lane. If improvements encroach, would need to amend ground lease. This process could take 12-24 months.
- Increased potential for collisions with maintenance activities and increased traffic.
- Existing maintenance building and offices to be relocated during construction.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$11,000,000*		
New scale facility (inbound and outbound)	No			
New entrance	No			
Accommodates bulk waste	No			
Self-serve recycling center	Yes			Existing maintained
Road improvements to transfer station	Yes	$1,800,000		
TOTAL		**$12,800,000**		

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 3 (ROUNTREE LANE)

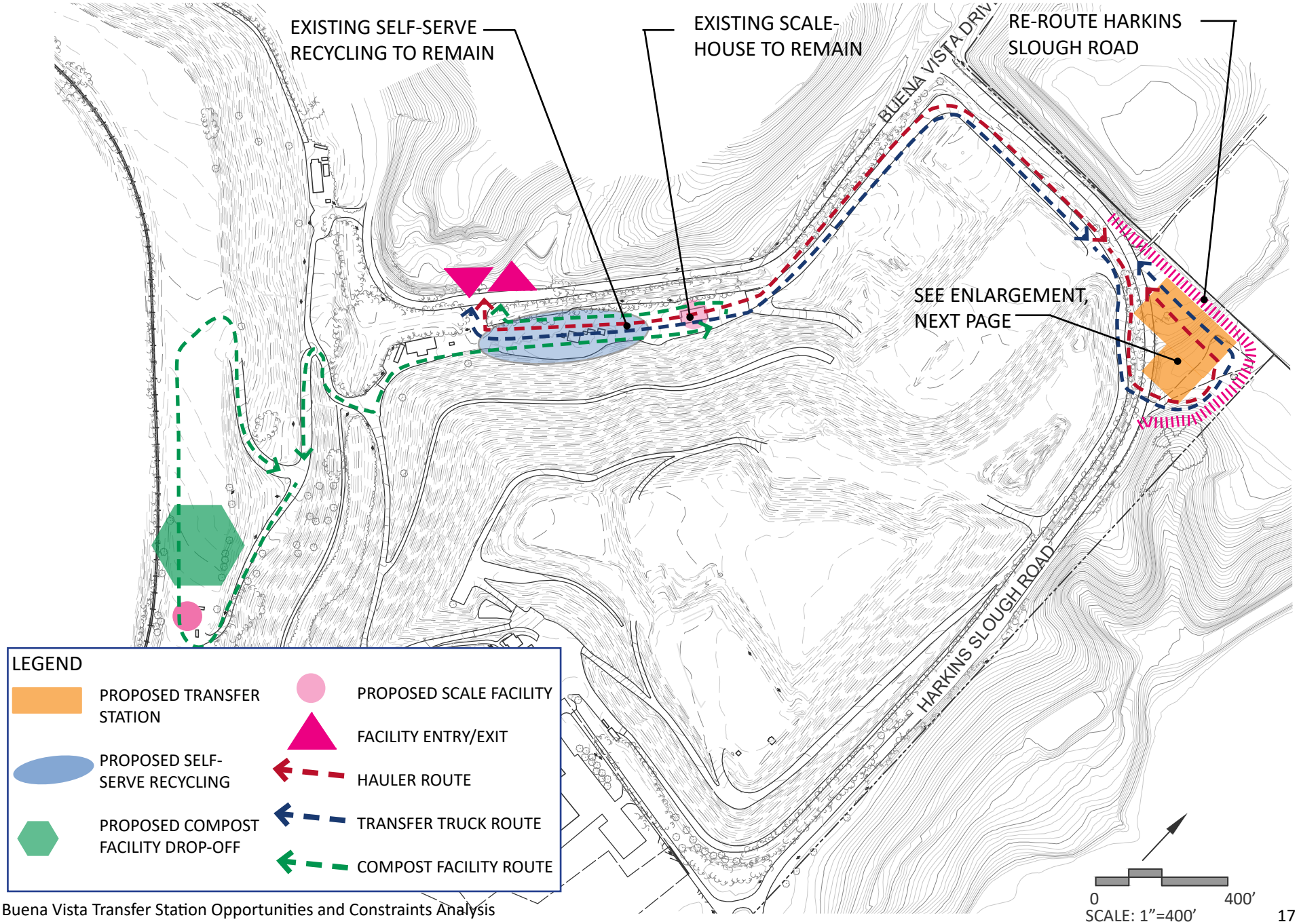
Harkins Slough Road and Rountree Lane intersection

View from Rountree Lane towards proposed facility location

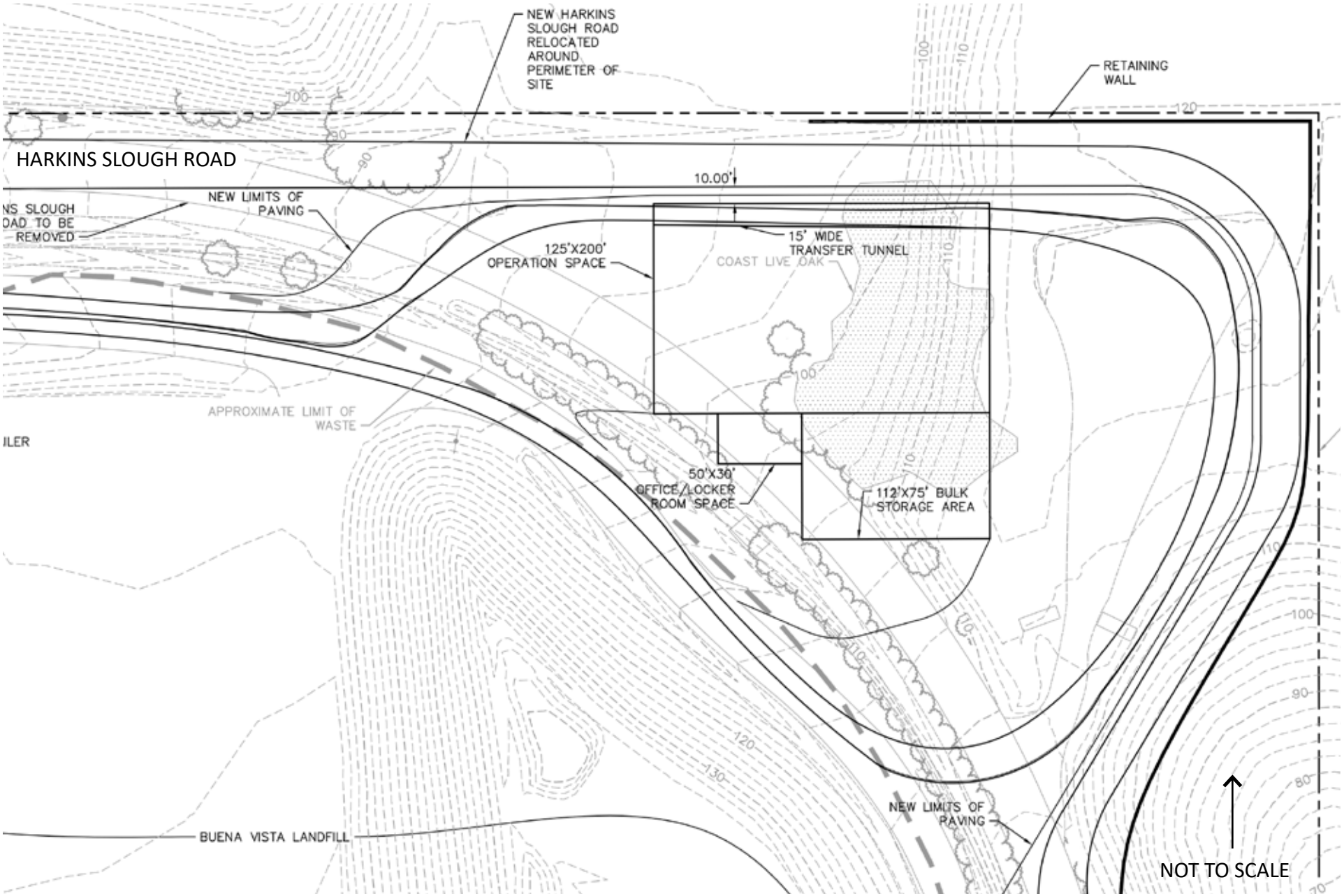
Existing maintenance building area

Existing "Back Road"

II. LOCATION 4 (NE CORNER OF PARCEL)



II. LOCATION 4- ENLARGEMENT (NE CORNER OF PARCEL)



II. LOCATION 4 (NE CORNER OF PARCEL)

Location 4 includes construction of new facility totaling 34,900 square feet on undeveloped land in the north east corner of the landfill property.

Opportunities

- Building configuration efficient for operations with the transfer station 125'x200' (25,000sf); bulk storage 112'x75' (8,400sf), and office 50'x30' (1,500sf).
- Re-route Harkins Slough Road to increase facility size and keep public road outside of the facility.
- Stable ground for construction.
- Current services would not be disrupted during construction.
- Continue to use existing scale house.
- Self-serve recycling maintained.
- No passive venting of landfill gases required.

Constraints

- Adjacent to the USFW Ellicott Slough National Wildlife Refuge (long-toed salamander) and existing oak trees on site.
- Scenic considerations from Buena Vista Drive.
- Reduction in 200' agricultural setback with Agricultural Policy Advisory Committee (APAC) required.

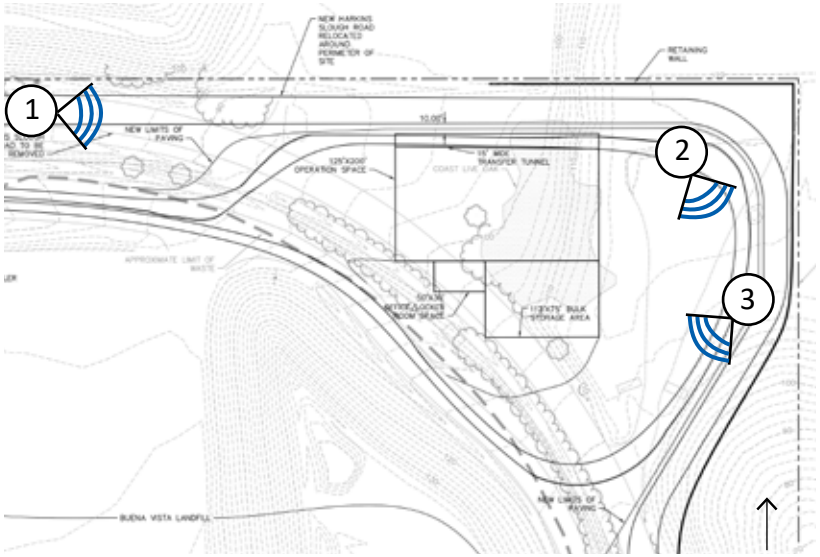
Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$11,000,000*	+6-12 months	CalRecycle & State Water Resource Control Board
New scale facility	No			
New entrance	No			
Accommodates bulk waste	Yes			
Self-serve recycling center	Yes			Existing maintained
Harkins Slough Road re-route	Yes	$850,000		
Retaining wall for Harkins Slough Road re-route	Yes	$3,000,000		
TOTAL		**$14,850,000**	**+6-12 months**	

*Cost extrapolated from SCS "Draft Buena Vista Landfill Transfer Station Design Report", dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 4 (NE CORNER OF PARCEL)

1 *View from Harkins Slough Road towards proposed facility location*

2 *View towards Ellicott Slough and Monterey Bay*



Key Map

3 *View southwest towards landfill*

II. LOCATION 5- OPTION A (ALTERNATE SITE)

Option A includes construction of new facility on County property other than the Buena Vista Landfill.

Opportunities

- Potential to design without many constraints.
- Current services would not be disrupted during construction.

Constraints

- County would need to purchase or develop property other than Buena Vista Landfill.
- Lack of available sites adequately zoned.
- Significant public review required and potential opposition.
- Increased ancillary costs to operate two sites while Buena Vista Landfill operational.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Additional Schedule Impacts**	**Notes**
Transfer station	Yes	$13,000,000*		CalRecycle & State Water Resource Control Board
Property acquisition	Yes	$4,000,000	+12 months	
TOTAL		**$17,000,000**	**+12 month**s	

*Cost extrapolated from SCS “Draft Buena Vista Landfill Transfer Station Design Report”, dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc.

II. LOCATION 5- OPTION B (ALTERNATE SITE)

Option B is to partner with another agency to provide a regional transfer station at location other than the Buena Vista Landfill.

Opportunities

- Possibility of industrial areas zoned appropriately outside of County.
- Shared cost of building and operating facility.
- Potential to design without many constraints.
- Current services would not be disrupted during construction.

Constraints

- Politically challenging.
- Less control over timing.
- Depending on location, could result in increased illegal dumping, additional traffic to Ben Lomond Transfer Station or to the Monterey Peninsula Landfill in Marina.

Capital & Operational Impacts	**Yes/No**	**Cost**	**Schedule**	**Notes**
Transfer station	Yes	$10,000,000*		CalRecycle & State Water Resource Control Board; Shared cost
Property acquisition	Yes	$4,000,000	+24-36 months	Develop agreement
TOTAL		**$14,000,000**	**+24-36months**	

*Cost extrapolated from SCS “Draft Buena Vista Landfill Transfer Station Design Report”, dated March 12, 2020. SCS cost estimate includes building (53,400sf), (1) scale, site work, design fees, etc. with +/- 20% cost savings with shared costs.

III. SUMMARY

Each of the locations have unique challenges where the cost, schedule, impacts, and long term functionality of the facility need to be weighed. The table below highlights the high level conceptual costs projected for each option, as well as additional time for the permitting that would be required above the baseline schedule for development of plans, specifications, estimates, bidding, and construction. It will likely take 12-18 months to award a bid and 18-24 months for construction, depending on the selected option.

Option	**Cost**	**Additional Schedule Impacts**	**Opportunities**	**Constraints**
Location 1-Option A *(Buena Vista Drive)*	$12,050,000		✓ Stable ground for construction. ✓ No disturbance to closed landfill. ✓ Minimal environmental impacts.	- Too narrow to be functional. - Existing services disrupted during construction. - Difficult to accommodate self-serve recycling.
Location 1-Option B *(Buena Vista Drive)*	$14,650,000	+12-24 months	✓ Coordination with Roads project to re-align Buena Vista Drive and provide adequate sized facility. ✓ Minimal internal road improvements required.	- Expanding west trigger environmental mitigations - Existing services disrupted during construction. - Difficult to accommodate self-serve recycling.
Location 2-Option A *(Old landfill top deck)*	$15,350,000	+6-12 months	✓ Existing services not disrupted during construction. ✓ Potential for rail line connection for future transport.	- Does not accommodate full compost processing facility. - Major landfill road improvements required. - Building foundation may be difficult on top of old waste. - Load out tunnel may not be possible on top of old waste. - Highly visible from Buena Vista Drive (scenic road).

III. SUMMARY

Location 2-Option B *(Old landfill top deck)*	$16,650,000	+6-12 months	✓ Minimize cross traffic between transfer trucks and haulers. ✓ Existing services not disrupted during construction. ✓ Potential for rail line connection for future transport.	- May not be compatible with adjacent County uses. - Does not accommodate full compost processing facility. - Major landfill road improvements required. - Building foundation may be difficult on top of old waste. - Load out tunnel may not be possible on top of old waste. - Highly visible from Buena Vista Drive (scenic road).
Location 3 *(Adjacent to existing maintenance building)*	$12,800,000		✓ Existing public services not disrupted during construction.	- May not be compatible with adjacent County uses. - Too narrow to be functional without amending State ground lease with Rountree facility. - Major landfill road improvements required. - Existing maintenance building activities and offices relocated during construction.
Location 4 *(NE corner of landfill)*	$14,850,000	+6-12 months	✓ Most efficient for operations. ✓ Accommodates desired services. ✓ Existing services not disrupted during construction. ✓ Keeps truck traffic on flatter roads, for improved safety and easier long term maintenance.	- Adjacent to USFW Ellicott Slough National Wildlife Refuge. - Existing oak trees to be removed. - Re-route Harkins Slough Road.

III. SUMMARY

Location 5-Option A *(Other County property)*	$17,000,000	+12 Months	✓ Potential to design with minimal constraints. ✓ Existing services not disrupted during construction.	- County would need to purchase or develop property other than Buena Vista Landfill. - Lack of available sites zoned with require zoning. - Significant public review and potential opposition.
Location 5-Option B *(partner with other agency)*	$14,000,000	+24-36 Months	✓ Potential to share costs and resources. ✓ Potential to design with minimal constraints. ✓ Existing services not disrupted during construction.	- Politically challenging. - Less control over timing. - Potential to result in increased traffic to other facilities or illegal dumping.

Conclusion

The County team evaluated each of the options based on operations, construction feasibility and impacts, permitting, and cost to determine Location 4 is the preferred option. The building configuration provides adequate space for bulk storage and maintains the existing self-serve recycling and household hazardous waste receiving areas. The circulation allows for a simple loop, utilizing the existing entrance on Buena Vista Drive and keeps traffic off the steeper facility roads, providing a safer route and reducing cost of construction and long term maintenance. In addition, there will be minimal impacts to operations during construction, allowing the landfill to maintain services and reach full capacity. Location 4 provides the greatest number of opportunities for the County to maximize the use of the Buena Vista Landfill in serving the public for both the short and long term.

VI-9. REGIONAL PLANNING

Collaborating, in mutually beneficial regional partnerships, is the key for ensuring sustainable transportation and land use investments that will affect the future of Santa Cruz and the greater region.

KEY RECOMMENDATIONS

Successful regional collaboration can address:

- Existing and future regional vehicle traffic congestion problems on Highway 1
- The location, extent and balance of future employment and population growth, including the provision of mixed-use development and affordable housing near transit, to preserve open space
- The type and availability of transit services and accessible routes to expand person-trip travel options
- Managing multi-modal travel way capacity more efficiently
- Managing parking availability and cost to increase carpooling and transit, and to encourage more efficient, compact land use
- Expanding regional bicycle and recreational trail networks.

Key partners include UCSC, Metro, SCCRTC, Santa Cruz County, Caltrans, Downtown Merchant's Association and major Santa Cruz employers.

The challenge of transportation planning is that solutions to one issue generally have both beneficial and negative consequences for related issues. Therefore, success relies upon regional collaboration and relying on the principles of sustainable transportation planning. Applying the principles will reflect core community values and help achieve balanced and integrated regional transportation and land use solutions. This approach offers a comprehensive perspective to frame issues and solutions. Santa Cruz should:

1. **Support regional funding and implementation of key regional projects that can significantly benefit the city, including:**
    - Metrobase Transit District Consolidations Operations Facility
    - Right-of-way acquisition on rail corridor
    - Bike and pedestrian path on rail right-of-way
    - Local bike projects
    - Expanding local and regional bus service
2. **Ensure, as the proposed Regional Transportation Commission Highway 1 widening project moves forward, that the following criteria are sufficiently**

evaluated so selection and funding of future projects are consistent with the MTS vision and community needs.

- *New travel choices.* Make a major regional transportation investment to provide new travel choices to ensure high-occupancy, high-frequency regional transit service and carpooling that serves local and regional activity centers as the primary means to address vehicle traffic congestion and increase person-trip mobility.
- *Funding availability for transit.* Ensure that Highway 1 widening project capital, operating and maintenance costs, which would be covered by an increase in sales tax, do not reduce funding for bus and transit services. In addition, ensure that sales tax funds are annually available to support other priority transportation projects.
- *Acceptable levels of local street vehicle congestion.* Ensure that there are no significant local street vehicle traffic congestion and increased SOV traffic impacts induced by Highway 1 widening or as a result of construction impacts related to the widening project.
- *Support local transit, carpooling pedestrian and bicycle travel.* Ensure that the design and operations of the widening project connect to the local street system in a manner that can support transit and carpooling operations as a priority on local arterial streets. Additionally, support pedestrian and bicycle connections across the highway to interconnect north and south neighborhoods.
- *Demonstrate sufficient benefits relative to other feasible alternatives to justify project costs and impacts.* Ensure that the future travel benefits and travel time savings for transit and carpooling are sufficient to justify the costs and environmental impacts of a Highway 1 widening project when compared with other feasible alternatives, including a BRT system on the rail corridor.
- *Minimize auto-oriented land use impacts both regionally and locally.* Conduct an evaluation of the land use impacts of a Highway 1 widening project. It should monitor progress in promoting compact, walkable, mixed-use and transit-oriented development (moving away from inducing low density, auto-oriented development). The evaluation should identify other feasible alternatives that support sustainable land use.

BACKGROUND

Regional Setting

The City of Santa Cruz is located on the Monterey Bay between the San Francisco Bay Area to the north and the Monterey Peninsula to the south. As the home for the University of California at Santa Cruz, county government, and several of the County's largest employers, Santa Cruz is an employment center for Santa Cruz County. With coastal mountains, sandy beaches and a vibrant downtown, Santa Cruz is also a major tourist destination and recreation attraction for the San Francisco Bay Area and the Monterey Bay Area.

Population and Employment Growth

As shown in Table 1, Association of Monterey Bay Area Governments (AMBAG) forecasts for population and employment growth for the City and County of Santa Cruz indicate that:

- Local programs can influence 74% of Santa Cruz peak hour travel demand. 50% are local trips and 24% are commute trips into the City.
- 26% are commute trips out of the City, which are significantly less influenced by local programs.
- The City of Santa Cruz contributes less than 20% to total regional PM peak hour trips, declining from 18% in 2000 to 17% in 2020.
- Santa Cruz County's population, residential housing construction and employment are projected to increase at a greater rate than the City's between 2000 and 2020.
- 69 percent of regional population growth by 2020 will be in Watsonville and the unincorporated areas of Santa Cruz County, increasing by 31,561 from 180,334 to 211,895 by 2020.
- Approximately 211,895 people will live in South County, approximately 70 percent of the County's projected 2020 population. Due to South County's low-density development pattern, future growth will continue to contribute to increased auto dependence and is less responsive to transit services.
- A net 19% of the County workforce commutes to areas outside of the County for employment in areas such as Monterey County and the Bay Area, with the majority of these trips going to the Silicon Valley area in Santa Clara County.
- Population in Santa Cruz County is anticipated to increase by 17,8% between 2000 and 2020 growing from 257,739 to 303,646.
- Employment in Santa Cruz County is anticipated to increase by 19% between 2000 and 2020, growing from 140,589 to 168,532 jobs.

Table 1: Population and Employment Growth, Santa Cruz County 2000 - 2020

	2000	Size in Region	2020	Growth	Rate	Percent of Region	Percent of Growth
Employment							
Santa Cruz County	140,589		168,532	27,943	19.9%		
Population							
Capitola	11,172	4%	11,750	578	5.2%	4%	1%
Santa Cruz	55,013	21%	64,386	9,373	17.0%	21%	20%
Scotts Valley	11,218	4%	15,615	4,397	39.2%	5%	10%
Watsonville	43,620	17%	55,875	12,255	28.1%	18%	27%
Unincorporated	136,714	53%	156,020	19,306	14.1%	51%	42%
Santa Cruz County	257,737	100%	303,646	45,909	17.8%	100%	100%
Unincorporated + Watsonville	180,334	70%	211,895	31,561	42%	70%	69%

TRANSPORTATION SETTING

Network

Regionally, State Highway Route I is the major inter and intra county route for the County, following the coast from San Francisco and San Mateo County south through the City of Santa Cruz. Within the city, Highway 1, traverses from the recently improved Mission Street, traverses east to its junction with Highway 17. At Highway 17 Highway 1 forms a four-lane freeway extending south to Watsonville and Monterey County. State Highway 17, which traverses the Santa Cruz mountains, terminates in Santa Cruz and connects Santa Cruz County to the greater San Francisco Bay area.

Highways I and 17 experience average annual daily traffic volumes of up to 110,000 and 66,000, respectively. The two highways serve regional traffic, motorists who commute every day to the high-tech job centers in the Silicon Valley, and motorists who travel into Santa Cruz County to enjoy the scenic recreation opportunities offered by the region. Highway 17 is often subject to high accident rates, primarily due to motorists driving faster than is safe for conditions.

Traffic Volume/Capacity

Annual Average Daily Traffic (AADT) along Route I range from 36,000 near the Monterey County line to in excess of 110,000 near the "fishhook" interchange with Route 17. Between State Park Drive and Morrissey Boulevard, current AADT ranges from 83,000 to 110,000 with the highest daily volumes occurring between the Soquel and Morrissey interchanges.

Peak hour travel demand in the study area exceeds the carrying capacity of the highway. Route 1 operates at Level of Service (LOS) "F" for multiple hours each day. Typical northbound AM mid week recurrent morning congestion lasts for over 3.5 hours; mid week southbound PM congestion lasts for over 4 hours.

Recurrent congestion related queuing on State Route 1 extends for several miles during peak hours. In the PM, southbound traffic queues from the Bay Porter Interchange back through the 1/17 Junction towards Pasatiempo Drive and north on Route 1 towards the Route 9 Junction. In the AM peak period, northbound congested queuing typically extends from Morrissey Drive to beyond Freedom Boulevard. Accidents, events, and other incidents in the corridor can further increase congestion related delays in either direction, on any day, including weekends.

The AMBAG travel forecasting model projects that the 2020 Average Annual Daily Traffic (AADT) volumes in the study area will range from 115,000 near State Park Drive to 144,000 between Morrissey and Soquel. With this projected increase in travel demand, the extent and duration of congestion in the study area will significantly increase. The duration of daily northbound congested conditions would increase by several hours with weekday recurrent congestion related queues extending as far back as Watsonville during both the AM and PM peak periods. In the southbound direction, the anticipated increase in travel demands will further impact Route 17, Route 9, Ocean Street, and Mission Street as congestion queues extend north. Soquel Avenue, Seabright neighborhood, Morrissey Boulevard and the Hwy 1/9 intersection also experience high levels of vehicle traffic.

Accident Data

During the five year period, there were a total of 921 accidents on Hwy 1 from Morrissey-St. Park with no fatalities and 281 injuries resulting in a total accident rate of 1.22, which is below the statewide average rate of 1.60. The types of collisions were rear end (287), hit object (66), and sideswipe (47). The primary collision factors for these types of accidents were speeding (263); improper turn (40), and tailgating (45). The times of the day when a large percentage of these accidents occurred were 8:00 a.m. (60), 9:00 a.m. (36), and 5:00 p.m. (70).

Transit Services

Regional bus routes provide service to destinations in Santa Clara and Monterey Counties. Weekday service is provided by the Highway 17 Express Bus, which serves Santa Cruz, Scotts Valley and San Jose (destinations include the Caltrain Station and San Jose State University). Amtrak buses provide service to downtown Santa Cruz's transit center and to the San Jose Caltrain station, with train connections to San Francisco, Sacramento, Stockton and intermediate cities. Limited Amtrak bus service is also available between Watsonville and San Jose. Greyhound buses serve downtown Santa Cruz, Los Gatos and the San Jose Airport.

Modal Choice/Transit

Although the urbanized portions of the County, especially University oriented areas of Santa Cruz, exhibit support for alternative transportation modes including transit and bicycling, the preponderance of new growth has been at lower, less transit conducive densities in communities and unincorporated area lying south of Santa Cruz. As a result, a recent survey indicates that 83% of the County's workers commute in single occupant vehicles. Those who live in Santa Cruz County and work elsewhere also impact Highway 1. According to the 1990 Census approximately 20% of employed Santa Cruz County residents travel to jobs in Silicon Valley and beyond; a significant proportion of these travelers use Highway 1 to access Highway 17 over the Santa Cruz Mountains.

The Route 1 facility currently includes park and ride lots in support of transit use, vanpools, and high occupancy vehicles. "Express Buses", including Route 17 Express Service are trapped in mixed flow lanes with all other traffic, and no incentives such as ramp meter HOV bypass lanes or mainline HOV lanes exist to encourage ridesharing.

Lack of Alternative Routes

Owing to geography, topography and historical development patterns, Route 1 is the lifeline for transportation through the County and its urbanized areas. While Route 1 is the only continuous route through the County, Soquel Drive/Soquel Ave and other local arterials including Capitola Road and Murray Street/East Cliff Drive, serve as parallel routes within certain sections of the urbanized area. These roadways, however, are themselves congested during peak hours and little opportunity exists to expand their capacity. An underutilized branch rail line provides potential for future transit growth in the corridor, and including potential use for as a bicycle and pedestrian path. The closest parallel State highway for interregional travel is U.S Route 101, which is separated from Route 1 by coastal mountains.

REGIONAL TRANSPORTATION PLANNING

Institutional Context

The regional transportation planning agency for Santa Cruz County is the Santa Cruz County Regional Transportation Commission (SCCRTC). SCCRTC oversees planning and funding programs for local & regional projects using state and federal transportation funds. The City of Santa Cruz has one City representative on the 12-member SCCRTC board and many City transportation projects are funded through grant programs administered by the SCCRTC.

Adopted Plans and Programs

Three regional transportation planning efforts directly affect the future of transportation planning for the City of Santa Cruz:

1. The Master Transportation Investment Study (MTIS), approved by the RTC in 1999, which sets forth a program of $260 million in transportation projects for the Watsonville - Santa Cruz - UCSC corridor to be pursued over the next 15 years.
2. The Regional Transportation Plan (RTP), adopted by the RTC in October 2001, which is the comprehensive regional transportation planning document providing guidance for transportation policy and projects to improve mobility through 2025 and incorporates the MTIS decision.
3. The 2002 Regional Transportation Improvement Program (RTIP), adopted by the RTC in December 2001, which implements the RTP, proposes how regional funds should be spent to the California Transportation Commission, and is the summary document which tracks state and federal transportation funding through fiscal year 2006/07.

Key Regional Projects

The adopted RTP confirmed the recommendations of the MTIS, with the following projects having significant potential to affect the mobility future for the City of Santa Cruz:

- **Acquisition of the Santa Cruz Branch rail line** for future transportation resource for the community.
- **Development of a bicycle and pedestrian pathway adjacent to the rail line**, where freight operations will continue and future transit options will not be precluded.
- **Implementation of the Highway 1/17 Merge Lanes project**. This project provides operational improvements by widening the existing to add merge lanes between Highway 17 and Morrissey Blvd. It is funded with $52 million in State Transportation Improvement Program (STIP) funds and is scheduled to start construction in 2004. It can be characterized as the next step toward full highway widening (with Mission St. widening as the first step).
- **Planning for Highway 1 widening from four lanes to six lanes to add HOV lane both ways is beyond the limits of the upcoming Highway 1/17 Merge Lanes project.** This project would modify six interchanges and ten structures, including three additional structures for pedestrian over crossings and sound walls. The extended Highway 1 widening project is not yet funded and will require a local sales or gas tax to enable future construction.

- **Funding for a 15-year growth plan for increasing bus service**, including new buses, bus stops, equipment and upgraded maintenance/operations facilities.
- **Funding for high priority local bike projects**, including around schools, and an **electric bike program** allowing discounted distribution and sale of electric bikes to people committed to driving less.

None of these projects are fully funded yet.

CONSISTENCY WITH MTS GOALS

Table 2 presents 2002 Regional Transportation Improvement Program funded projects and longer-term RTP projects that will affect future City of Santa Cruz travel. The table provides a conceptual evaluation for consistency with the MTS goals. All identified RTIP and RTP projects are consistent with the MTS, with the following comments:

MTS High Priority Projects

The following projects are MTS high priority projects:

- Metrobase Transit District Consolidations Operations Facility.
- Right of Way Acquisition on rail corridor.
- Bike and pedestrian path on rail right-of-way.
- Local bike projects.
- Expanded Bus Service

Projects Requiring Further Evaluation

The proposed Highway 1 widening projects, both the 1) widening of existing on-ramps, adding auxiliary lanes and ramp metering, and 2) adding one HOV lane each direction - widening Highway 1 from 4 to 6 lanes - modification to 6 interchanges and 10 structures, including 3 pedestrian over crossing and sound walls, require additional design and operational information to evaluate project impacts and ensure consistency with MTS goals.

Key questions to be analyzed in the environmental analysis are:

1. The potential effect of increasing SOV use with the addition of HOV lanes.
2. Local street system peak hour traffic impacts associated with increased HOV and SOV traffic including the Highway 1 and Mission Street corridors, as well as on Soquel Avenue.
2. Operational efficiency and travel timesaving with the design of the transitions from Hwy 1 HOV lanes to local city streets including the flow of transit and ridesharing to UC, downtown and employment center locations.

4. Opportunities for new bicycle lanes and pedestrian connections across Highway 1 to link the north and south areas of Santa Cruz together.

A proposed Route 1 strategy for MTS is to

1. Recognize the regional problem;
2. Raise questions regarding the problem and potential solutions for consideration;
3. Identify issues, solutions and alternatives to address potential impacts for environmental analysis. Items identified by the Steering Committee are:

- Park and ride at Hwy 1/9 is critical.
- Park and ride all along the Hwy 1 corridor.
- Transit stops directly along Hwy 1 corridor (on the freeway).
- Consider Hwy 1 corridor/ROW as accommodating other very high occupancy transit systems (fixed guide way).
- Increase efficiency of Hwy 1 corridor.
- Provide better housing opportunities for those working in the City and currently residing in the County.
- Balance jobs & housing.
- Widening of all bridges across the corridor to accommodate bike lanes and pedestrian facilities.
- Parking pricing options.
- Consider appropriate transit technologies given regional distribution of land use, i.e. that 50% future growth is in low density, auto dependent unincorporated areas of county.
- Provide land use alternatives in EIR analysis for region.
- Providing alternatives, including HOV lanes, improve SOV travel.
- City hire separate EIR consultant to independently evaluate HOV lane impacts.
- Offer choices.
- Recommend rationale to council.
- Ensure that if there is a 1/2 cent sales tax to pay for the widening, that it does not eliminate funding for transit.
- What are the local street impacts of the Highway 1 widening?

Table 2: Regional Projects

Project	Cost	Consistent MTS	Remarks
Hwy 1 widening - merge lanes cost increases	$52 million	- Projects Funded in the RTIP that Affect the City --	need additional information to evaluate impacts & insure consistency with MTS goals
Metrobase - Transit District Consolidated Operations Facility	$31 million	Yes	**MTS high priority** *needs additional funds*
Traffic management - Hwy 1 freeway service patrol	$240,000	Yes	non capacity increasing project that improves safety and traffic flow
Traffic management - Commute solutions	$444,000	Yes	regional carpool program
Project management - SB45 planning funds	$230,000	Yes	helps track funding for all projects
Sanctuary Scenic Trail	$1.5 million		Only $150,000 currently funded
Santa Cruz Metro Center Rehabilitation	$6 million		
Highway 17 Bus Purchases	$4 million		
Santa Cruz Branch Rail Line Acquisition needs additional funds	$15 million	yes	**MTS high priority**
Regional Vanpool Incentive Program	$100,000		
Santa Cruz Area TMA Program	$90,000/yr		
Electric Bicycle Commuter Incentive Program	$1 million	yes	*needs additional funds*
One in Five (Don't Drive) Rideshare Promotion	$1 million	yes	*needs additional funds*
Bike & pedestrian path on rail right-of-way only environmental and planning phase funded	$12 million	yes	**MTS high priority**
Battery Backup of Signals program	$200,000		

City of Santa Cruz Projects

San Lorenzo River bike/ pedestrian bridge needs additional funds	$3 million	yes	**MTS high priority**
Santa Cruz Multimodal Station at Depot Site	$4 million		
Broadway-Brommer Bike Path	$2 million		
Beach Street Contraflow Bikeway	$600,000		
Front St. pavement rehabilitation	$325,000	yes	
High St./Highland Ave. pavement rehabilitation	$611,000	yes	
Water St. pavement rehabilitation	$195,000	yes	
EastCliff/Murray St. pavement rehabilitation	$395,000	yes	

Project	Cost	Consistent MTS	Remarks
San Lorenzo/E. Cliff/Riverside pavement rehabilitation	$900,000	yes	
West Cliff Dr Path Widening	$888,000	yes	*may need additional funds*
Mission St/Hwy 1 Lighting	$1 million	yes	*needs additional funds*
Water, Soquel, and Broadway pavement rehabilitation	$395,000	yes	aka "arterial roadway rehab"
Mission St/Hwy 1 Landscaping	$625,000		

RTP Projects that may be implemented/constructed 2002-2025 (Not currently funded)

Bus service improvements		yes	**MTS high priority**
-Bus stop improvements	$7.5 million		
-Fleet preventative maintenance	$1.1 million		
-Hwy 17 Express Service Expansion	$21 million		
-Local transit service expansion	$32.2 million		
-Replacement Buses	$69 million		
-Metro System Automated Customer Service	$200,000		
-Transit Alternative Fuel Conversions	$3.2 million		
-Transit Mobility Training Program Expansion	$1.2 million		
-Transit Service Operations and maintenance	$732 million		
-Transit Technological Improvements	$5 million		
-UCSC Bus Service Expansion	$12.3 million		
-Web-based Transit Rte Info	$300,000		
-ADA Paratransit fleet and service	$21.5 million		
-Countywide Specialized Transportation	$34.5 million		
-Liftline Consolidated Op Facility	$10 million		
-Non-ADA Paratransit Service Expansion	$17 million		
Hwy Improvements			
Adding 1 HOV lane each direction by Widening Hwy 1 from 4 to 6 lanes, Morrissey Blvd to State Park Drive	$300 million		need additional information to evaluate impacts & insure consistency with MTS goals
Hwy 1/9 intersection modifications and park and ride lot	$6 million	yes	
Intelligent Transportation Systems on Hwy 1	$3 million		
Bike/Ped bridge on Hwy1 @ Mattison	$2 million		
Hwy 1 Ramp Metering	$2.5 million		

Project	Cost	Consistent MTS	Remarks
Hwy 1/San Lorenzo Bridge Widening	$10 million		
Hwy 17 ITS	$7 million		
Hwy 17 Operational Improvements	$50 million		
Hwy 17 CHP Safety Program	$2.5 million		
local road improvements (MTS project listing) evaluate impacts & ensure consistency with MTS goals		yes	need additional information to
Neighborhood Traffic Management	$2.5 million		
Countywide bicycle projects	$75 million	yes	MTS high priority
Local Arterial EMS and HAR System	$600,000		
Intracity Rail Transit	$10 million		Passenger rail in City of SC
Other Regional Projects/Programs			
Bike to Work Project (Ecology Action)	$620,000		
Electric Vehicle Recharging Stations	$2 million		
Integrated Transportation Info Center			
Park and Ride Lot Development	$8 million		
Transit Oriented Development Program	$5 million		
Car sharing Program (SC TMA)	$2.5 million		

4.4 TRANSPORTATION & TRAFFIC

4.4.1 ENVIRONMENTAL SETTING

IN THIS SECTION:

- Regulatory Setting
- Summary of Transportation Modes & Use
- Transportation Plans & Studies
- Road Network & Traffic Conditions
- Bicycle & Pedestrian Circulation
- Public Transit
- Rail Service
- Planned Improvements
- Transportation Management
- Parking

This section was prepared with assistance from Ron Marquez, traffic consultant to the City of Santa Cruz Public Works Department, and Jeff Waller of Hatch Mott MacDonald (formerly Higgins and Associates), who ran the TRAFFIX model and developed Level of Service calculations under the direction of City staff and consultants. A summary of the traffic analysis methodology is included in Appendix C. Traffic volumes and intersection level of service calculations are included in Technical Appendices F-5 and F-6, respectively. The technical appendices are available for review at the City of Santa Cruz Planning Department[1] and are also included on the Draft EIR CD and on the online version of the Draft EIR on the City's website at www.cityofsantacruz.com, Planning Department.

REGULATORY SETTING

A number of local, regional and state agencies are involved with transportation planning and implementation of transportation programs and improvements within the City of Santa Cruz. The City maintains local roadways and bike and pedestrian facilities. The California Department of Transportation (Caltrans) has jurisdiction over State highway segments that traverse the City, including portions of Highways 1, 9, and 17. To help fund local roadway and intersection improvements, the City has developed a "Traffic Impact Fee" (TIF) that is applied to new development at the time of issuance of building permits (see discussion below in the "Planned Transportation Improvements" subsection for more details), and the City is active in acquiring transportation funding from federal and state sources.

[1] Located at 809 Center Street, Room 107, Santa Cruz, California during business hours: Monday through Thursday, 8 AM to 12 PM and 1 to 5 PM.

The City's Zoning Ordinance includes a trip reduction program requirement for specified classifications of employers (Chapter 10.46-Citywide Trip Reduction Program). Key purposes are: to establish programs and requirements for new and existing employers that will help to reduce traffic congestion and to improve air quality; to assist employers in identifying and utilizing cost-effective programs and methods to reduce vehicle trips made by employees; and to ensure the City plays a significant role in promoting alternatives to the use of single-occupant vehicles. The Zoning Ordinance also provides regulations regarding parking and parking space requirements for different land uses in Chapter 12 that include provisions for reduced parking for specified shared parking opportunities.

In addition to the City and Caltrans, other local and regional agencies responsible for transportation services and/or transportation planning include:

- *The Association of Monterey Bay Area Governments* (AMBAG) addresses transportation problems and concerns through its regional transportation system management element and preparation of regional traffic forecasts related to local land use and population projections. AMBAG is the federally designated Metropolitan Planning Organization (MPO) for transportation planning activities in the tri-county Monterey Bay Region. It is the lead agency responsible for developing and administering plans and programs to maintain eligibility and receive federal funds for the transportation systems in the region. AMBAG works with regional transportation planning agencies, transit providers, the Monterey Bay Unified Air Pollution Control District (MBUAPCD), state and federal governments, and organizations having interest in or responsibility for transportation planning and programming. AMBAG also coordinates transportation planning and programming activities with the three counties and 18 local jurisdictions within the Monterey Bay Region. AMBAG develops the Metropolitan Transportation Plan (MTP) and the Metropolitan Transportation Improvement Program (MTIP). (AMBAG website; online at http://www.ambag.org/programs/met_transp_plann.html).
- *The Santa Cruz Metropolitan Transit District* (SCMTD) provides transit services throughout Santa Cruz County.
- *The Santa Cruz Regional Transportation Commissio*n (SCCRTC) oversees planning and funding programs for local and regional projects within Santa Cruz County using state and federal transportation funds. The City of Santa Cruz has one City representative on the 12-member SCCRTC board and many City transportation projects are funded through grant programs administered by the SCCRTC (Fukuji Planning and Design, July 2003).
- *The University of California at Santa Cruz (UCSC)* implements a transportation systems management and parking program that provides a comprehensive package of commute options, including carpools, bicycles, and transit; free bus passes; and shuttle buses serving all areas of the campus.

SUMMARY OF TRANSPORTATION MODES & USE

The movement of people and goods is provided via a range of transportation modes including private and shared auto on a network of local and regional roads and highways; public transit; bicycle; walking; and rail service that is currently used for freight movement and limited seasonal visitor use. Transportation modes provide access for work, shopping, recreation, and

personal and social purposes. The state highways through the City also carry regional and statewide traffic. Key activity centers in the City include:

- The Mission Street corridor in the Westside;
- Ocean Street;
- Soquel Avenue in the eastside; the downtown area; the beach-Boardwalk area;
- the Harvey West-River Street area; and
- UCSC (Fukiji Planning and Design, July 2003).

The joint City-UCSC "Master Transportation Study" (MTS) found that 70% of daily residential mobility within the City is for local trips. For peak-hour travel citywide, 50% is local and 50% is regional travel. Of regional trips, commute in and commute out trips are roughly split in half (Fukiji Planning and Design, July 2003). Surveys conducted as part of the MTS found that 30% of trips in Santa Cruz are for work compared to 25% for social purposes, 18% for personal purposes, 14% for school, and 13% for shopping (Ibid.).

Daily citywide residential trips were made by auto, bus, bicycle and walking. City resident travel patterns identified in the MTS are shown on Figure 4.4-1.[2] For the PM peak period (4 PM to 7 PM), 80% of all travel modes used a car (68% drove alone and 12% carpooled) and 20% bicycled, walked or rode transit. Of these travel groups, full and part-time employees comprised 84% of the trips, compared to 16% for students and retired persons (Fukiji Planning and Design, July 2003). The Santa Cruz County Regional Transportation Commission reports that the number of people per vehicle has remained fairly constant over the last 15 years at an average of 1.2 persons per vehicle in the morning and 1.3 in the evening based on annual vehicle occupancy counts for Highway 1 and Highway 17 (Santa Cruz County Regional Transportation Commission, June 2010).

LOCAL & REGIONAL TRANSPORTATION PLANS & STUDIES

City-UCSC Master Transportation Study

In April 2000, the City of Santa Cruz and the University of California at Santa Cruz initiated a partnership to jointly fund a community-based approach to planning the City's transportation future that resulted in the completion of "The Master Transportation Study" (MTS). The Mission Statement of the study is to *"Create a Transportation Plan for the City of Santa Cruz that is inspiring, innovative and implementable with broad-based community support."* The MTS integrates pedestrian, bicycle, transit and street transportation plans and programs as a foundation for updating the City's General Plan, City zoning ordinance, UCSC's Long Range Development Plan and other city and regional transportation planning documents (Fukuji Planning and Design, July 2003). The MTS is not an adopted plan, but was reviewed and accepted by the City Council.

The MTS recommends a series of City-initiated strategies, short-term transit strategies and long-term recommendations to reduce single-occupant trips, increase multiple-occupant vehicles,

[2] All EIR figures are included in Chapter 7.0 at the end of the EIR (before appendices) for ease of reference as some figures are referenced in several sections.

increase transit, bicycle and pedestrian modes, and improve traffic system efficiency. Elements of these recommendations include an emphasis on carpooling and recommended support of a Bus Rapid Transit (BRT) system. The recommended travel mode splits as envisioned in the MTS would shift as follows:

- SINGLE-OCCUPANT VEHICLES (SOV): Decrease by 13% for internal trips and 4% for external trips.
- MULTIPLE-OCUPPANT VEHICLES (MOV): Increase by 4% for internal trips and 3% for external trips.
- BUS USE: Increase by 2% for internal trips and 1% for external trips.
- BIKE USE: Increase by 3% for internal trips.
- PEDESTRIAN USE: Increase by 4% for internal trips (Fukuji Planning and Design, July 2003).

  (Fukuji Planning and Design, July 2003).

The following projects are identified as MTS high priority projects:

- Metrobase Transit District Consolidations Operations Facility,
- Right-of-Way Acquisition on rail corridor,
- Bike and pedestrian path on rail right-of-way,
- Local bike projects and expanded bus service.

Santa Cruz County Regional Transportation Plan (RTP)

The Santa Cruz County Regional Transportation Commission (SCCRTC) deals with transportation issues in Santa Cruz County. The purpose of the SCCRTC is to:

- Set priorities for major capital improvements to the County's transportation infrastructure, including highways, major roads, rail and alternative transportation facilities.
- Pursue and allocate funding for all elements of the County's transportation system.
- Adopt policies to improve mobility, access and air quality.
- Plan for future projects and programs to improve the regional transportation system.
- Inform businesses and the public about alternatives to driving alone and the need to better manage our existing transportation system.
- Conduct programs to encourage the use of alternative transportation modes (Santa Cruz County Regional Transportation Commission website: www.sccrtc.org).

The *Regional Transportation Plan* (RTP) is a state-mandated, long-range plan that serves as a blueprint to guide future transportation funding decisions. The RTP, prepared by the SCCRTC, outlines transportation challenges and establishes investment priorities for all of Santa Cruz County. The plan includes lists of transit, highway, local road, bike, and pedestrian needs in the region and estimates the amount of local, state and federal dollars that may be available for these projects over the next 25 years. The plan is updated to reflect the latest funding and project needs every four to five years (Santa Cruz County Regional Transportation Commission website, online at: http://www.sccrtc.org/rtp.html.)

The current version was adopted by the SCCRTC in June 2010. The "2010 RTP" is a minor update of the last version, completed in 2005, and provides guidance for transportation policy and projects through the year 2035. The 2010 RTP is the SCCRTC's comprehensive planning document, which identifies the goals, projects, and programs that will maintain and improve the County's transportation system over the next twenty-five years. Identified improvements and projects are categorized as either "Constrained", meaning there are foreseeable funds for the improvement or "Unconstrained", meaning new revenues would need to be generated or become available. Individual projects listed in the 2010 RTP must still undergo separate design and environmental processes, and can only be implemented as local, state and federal funds become available (Santa Cruz County Regional Transportation Commission, June 2010).

The 2010 RTP carries forward goals from the 2001 and 2005 RTPs, which are to:

- Preserve and maintain the existing transportation system, emphasizing safety and efficiency
- Increase mobility by providing an improved and integrated multi-modal transportation system.
- Coordinate land use and transportation decisions to ensure that the region's social, cultural, and economic vitality are sustained for current and future generations.
- Ensure that the transportation system complements and enhances the natural environment of the Monterey Bay region and reduce greenhouse gas emissions.
- Make the most efficient use of limited transportation financial resources.
- Solicit broad public input on all aspects of regional and local transportation plans. Santa Cruz County Regional Transportation Commission, June 2010).

The 2010 RTP assigns future transportation funds to a range of projects and programs designed to maintain the current transportation system, provide traffic congestion relief and broaden transportation options. Key proposals include:

- Maintenance of the existing transportation network including roads, highways, bike lanes, sidewalks, and transit.
- Safety and operational improvements to Highways 1, 9, 17, 129 and 152.
- Adding auxiliary lanes and High Occupancy Vehicle (HOV) lanes on Highway 1 between Aptos and Santa Cruz.
- Modifications to major arterial roads -- including bus, pedestrian and bicycle facilities.
- Expanded bus service, with additional Highway 17 Express buses and more Park and Ride lots to serve Silicon Valley, University of California Santa Cruz (UCSC), and south county commuters.
- Construction of the Monterey Bay Sanctuary Scenic Trail Network along the coast.
- Local bicycle and pedestrian projects designed to increase bicycle commuting, and provide safe bicycle and pedestrian routes to schools.
- Expansion of specialized transport services in response to projected increases in senior and disabled populations.

- Increased availability of information about road conditions, transit operations, and other transportation options.
- Landscaping and lighting improvements to make transportation corridors part of livable communities (Santa Cruz County Regional Transportation Commission, June 2010).

The 2010 RTP also includes a new discussion on greenhouse gas (GHG) emissions in relation to transportation planning. In the absence of tools to measure the effectiveness of specific RTC policies towards reducing GHGs and without having the specific GHG reduction targets from the state during development of the 2010 RTP, the new chapter introduces some of the best practices which could be included in a portfolio of strategies to meet future emission reduction goals in Santa Cruz County. The RTP includes many projects that pro-actively implement GHG reduction strategies such as: operating a Commute Solutions program to encourage ridesharing; funding freeway service patrols to remove incidents and improve traffic flow; adding high occupancy vehicle lanes in the Highway 1 corridor to encourage carpools, vanpools and transit use; acquiring the rail corridor for goods movement, bicycle and pedestrian access and possible passenger service; and supporting bicycle, pedestrian and transit projects (Santa Cruz County Regional Transportation Commission, June 2010).

Monterey Bay Area Metropolitan Transportation Plan (AMBAG)

AMBAG is the MPO (Metropolitan Planning Organization) for the Monterey Bay Area, and as the region's MPO, AMBAG is required to produce certain documents that maintain the region's eligibility for federal transportation assistance. The Metropolitan Transportation Plan (MTP) is the federally mandated long-range transportation plan for the Monterey Bay Area. This plan lays out a financially constrained list of transportation projects over the following 25 years that will enhance regional mobility (AMBAG website, "Metropolitan Transportation Plan", online at: http://www.ambag.org/programs/met_transp_plann/mtp.html).

Federal regulations require that this long-range transportation plan be both financially constrained and fall under the on-road motor vehicle emissions budget included in the Federal Air Quality Maintenance Plan. The MTP, referenced as *Monterey Bay Area Mobility 2035*, was approved by the AMBAG Board of Directors on June 8, 2010, and includes goals, policies, programs and projects to meet the stated objectives and meet the transportation needs and deficiencies. Programs and projects are taken from each county's RTP and first incorporated, in their entirety, into the MTP (AMBAG, June 2010).

As a region that meets federal standards for ozone precursors, the region is considered to be in 'attainment' for those standards. As an attainment region, the MTP is only required to be updated every five years. Because new state legislation, SB 375, calls for MPOs to prepare a Sustainable Communities Strategy (SCS) to be used to synchronize and coordinate both the metropolitan transportation planning process and the regional housing needs allocation process, AMBAG is treating this 2010 update of the MTP as a minor update. Beginning with the 2012 update, AMBAG is moving to a four-year update cycle to align regional planning efforts for transportation with an eight year housing planning cycle. (AMBAG website, "Metropolitan Transportation Plan", online at: http://www.ambag.org/programs/met_transp_plann/mtp.html).

Caltrans' Corridor System Management Plan

Caltrans is in the process of developing a "Corridor System Management Plan" (CSMP) for Highway 1 from the junction of Highway 68 in Monterey County to King Street/Mission Street in Santa Cruz to develop strategies to manage the corridor and sustain existing transportation investments (Caltrans, October 2010). The draft plan indicates that the following strategies will be used to manage State Route 1 over the next 20 years:

- Maintenance and preservation of the roadway.
- Support improvement of transit service, including new express bus service on the HOV lanes planned for the Santa Cruz corridor.
- Support land use and transportation planning efforts such as AMBAG's "Blueprint Plan".
- Reduce congestion by encouraging programs that increase the use of transit, improve bicycle and pedestrian programs and encourage programs such as carpools, ridesharing, telecommuting and park-and-ride facilities to reduce demand.
- Intelligent Transportation Systems/Traveler Information/Traffic Management to clear congestion after collisions.
- Operational Improvements, including auxiliary lanes, intersection improvements, ramp metering (Caltrans, October 2010).

ROAD NETWORK & TRAFFIC CONDITIONS

Road and Highway Network

LOCAL ROADWAYS

The City's road system consists of arterial highways and arterial, collector and local streets (see Figure4.4-2). These different classifications relate to different transportation functions and are classified in terms of access, mobility, design and use. Additionally, visitor/coastal access and truck routes have been designated to facilitate the movement of visitor traffic and commodities.

Highways and arterial streets carry the City's heaviest traffic flows and provide regional and inter-community access. State highways through the City are described in the following section. Major arterial streets within the City include:

- Ocean Street (the primary north-south arterial);
- Mission Street, Water Street, Soquel Avenue and Broadway Avenue-Laurel Street (the primary east-west arterials);
- Other designated arterial streets include Bay Street, Delaware Avenue, Morrissey Blvd., Murray Street-San Lorenzo Blvd., Seabright Avenue, Market Street, Beach Street, Second Street, Front Street, Pacific Avenue, Cedar Avenue, Center Street, Walnut Street, River Street and High Street.

Collector streets provide circulation within and between neighborhoods and commercial and industrial areas. These streets usually serve relatively short trips and are meant to collect traffic from local streets and distribute them to the arterial network. Examples of collector streets

include: California Street, Chestnut Street, Escalona Drive, Fairmount Street, Frederick Street, King Street, Swift Street, and West Cliff Drive.

Local streets provide direct access to abutting land uses, collectors, or arterials, and usually do not accommodate bus routes.

Visitor/coastal access routes are intended to be inviting to visitors and to provide convenient, clear access to and from visitor and coastal destinations. Highways 1 and 17, Ocean Street and Mission Street are key visitor routes into Santa Cruz and the City's beach areas. West Cliff Drive also provides a scenic route along the coast.

Truck routes are intended to channel trucks through the community and away from residential and other areas where they would be a nuisance. The truck routes in the City are Highway 1 – Mission Street, Highway 17, Bay Street north of Mission, Empire Grade west of Bay, Highway 9, Morrissey Boulevard, and Soquel Avenue.

STATE HIGHWAYS

State highways that go through the City of Santa Cruz include segments of Highways 1, 17, and 9. Though referenced as "state routes" in Caltrans documents, the more common term, "highway", is used in this EIR. Highways 1 and 17 serve regional traffic, including motorists who commute to jobs in the Santa Clara Valley and motorists who travel into Santa Cruz County for recreational opportunities offered in the county. A short segment of Highway 9 also is within city limits.

Highway 1 provides access to San Francisco to the north and Monterey to the south. Regionally, Highway 1 is the major inter- and intra-county route for Santa Cruz County. Within the City of Santa Cruz, it is oriented in an east-west direction, although the interregional alignment of Highway 1 is primarily north-south. It is a four-lane arterial along Mission Street from the west side of Santa Cruz to Chestnut Street Extension, a four-lane expressway between Mission Street-Chestnut Street and River Street, and a four-lane freeway east of River Street. The speed limit on Highway 1 is 25 miles per hour (mph) along Mission Street, 45 mph along the expressway section, and 55 and 65 mph on the freeway sections further east. Recurrent congestion results in queuing on Highway 1 that extends for several miles during peak hours. Accidents, events, and other incidents in the corridor can further increase congestion related delays in either direction, on any day, including weekends.

Highway 9 is a two-lane state highway that connects the City of Santa Cruz with the San Lorenzo Valley, and eventually, Saratoga and Los Gatos. Approximately 0.5 miles of Route 9 are located within Santa Cruz city limits.

Highway 17 connects Santa Cruz with Scotts Valley and San Jose and other Santa Clara County communities. It is a four-lane freeway north of the Highway 1/ Highway 9 intersection. Highway 17 is the primary route between the Santa Clara Valley and Santa Cruz County that serves as both a commute route for Santa Cruz County residents that work in Santa Clara County and for recreational visitors that come to Cruz County. Congestion occurs both during weekday commute times and on summer weekends. This winding, four-lane road has steep sections, frequent road crossings, and substandard median shoulders and outside shoulders for

most of its length. In addition to the challenging roadway configuration, weather-related conditions such as thick fog, heavy rains and mudslides affect roadway operations.

Existing Traffic Conditions & Level of Service

Traffic conditions are measured by average daily traffic (ADT), peak hour traffic volumes, and level of service (LOS), average delay, and volume to capacity (V/C) ration. Average daily traffic is the total number of cars passing over a segment of the roadway, in both directions, on an average day. Peak hour volumes are the total number of cars passing over a roadway segment during the peak hour in the morning (AM) or afternoon/evening (PM). In the City of Santa Cruz, the peak hour for weekdays occurs in the evening.

"Level of Service" (LOS) is used to identify the magnitude of traffic congestion and delay at intersections. Traffic flows along city streets are typically controlled by the volume and capacity of the nearest intersection (City of Santa Cruz, 1994). Intersections are rated based on a grading scale of LOS "A" through LOS "F", with LOS A representing free flowing conditions and LOS F representing forced flow conditions. The intermediate levels of service represent incremental levels of congestion and delay between these two extremes.

The signalized intersection LOS methodology addresses the capacity, LOS, and other performance measures for lane groups and intersection approaches and the LOS for the intersection as a whole. Capacity is evaluated in terms of the ratio of demand flow rate to capacity (v/c ratio), whereas LOS is evaluated on the basis of control delay per vehicle (in seconds per vehicle). Control delay is the portion of the total delay attributed to traffic signal operation for signalized intersections. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay as listed in the following table from the *Highway Capacity Manual 2000,* Transportation Research Board.

LOS CRITERIA FOR SIGNALIZED INTERSECTIONS

LOS	LOS Control Delay per Vehicle (seconds/vehicle)
A	≤ 10
B	> 10–20
C	> 20–35
D	> 35–55
E	> 55–80
F	> 80

Capacity analysis at two-way stop control (TWSC) intersections depends on a clear description and understanding of the interaction of drivers on the minor or stop-controlled approach with drivers on the major street. Both gap acceptance and empirical models have been developed to describe this interaction. LOS for a TWSC intersection is determined by the computed or measured control delay and is defined for each minor movement. LOS is not defined for the intersection as a whole as shown in the following table.

LOS CRITERIA FOR TWSC INTERSECTIONS

LOS	LOS Control Delay per Vehicle (s/veh)
A	**0–10**
B	**> 10–15**
C	**> 15–25**
D	**> 25-35**
E	**> 35-50**
F	**> 50**

SOURCE: *Highway Capacity Manual 2000,* Transportation Research Board

The City of Santa Cruz has established LOS D as the minimum acceptable LOS for overall intersection operations during weekday AM and PM peak hours. However, the existing General Plan recognizes that some major regional intersections (which were once part of the "Congestion Management Program" – a formerly mandated state program[3]) as experiencing lower levels of service than the City's LOS D standard. Thus, the existing General Plan accepts a lower (i.e., worse) LOS at these intersections (listed below) per existing Circulation Policy 5.1.2 due to environmental, economic, and/or feasibility constraints with implementing improvements at these locations.

- Mission St. / Chestnut St.-Hwy 1 (F)
- Highway 1 / River St.-Hwy 9 (F)
- Ocean St. / Plymouth St. (F)
- Water St. / Ocean St. (F)
- Soquel Ave. / Ocean St. (F)
- Soquel Ave. / Water St. / Morrissey Blvd. (E)

Caltrans, which has jurisdiction over state highways, endeavors to maintain a target LOS at the transition between LOS C and D. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS (Caltrans, December 2002). If an existing State highway facility is operating at less than the appropriate target LOS, the existing LOS should be maintained (Ibid.).

The critical volume to capacity ratio (V/C) is another measure of the operating conditions of an intersection as opposed to LOS. The ratio provided in the worksheets is a calculation of the volume to capacity for the critical movements at the intersection. It is not the average of all the movements at the intersection. V/C is not used as a measure to define the levels of service.

[3] The Code of Federal Regulations, Title 23 Volume 1, adopted in April. 2005 require Transportation Management Areas (TMAs) to prepare Congestion Management Programs. TMAs are defined as urbanized areas with a population over 200,000. There are eight such areas in California plus Santa Barbara that asked to be included.

LOCAL INTERSECTION LEVELS OF SERVICE

Weekday Peak Hour Traffic Conditions. In the City of Santa Cruz, the peak hour for weekdays occurs in the evening. The PM peak hour (roughly 4 PM to 7PM) generally has the highest number of trips compared to the AM peak hour (7 AM to 10 AM) or the midday peak hour (Fukuji Planning and Design, July 2003). Intersection traffic counts were collected during the weekday PM peak hour (4:00 – 6:00 PM) at nearly 80 intersections throughout the City. The counts were done in May 2006, November 2006 and February 2007. The intersection counts are included in Appendix F-5.

The City's consulting traffic engineer compared traffic counts taken for the General Plan traffic with counts taken in 2008 and 2009 that were obtained from the SCCRTC to ensure the validity of the counts for the General Plan EIR analysis. The review indicates that all but one of the counts the City made in 2006 were higher than those reported by the Commission (Marquez, March 2010; see Appendix C for details). Traffic counts were also compared to traffic volumes reported by Caltrans; overall the counts reported for 2006 are 8% higher than those reported in 2008 (Ibid.).

In Fall 2010, UCSC completed new traffic counts at intersections within the City. Of the 24 intersections that the City was able to compare, traffic volumes increased for about half of these and half decreased. Overall, on average, traffic has decreased by 5%. The increased traffic increases were at intersections along Mission Street, High Street, and at the River/Water, Bay/W. Cliff, Delaware/Swift and Front/Laurel intersections (see Appendix C). The increased traffic has been addressed in the City's traffic model. Traffic from projects that were being constructed and/or occupied after the General Plan traffic counts were taken have been added to the "Existing" baseline conditions (see Appendix C) as these projects would be generating traffic at the time the EIR NOP was released. As a result, the existing-baseline condition for this EIR is slightly higher overall than the 2010 counts (Marquez, personal communication, February 2011), except for three intersections – Bay/West Cliff, King/Storey, and Laurel/Front. However, overall, the City continues to see lower counts than were experienced four years ago. Thus, the traffic estimates made for the General Plan 2030 are conservatively high and represent a worst-case scenario for CEQA purposes.

Quantitative Levels of Service (LOS) analysis was performed for the study intersections based the *2000 Highway Capacity Manual* methodologies, prepared by the Transportation Research Board. Intersection operations were evaluated using the Traffix analysis software. Intersection traffic flow operations are evaluated using a level of service (LOS) concept. The technical LOS calculations are included in Technical Appendix F-6, which is available for review at the City of Santa Cruz Planning Department[4] and is also included on the Draft EIR CD and on the online version of the Draft EIR on the City's website at www.cityofsantacruz.com, Planning Department.

Existing intersection PM peak hour levels of service are summarized in Table 4.4-1. All of the study intersections currently operate at an acceptable LOS except for the following 11 intersections, of which six intersections are signalized, and five intersections are unsignalized.

[4] Located at 809 Center Street, Room 107, Santa Cruz, California during business hours: Monday through Thursday, 8 AM to 12 PM and 1 to 5 PM.

For these intersections. Table 4.4-1 also identifies the delay (in seconds) and V/C ratio[5] for the intersections operating at unacceptable levels. For unsignalized intersections, the unacceptable LOS is usually due to delays on a minor leg of the intersection.

- Highway 1 / Highway 9-River Street (F)
- Highway 9-River / Street-Encinal (E)
- Ocean Street / San Lorenzo Blvd. -East Cliff Drive (E)
- Ocean Street / Water Street (E)
- Mission Street / Bay Street (E)
- Bay Street / Escalona Drive (F)
- Bay Street / California Street (F)
- Bay Street / California Avenue (F)
- Laurent Street / High Street (F)
- Western Drive / High Street (E)
- Seabright Avenue / Water Street (F)

Summer and Weekend Peak Hour Traffic Conditions. The City also experiences significant traffic during the summers and holiday weekends due to tourist traffic. A portion of the City's circulation system is affected by seasonal surges resulting from coastal access demands from all of northern California. Santa Cruz has recognized that it is not practical to build to accommodate this seasonal demand, and has considered beach access congestion to be acceptable as long as it does not divert traffic onto residential streets. The 2030 Plan has focused on addressing the congestion associated with the weekday travel of City residents, employees and customers.

STATE HIGHWAY TRAFFIC OPERATIONS & LEVEL OF SERVICE

Based on the most recent Caltrans traffic data (2009 counts), the average daily trips (ADT) on state highways within Santa Cruz is as follows:

- Highway 1, Morrissey Boulevard. ADT is approximately 88,000 to 97,000 trips with 6,300 to 6,900 trips occurring during the peak hour.
- Highway 17, between Santa Cruz and Scotts Valley. ADT is approximately 63,000 - 73,000 trips with 5,700 – 6,300 trips occurring during the peak hour.
- Highway 9 within Santa Cruz City Limits. ADT is approximately 5,000 trips with approximately 510-550 trips in the peak hour as measured at the City limits, north of Encinal.

[5] The V/C ratio is the average adjusted volume of vehicles for each movement over the serviceable capacity of each movement at the intersection. The volume for each approach is adjusted for percentage of trucks and buses, for peaking characteristics, and for abutting parking characteristics. The capacity of each movement is adjusted for lane width, grade, and green time available.

TABLE 4.4-1
Existing Intersection PM Peak Hour Levels of Service

	Intersection	PM Peak LOS	Delay [in seconds]	V/C Ratio
SIGNALIZED INTERSECTIONS				
1	Hwy 1/Western	B		
2	Mission/Swift	B		
3	Mission/Miramar	B		
4	Mission/Almar-Younglove	B		
5	**Mission/Bay**	**E**	**55.8**	**0.944**
6	Mission/Laurel	B		
7	Mission/Walnut	B		
8	Mission/King-Union	C		
9	Mission/Chestnut-Hwy. 1	D		
10	High/Moore	A		
11	Bay-Coolidge/High	D		
12	Bay/Nobel-Iowa	B		
13	Bay/King	B		
14	California/Laurel	C		
15	Chestnut/Laurel	B		
16	Center/Laurel	B		
17	Center/Mission	B		
18	Pacific/Laurel	B		
19	Front/Laurel	C		
20	Front/Metro Center	A		
21	Front/Cathcart	A		
22	Front/Soquel	C		
23	Front/Cooper	A		
24	Front-Pacific/Mission-Water	B		
25	River/Water	C		
26	N. Pacific/River	B		
27	River/Potrero	B		
28	**River/Hwy. 1**	**F**	**83.9**	**0.942**
29	**River/Encinal**	**E**	**73.9**	**1.099**
30	San Lorenzo/Laurel-Broadway	B		
31	Riverside/San Lorenzo	C		
32	Riverside/Third	C		
33	Riverside/Beach	A		
34	**Ocean/San Lorenzo-East Cliff**	**E**	**64.7**	**1.061**
35	Ocean/Broadway	C		
36	Ocean/Soquel	D		
37	**Ocean/Water**	**E**	**73.6**	**1.081**
38	Ocean/Kennan-Washburn	A		
39	Ocean-Hwy.17/Ocean-Plymouth	C		
40	Market/Water	C		

TABLE 4.4-1
Existing Intersection PM Peak Hour Levels of Service

	Intersection	PM Peak LOS	Delay [in seconds]	V/C Ratio
41	N. Branciforte/Water	D		
42	Branciforte/Soquel	C		
43	S. Branciforte/Broadway	B		
44	Seabright/Soquel	C		
45	Seabright/Broadway	B		
46	Seabright/Murray	D		
47	Morrissey/Water-Soquel	C		
48	Morrissey/Fairmount	A		
49	Frederick/Soquel	C		
50	Hagemann-Trevethan/Soquel	A		
51	Park/Soquel	B		
52	Capitola Rd./Soquel Ave.	C		
53	La Fonda/Soquel	B		
54	Riverside-Dakota/Soquel (new)	A		
55	River S./Soquel	B		
56	Seventh Ave./Soquel Ave.	C		
57	Seventh Ave./Capitola Rd.	C		
58	Seventh Ave./Eaton	D		
UNSIGNALIZED INTERSECTIONS				
59	**Bay/California St**	**F**	**434.0**	**1.704**
60	**Bay/California Ave**	**F**	**67.6**	**1.130**
61	West Cliff/Bay	C		
62	Beach/Pacific Ave	C		
63	Pacific Avenue/Center	B		
64	Storey/King	B		
65	River/Fern	B		
66	King/Laurel	B		
67	**Laurent/High**	**F**	**59.6**	**1.066**
68	Market/Isbel-Goss	B		
69	North Branciforte/Goss	B		
70	Highway 1/Shaffer Rd	B		
71	Cedar/Laurel	C		
72	**Bay/Escalona**	**F**	**782.2**	**2.015**
73	**Western/High**	**E**	**45.9**	**05.44**
74	Cliff/Beach	B		
75	Riverside/Second-Liebrandt	A		
76	**Seabright/Water**	**F**	**112.8**	**0.589**
77	Swift and Delaware	C		
78	Seventh Ave./Brommer	C		
79	Seventh Ave./E. Cliff	C		

SOURCE: Hatch Mott MacDonald

State Route 1 (Highway 1). The highest average daily traffic volumes along Highway 1 within Santa Cruz County occur in Capitola at the 41st Avenue interchange with 94,000 to 104,000 ADT (Caltrans, October 2010). The segment near the Morrissey Blvd. interchange carried the second highest volume of traffic. Highway 1 west of Morrissey Boulevard is currently operating at LOS D-E (Caltrans, October 2010). Congestion along Highway 1 extends for several miles during peak hours.

According to the *Transportation Concept Report* for Highway 1, the target level of service for State Highway 1 east of Morrissey Boulevard is LOS D (Caltrans, April 2006). Additionally, according to the *Caltrans Guide for the Preparation of Traffic Impact Studies (Caltrans, 2002),* if an existing State Highway facility is operating at less than the target LOS, the guide states that the existing LOS should be maintained (Caltrans, 2002).

Caltrans is in the process of developing a "Corridor System Management Plan" (CSMP) for Highway 1 from the junction of Highway 68 in Monterey County to King Street/Mission Street in Santa Cruz to develop strategies to manage the traffic and congestion along the corridor and sustain existing transportation investments. According to the draft plan released in October 2010, a small segment of the City is located in Segment 4 (Larkin Valley to Branciforte Creek Bridge), with the remainder of the City being located in Segment 5 (Branciforte Creek Bridge to King Street). The draft CSMP indicates that between Branciforte Creek and King Street, traffic volumes are projected to increase from 54,000 average daily trips (AADT) in 2008 to 60,000 in 2025. Existing and future LOS along Highway 1 as identified by Caltrans in this draft plan is identified below (Caltrans, October 2010).

	Existing LOS (2007)	Future LOS (2030)
❑ Hwy 1, Larkin Valley Road to Branciforte Creek Bridge	E - F	F
❑ Branciforte Creek Bridge to King St.	D - E	E - F

The *Concept Report* for Highway 1 indicates that to achieve LOS D on Highway 1, added capacity, operational improvements, and investment in the multi-modal system will be required (Caltrans, April 2006). The Route Concept Report for Highway 1 includes the addition of High Occupancy Vehicle (HOV) lanes to Highway 1 in each direction to reduce congestion, encourage carpooling, expand express bus service, and improve safety from Morrissey Boulevard to San Andreas/Larkin Valley Road. Caltrans' draft *Corridor System Management Plan* for Routes 1 and 183 indicates that LOS along added Highway 1 HOV lanes during peak hours would range between B and C in the year 2035 (Caltrans, October 2010). While the overall LOS would remain unchanged in the other lanes with addition of an HOV lane, average speeds would be increased and delays and average travel time would be reduced (Ibid.).

In October 2008, Caltrans completed improvements to Highways 1 and 17 as part of the Route 1/17 Merge Lanes Project, which was designed to improve merging by adding additional merge lanes from Highway 1 to Highway 17. The project added merge lanes to the connection between northbound Route 1 and northbound Route 17 and to southbound Route 1 through the 1/17 interchange. Existing bridge structures were widened or replaced, soundwalls were constructed, and landscaping was installed.

State Route 17 (Highway 17). Highway 17 near Pasatiempo Boulevard is currently operating at LOS F (Caltrans, April 2006). According to the *Transportation Concept Report* for Highway 17, the target peak level of service for State Highway 17 between the Ocean Street and Scotts Valley is LOS E (Caltrans, January 2006). The Route Concept Report for Highway 17 indicates that widening is not envisioned and this segment of the highway is considered to be a four-lane freeway (Caltrans, January 2006).

Traffic Forecasts

The SCCRTC's *Regional Transportation Plan* (RTP) indicates that annual Vehicle Miles Traveled (VMT) throughout Santa Cruz County will increase over 2005 levels within the next 30 years. These VMT projections are made using AMBAG's Regional Travel Demand Model (RTDM). The current RTDM is developed and calibrated for 2005 and forecast for the year 2035.[6] Overall the RTP forecasts the following traffic conditions between the years 2005 and 2035 within Santa Cruz County:

- Daily person trips (trips per person) are projected to increase by 16%.
- Single-occupant auto travel for work trips is projected to increase by 13%.
- Daily vehicle miles of travel are projected to increase by 40%.
- The largest increases in vehicle miles traveled are projected to be on freeways (Santa Cruz County Regional Transportation Commission, June 2010, page 2-10).

According to the SCCRTC, there are three reasons why traffic congestion is a major issue in Santa Cruz County, as well as elsewhere in the state and nation. First, more people are driving more miles and per person vehicle registrations are at an all time high. Second, investment in transportation facilities and services has not kept pace with growing demands for road space and transportation alternatives due to decreases in the amount of transportation funding available for local projects. Third, there has been a lack of consensus on how to invest in the County's transportation system (Santa Cruz County Regional Transportation Commission, June 2010).

The joint City-UCSC "Master Transportation Study" (MTS) also made traffic projections for the years 2000 to 2020 based on AMBAG traffic model projections and population projections, which have now been superseded by more current projections as described in the POPULATION AND HOUSING (Chapter 4.2) section of this EIR. The AMBAG projections at the time the MTS was prepared assumed a 15% increase in population growth within the City (from 67,900 to 78,100 people in 2020) and a 24% increase in employment growth (from 37,800 workers to 47,000 workers 2020) (Fukuji Planning and Design, July 2003). However, current adopted AMBAG forecasts show a lower level of forecast growth with estimated population at 65,884 in 2030 and 41,548 workers in 2030.

[6] The AMBAG model relies on land-use and socio-economic data from the AMBAG forecast and road and transit network information to estimate traffic volumes and determine trip generation rates by mode. Where possible, the model is calibrated using existing roadway data (Santa Cruz County Regional Transportation Commission, June 2010).

The MTS includes a goal of no net growth in traffic between 2000 and 2020 and examined two scenarios to substantially decrease single-occupant travel and increase use of other transportation modes. One scenario increases transit use moderately and carpooling substantially. The second scenario increases transit substantially and carpooling moderately. Both scenarios were based on implementation of regional transportation improvements of either the addition of a HOV lane on Highway 1 or development of a Bus Rapid Transit (BRT) corridor along the Union Pacific Railroad right-of-way (Fukuji Planning and Design, July 2003). In Scenario 1, to achieve no growth in the year 2020 traffic, single-occupant travel internal to Santa Cruz needs to be reduced by 29%, carpooling increased by 75%, transit use increased by 50%, and bicycling and walking modes increased by 38% and 100%, respectively (Ibid.). Without a change in travel patterns, the MTS predicted a 19% increase in vehicle miles traveled between the years 2000 and 2020.

BICYCLE & PEDESTRIAN CIRCULATION

Bicycle Circulation

The existing bikeway system in the City of Santa Cruz has developed over the last 35 years. The City of Santa Cruz' bicycle system is comprised of off-street multi-use paths (Class I), on-street bicycle lanes (Class II) and on-street bicycle routes (Class III). Class I and Class II bike facilities are shown on Figure 4.4-3. Class I bike paths are currently limited to West Cliff Drive, the San Lorenzo River levees, a new path under Highway 1 from the river levee, and a new path under Highway 1 at Lee Street, all of which are also shared by pedestrians. A Class I path also is provided on the UCSC campus.

Support facilities include different classes of bicycle parking facilities, which are required by City parking regulations, and shower facilities at major employment facilities. All of the SCMTD buses are equipped with front-mounted bicycle racks capable of carrying two bicycles (City of Santa Cruz, November 2008). The University of California operates a bike shuttle near the intersection of Bay/Mission Streets to transport bicycles to the University.

In October 2007, the City of Santa Cruz was awarded the Silver Level Bicycle Friendly Community by the League of American Bicyclists. According to data contained in the 2000 Census, approximately 4.7% of the commuters within the City of Santa Cruz are bicyclists (City of Santa Cruz, 2008). The City's existing Bicycle Plan, adopted in November 2008, forecasts a bicycling increase to 7% of the peak hour traffic within a 5-year period.

The emphasis of the 2008 Bicycle Transportation Plan shifted from earlier plans in 2000 and 2004 Plans, which were focused on completing large-scale bicycle projects on the major commute corridors. Many of those significant projects have been completed—Bay Street, Beach Street, Broadway-Laurel, High Street, Soquel Avenue, and major portions of the San Lorenzo River Path. The bicycling projects to be pursued in the next five years include completing those significant projects begun in the earlier Plans, as well as building the connector projects that can get bicyclists from origin to destination easily and safely. One new possibility for an east-west bicycle travel corridor is the Union Pacific rail right-of- way, which the SCCRTC has purchased and begun a planning process.

Pedestrian Circulation

The City has approximately 135 miles of sidewalks. Approximately 50 miles of sidewalk is missing from the existing system; predominate problem areas are the upper eastside and Westlake areas that have large continuous sidewalk links missing (Fukuji Planning and Design, July 2003).

The "Pedestrian System" chapter of the Master Transportation Study is considered the City's Pedestrian Plan. The MTS was accepted by the City Council on December 9, 2003. The MTS goals for Santa Cruz's pedestrian system are to:

- Provide multiple transportation modes thereby creating a flexible and adaptive transportation system throughout the City of Santa Cruz.
- Close all "gaps" in the pedestrian network and connect all major destinations and activity centers.
- Ensure that the City's diverse user groups have access to a sustainable and efficient mode of transportation / Create a system that is "scaleable" and responds to changing community needs, and provide flexibility and variety in the City's transportation network.
- Adopt design standards for the pedestrian system to assure a high level of user amenities, safety and quality.

Overall, priorities for the City's pedestrian system include completion and maintenance of the City sidewalk system, improve safety, adopt pedestrian-friendly street designs, enhance key pedestrian connections, and encourage walking (Fukuji Planning and Design, July 2003). .

PUBLIC TRANSIT

Transit service within Santa Cruz County is primarily provided by the Santa Cruz Metropolitan Transit District (SCMTD). Regional bus routes provide service to destinations in Santa Clara and Monterey Counties including daily weekday service via Highway 17 by the SCMTD. SCMTD buses provide service from the downtown Santa Cruz transit center to the San Jose Caltrain station, with connections to San Francisco, Sacramento, Stockton and other cities. Greyhound bus service also is provided from Downtown Santa Cruz to select destinations.

The City of Santa Cruz operated the Summer Beach Shuttle in the past when private donations were available. The Shuttle provided service to and from destinations within the City of Santa Cruz, such as the Downtown and the Santa Cruz Boardwalk. Use of the County Government Center parking lot was used in conjunction with the beach shuttle. Due to lack of funding, the Summer Beach Shuttle was discontinued over ten years ago. Recently the business sector has initiated a Beach-Downtown Shuttle for the summer of 2010. Budget constraints have prevented the City from continuing operation of a beach shuttle.

SCMTD Service

The Santa Cruz Metropolitan Transit District (SCMTD), also known as Santa Cruz Metro, provides transit service within Santa Cruz County. SCMTD provides the following types of service: regional (Highway 17 Express), intercity (8 routes), urban local-feeder (16 routes), UCSC (7 routes) and rural routes (7 routes) (Wilbur Smith Associates, December 2008). The Highway 17 Express Bus service was initiated after the 1989 Loma Prieta earthquake in response to an emergency need for transit over the Hill while Highway 17 was being repaired, and is currently a joint operation between the SCMTD, . Amtrak, and the Santa Clara Valley Transportation Authority (VTA). The route currently connects Santa Cruz (downtown METRO station) and San Jose (Diridon station); at the Diridon station, passengers can connect to the Santa Clara Valley Transportation Authority' transit system and Caltrain and Amtrak regional rail systems (Ibid.).

The District serves transit centers in Santa Cruz, Capitola, Felton, Scotts Valley and downtown Watsonville. SCMTD routes also meet Monterey-Salinas Transit (MST) routes at the Watsonville Transit Center. The two operators have provided reciprocal transfers since 1989. Additionally, SCMTD partners with the University of California, Santa Cruz (UCSC) to provide late night fixed route and demand response service in the general Westside Santa Cruz area (AMBAG, June 2010).

The SCMTD complements its regular fixed-route bus service with ParaCruz, a shared ride-door-to-door paratransit service that provides public transportation for persons who are unable to independently use fixed route buses due to a disability some or all of the time. It is provided by public transportation systems as part of the requirements of the Americans with Disabilities Act of 1990 (ADA). Rides are scheduled in advance and frequently include picking up and dropping off other customers along the way. ParaCruz operates a fleet of lift-equipped small buses and ramp-equipped minivans. On November 1, 2004, Santa Cruz METRO assumed direct operation of the ParaCruz (Santa Cruz Metropolitan Transit District, "METRO Para Cruz ADA Paratransit Service").

SCMTD's total ridership on fixed route service for Fiscal Year 2008-09 was 5,987,518; annual expenses for providing these transit services, including ParaCruz, were approximately $37 million (Santa Cruz County Regional Transportation Commission, June 2010). From 2003 to 2007, there had been a general increase in fare revenues and total operating cost, while ridership and hours of operation declined (Wilbur Smith Associates, December 2008). However, the SCCRTC noted a 7% increase in ridership since Fiscal Year 2004/05 due to rising gasoline prices, traffic congestion, and job market uncertainty (Santa Cruz County Regional Transportation Commission, June 2010).

Increasing congestion on highways and the local transportation network in Santa Cruz County is expected to generate more transit service demand (AMBAG, June 2010). However, the SCCRTC's RTP does not envision expansion of transit services without additional revenues. In order to increase transit service to levels needed to meet projected population growth, greenhouse gas emission reduction goals, and significantly increase the percentage of people using transit, bus service would need to be increased by 25% at an additional annual cost of approximately $11 million (Santa Cruz County Regional Transportation Commission, June 2010). To accommodate this demand, the SCMTD would like to increase service, but due to

ongoing funding shortfalls, SCMTD is struggling to maintain existing service (Ibid.). Due to declining sales tax and other non-fare revenue sources, the SCMTD reduced service in the fall of 2010. It is expected that transit service will continue with minor improvements without major route cuts or rate changes for about five years, however, additional funding will be necessary in the future for expansion of service (White, SCMTD, personal communication, August 2011).

In recent years, Metro has been working on upgrading its transit operations facilities in an effort to reduce operating costs, improve efficiency, and allow for future expansion of the transit system (Santa Cruz County Regional Transportation Commission, June 2010). In 2008, Santa Cruz METRO completed the compressed natural gas-CNG fueling station and conversion of 40 buses.

Bus Rapid Transit (BRT)

The joint City-UCSC "Master Transportation Study" (MTS) recommends "Bus Rapid Transit" (BRT) for long-term implementation as the technology with the highest potential to increase ridership and shift travel modes to transit. BRT is a rubber tire vehicle system operation on an exclusive transit way or dedicated busway with flexibility to operate on surface streets with mixed flow traffic. According to the MTS, a BRT system has significant potential to affect a regional commute shift away from SOV to transit for trips to and from the UCSC campus, downtown and the Harvey West area. A BRT busway could operate on a dedicated HOV lane along Highway 1 or on a shared bus/freight/bicycle lane using the Union Pacific rail corridor. Application to Soquel Avenue and Water Street was also considered (Fukuji Planning and Design, July 2003).

RAIL SERVICE

Freight Service

The former Union Pacific Railroad rail line forms a continuous, single-track, 32-two mile corridor from Davenport to the City of Watsonville. The Santa Cruz County Regional Transportation Commission is in the process of purchasing the right-of-way and is awaiting final approval from the state. This branch rail line extends from Watsonville Junction in Pajaro north to Davenport and passes through much of the county's urban area. For many years, freight deliveries to and from the CEMEX cement plant in Davenport occurred three times per week. As of 2010, CEMEX plant operations ceased due to the economic downturn. The rail line is currently operated by Sierra Northern. Sierra Northern Railway. Sierra runs trains twice per week to serve existing freight customers and stores empty rail cars in the unused northern section of the rail line. Sierra will be responsible for operations, maintenance and start-up costs associated with rail service (Santa Cruz County Transportation Commission, February 2011).

Recreational Service

The Santa Cruz Big Trees and Pacific Railway Company operates a tourist-oriented passenger service between Felton and the Santa Cruz Beach Boardwalk on its 9-mile track line from Santa Cruz to its current terminus at Roaring Camp. The service is provided daily during mid June through the end of August, and weekends and holidays in May, early June, September through

October, late November, and December. The trains run twice in each direction every day during regular operations, and partially use the Union Pacific Railway tracks that cross Pacific Avenue just north of the intersection of Pacific Avenue and Beach Street. The line is occasionally used for freight (AMBAG, June 2010). Historically the line crossed the Santa Cruz Mountains to Los Gatos, but was abandoned in 1939 past Olympia. The tunnel sections are now used as records storage for major corporations in the San Francisco Bay Area (Ibid.).

Passenger Service

The Santa Cruz Branch line has been the subject of a number of studies regarding its potential for passenger rail service. A 1996 study analyzed the potential viability of inter-city passenger rail service between Santa Cruz and Watsonville to San Jose. The 1999 Major Transportation Investment Study examined three options for passenger rail on the Santa Cruz Branch line along the Watsonville- Santa Cruz-UCSC corridor. Also in 1999, the Around-the-Bay Rail Study looked at the feasibility of partnering with Monterey County to bring passenger rail from the San Francisco Bay Area to both counties, as well as linking the two counties via a wharf-to-wharf type rail transit service.

On May 6, 2010, the SCCRTC unanimously agreed to acquire the Santa Cruz Branch Rail Line right-of-way, which is being finalized. Future transportation uses could include passenger rail service, transit, bicycle and pedestrian facilities, and freight rail service. This project was one of the selected outcomes for the Watsonville-Santa Cruz-UCSC corridor from the SCCRTC's 1999 Major Transportation Investment Study. The SCCRTC also intends to maintain the existing freight service on the rail line. The *2005 Regional Transportation Plan* (Policy 3.4.5) supports reserving areas adjacent to rail lines for future rail and bus facilities as part of new development adjacent to rail lines. Passenger service to from Santa Cruz to Davenport is currently being considered by the SCCRTC.

PLANNED IMPROVEMENTS

State Highways

STATE ROUTE 1

Beginning in 1986 the Santa Cruz County Regional Transportation Commission (SCCRTC), working with Caltrans and the Federal Highway Administration, conducted a series of studies to identify an affordable and appropriate response to the growing congestion problem on Highway 1, including feasibility studies for Highway Occupancy Vehicle Lanes (HOV) on Highway 1 and a toll lane feasibility study in 2002. The current Caltrans Route Concept Report for Highway 1 includes the addition of High Occupancy Vehicle (HOV) lanes to Highway 1 (California Department of Transportation, April 2006). This project will add a lane in each direction to reduce congestion, encourage carpooling, expand express bus service, and improve safety. The limits of this project extend from Morrissey Boulevard to San Andreas/Larkin Valley Road. Preliminary traffic performance data shows the anticipated shift in traffic volumes from local arterials to Highway 1 with the HOV Lane Alternative (Santa Cruz Regional Transportation Commission website, http://www.sccrtc.org/hov.html). Caltrans' draft *Corridor System Management Plan* for Routes 1 and 183 also supports HOV lanes on Highway 1 in

conjunction with other transportation demand management strategies (Caltrans, October 2010).Detailed project design and environmental data is in development and is expected to be available in the winter of 2012. Funding is not secured to advance the project beyond the current environmental study. The SCCRTC's *2010 Regional Transportation Plan* assumes adoption of a transportation sales tax measure to provide a significant amount of the funding needed to advance this project into the next development phase – final design, right-of-way, and construction (Santa Cruz Regional Transportation Commission website, http://www.sccrtc.org/hov.html).

In 2006, the Santa Cruz County Regional Transportation Commission initiated work on the preliminary design and environmental review phase of the Highway 1 Soquel to Morrissey Auxiliary Lanes Project spanning the busiest section of Highway 1 in Santa Cruz County (carrying 115,000 vehicles per day in 2006). An auxiliary lane connects an adjacent highway on-ramp with the next highway off-ramp thereby extending the weaving and merging distance between the ramps and improving traffic flow and safety on the highway. An auxiliary lane is not designed for use by through traffic, but to provide greater separation between vehicles entering and exiting the freeway from mainline traffic. The Soquel/Morrissey Auxiliary Lanes project proposes to add 12–foot wide auxiliary lanes northbound and southbound between Soquel Avenue and Morrissey Boulevard, respectively. This project includes reconstruction of the La Fonda Avenue overcrossing; the La Fonda Avenue overcrossing must be replaced to accommodate the auxiliary lanes under the bridge. The new La Fonda Avenue bridge will be wider to provide bike lanes and wider sidewalks for pedestrians. This project is designed to complement the work recently completed as part of the Highway 1/17Merge Lanes Project, by eliminating the proposed lane drop north of the La Fonda Avenue resulting from the Highway 1/Highway 17 Project. Design is nearly complete, and the final environmental documents were approved by Caltrans, although the project is contingent on approval by the California Transportation Commission.. Funding has been secured for the project. Construction could begin in 2012 or 2013.

STATE ROUTE 17

According to the Transportation Concept Report for State Route 17 in District 5 (Caltrans District 5, January 2006), the target level of service for State Highway 17 between the Ocean Street and Scotts Valley is LOS E. The Route Concept Report for Highway 17 indicates that the highway segment between Santa Cruz and Scotts Valley accommodates local and regional trips. Recognizing the existing policy of the Santa Cruz County Regional Transportation Commission, widening is not envisioned and this segment of the highway is considered to be a four-lane freeway (Caltrans, January 2006).

Reconstruction of the highway to meet current standards would be both exorbitantly expensive and environmentally destructive. Thus, over the past two decades, the Santa Cruz County Regional Transportation Commission (SCCRTC) has consistently opted to keep Highway 17 a four-lane highway, targeting funds for safety and operational improvements. Median barriers, acceleration-deceleration lanes, motorist call boxes and changeable message signs are improvements that have been installed over the past decade.

In the fall of 2000, Caltrans completed a Project Report that assessed the operational value and cost of constructing a 1.1-mile truck climbing lane on northbound Highway 17 at the

summit. As a result of the study, Caltrans recommended, and the Regional Transportation Commission concurred, not building the project ("No Build"), as the potential benefits of the project were not justified by the high cost and potentially significant environmental impacts. As an alternative, Caltrans continued to evaluate other potential safety and operational improvements on Highway 17. The products of this analysis were two safety improvement projects on Highway 17 at Laurel Curve and Glenwood Curve.

In response to the need for further safety and reliability improvements in this corridor, the *Highway 17 Transportation Improvement Study* was conducted to provide SCCRTC, Santa Clara Valley Transit Authority (VTA), and SCMTD to recommend safety and efficiency improvement projects with the following two main objectives: 1) recommend steps *to optimize* the Highway 17 Express Bus service reliability; and 2) *expand* Highway 17 Express Bus ridership in the corridor in order to reduce vehicle trips, miles traveled, and emissions. Recognizing that the roadway and traffic conditions along Highway 17 affect the operation of the Highway 17 Express Bus service, an additional objective was to recommend safety and operational improvements to add reliability, speed and functionality to the project corridor to benefit both the patrons of the Highway 17 Express Bus service and the motorists traveling along this route. A series of recommendations were made to support and expand the existing transit service on Highway 17, including provision of weekend service.

STATE ROUTE 9

The Highway 1/Highway 9 intersection, which is controlled by a signal, currently operates at LOS E during the both the PM and Design Day peak hours, which does not meet Caltrans standards. The City is working with Caltrans to implement lane modifications at this intersection. The improvements require Caltrans approval and an encroachment permit. With implementation of these improvements, the intersection would operate at LOS D during both the existing PM and Design Day peak hours.

The following improvements are included in the Highway 1/Highway 9 intersection planned improvement:

- Widen and add a left-thru turn lane from Highway 9 southbound.
- Improve the northbound River Street approach to modify the existing exclusive left-turn lane to a shared thru/left-turn lane.
- Widen and add a second left-turn lane from Highway 1 southbound onto Highway 9.
- Widen and add a second northbound lane on Highway 9.
- Modify signal.
- Add bike lane and shoulder

Currently, a Project Report, preliminary engineering, associated studies and environmental review are underway. The improvements are already required under existing conditions.

Planned City Improvements

The City faces an ongoing challenge to meet its capital needs with limited resources. Preparing and adopting a Capital Improvements Program (CIP) is an important part of the City's planning

process to identify and meet those needs. It is a multi-year schedule of projects with their associated costs and proposed funding sources. The CIP represents the best efforts to allocate available resources toward projects that provide the most benefit for the people of Santa Cruz. In addition to the Highway 1 / Highway 9 intersection improvement described above, other major improvements on the current CIP include: intersection improvements at Mission/Bay and Mission/Chestnut (design and environmental review); intersection signalization (Bay/West Cliff); installation of a roundabout at the Pacific/Beach intersection;

The City operates a "Traffic Impact Fee" (TIF) program based on future projected trips generated for each new project. The TIF program, adopted in June 2005, evaluated over 60 intersections and identified numerous projects within the City which were needed to address the effects of cumulative development, and fees established. The fees are used to fund planned improvements at those intersections and roadways included in the program. New development and redevelopment projects are required to pay traffic impact fees, which are calculated at the time of building permit issuance. The TIF includes highway intersections on Mission (Highway 1) and at the Highway 1 / Highway 9 intersection.

The City's TIF program includes both a City-wide TIF fee and a Beach/South of Laurel (B/SOL) TIF. New projects that are located in the B/SOL area are required to pay both fees. The fee program is updated annually in July. The fees are based on project trip generation and are calculated at the time the project applies for a building permit. By ordinance the City has identified the per trip fee, which was determined by dividing the total cost of all projects identified in the City's "Cumulative Development Traffic Study" by the total cumulative additional trips added by new development. The fee assumes the City will fund 25% of the cost of improvements as a result of existing capacity differences. In addition, 15% of the fee is dedicated to alternative transportation. The current City-wide fee is $405 per trip. The current B/SOL fee is $94 per trip.

Bicycle and Pedestrian Path Improvements

The City's adopted *Bicycle Transportation Plan* (2008) includes the following new paths: Arana Gulch path to connect Broadway with Brommer Street; Branciforte Creek Connection to complete the levee path under the Soquel Bridge; Monterey Bay Sanctuary Scenic Trail Network (as discussed below); and Spring Street Connection to UCSC. The Plan also includes numerous other improvements to existing bike lanes and facilities.

The Monterey Bay Sanctuary Scenic Trail Network (MBSST) is proposed to span the Monterey Bay from Lover's Point in Pacific Grove to Wilder Ranch in Santa Cruz. The SCCRTC is in the process of developing a more detailed plan for the Santa Cruz County portion of the trail. The MBSST efforts will ultimately result in a network of continuous multi-use recreational, interpretive and transportation pathways spanning the Monterey Bay that will also be an important piece of the 1,300 mile statewide California Coastal Trail (Santa Cruz Regional Transportation Commission, January 2008). If the SCCRTC is successful in its rail line acquisition efforts, part of the network may be built within the rail line right-of-way (Ibid.).

The SCCRTC is working on a comprehensive Master Planning process that will include: developing goals and objectives; identifying and assessing possible segments; setting design options; soliciting and incorporating input from interested parties and the community at large;

preparing cost estimates for segments; and conducting environmental analysis of the Plan. In addition to identifying new trails, the MBSST Network is intended to link together (and upgrade where needed) trail segments that already exist and to fill in gaps in the existing trail system (Santa Cruz Regional Transportation Commission, January 2008).

TRANSPORTATION MANAGEMENT

Transportation System Management

Transportation Systems Management (TSM) refers to methods to find optimum strategies to relieve, lessen or control traffic congestion with minimum roadway widening. These strategies can reduce vehicle travel time and enhance system accessibility with little impact on other modes (Fukuji Planning and Design, July 2003). Examples of TSM measures include signal synchronization, intersection modifications, access management, i.e., consolidation of driveways, railroad crossing modifications, highway ramp metering, preferential treatment for high occupancy vehicles, and signage and lighting upgrades.

Transportation Demand Management

Transportation Demand Management (TDM) refers to measures that can be implemented to encourage the use of alternative modes of transportation to single occupancy vehicles. TDM emphasizes the movement of people and goods rather than motor vehicles, and gives priority to public transit, ridesharing and non-motorized travel, particularly under congested conditions (Fukuji Planning and Design, July 2003). TDM is a demand side strategy with the purpose to change human travel behavior through incentives and disincentives in order to reduce the number of peak-hour vehicle trips, shift trips to non-peak times, and increase the percentage of people bicycling, walking, riding transit, carpooling and vanpooling (Ibid.). Examples include carpool and vanpool rideshare matching, employer outreach and assistance, emergency ride home programs, telecommuting, bike loan programs, bicycle parking subsidies, bicycle advocacy, and parking pricing and management strategies.

Existing agencies and programs that support and promote TDM in the city of Santa Cruz include the following as presented in the "Master Transportation Study":

- *Santa Cruz Regional Transportation Commission* (SCCRTC) serves many transportation roles in Santa Cruz County, including housing "Commute Solutions" and providing bicycle planning and funding to the region. Commute Solutions provides carpool and vanpool ride matching to commuters throughout Santa Cruz County, especially long-distance commuters.
- *Transportation Membership Services* is run by Ecology Action and offers programs that encourage member employees to use transportation modes other than driving alone to commute to and from work, including Emergency Ride Home Programs, 0% Interest Bicycle Loan Programs and Discount Metro Bus Passes.
- *Ecology Action* supports "Bike to Work," a 10-year old community-based effort that seeks to increase the number of people riding bikes. Ecology Action also receives funds for the Electric Bike Commuter Incentive Program.

- *Onsite Employer Programs*. Major employers within the City that implement TDM measures include: UCSC, SCMTD, the City of Santa Cruz, the County of Santa Cruz, the Seaside Company, the Santa Cruz Medical Clinic, and others.

Traffic Calming

Measures to reduce speeding and cutting through neighborhoods has been a focus over the years as these issues have been raised by residents. Measures include installation of traffic claming measures, signage, and improving the arterial street system.

PARKING

The City of Santa Cruz maintains both on-street and off-street public parking throughout the City, including the Downtown Parking District. Amendments to the State CEQA Guidelines, effective in March 2010, eliminated the environmental checklist question regarding adequacy of parking. Nonetheless, general background on existing conditions is provided below.

Downtown Parking District

Public parking in the downtown area is managed by the Downtown Parking District, which includes the most concentrated City ownership and operation of parking in the City and is the only parking district in the City. In 2007, there were 4,510 parking spaces available to the public, including 820 on-street spaces, 2,247 off-street spaces, and 1,443 private spaces ("Downtown Parking Study, 2007"). In 2010, there were 4,583 parking spaces available to the public, including 830 on-street spaces, 2,226 off-street parking spaces and 1,527 private parking spaces. In 2010, the parking supply (4,583 spaces) in the Downtown Parking District exceeded demand (4,504 spaces). However, by the year 2012 with new projects in place, the demand (4,731 spaces) is estimated to exceed supply (4,638 spaces) by 93 spaces.

The City-operated spaces include a wide variety of parking types dispersed throughout the District, including meters that have different time periods. The municipal parking garages have an average peak occupancy of approximately 85%, with the Cedar/Church garage almost 100% occupied at peak times (Fukuji Planning and Design, July 2003).

New businesses are exempt from typical parking requirements required elsewhere in the City. Business owners have the option of providing required parking or paying a Deficiency Fee that is used to fund, operate and maintain parking facilities. The District charges an annual deficiency fee.

Beach / South of Laurel Area

The Beach / South of Laurel area includes the area directly adjacent to the Downtown Parking District and stretching down to the Beach. It provides parking for both its own set of uses, though also experiences overflow demand from the Downtown and the Beach Areas. The Beach Area itself includes the largest supply of privately provided for-charge parking in the City, as well as a mix of publicly provided parking (Fukuji Planning and Design, July 2003).

The Beach / South of Laurel Area includes about 7,800 parking spaces with over 80% of which, about 6,300 space, are in the Beach Area. A total of 4,145 spaces, a little over 50% of the total, are available to the general public, independent of intended activity. A total of 3,562 of these spaces are in the in the Beach Area and 583 spaces are in the South of Laurel district. Unrestricted publicly available Beach Area spaces are dominated by the two Seaside Company lots, with a combined total of 1,771 spaces, and the City owned and operated 430-space Wharf lot. Other spaces include other City operated lots, on-street meters, and free curbside spaces. South of Laurel general public access spaces include small City operated lots, on-street meters, and free curbside parking spaces. The City operates 633 on-street meters in the Beach and South of Laurel areas (Fukuji Planning and Design, July 2003).

Residential Parking Permit Programs

Due to seasonal influx of visitors and UCSC students and encroachment into residential neighborhoods, the City implements a residential parking program in the following neighborhoods: beach area, downtown, Lighthouse/Cowell neighborhood, eastside, Seabright, and Westside. Residents in these areas must purchase permits to park on streets without citations. According to information on the City's Public Works Department website, the coastal permit programs are enforced seasonally from May 15th through September 30th, between the hours of 9 AM and 9 PM, everyday. The Westside permit program is enforced from September 15th through June 30th, Monday through Friday, during posted hours (excluding City holidays). Parking in these areas without a permit is subject to a citation and fine. The downtown and eastside area permit requirements are enforced all year.

4.4.2 RELEVANT PROJECT ELEMENTS

PROPOSED GOALS, POLICIES & ACTIONS

The proposed *General Plan 2030* includes goals, policies and actions that address transportation planning, management and traffic. The MOBILITY chapter of the draft *General Plan 2030* corresponds to the required circulation element. Its purpose is to set forth policies and ways to ease the ability of people and vehicles to move around, out of, and into the City in the long term, through 2030. This chapter looks at ways to facilitate transportation alternatives, keep transportation and road systems safe and efficient, and systematically interconnect bicycle and pedestrian ways. The proposals below aim to encourage greater use of alternative transportation modes and reduce automobile travel in concert with other parts of the Plan that foster supportive land uses, building types, and activities. The City Council accepted the following key principle with regard to Mobility:

> *We will provide an accessible, comprehensive, and effective transportation system that integrates automobile use with sustainable and innovative transportation options—including enhanced public transit, bicycle, and pedestrian networks throughout the community.*

The draft General Plan includes four goals and 19 associated policies with 94 accompanying actions that address transportation management and modes of travel. The four goals related to transportation are outlined below. Overall, the accompanying policies and actions Furthermore, proposed General Plan policies seek to maintain an acceptable LOS D or better at signalized intersections with acceptance of a lower LOS at major regional intersections (M3.1.3, M3.1.4) and promote transportation system management strategies (M2.5.2) and other alternative transportation modes.

GOAL M1	Land use patterns, street design, parking, and access solutions that facilitate multiple transportation alternatives.
GOAL M2	A safe, sustainable, efficient, adaptive, and accessible transportation system.
GOAL M3	A safe, efficient, and adaptive road system.
GOAL M4	A citywide interconnected system of safe, inviting, and accessible pedestrian ways and bikeways.

Other goals, policies and actions promote sustainable land use patterns, such as encouraging mixed-use development along the City's four major transportation corridors that have easy access to pedestrian, bike and transit facilities, and encouraging use of alternative transportation modes.

PROPOSED IMPROVEMENTS

The draft *General Plan 2030* includes several policies and actions that call for implementation of road, pedestrian, bicycle and transit improvements through the City's Capital Improvement Program and other sources (M2.1.3, M2.3.2, M3.2.2). The draft Plan supports regional funding and implementation of key regional projects "that can significantly benefit Santa Cruz and further the City's mobility policies" (M2.1.4). There are no specific road transportation improvements identified for specific locations, except for improvement of access to/from the Harvey West area, including a possible new approach to Highway 1 (M3.1.13), and that the circulation system of the specific plan for the Swenson parcel shall be from Shaffer Road (LU1.1.4).

Several policies address visitor traffic improvements. .Policy ED1.2.1 specifically encourages transportation improvements and pedestrian activity along Ocean Street to stimulate economic vitality. Policy ED1.8.4 directs the City to improve access to and routes between tourist and visitor designations and lodging facilities as part of the City's economic development policies. The proposed General Plan also calls for updating the Beach and South of Laurel Area Plan to reflect needed improvements along the Visitor/Beach Area travel corridors (M3.3.3) with improvement of access along these corridors through coordinated signs and street naming, protected turn lanes, remote parking/shuttle programs, and other strategies (M3.3.2).

The draft Plan promotes alternative transportation improvements with TSM strategies, road improvements and widening/expansion projects that can achieve an acceptable LOS (M2.32). Action M4.3.2 seeks to develop bike commute routes along the railroad right-of-way, West Cliff Drive, Broadway, King and other streets. The draft General Plan also includes a policy that prohibits approval or construction of an Eastern Access to the University without a citywide

vote (M2.1.5). No other specific road or alternative transportation projects are identified for specific support. The draft *General Plan 2030* also encourages passenger rail transit or other alternative transportation options along the existing rail corridor via the continued support, acquisition, and expansion of railroad rights-of-way (M2.2) and encourages the continuing transport of goods by rail (M2.2.1). Policy LU4.5 supports securing land for development of a transit center along the rail line, and evaluation of a rail transit stop is to be included in the Area Plan analysis for the Golf Club Drive area (LU1.15). Pedestrian and bicycle access to Pogonip and nearby employment areas are also to be included in this future area plan.

POTENTIAL FUTURE DEVELOPMENT

The *General Plan 2030* Land Use Map and land use designations are largely unchanged from the 1990-2005 General Plan / Local Coastal Program, except for three new mixed use land designations that have been developed and applied to the following major transportation corridors: Mission Street, Ocean Street, Soquel Avenue, and Water Street. Additionally, land use designation changes are proposed for three specified sites: Swenson, Golf Club Drive area, and an addition to the Dimeo Lane landfill site. The Swenson and Golf Club Drive sites are designated for residential uses. A 5.5-acre parcel immediately south of and adjacent to the City's Landfill and Resource Recovery Center on Dimeo Lane has been acquired by the City, and it is expected that future uses would be ancillary to the landfill and Resource Recovery Center uses. Specific uses have not yet been identified and will be determined in the future, however, the parcel is not planned for expansion of the landfill disposal operations (Arman, personal communication, April 2010).

Additionally, some of the *General Plan 2030* policies and actions also support mixed use districts and/or intensified redevelopment along transit and commercial corridors (Policies LU3.3.1 and LU4.1). In addition, the proposed *General Plan 2030* supports development of a downtown performing arts center or expansion of the Civic Center (Policy HA2.2.5).

4.4.3 IMPACTS AND MITIGATION MEASURES

CRITERIA FOR DETERMINING SIGNIFICANCE

In accordance with the California Environmental Quality Act (CEQA), State CEQA Guidelines (including Appendix G), City of Santa Cruz plans, policies and/or guidelines, and agency and professional standards, a project impact would be considered significant if the project would:

4a Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit (see discussion of City standards below);

4b Change the level of service of a State Highway roadway segment from acceptable operation (LOS A, B, or C) to deficient operation (LOS D, E or F) based on Caltrans significance criteria[7];

4c Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways;

4d Substantially increase hazards due to a design feature (for example, sharp curves or dangerous intersections) or incompatible uses (for example, farm equipment);

4e Result in inadequate emergency access; or

4f Conflict with adopted policies, plans, or programs regarding public transit, bicycle or pedestrian facilities or otherwise decrease the performance or safety of such facilities.

The City of Santa Cruz considers "D" or better to be an acceptable intersection level of service for intersections, which is a policy in the City's existing General Plan as well as in the proposed General Plan. A significant impact would result if LOS dropped below a "D" level of service or where a project would contribute traffic increases of more than 3% at intersections currently operating at unacceptable levels (E or F), as further described below. The existing and proposed General Plans also account for accepting a LOS below "D" at major regional intersections where improvements would be prohibitively costly or result in significant, unacceptable environmental impacts. There are no other adopted plans, ordinances or policies that establish "measures of effectiveness" for the performance of the circulation system.

For City intersections that already operate at unacceptable levels of service (E or F), the City considers project impacts to be significant if congestion will measurably worsen at the intersection as a result of the project. "Measurably worse" is considered to be a 3% increase in trips at the affected intersection. The City has used the 3% significance criterion for project trip contribution at existing impacted intersections, in part based on directives in the City's existing General Plan to accept a certain level of congestion during peak hours at major intersections, as well as to reflect variations in daily traffic volumes. The 3% criterion has been used throughout the City and is based upon the likelihood that a project will result in an observable increase in congestion at a given intersection or road segment. This is based in part on information provided by Caltrans in the yearly "Traffic Volumes" reports that identifies the standard deviation expected with regards to reliability of traffic count data. The standard deviation ranges indicate a 12% deviation at 10,000 vehicle trips, meaning that if a traffic count totals 10,000 vehicles per day, then approximately 90% of the time, the actual traffic counts will lie within a range of 8,800 to 11,200 vehicles. Thus, the 3% reflects this variation in daily traffic conditions (California Department of Transportation, June 2006).

[7] Caltrans. December 2002. "Guide for the Preparation of Traffic Impact Studies."

IMPACT ANALYSIS

Based on the significance criteria identified above, the following impact analyses address potential impacts to the City's circulation system (4a); potential traffic impacts on state highways (4b); potential increase in hazards (4d); and potential conflicts with adopting policies, plans or programs that support alternative transportation (4f). There are no applicable congestion management programs in effect within the City of Santa Cruz (4c), and thus this is not an issue that needs discussion. Emergency access issues (4e) are addressed in the "Fire Protection" and "Police Protection" subsections of the PUBLIC SERVICES (Chapter 4.8) section of this EIR.

Potential Future Development & Buildout

Adoption and implementation of the proposed *General Plan 2030* would not directly result in increased new development. However, the draft General Plan includes policies and a land use map that support additional development. The proposed General Plan would accommodate future development. As described in the PROJECT DESCRIPTION and LAND USE sections of this EIR (Chapters 3.0 and 4.1, respectively), buildout projections were estimated for the draft General Plan to provide an estimate of the amount of development that is expected to occur by the year 2030.[8] The projections indicate the following level of new development by the year 2030:

- 3,350 residential units
- 1,087,983 square feet of commercial development and 311 hotel rooms
- 1,273,913 square of office space
- 776,926 square feet of industrial development.

The proposed *General Plan 2030* supports infill development along transportation corridors to promote alternative land use patterns to help reduce automobile travel. Development under the proposed General Plan would primarily occur on vacant infill sites, on underutilized properties that could redeveloped at higher densities and/or land use intensities, and in the new mixed-use districts along the City's four major street corridors: Mission Street, Ocean Street, Soquel Avenue, and Water Street. Based on the estimated development occurring under the proposed plan,[9] approximately 55 percent of all new housing, 45 percent of new commercial development and 52 percent of new office development would located along these corridors. Thus, new development would be concentrated in specific areas.

The proposed General Plan also includes other policies and actions that could result in development that supports year-round expanded performances, events, visitors that would result in potential traffic increases. These potential uses include:

[8] The projections are based on the draft Land Use Map, taking into account land use map changes, vacant lands, sites subject to reuse or redevelopment, and underutilized parcels, assuming that not all development will occur at maximum density. On average it is assumed that all new development will occur at 80% of the permitted residential density or floor area ratio. See Appendix B for further discussion.

[9] See Table 3-3 in the PROJECT DESCRIPTION (Chapter 3.0) section of this EIR and Figure 2-3 for estimated distribution of new development per specific areas in the City.

- Supporting a downtown performing arts center or expansion of the Civic Center (HA2.2.5),
- Amending the Zoning Ordinance to allow development of arts and cultural facilities in a wide variety of districts (HA2.2.4),
- Supporting Santa Cruz as a year-round conference destination (Policy ED1.4), and supporting development of a new conference center (ED1.4.1) or developments that accommodate conferences (ED1.5.1),
- Encouraging development of new lodging facilities (ED1.5) and attracting top-end, full-service hotels (ED1.5.2),
- Supporting year-round events (HA3.2.4), and promoting Santa Cruz as a year-round arts destination, and
- Promoting Santa Cruz as a principal retail, cultural, recreational, entertainment and commercial destination in the region (ED1.1).

There are no specific locations or intensity of development anticipated for these types of uses. It is likely that development of such entertainment and/or visitor-serving uses would be within the total square footage of commercial development that has been estimated for the proposed *General Plan 2030* buildout. Adoption of Arts and Entertainment Districts also is supported in the draft plan (HA3.1.1), but most performances do not occur during peak commute hours.

Impact 4.4-1: Traffic Impacts on Intersections Levels of Service (LOS) Adoption and implementation of the proposed *General Plan 2030* would accommodate future development that would result in increased vehicle trips and traffic, resulting in changes in intersection levels of service to unacceptable levels or further deterioration of intersections currently operating at unacceptable levels of service. With implementation of proposed *General Plan 2030* policies and actions, including road improvements identified in an updated Traffic Impact Fee program, intersection operations would be improved and traffic levels would be reduced, except at eight intersections. This is considered a *significant impact*.

PROJECT TRIP GENERATION AND DISTRIBUTION

Adoption and implementation of the proposed *General Plan 2030* would not directly result in increased population or new development. However, the draft General Plan includes policies and a land use map that support additional development as summarized above. This potential development would generate an estimated 78,260 new daily trips with approximately 7,180 trips occurring during the PM peak hour. The Traffix model was used for the traffic impact analysis, which estimates the trip generation for all uses and distributes these new trips to the existing road network.

The trip generation is based on the new potential development expected with buildout under the *General Plan 2030*. Results of surveys conducted for the MTS indicate that 58% of all trips by City residents are made for shopping, work or personal purposes. In addition about 75% of

all trips made by residents remain within the City of Santa Cruz. If it is assumed that this distribution will remain relatively constant for all new residents in the City then approximately 44% of all trips made by new residents will be to commercial, office, industrial or personal service facilities within the City (Marquez, March 2010). Appendix C provides a full description of trip generation assumptions. A reduction was also included for trips generated along the new mixed-use corridors in which transportation modes other than vehicles would be used.

The traffic forecast includes assumptions regarding trip reduction due to mixed use and smart growth developments, which in part utilized information identified in the MTS regarding travel patterns, taking into account travel patterns identified in the City's "Master Transportation Study." See Appendix C for further discussion of these underlying assumptions and the details of determining trip generation rates.

INTERSECTION LEVEL OF SERVICE

Project traffic volumes were calculated by adding peak-hour project trips generated by the estimated General Plan buildout to the existing volumes, which are provided in Appendix F-5. The LOS calculations are included in Technical Appendix F-6, which is available for review at the City of Santa Cruz Planning Department[10] and is also included on the Draft EIR CD and on the online version of the Draft EIR on the City's website at www.cityofsantacruz.com, Planning Department.

Intersection levels of service during the PM peak hour with addition of new development accommodated by the *General Plan 2030* are summarized on Table 4.4-2. A majority of the intersections would drop from LOS B or C to LOS C or D, but would remain within the City's acceptable LOS of "D". However, 21 intersections would operate at unacceptable levels of service. Of these, the following ten intersections would degrade from acceptable to unacceptable levels of service as follows, which include three unsignalized intersections:

- Mission / Laure1 – from LOS B to **F**
- Mission / King-Union – from LOS C to **F**
- Mission / Chestnut – from LOS D to **F**
- Ocean / Broadway – From LOS C to **F**
- N. Branciforte / Water – From LOS D to **E**
- Branciforte / Soquel – From LOS C to **E**
- Seabright / Murray – From LOS D to **E**
- Beach / Pacific – From LOS C to **E**
- River / Fern – From LOS B to **F**
- Swift / Delaware– From LOS C to **F**

Five intersections would drop from an unacceptable "E" to "F" LOS s to include the following, of which only one is unsignalized (Western/High):

- Mission / Bay – From LOS **E** to **F**
- River / Encinal – From LOS **E** to **F**
- Ocean / San Lorenzo-East Cliff – From **E** to **F**

[10] Located at 809 Center Street, Room 107, Santa Cruz, California during business hours: Monday through Thursday, 8 AM to 12 PM and 1 to 5 PM.

- Ocean / Water – From **E** to **F**
- Western / High – From **E** to **F**

Six intersections would continue to operate at unacceptable levels of service E or F as identified below, which are unsignalized, except for the signalized River/Highway 1 intersection. For unsignalized intersections the delays are experienced on the minor approach.

- River / Highway 1 – Remain at **F** with further delays
- Bay / Escalona – Remain at **F** with further delays
- High / Laurent – Remain at **F** with further delays
- Seabright / Water – Remain at **F** with further delays
- Bay / California Ave. – Remain at **F** with further delays
- Bay / California St. – Remain at **F** with further delays

Improvements have been identified for the intersections forecast to operate at unacceptable levels of service as a result of future development accommodated by the *General Plan 2030*. Many of the impacted intersections can be improved to an acceptable LOS with signalization, turning restrictions, and/or other improvements. Table 4.4-3 summarizes these improvements and resulting LOS and delays for the impacted intersections. However, even with improvements, the following eight intersections would remain at an unacceptable LOS:

- Western / High – Would improve from **F** to **E**
- River / Highway 1 – Would remain at **F**
- Bay / Mission – Would remain at **E**
- Laurel / Mission – Would remain at **F**
- Chestnut / Mission – Would remain at **F**
- Ocean / Water – Would improve from **F** to **E**
- Seabright / Water – Would improve from **F** to **E**
- Seabright / Murray – Would remain at **E**

Intersections that are identified in the current TIF Program as requiring improvement in the future are those listed below. The proposed General Plan 2030 supports maintaining and updating the City's Traffic Impact Fee (TIF) program to implement road improvements (M3.1.5, M2.1.3). The TIF Program would be updated to reflect new intersections and/or new or revised improvements identified as a result of the EIR analyses and recommendations. Improvement costs and potentially revised impact fees would be calculated.

- Western/High (Extended two-way left turn lane)
- High/Laurent (Signalization)
- River-Hwy 9/Hwy 9
- Bay/Escalona (turn Restrictions
- Mission/Bay
- Mission/Chestnut
- Ocean/Water
- Bay/California Street
- Branciforte/Soquel
- Ocean/San Lorenzo-E. Cliff Dr
- Seabright/Murray
- Beach/Pacific

TABLE 4.4-2
Intersection PM Peak Hour Levels of Service with *General Plan 2030* Buildout

	Intersection	PM Peak LOS	Delay [in seconds]	V/C Ratio
SIGNALIZED INTERSECTIONS				
1	Western/Hwy. 1	B		
2	Swift/Mission	D		
3	Miramar/Mission	C		
4	Almar-Younglove/Mission	C		
5	**Bay/Mission**	**F**	**164.1**	**1.347**
6	**Laurel/Mission**	**F**	**87.9**	**1.201**
7	Walnut/Mission	D		
8	**King-Union/Mission**	**F**	**90.5**	**1.143**
9	**Chestnut-Hwy. 1/Mission**	**F**	**121.8**	**1.228**
10	Moore/High	A		
11	Bay/High/Coolidge	D		
12	Bay/Nobel-Iowa	B		
13	Bay/King	C		
14	California/Laurel	C		
15	Chestnut/Laurel	C		
16	Center/Laurel	C		
17	Center/Mission	C		
18	Pacific/Laurel	D		
19	Front/Laurel	D		
20	Front/Metro Center	A		
21	Front/Cathcart	A		
22	Front/Soquel	C		
23	Front/Cooper	A		
24	Front-Pacific/Mission-Water	C		
25	River/Water	D		
26	N. Pacific/River	B		
27	River/Potrero	B		
28	**River/Hwy. 1**	**F**	**209.0**	**1.540**
29	**River/Encinal**	**F**	**198.7**	**1.715**
30	San Lorenzo/Laurel-Broadway	B		
31	Riverside/San Lorenzo	D		
32	Riverside/Third	D		
33	Riverside/Beach	A		
34	**Ocean/San Lorenzo-East Cliff**	**F**	**113.9**	**1.168**
35	**Ocean/Broadway**	**F**	**90.8**	**1.153**
36	Ocean/Soquel	D		
37	**Ocean/Water**	**F**	**169.4**	**1.454**
38	Ocean/Kennan-Washburn	B		
39	Ocean-Hwy.17/Ocean-Plymouth	D		
40	Market/Water	C		

TABLE 4.4-2
Intersection PM Peak Hour Levels of Service with *General Plan 2030* Buildout

	Intersection	PM Peak LOS	Delay [in seconds]	V/C Ratio
41	**N. Branciforte/Water**	**E**	**73.7**	**1.117**
42	**Branciforte/Soquel**	**E**	**67.6**	**1.073**
43	S. Branciforte/Broadway	B		
44	Seabright/Soquel	D		
45	Seabright/Broadway	C		
46	**Seabright/Murray**	**E**	**62.7**	**1.013**
47	Morrissey/Water-Soquel	D		
48	Morrissey/Fairmount	B		
49	Frederick/Soquel	D		
50	Hagemann-Trevethan/Soquel	B		
51	Park/Soquel	B		
52	Capitola Rd./Soquel Ave.	C		
53	La Fonda/Soquel	B		
54	Riverside-Dakota/Soquel (new)	A		
55	River S./Soquel	B		
56	Seventh Ave./Soquel Ave.	C		
57	Seventh Ave./Capitola Rd.	C		
58	Seventh Ave./Eaton	D		
UNSIGNALIZED INTERSECTIONS				
59	**Bay/California St**	**F**	**OVRFLW**	**2.917**
60	**Bay/California Ave**	**F**	**150.3**	**1.429**
61	West Cliff/Bay	C		
62	**Beach/Pacific Ave**	**E**	**39.9**	**1.058**
63	Pacific Avenue/Center	C		
64	Storey/King	D		
65	**River/Fern**	**F**	**OVRFLW**	**1,251**
66	King/Laurel	D		
67	**Laurent/High**	**F**	**94.1**	**1.190**
68	Market/Isbel-Goss	C		
69	North Branciforte/Goss	C		
70	Highway 1/Shaffer Rd	C		
71	Cedar/Laurel	D		
72	**Bay/Escalona**	**F**	**OVRFLW**	
73	**Western/High**	**F**	**69.5**	**0.678**
74	Cliff/Beach	B		
75	Riverside/Second-Liebrandt	A		
76	**Seabright/Water**	**F**	**OVRFLW**	**2.963**
77	**Swift and Delaware**	**F**	**241.6**	**2.751**
78	Seventh Ave./Brommer	D		
79	Seventh Ave./E. Cliff	C		

SOURCE: Hatch Mott MacDonald

TABLE 4.4-3
Intersection PM Peak Hour Levels of Service with Recommended Improvements

Intersection	Existing		Buildout		Recommended Improvement	With Mitigation	
	LOS	Delay	LOS	Delay		LOS	Delay
Western Dr/High St	E	45.9	F	69.5	TWLTL	**E**	38.1
High/Laurent	F	59.6	F	94.1	Signalize	B	18.2
River-Hwy 9/Hwy 1	F	83.9	F	209	Ebnd 2l 3t 1r, wbnd 2l 3t 1r, nbnd 1tl 1t 2r, sbnd 2l 1tl 1t 1r	**F**	80.8
River/Fern	B	14.5	F	Ovrfl	Signalize no l esbnd	B	15.1
River/Encinal	E	73.9	F	198.7	Ebnd 1l 1tr 1r, wbnd 1l 1tr, nbnd 1l, 1t, 1r, sbnd 1l,1t, 1tr	D	37.9
Bay St/Escalona Dr	F	782.2	F	Ovrfl	Escalona right turns only	C	18.3
Bay/Mission	E	55.8	F	164.1	Ebnd 1l, 2t,1r, wbnd 1l,2t,1r,nbnd 1l,1t,1r, sbnd 2l,1t,1r	**E**	57.7
Mission/Laurel	C	24.9	F	87.9	Add Ebnd r	**F**	85.6
Mission/King	C	32.7	F	90.5	Ebnd no l, 2t, 1tr, wbnd 1l, 1t, 1tr,nbnd 1ltr, sbnd 2l 1ltr	D	50.8
Mission/Chestnut	D	42.9	F	121.8	Ebnd 2l, 2t, 1r, wbnd 1lt,1t, 1r, nbnd 1l, 1t, 1tr, sbnd 1l,2t, 2r	**F**	112.9
Ocean/Water	E	73.6	F	169.4	Ebnd 2l, 2t, 1r, wbnd 1l,2t, 1r, nbnd 1l, 2t, 1tr, sbnd 2l, 3t, 1r	**F**	130.7
Seabright/Water	F	112.8	F	Ovrfl	Extend TWLTL & add nbnd r	**E**	39
Water/Branciforte	D	36.6	E	73.7	Add ebnd 1, nbound r & sbnd r	D	53.6
California Ave/Bay	F	67.6	F	150.3	Allow nbnd t free	D	26.4
California St/Bay	F	434	F	Ovrfl	Allow sbnd t free	B	12.5
Branciforte/Soquel	C	23.6	E	67.6	Esbnd 1 l, 1t, 1 tr, wsbnd 1l, 1tr no splt phase	C	24.5
Ocean St/Broadway	C	34.3	F	90.8	Prohibit lfts from Ocean	D	36.5
Pacific/Beach	C	20.9	E	39.9	Roundabout	C	
Ocean St/San Lorenzo-ECliff Dr	E	64.7	F	113.9	Add sbnd r	D	53.2
Seabright/Murray	D	43.7	E	62.7	ADD wsbnd r, nbnd r & sbnd r	**E**	59.4
Swift/Delaware	C	23.9	F	241.6	Roundabout/Signal	C	20.1

The mitigation measure column reflects the recommended lane geometry where r = right turn lane, rt = right/through lane, l = left turn lane, lt = left/through lane, t = through lane, and twltl = two-way left turn lane.

SOURCE: Ron Marquez

IMPACT DISCUSSION

The proposed *General Plan 2030* strives to maintain LOS D or better at signalized intersections with acceptance of a lower LOS at major regional intersections if necessary improvements would be too costly or result in significant environmental impacts (Policies M3.1.3, M3.1.4). In conjunction with this directive, Policies M2.1.3, M2.1.4 and ED1.9.2 direct the City to implement pedestrian, bike, mass transit, and road system improvements through the Capital Improvements Program (CIP), and draft plan supports "regional funding and implementation of key regional projects that can significantly benefit Santa Cruz and further the City's mobility policies," although it is not clear what these projects may be. As most of the recommended improvements to impacted intersections are within the City's TIF Program or would be added with proposed updating of the TIF (M3.1.5), the needed improvements are expected to be implemented over time as projects are added to the City's CIP. Intersections along state highways would also come under the jurisdiction of Caltrans. Overall, intersection improvements would be constructed within existing developed rights-of way, and would not be expected to required construction on undeveloped land that would result in potential significant impacts. However, an appropriate level of environmental review would be required at the time a specific intersection improvement is proposed.

As shown on Table 4.4-3, eight intersections would remain at unacceptable levels of service even with implementation of identified improvements. These include four major intersections within the City that carry regional and visitor traffic: River-Highway 9/Highway 1; Mission/Chestnut, Mission/Bay and Ocean/Water. For these intersections, the proposed *General Plan 2030* accepts a lower LOS at major regional intersections (M3.1.4). These intersections would be considered major intersections, and are also included in the existing General Plan as deficient intersections for which a lower LOS would be accepted. However, while, the City may be willing to accept a lower LOS at the intersections along Highway 1- Mission Street, these intersections are within the jurisdiction of Caltrans and would not meet its desired C-D LOS. The recommended intersection improvements would improve delay to slightly less than what occurs under existing conditions even though an acceptable LOS still would not be achieved with the improvements at one of these intersections: River-Highway 9/Highway 1.

The other four intersections that would remain at unacceptable levels of service include: Mission/Laurel (Caltrans intersection), High/Western, Seabright/Water and Seabright/Murray. As shown on Table 4.4-3, delays would be reduced below existing levels with implementation of the recommended improvements at the High/Western and Seabright/Water intersections. The level of service calculation for these two intersections is based on the left turn movement from the minor stop controlled street. Overall both of these intersection operate well, despite the LOS. However, the Mission/Laurel and Seabright/Murray intersection would operate at an unacceptable level of service.

The Draft *General Plan 2030* includes goals, policies and actions that set forth comprehensive measures to reduce vehicle trips, increase vehicle occupancy, encourage use of alternative transportation modes, and promote alternative-sustainable land use patterns, all of which would help reduce vehicle trips, and avoid and minimize adverse impacts related to traffic. A summary of the proposed *General Plan 2030* policies that serve to reduce/mitigate impacts of increased traffic is presented in Table 4.4-4.

Policy M2.3 and its four accompanying actions seek to increase the efficiency of the City's multi-modal transportation system to design for and accommodate multiple transportation modes (M2.3.1), as well as TSM measures and road improvements to achieve an acceptable level of service (M2.3.2). Policies M3.1.1 and M3.1.2 direct the City to seek ways to reduce vehicle trip demand, reduce the number of peak hour vehicle trips, and encourage high occupant vehicle travel. A significant rise in vehicle occupancy from the existing average of 1.2-1.3 persons per vehicle would provide additional road capacity, increase the efficiency of the existing transportation and roadway system and reduce the need for costly improvement to the road system (Santa Cruz County Regional Transportation Commission, June 2010).

TABLE 4.4-4
Proposed General Plan Policies and Actions that Reduce Traffic Impacts

Type of Measure / Action	Policies / Actions

MAINTAIN LEVEL OF SERVICE STANDARD & IMPLEMENT TRANSPORTATION IMPROVEMENTS	• Maintain LOS D or better at signalized intersections; accept lower LOS at major regional intersections: M3.1.3, M3.1.4
	• Implement road improvements & alternative transportation to achieve acceptable LOS: M2.3.2
	• Manage, reduce congestion: M.3.1, M2.4.4 (work with UCSC)
	• Maintain road system with efficient arterial operations: M3.2.2, M3.3.6, M3.1.12 (coordinated signal timing)
	• Promote TSM strategies: M2.5.2
	• Improve access along the Visitor/Beach Area travel corridors: M3.3.2
	• Maintain/update Traffic Impact Fee and implement road improvements: M3.1.5; M2.1.3
	  ⅄ Implement pedestrian, bike, transit & road improvement through CIP: M2.1.3, ED1.9.2
	  ⅄ Support regional funding & implementation of key regional projects that benefit Santa Cruz: M2.1.4
	  ⅄ Transportation improvements on Ocean: ED1.2.1
	  ⅄ Visitor access improvements: ED1.8.4

REDUCE AUTO/VEHICLE TRIPS & INCREASE VEHICLE OCCUPANCY	• Reduce auto dependence, vehicle trips and peak hour trip & increase vehicle occupancy: M1.1, M3.1.1, M3.1.2 • Encourage employment-related strategies (i.e., flex-time, telecommuting, parking management, ridesharing): M3.1.7, M3.1.8, M2.4.4
ENCOURAGE MULTI-MODAL SYSTEMS	• Design, accommodate & increase efficiency of multiple transportation modes: M2.3, M2.3.1, ED1.9.2 (alternative transportation), NRC4.4.2, M3.1.11 (studies to determine deficiencies) • Include pedestrian, bike, transit facilities in ROW acquisition, street design, bridge & road projects: M1.4.1, M1.4.2, M2.3.3 • Develop Depot Park as multi-modal center: LU3.5.2 • Multi-modal use of future rights-of-way: M1.4.2
ENCOURAGE ALTERNATIVE TRANSPORTATION MODES	• Encourage use of alternative transportation modes: M.2.1.2 • Promote alternative transportation with TSM strategies: M2.3.2, M2.5.2 • Connect activity centers with pedestrian & bike paths: M1.1.2 • Encourage hotels to provide bike/shuttle programs: M2.3.4 • Employment and parking-related strategies: M3.1.7, M3.1.8, M3.1.9 **(CONTINUED ON NEXT PAGE)**

TABLE 4.4-4
Proposed General Plan Policies and Actions that Reduce Traffic Impacts

Type of Measure / Action	Policies / Actions
➤ Bicycle Use	• Interconnected bike network & maintain/update Bike Plan: M4.2, M4.2.1, M4.2.2, M4.2.3 • Implement bicycle improvements: M2.1.3 • Bike lanes: M4.3.1, 4.5.4 • Bike commute routes: M4.3.2 (rail r-o-w, West Cliff, Broadway) • Support bicycle improvements, amenities & maintenance: M4.4 & actions, M4.2.6, M4.3, M4.5 & actions, PR1.6.4 (at parks); CC8.4 (at educational facilities)
➤ Pedestrian Use	• Connected street and pedestrian network: CD5.1, M1.1.2, M1.1.3, M4.1.5 (development dedication) • Implement pedestrian improvements: M2.1.3, M1.3.1 • Implement MTS pedestrian recommendations; update/implement Pedestrian Master Plan: CD5.1.1, M1.2, M4.1.1 • Encourage walking: M4.1, M4.1.3 and pedestrian access: CC8.4 • Neighborhood parking strategies & development designs to foster pedestrians: CD 5.2.3, M4.1.7
➤ Transit Use & Expansion	• Encourage transit options & increased transit service, capacity & ridership: M1.1.3, M2.1.1, M2.4, M2.4.2, M2.4.6, M2.4.7, M2.4.8 (commuter travel), M2.4.9 • Implement transit improvements: M2.1.3 • Consider giving priority to transit on City corridors: M2.4.5 • Conveniently located transit stops, centers & transit links: M.1.4, M2.4.11 and as part of new development: M2.4.12, M2.4.12 • Encourage maintenance/upgrading of transit infrastructure: M.2.4.10 • Encourage Beach shuttle: M2.4.1
➤ Rail	• Encourage/support passenger rail transit & other modes along rail ROW: M2.2, M2.2.1 • Rail Land Use Plan: LU4.2.4 • Rail Transit Center: LU4.5, LU4.5.2 • Condition development along rail-potential stops: LU4.5.2 • Encourage transport of good by rail: M2.2.2
LAND USES / PATTERNS TO REDUCE VEHICLE TRIPS	• Reduce auto use with pedestrian/transit-oriented activity centers & development centers (M1.1) • Expand neighborhood facilities (LU4.3, LU4.3.1) • Encourage land use changes that reduce auto use: LU4.2); locate community facilities within walking distance to residential areas and transit: (CC2.1.4) • Encourage home occupations & telecommuting: LU4.4, LU4.4.1 and live-work units: LU4.1.4, HA4.4 (artists) • Ensure optimum utilization of infill parcels (LU1.1, LU1.1.1) and Consolidation of Underutilized Parcels (LU1.1.2) • Encourage mixed uses: LU3.5 (Lower Pacific), LU3.6 (River) , LU4.1.1, LU4.2.2 (new districts), LU4.2.3, LU4.1.3 • Encourage assembly of small parcels along transit: CD3.3, CD3.3.1, CD3.3.2 **(CONTINUED ON NEXT PAGE)**

TABLE 4.4-4
Proposed General Plan Policies and Actions that Reduce Traffic Impacts

Type of Measure / Action	Policies / Actions
	• Encourage higher/maximum densities: LU3.6.1 (Lower Front St), LU3.7, LU3.7.1, LU3.8 • Encourage higher densities along transit/commercial corridors: LU4.1, LU4.1.1 • Encourage University shopping/services on UC lands: LU4.2.5
REDUCE & DISCOURAGE THROUGH-TRAFFIC IN NEIGHBORHOODS	• Discourage, reduce, and slow through-traffic: M3.3 • Enhance neighborhood livability through road& transit design: M3.3.1 • New development to be designed to discourage through traffic and encourage bicycle or pedestrian connections: M3.3.5 • Reduce traffic in residential neighborhoods by improving arterial and collector streets: M3.3.6 • Develop neighborhood traffic control plans where necessary to minimize traffic impacts on local streets: M3.3.7

Policy M2.1.2 encourages use of alternative modes of transportation, and numerous policies and actions support expanded and improved bicycle and pedestrian facilities, a well as increased transit use. Several policies support higher land use densities along transit corridors (LU4.1, LU4.2, M1.1) to support land use patterns that reduce reliance on automobiles. Home occupations and telecommuting also are encouraged (LU4.4). The draft General Plan also directs the City to improve access to and routes between tourist and visitor designations and lodging facilities as part of the City's economic development policies ED1.8.4).

These policies would serve to help reduce project vehicular traffic and thus reduce traffic impacts in addition to proposed intersection improvements. Of the eight identified intersections that would remain at unacceptable levels of service with implementation of identified improvements, four are at major intersections where the City has historically accepted a lower level of service at major regional intersections where improvements would be too prohibitively costly or could result in unacceptable significant environmental impacts, and this policy is maintained in the proposed General Plan (M3.1.4), although the intersections within Caltrans' jurisdiction would not meet Caltrans LOS standards. Additionally, the delays at these intersections would be less than without the improvement, and at the Highway 1/Highway 9 intersection, the delay would be less than under existing conditions. The other four intersections that would remain at unacceptable levels of service, although delays would be reduced to levels below existing conditions at the Western/High and Seabright/Water intersections.

Roadway, as well as bicycle and other non-vehicular improvements, would be contingent on future funding. The potential growth estimated to result from implementation of the proposed *General Plan 2030* could generate nearly $32 million in impact fees at current rates that could be used for improvements, of which 15% would be for alternative transportation. However the TIF program, including improvements, costs and impact fees, would be updated pursuant to actions specified in the draft General Plan (M3.1.5). Improvements to intersections along state highways would be contingent on Caltrans approval and state and/or federal funding. Revenues for transportation, including road and other transportation mode improvements, have not kept pace with the multimodal needs of travelers in Santa Cruz County (Santa Cruz County

Regional Transportation Commission, June 2010). Given chronic state budget deficits, as well as reduced local revenues funding road, bicycle, and pedestrian improvements will continue to be a challenge. Additionally, the lack of community consensus on regional highway improvements and local multi-use paths further constrain the feasibility of either roadway or alternative transportation mode improvements being implemented (Santa Cruz County Regional Transportation Commission, June 2010).

Revenue issues and service cuts have reduced the SCMTD's level of service, affecting the ability to increase transit service. It is estimated that 1,500 to 2,000 additional transit passengers may need to be served with projected General Plan buildout. It is expected that service would continue along major the City's major transportation corridors and where high use is concentrated. However, additional funding will be necessary to expand transit service in the future and provide implementation of "Sustainable Community" strategies,[11] and such funding, is at this time uncertain (SCMTD, White, personal communication, August 2011).

Conclusion. Future development accommodated by the proposed *General Plan 2030* would generate traffic that would result in unacceptable levels of service at 21 intersections, all of which could be improved to acceptable levels with intersection improvements, except for four local intersections and four intersections on state highways. Therefore, these intersections could not be improved to an acceptable LOS to meet City or Caltrans' standards, and the resulting effects on these eight intersections would be considered a significant impact unavoidable impact as no feasible improvements have been identified. With implementation of the identified improvements and proposed *General Plan 2030* policies and actions to reduce vehicular traffic, increase vehicle occupancy and support/encourage use of alternative transportation measures, the impact could be reduced to a less-than-significant level at the remaining impacted intersections. However, funding availability likely will remain constrained for major facility improvements and expansion of transit service into the foreseeable future. Thus, implementation of recommended improvements and alternative transportation facilities cannot be assured, and thus, the impact to the intersections identified as operating at unacceptable levels of service under the proposed *General Plan 2030* remains significant.

Mitigation Measures

With implementation of the proposed *Plan 2030* policies and actions to reduce vehicular traffic, increase vehicle occupancy and support/encourage use of alternative transportation measures, the impact could be reduced to a less-than-significant level at all but four intersections along state highways and the four local intersections. Impacts would remain significant and unavoidable. With uncertainly regarding funding and implementation of transportation projects for the other intersections, the impact remains

[11] Senate Bill 375 (SB 375) provides a means for addressing greenhouse gas (GHG) emissions by aligning regional transportation planning efforts, regional GHG reduction targets, and land use and housing allocation, thereby discouraging urban sprawl and reducing vehicle miles traveled, with an emphasis on increasing land use intensity along transit corridors. See the GLOBAL CLIMATE CHANGE (Chapter 4.12) section of this EIR for further discussion.

significant and unavoidable. However, revision of the following *General Plan 2030* action is recommended.

Recommended Revisions to the *Draft General Plan 2030*

Revise or add policies/actions as indicated below. Deleted text is shown in ~~strikeout~~ typeface, and new text is shown in underlined typeface.

M3.1.4 Accept a lower level of service and higher congestion at major regional intersections if necessary improvements would be ~~too~~ prohibitively costly or result in significant, unacceptable environmental impacts.

Impact 4.4-2: Traffic Impacts on State Highway Levels of Service (LOS) Adoption and implementation of the proposed *General Plan 2030* would accommodate future development that would result in increased vehicle trips and traffic on state highways in the regions (Routes 1, 17, and 9), which would further exacerbate existing unacceptable levels of service. This is considered a *significant impact*.

The proposed project would result in increased traffic on state highway segments. It is estimated that the proposed project would generate approximately 78,235 weekday daily trips. Based on the results of the TRAFFIX model, the distribution of project traffic to state highways is estimated as follows:

- Highway 1, southbound: 24.6% of all trips
- Highway 9, north of City Limits: 1.9% of all trips
- Highway 17, northbound: 20.5% of all trips

Based on this distribution, traffic resulting from future development accommodated by the proposed *General Plan 2030* would increase traffic on southbound Highway 1 by approximately 19,250 daily trips, on northbound Highway 17 by approximately 16,000 daily trips, and on northbound Highway 9 by about 1,500 daily trips. This represents an increase of approximately 20% on Highway 1 and 22% on Highway 17, which would be considered a substantial increase.

According to the Transportation Concept Report for state highways, the target level of service for State Highway 1 west of Morrissey Boulevard is LOS D, and the target level of service for State Highway 17 south of Pasatiempo is LOS E (Caltrans, April 2006, January 2006). However, according to the Caltrans Guide for the Preparation of Traffic Impact Studies (Caltrans, 2002), if an existing State Highway facility is operating at less than the target LOS, the guide states that the existing LOS should be maintained. Highway 1 between Morrissey and Branciforte Creek Bridge operates at a E-F LOS (Caltrans, October 2010), and Highway 17 operates at LOS F (Caltrans, January 2006).

The addition of project-related traffic would contribute to significantly worsened conditions. However, some of this traffic would be within projected future volumes estimated by Caltrans. According to Caltrans' studies, Highway 1 traffic near Morrissey-Branciforte Creek Bridge is expected to increase by 50,000 daily trips in 2030-2035 (Caltrans, October 2010). Future year traffic volumes were projected using growth rates from AMBAG's regional travel demand model, version April 2007, applied to 2007 counts (Ibid.). By incorporating trip reduction and smart growth design in the proposed General Plan policies and actions, the forecast of increased traffic on Route 1 as a result of potential development accommodated by the *General Plan 2030* is significantly less than that anticipated in Caltrans Corridor Systems Management Plan.

The Route Concept Report for Highway 1 includes the addition of High Occupancy Vehicle (HOV) lanes to Highway 1. This project will add a lane in each direction to reduce congestion, encourage carpooling, expand express bus service, and improve safety. The limits of this project extend from Morrissey Boulevard to San Andreas Road/Larkin Valley Road. Project environmental review and preliminary design are underway. Caltrans' draft "Corridor System Management Plan's" strategy for Highway 1 includes new express bus services on the planned HOV lanes, support of land use and transportation efforts to reduce traffic, and overall reduction of congestion by encouraging alternative transportation facilities and programs. The County and Caltrans are also working on design and environmental review for reconstruction of the La Fonda Avenue overcrossing as part of the Auxiliary Lane Project.

The Route Concept Report for Highway 17 identifies an increase of about 8,100 daily trips to the year 2023 (Caltrans, January 2006). The report acknowledges that Highway 17 will remain a 4-lane freeway without widening. Using the traffic forecast in the Corridor System Management Plan for Route 1 the increase in volume on Route 17 would range from 30,000 to 40,000 vehicles per day by the year 2035. Again this figure is well above the volume forecast for the general plan.

As discussed above in the Impact 4.4-1 analysis, the Draft *General Plan 2030* includes goals, policies and actions that set forth comprehensive measures to reduce vehicle trips, increase vehicle occupancy, encourage use of alternative transportation modes, and promote alternative-sustainable land use patterns, all of which would help reduce vehicle trips, and avoid and minimize adverse impacts related to traffic. The draft Plan encourages use of alternative modes of transportation, and numerous policies and actions support expanded and improved bicycle and pedestrian facilities, as well as increased transit use. Several policies support higher land use densities along transit corridors to support land use patterns that reduce reliance on automobiles. The draft Plan supports regional funding and implementation of key regional projects "that can significantly benefit Santa Cruz and further the City's mobility policies" (M2.1.4).

Caltrans is responsible for improvements along state routes and has proposed a series of improvements along Highway 1, which would improve transit and carpooling with addition of an HOV lane. While overall levels of service would remain unchanged if the additional lane were not an HOV lane, average speeds would be increased and delays reduced (Caltrans, October 2010). Similarly, Highway 17 is forecast to remain at an unacceptable LOS in the future with no potential improvements having been identified. Both the Highway 1 planned HOV lanes and Soquel/Morrissey auxiliary lanes are supported in the current Regional

Transportation Plan. The SCCRTC assumes that a half-cent, 30-year sales tax measure or similar local funding mechanism will be ultimately be approved (Santa Cruz Regional Transportation Plan, June 2010).

The increase of 1,500 vehicles per day on Route 9 will not result in a significant impact. The existing volumes on Route 9 range from 5,000 AADT to 5,600 ADT north of City limits during peak months. Traffic volumes have increased on this highway approximately 1,000 vehicles per day in the last 30 years. Route 9 is a conventional undivided two-lane highway which is classified as a major collector. No major improvements are planned in the corridor from Santa Cruz to Felton north of the City limits. (Transportation Planning Fact Sheet State Route (SR) 9 in Santa Cruz County, Caltrans).

Conclusion. Future development accommodated by the proposed *General Plan 2030* would generate traffic that would contribute to existing and future forecast unacceptable levels of service along Highway 1 and Highway 17. Project traffic represents a significant addition, although the estimated General Plan buildout traffic is less than the future forecasts estimated by Caltrans in its draft "Corridor System Management Plan." With implementation of the proposed *General Plan 2030* policies and actions to reduce vehicular traffic, increase vehicle occupancy and support/encourage use of alternative transportation measures, and with future improvements along Highway 1 that are planned by Caltrans, traffic congestion along Highway 1 will be minimized. However, highway operations would continue to remain at unacceptable levels. Thus, the impact remains significant.

Mitigation Measures

None are known beyond those being considered for Highway 1 by Caltrans as discussed above.

Impact 4.4-3: Traffic Hazards
Adoption and implementation of the proposed *General Plan 2030* would not result in new roads that could potentially create hazards, and with implementation of proposed *General Plan 2030* policies and actions to ensure road safety, the project would not result in direct or indirect impacts related to increased hazards. Therefore, there is *no impact* related to road safety/hazards.

The proposed *General Plan 2030* does not include new roads or road alignments, and thus, would not create or increase hazards due to a road or intersection design. Action M3.1.13 does support an approach to Highway 1 to from the Harvey west area, but a specific location is not identified. If this option were to be considered in the future, it would require Caltrans' approval, and would be subject to project-level design and environmental review.

Furthermore, Policy M3.2 seeks to ensure road safety for all users. To this end, the plan proposes to maintain the condition of the existing road system (M3.2.1), ensure safe and

efficient arterial operations and designs (M3.2.2, M3.2.11), ensure adequate street widths and designs for emergency vehicles (M3.2.3), and improve traffic safety and flow, including at high collision and congested areas (M3.2.4, M3.2.5). Regular inspection and maintenance of street pavements is supported to help encourage bicycling (M3.2.6).

Conclusion. The proposed *General Plan 2030* does not include new roads or road alignments, and thus, would not create or increase hazards due to a road or intersection design. Implementation of the proposed *General Plan 2030* policies and actions would help to maintain road safety and prevent hazardous conditions due to future designs of roadway or intersection improvements. Therefore, there is no impact associated with creating or increasing hazards due a specific roadway design feature.

Mitigation Measures

No mitigation measures are required as a significant impact has not been identified.

Impact 4.4-4: Conflicts with Adopted Plans
Adoption and implementation of the proposed *General Plan 2030* would not result in conflicts with adopted plans, policies or programs that support alternative transportation, as the proposed goals, policies and actions directly support implementation and use of alternative transportation modes. Therefore, there is *no impact* related to potential conflicts with plans and policies.

Both the SCCRTC's *Regional Transportation Plan* and AMBAG's *Monterey Bay Area Mobility 2035* support and promote transit, bicycling, walking, carpooling and other alternative transportation modes. The proposed *General Plan 2030* directly supports these alternative modes as well. Action M2.1.2 encourages use of alternative modes of transportation, and numerous policies and actions support expanded and improved bicycle and pedestrian facilities, a well as increased transit use and passenger rail transit, as summarized on Table 4.4-4. Policy M2.3 seeks to increase the efficiency of the City's multi-modal transportation system. Several policies support higher land use densities along transit corridors (LU4.1, LU4.2, M1.1) to support land use patterns that reduce reliance on automobiles.

Conclusion. The proposed *General Plan 2030* directly supports regional plans and policies that support alternative transportation modes as it includes numerous policies and actions that encourage use of alternative modes of transportation, and support expanded and improved bicycle and pedestrian facilities, a well as increased transit use. Therefore, there is no impact related to potential conflict with adopted plans and policies that support alternative transportation.

Mitigation Measures

No mitigation measures are required as a significant impact has not been identified.

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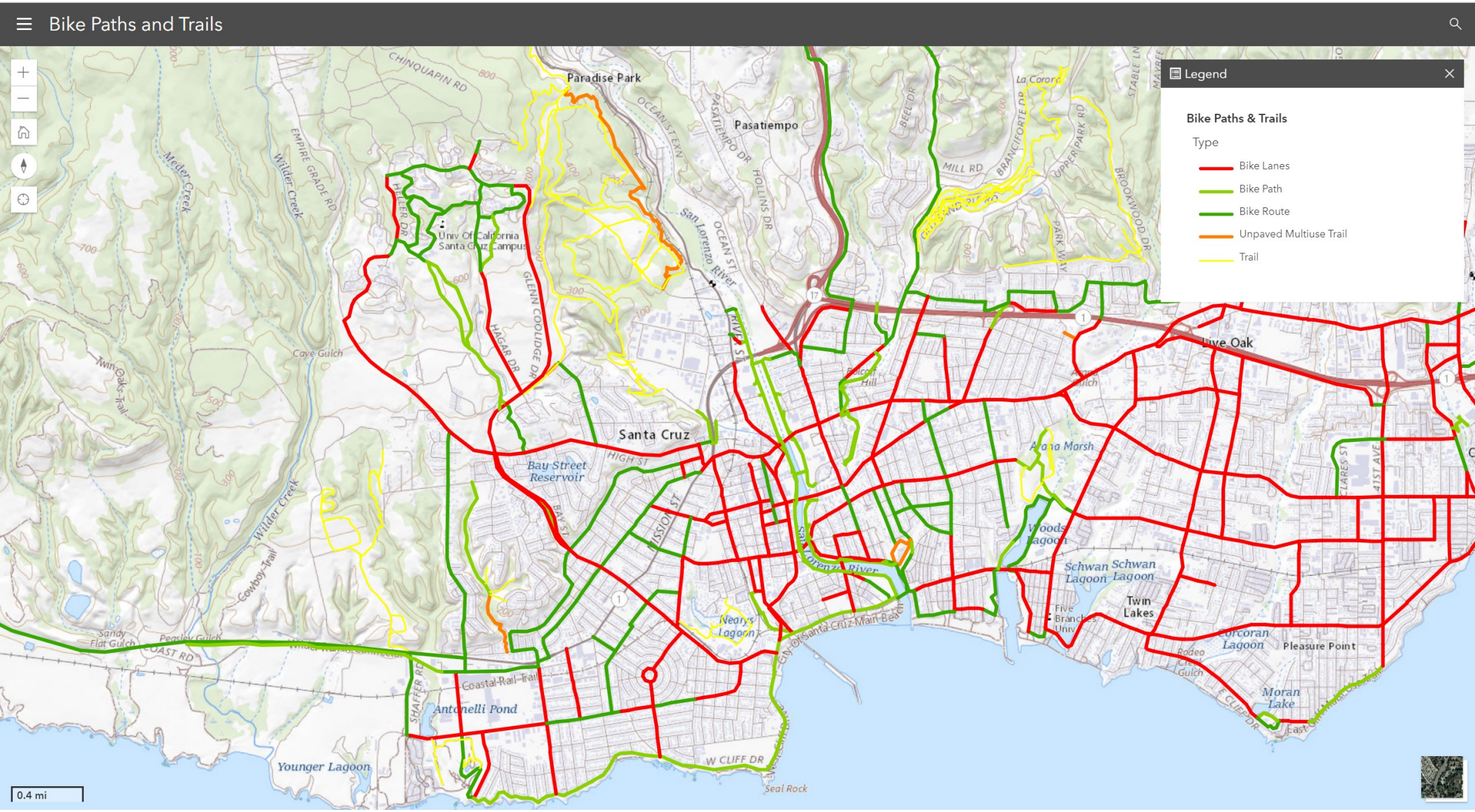
Bike Paths and Trails
Legend
Bike Paths & Trails
Type
Bike Lanes
Bike Path
Bike Route
Unpaved Multiuse Trail
Trail
Paradise Park
Pasatiempo
Santa Cruz
Live Oak
Twin Lakes
Pleasure Point
Bay Street Reservoir
Antonelli Pond
Younger Lagoon
Seal Rock
Moran Lake
Schwan Lagoon
Woods Lagoon
Neary's Lagoon
Cave Gulch
Wilder Creek
Meder Creek
Coastal Rail Trail
Cowboy Trail
Twin Oaks Trail
Univ Of California Santa Cruz Campus
San Lorenzo River
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  - Parcel Related
  - Transportation
    - Street Signs
    - Street Lights
    - Street Sweeping Routes
    - Traffic Counts - Average Daily Total
    - Caltrans Grid
    - County Bridges
    - Post Miles
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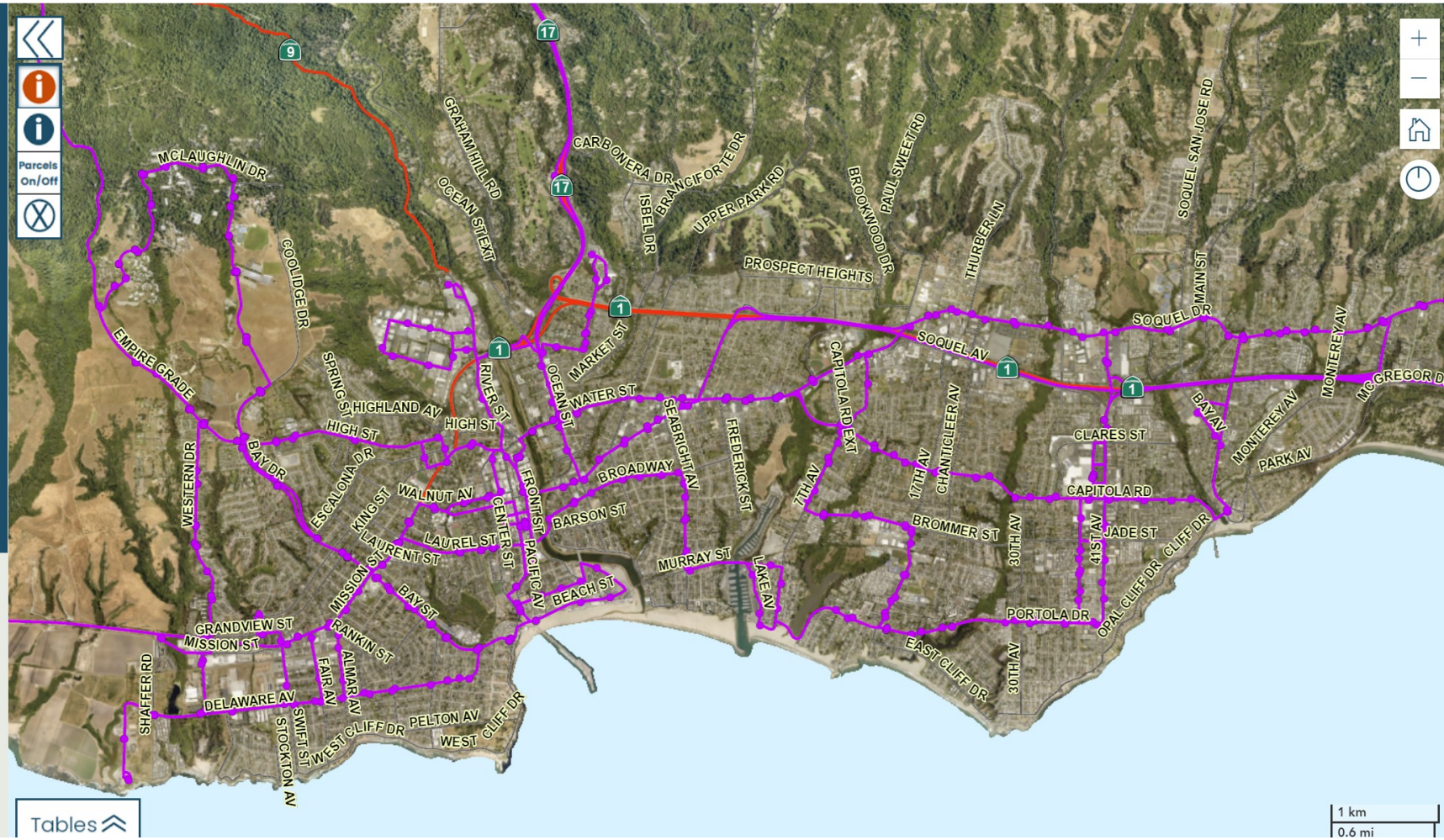
    - County Maintained Roads
    - Major Roads
    - Streets
    - Bicycle Facilities
    - Scenic Roads
    - Pavement Condition Index
    - Encroachment Zones
  - Biotic Resources
  - Water Resources



City of Santa Cruz

2020 Urban Water Management Plan

November 2021

Prepared by: City of Santa Cruz Water Department

City of Santa Cruz Water Department

Final Adopted

2020 Urban Water Management Plan

Santa Cruz City Council

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Sonja Brunner, Vice Mayor
Sandy Brown
Justin Cummings
Renee Golder
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Chapter 8 WATER SHORTAGE CONTINGENCY PLANNING

Appendices

ACRONYMS AND ABBREVIATIONS

ACS	American Community Survey
AMBAG	Association of Monterey Bay Area Governments
AMI	Advanced Metering Infrastructure
AMR	Automated Meter Reading
ASR	Aquifer Storage and Recovery
AWWA	American Water Works Association
CCF	Centium Cubic Feet
CCLEAN	Central Coast Long-Term Environmental Assessment Network
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CFS	Cubic feet per second
CIMIS	California Irrigation Management Information System
CMIP3	Geophysical Fluid Dynamics Laboratory Coupled Model or GFDL2.1
CMIP5	Coupled Model Intercomparison Project 5
DRA	Drought Risk Assessment
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
F	Fahrenheit
FESA	Federal Endangered Species Act
GFDL2.1	Geophysical Fluid Dynamics Laboratory Coupled Model or CMIP3
GHWTP	Graham Hill Water Treatment Plant
GPCD	Gallons per capita per day
GPF	Gallons per Flush

GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCP	Habitat Conservation Plan
IN	Inches
IRF	Infrastructure Reinvestment Fee
IRWM	Santa Cruz Integrated Regional Water Management Group
IWA	International Water Association
LAFCO	Local Agency Formation Commission (of Santa Cruz County)
LHMP	Local Hazard Mitigation Plan
LRDP	Long Range Development Plan
MG	Million Gallons
MGA	Santa Cruz Mid-County Groundwater Agency
MGD	Million gallons per day
MGY	Million gallons per year
NMFS	NOAA National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
RUWMP	Regional Urban Water Management Plan
RWFPS	Recycled Water Facilities Planning Study
SCMU	Santa Cruz Municipal Utility
SGMA	Sustainable Groundwater Management Act
SMGA	Santa Margarita Groundwater Agency
SWMP	Storm Water Management Program
UCSC	University of California, Santa Cruz
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WCMP	Water Conservation Master Plan

WELO	Water Efficient Landscape Ordinance
WSAC	Water Supply Advisory Committee
WSAS	Water supply Augmentation Strategy
WSCP	Water Shortage Contingency Plan
WWTF	Wastewater Treatment Facility

Chapter 1

INTRODUCTION AND OVERVIEW

1.1 Urban Water Management Planning Act

This report has been prepared by the City of Santa Cruz Water Department in response to the Urban Water Management Planning Act. The Act, which became part of the California Water Code with the passage of Assembly Bill 797 in 1983, requires that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually prepare and adopt an Urban Water Management Plan (UWMP), and to update it every five years.

The Act requires water agencies to evaluate and describe their water resource supplies and projected needs over a twenty-year planning horizon and to address a number of related subjects including water conservation, water service reliability, water recycling, opportunities for water transfers, and contingency plans for drought events.

The Act recognizes that water is a limited and renewable resource subject to ever-increasing demands and that conservation and efficient use of urban water supplies is a statewide concern. The Act also states that a long-term reliable supply of water is essential to protect the productivity of California's businesses and economic climate and, as part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry years.

The purpose, required contents, and process for preparing and adopting Urban Water Management Plans are specified in Water Code sections 10608 and 10610 – 10657. The overall goal is to provide water suppliers throughout the state a framework for carrying out their long-term planning responsibilities and for reporting their strategies to meet future water challenges to both state government and the communities they serve. These sections of Water Code, as of January 1, 2020, are included as Appendix A of the 2020 Urban Water Management Plan Guidebook (CA DWR, 2021).

1.2 Recent Changes to the Water Code

The Act has continued to be revised and expanded since the preparation of the 2015 UWMP driven by issues such as prolonged droughts, groundwater overdraft, regulatory modifications, and changing climatic conditions.

Recent legislative amendments to the Water Code since 2015 include the following:

- Five Consecutive Dry-Year Water Reliability. The dry-year water reliability assessment, which examines reliability over a twenty to twenty five year planning horizon was modified to consider a drought lasting five consecutive water years.

- Drought Risk Assessment. This new assessment requires examination of water supply reliability over a five-year period from 2021 to 2025 under a reasonable prediction for five consecutive dry years.

- Seismic Risk. Seismic risk to water facilities is now a required assessment.

- Energy Use Information. Readily obtainable information on estimated amounts of energy for water uses is now required to be included in the UWMP.

- Water Loss Reporting for Five Years. The UWMP now requires the past five years of water loss audit reports to be included.

- Water Shortage Contingency Plan. Specific elements are now required in the more prescriptive Water Shortage Contingency Plan.

- Groundwater Supplies Coordination. Consistency with Groundwater Sustainability Plans in areas where those plans have been completed by a Groundwater Sustainability Agency is now required.

- Lay Description. There is a new statutory requirement for an easy to understand description of the fundamental determinations of the UWMP, specifically regarding water service reliability, challenges ahead, and strategies for managing reliability risks.

A summary of the changes to the Water Code since 2015 is included as Appendix B of the 2020 Urban Water Management Plan Guidebook (DWR, 2021).

1.3 Report Format

For this 2020 submittal cycle, the City has elected to utilize the basic structure and organization used in the 2015 UWMP, which is in alignment with 2020 Urban Water Management Plan Guidebook (DWR, 2021). Required content is grouped by topic as follows:

Chapter 1 – Introduction and Overview: This chapter covers the background, purpose, and scope of an Urban Water Management Plan and includes the lay description.

Chapter 2 – Plan Preparation: This chapter covers the process used to develop the 2020 plan, including efforts in coordination and outreach.

Chapter 3 – System Description: This chapter describes the City's water service area including population, climate, and other factors affecting the City's water management planning, including governance and the City of Santa Cruz Water Department's organizational structure.

Chapter 4 – System Water Use: This chapter covers the past, current, and projected water uses within the City's water service area. It also provides information on distribution system water losses.

Chapter 5 – Conservation Target Compliance: This chapter provides information about the City's baseline per capita water use and urban water use targets and success in achieving its 2020 target.

Chapter 6 – System Supplies: This chapter describes and quantifies the current and projected sources of water available to the City, including surface water, groundwater, recycled water, transfers, and future water projects that support the City's Water Supply Augmentation Strategy including the Santa Cruz Water Rights Project, and the Santa Cruz Water Program. Climate change impacts to water supply and energy use are also addressed in this chapter.

Chapter 7 – Water Supply Reliability and Drought Risk Assessment: This chapter characterizes the reliability of the City water supply system over a 25-year planning horizon under differing hydrologic conditions including normal/average year, single dry year, and a five consecutive dry year scenarios. The five-year Drought Risk Assessment is also included in this chapter. These analyses are conducted using both historic hydrology and a projected climate change hydrology.

Chapter 8 – Water Shortage Contingency Planning: This chapter in combination with Appendix O, Water Shortage Contingency Analysis and Implementation, comprise the City's 2021 Water Shortage Contingency Plan. It summarizes the City's plan for addressing water shortages and describes actions that would be undertaken in response to a catastrophic interruption of water supplies.

Chapter 9 – Demand Management Measures: This chapter describes the measures currently being implemented by the City to promote conservation and discusses the future water conservation activities.

Chapter 10 – Plan Adoption, Submittal, and Implementation: This chapter describes the steps taken to adopt and submit the Urban Water Management Plan and Water Shortage Contingency Plan and to make the plan available for public use and reference.

1.4 Urban Water Management Plans in Relation to Other Planning Efforts

Urban Water Management Plans serve a variety of purposes and are intended to be consistent with and support other local, regional, and statewide plans and processes. Information about water use and supplies reported by water agencies is collected and used by the state in updating the California Water Plan every five years. They provide a common basis for cooperative water resource management through preparation of Integrated Regional Water Management Programs, such as one now being implemented in Santa Cruz County, of which the City of Santa Cruz is an active project participant. Land use agencies rely on a water agency's Urban Water Management Plan as a long-range planning document to aid in updating city and county General Plans and for the preparation of environmental documents under the California Environmental Quality Act (CEQA). They also serve as a detailed source of information to coordinate local water supply availability and certain land use decisions made by cities and counties under Senate Bills 610 and 221 of 2001.

1.5 UWMPs and Funding Eligibility

In order for an urban water supplier to be eligible for any state water grants or loans administered by California Department of Water Resources, the agency must have a current Urban Water Management Plan on file that has been determined by California Department of Water Resources to address the requirements of the Water Code.

Urban water suppliers must also comply with the requirements of the Water Conservation Act of 2009 in order to be eligible for state water grants and loans, meaning an agency must both meet its water use target and report compliance in its 2020 Urban Water Management Plan.

1.6 2020 Urban Water Management Plan Lay Description

This document constitutes the seventh update of the City's Urban Water Management Plan. Since 1986, the City has prepared the following plans:

- 1985 UWMP adopted 1986,
- 1990 UWMP, adopted 1991,
- 1995 UWMP, adopted 1996,
- 2000 UWMP, adopted 2001,
- 2005 UWMP, adopted 2006,
- 2010 UWMP, adopted 2011, and
- 2015 UWMP, adopted 2016.

The plan was most recently updated and adopted in 2016. This 2020 Urban Water Management reflects current system circumstance and events in 2020.

A lay description of the fundamental determinations of this Urban Water Management Plan is provided below:

1.6.1 System Water Use and Water Demand

Until the early 2000s, the general trend in the City of Santa Cruz water system use was one in which water use rose roughly in parallel with account and population growth over time, except during two major drought periods in the late 1970s and the early 1990s. Around 2000, this pattern changed and system demand began a long period of decline, accelerated by pricing changes, drought, economic downturn, and other factors. In 2015, after two years of water rationing, annual water use fell to a level of about 2.5 billion gallons, similar to the level experienced during the 1970s drought. In 2020, demand was still at a similar level as 2015, about 2.6 billion gallons, despite several years above long-term average rainfall from 2016 and 2020. While demand did rebound following droughts in the 1970s and 1980s, demand has not rebounded to pre-drought conditions following 2014, contrary to previous projections. Current projections forecast that water use over the next 25 years, including projected population growth, will increase at a very slow rate to reach approximately 2.8 billion gallons per year by 2045. For additional details, see Chapter 4 of this Urban Water Management Plan.

1.6.2 Conservation Target Compliance

The Water Conservation Act of 2009, also known as SB X7-7, required the State to reduce urban per capita water use by 20 percent by the year 2020. Each retail urban water supplier was required to determine a target water use for the year 2020 in order to help the State achieve the 20 percent reduction. The City of Santa Cruz' target gross per capita water use[1] for 2020 was 110 gallons per capita per day (GPCD) as determined in accordance with California Department of Water Resources' technical methodologies. In 2020, the City's gross per capita water use was 74 GPCD. This 2020 gross per capita water use is far below the 2020 target, and the City is in compliance with all requirements of Senate Bill X7-7. For additional details, see Chapter 5 of this Urban Water Management Plan.

1.6.3 Existing System Water Supply

The Santa Cruz water system relies predominantly on local surface water supplies, which include the North Coast sources (Liddell Spring and Laguna, Majors, and Reggiardo Creeks), the San Lorenzo River, and Loch Lomond Reservoir. Together, these surface water sources represent the majority of the City's total annual water production used to meet system demand. The balance of the City's supply comes from groundwater, all of which is extracted from the Beltz Well system in the Purisima Formation in the Santa Cruz Mid-County Groundwater Basin. During the past decade, the North Coast sources represented 23 percent of the total water supply, the San Lorenzo River represented 56 percent, Loch Lomond Reservoir (Newell Creek) represented 15 percent, and the Beltz Well system contributed the remaining 5 percent.

The City does not currently operate a recycled water system in its service area; however, the Pasatiempo Golf Course, located within the City's service area, now receives disinfected secondary effluent from the City of Scotts Valley that it treats to tertiary standards at the Pasatiempo Golf Course Tertiary Plant for use as recycled water golf course irrigation. This reduces the demand for potable water from the Santa Cruz water system that would otherwise be used for irrigation.

For additional details, see Chapter 6 of this Urban Water Management Plan.

1.6.4 Future Water Projects

As described in Section 1.6.5 below, the City of Santa Cruz is vulnerable to water shortages during multiple dry year periods and as such faces potential obstacles in meeting its future water supply needs. This is primarily due to the limitation in when and how much

[1] Gross water use is the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier.

water is available to meet system demand, exacerbated by a lack of storage within the system. To address these limitations, the City is actively planning and implementing a number of projects and major investments in the water system designed to secure future water supply reliability. Major projects are described below. For additional details on these projects, see Chapter 6 of this Urban Water Management Plan.

1.6.4.1 Water Supply Augmentation Strategy

Since 2015, the City of Santa Cruz has been pursuing a Water Supply Augmentation Strategy (WSAS) developed by the Water Supply Advisory Committee. The Water Supply Advisory Committee was a citizen committee formed in 2014 by Santa Cruz City Council with the charge to analyze potential solutions to deliver a safe, adequate, reliable, affordable and environmentally sustainable water supply for the City of Santa Cruz. The WSAS portfolio elements, which are being pursued on a concurrent timeline, and current progress are summarized below:

- **Element 0: Demand Management**. Demand Management, or conservation, is not considered a water supply for the purposes of the UWMP, and is discussed in Chapter 9 of this Urban Water Management Plan.
- **Element 1: Transfers and Exchanges**. The City has been piloting water transfers to the Soquel Creek Water District since 2018, as water supplies are available, under a cooperative piloting agreement that extends through 2025. The Santa Cruz Water Rights Project Draft Environmental Impact Report, described below, examines implementation of water transfers and exchanges with local water districts, the Soquel Creek Water District, Central Water District, Scotts Valley Water District, and San Lorenzo Valley Water District, that would be facilitated by the proposed water rights modifications to place of use.
- **Element 2: Aquifer Storage and Recovery**. The City has been evaluating the feasibility of ASR in both the Santa Cruz Mid-County and in the Santa Margarita Groundwater Basins, with current work primarily focused on the portion of Santa Cruz Mid-County Basin within the City of Santa Cruz service area. Pilot testing has been conducted at the existing Beltz 8 and Beltz 12 well facilities to better understand potential water quality and operational constraints. The Santa Cruz Water Rights Project Draft Environmental Impact Report, described below, examines implementation of ASR that would be facilitated by the proposed water rights modifications. Next steps include consideration of longer-term demonstration of ASR at existing Beltz Well system facilities.

- **Element 3: Recycled Water or Desalination**. Following completion of the 2017 Desalination Feasibility Update Review Report (Appendix J), further study of recycled water has been prioritized over study of seawater desalination. The City is continuing to examine the use of recycled water through commissioned engineering studies. The 2018 Recycled Water Facilities Planning Study (Appendix I) recommendation includes two projects that would provide non-potable reuse in the City:
  - Santa Cruz Public Works Department Title 22 Upgrade Project
  - BayCycle Project

  The City is also committed to exploring other reuse opportunities, including:
    - Coordination with Soquel Creek Water District's Pure Water Soquel project
    - Explore Groundwater Replenishment Reuse at Beltz Well system
    - Explore Groundwater Replenishment Reuse in Santa Margarita Groundwater Basin

  The City of Santa Cruz is continuing to actively investigate the feasibility of recycled water though an ongoing Phase 2 Regional Recycled Water Facilities Planning Study.

1.6.4.2 Santa Cruz Water Rights Project

The Santa Cruz Water Rights Project supports the implementation of the WSAS and involves the modification of the City's existing water rights to increase the flexibility of the water system by improving the City's ability to utilize surface water within existing allocations. This project also incorporates into the City's water rights bypass flow requirements for all of the City's surface water sources which are protective of local anadromous fisheries (Agreed Flows). The success of this project is necessary for fisheries protection and to facilitate future water supply projects. The primary components of the Santa Cruz Water Rights Project include:

- **Water rights modifications** related to place of use, method of diversion, points of diversion and rediversion, underground storage and purpose of use, extension of time, and stream bypass requirements for fish habitats;
- **Water supply augmentation components**, including new aquifer storage and recovery (ASR) facilities at unidentified locations, ASR facilities at the existing Beltz Well facilities, water transfers and exchanges and intertie improvements; and
- **Surface water diversion improvements**, including the Felton Diversion fish passage improvements and the Tait Diversion and Coast Pump Station improvements.

State Water Resources Control Board noticed the City's water rights change petitions on February 10, 2021. Subsequently, the project's Draft EIR was released for public review in summer 2021. The Final EIR, to be prepared addressing comments received on the Draft EIR, is expected to be completed in late 2021 or early 2022. Once completed, the Santa Cruz City Council will consider project approval and certification of the EIR and the State Water Resources Control Board will consider action on the City's water rights change petitions. The Santa Cruz Water Rights Project Community Guide is included as Appendix L.

1.6.4.3 Santa Cruz Water Program (Capital Investment Program)

City of Santa Cruz has embarked on an ambitious capital investment program, the Santa Cruz Water Program, to secure its future water supply portfolio, to improve reliability and resiliency in the face of climate change, and to address aged infrastructure. Major investments are planned in the coming years to advance toward a twenty-first century water system. Information on all projects included in the Program is included in Appendix N. Elements of the Santa Cruz Water Program Program that will help contribute to support implementation of the WSAS and support water supply reliability include the following.

- **Graham Hill Water Treatment Plant Projects**. Upgrades to the City's Graham Hill Water Treatment Plant are critical to the implementation of the WSAS to allow treatment of higher turbidity source water that otherwise would need to be bypassed during high flow periods such as during and after storm events. Recent and ongoing projects include major maintenance repairs to the flocculation, sedimentation and filtration basins, and replacement of three of the four concrete tanks. Simultaneous with these component repair and replacement projects, staff has been developing the Facilities Improvement Project. The project is a comprehensive evaluation of the facility that identifies the most cost-effective improvements to meet water treatment objectives and improve the overall reliability and resiliency of the plant. These investments are designed to address aging infrastructure, prevent noncompliance with drinking water standards under anticipated future conditions, and support mission-critical values of supplying adequate, safe, and reliable water for the City's customers.
- **Raw Water Transmission Pipeline Projects**. The City is planning improvements to raw water conveyance by upgrades to both the Newell Creek Pipeline and segments of the North Coast system. These projects will improve reliability and reduce hydraulic constraints to improve delivery of raw water to the Graham Hill Water Treatment Plant.
- **Tait Diversion Improvements**. The City is also investigating improvements to the Tait Diversion facility that would improve reliability and fish screening. As described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, if the Tait Diversion is added as a new point of diversion to existing Felton water rights,

Tait Diversion capacity would be increased to accommodate the combined diversion of water under both the Tait and the Felton water rights at this facility.

1.6.5 Water Service Reliability Analyses

The Drought Risk Assessment (DRA) is a new requirement in the 2020 Urban Water Management Plan. The assessment includes a supply and use comparison looking ahead assuming drought conditions over the next five years, 2021 - 2025. In this Urban Water Management Plan, the period 1973 – 1977 is used as the DRA and five-consecutive-year drought in the reliability assessment because it is the period in the historic record that would pose the greatest challenge to the City's water supply system. The City also conducted a parallel analysis utilizing a projected climate change hydrology and five-year consecutive drought. Based on anticipated timing of certification of the Santa Cruz Water Rights Project Environmental Impact Report and action by the State Water Resources Control Board on proposed water rights modifications, the City's proposed water rights modifications, including implementation of the Agreed Flows which are protective of local anadromous fisheries, are assumed for 2022 through 2025 of the DRA, but are not assumed in the first year of the analysis.

Figure 1-1 presents the results of the DRA and anticipated supply from each source. This analysis shows that projected supply would meet projected demand for the first four years of the extended five-year drought, but that in the fifth year, a substantial, 27 percent, shortage is projected. This projected shortage would require aggressive reduction savings according to the City's Water Shortage Contingency Plan. During an extended drought period, however, the City would likely utilize the Water Shortage Contingency Plan and implement demand reduction requirements in earlier years before an actual shortage is experienced, to ensure adequate supplies remain in Loch Lomond Reservoir, thereby potentially reducing the depth of shortage experienced in the fifth year.

The City also conducted Drought Risk Assessment utilizing a selected climate change projection. Figure 1-1C illustrates the City's water supply by source that is projected to be utilized under this climate change projection. The vulnerability of flowing sources, the North Coast Streams and San Lorenzo River, to drought can be seen in the rapid drop of availability of these sources between years two and three in this scenario. Subsequently, the inability to refill Loch Lomond Reservoir during ensuing dry years, leads to two successive years of projected substantial supply shortages.

Figure 1-1: Drought Risk Assessment Supply by Source

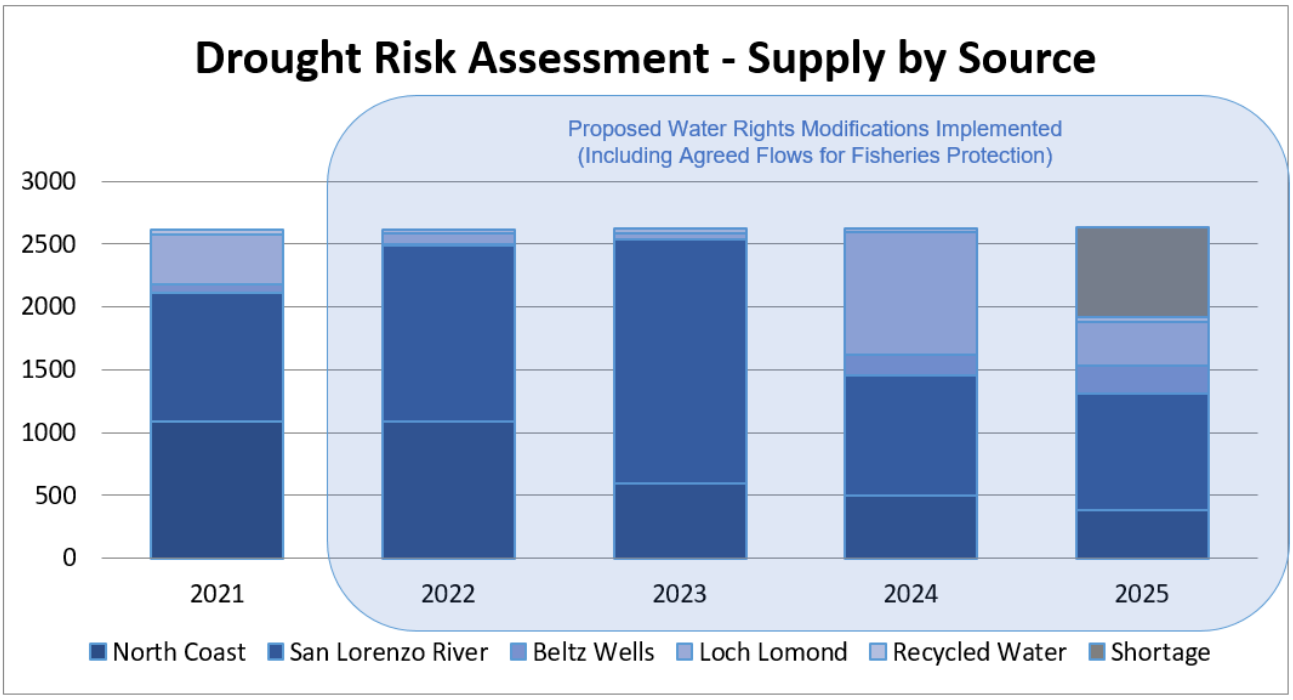
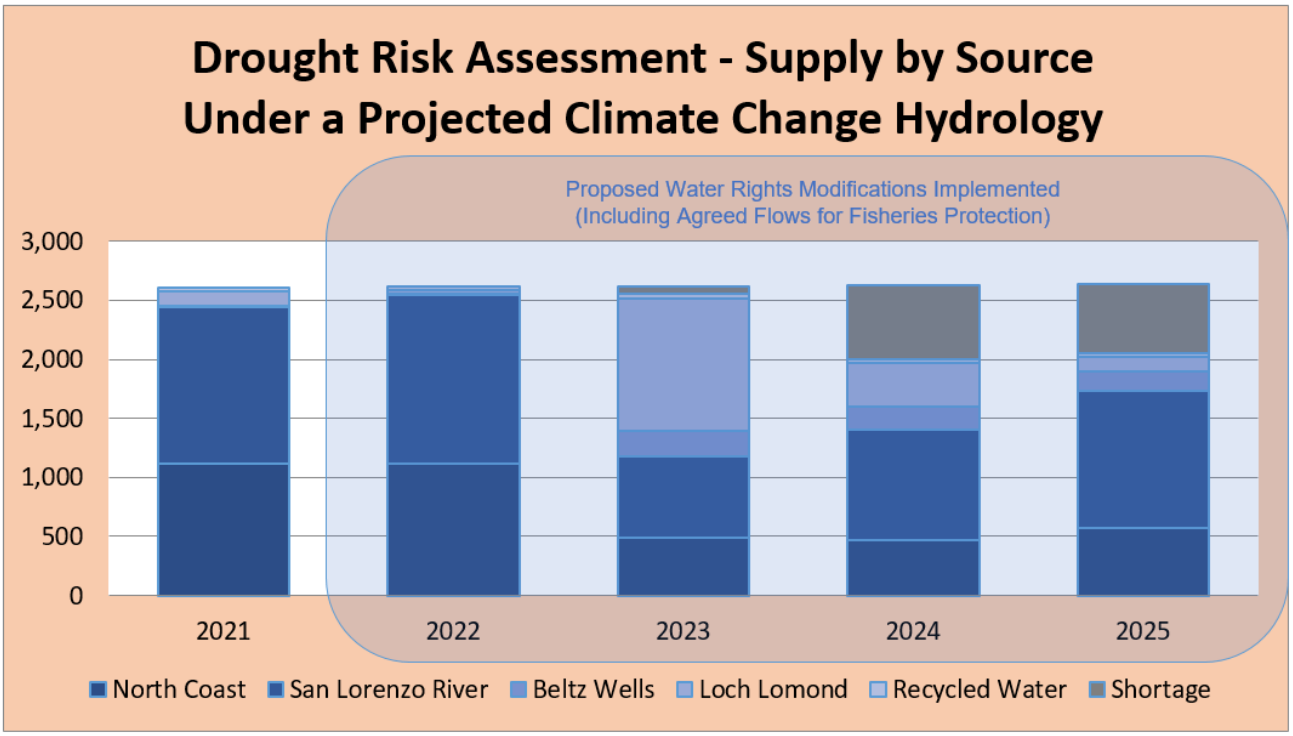


Figure 1-1C: Drought Risk Assessment Supply by Source under a Projected Climate Change Hydrology



To demonstrate supply reliability over time for under different conditions, Figure 1-2 illustrates projected supply available relative to demand over the 25-year planning horizon assessment. The City is safeguarding against future water shortages by actively implementing future water projects as described in Chapter 6, Section 6.8. Implementation of these projects is therefore assumed in the City's water supply planning process. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies over the 25-year planning horizon of this analysis.

- In 2025, the City will have implemented proposed water rights modifications, including implementation of the Agreed Flows which are protective of local anadromous fisheries, as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report (see Section 6.8.2) and
- In 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects:
    - Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report,
    - Improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program (see Section 6.8.3),
    - Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and
    - Replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program.

Under this supply and demand reliability assessment, the City projects having sufficient water supply available in normal years and single dry years to serve anticipated demand throughout the 2025 – 2045 planning period.

Under multi-year drought conditions in the near term (2025), with proposed water rights modifications but before implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the multi-year drought scenario, but would fall short of demand by 27 percent in year five. While the analysis characterizes this vulnerability for year five of the drought period, depending on sequencing of rain years, in reality it is possible that such a shortage could occur sooner and persist longer through a multiple dry year period. Under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the mutli-year drought scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than a negligible two percent.

Figure 1-2C shows the projected supply available relative to demand under the modeled climate change hydrology. Compared to historic hydrology, there is potential for decreased reliability under a single dry year and under multi-year drought conditions under the climate change scenario. The City projects having sufficient water supply available in normal years under the climate change hydrology.

In single dry year conditions under a projected climate change hydrology in the near term (2025), with proposed water rights modifications but before implementation of the ASR and planned infrastructure projects, supply would fall short of projected demand by seven percent. Under multi-year drought conditions in the near term, available supplies would meet projected demand in years one and two of the multi-year drought scenario, but would fall short of system demands by two percent in year three and by 23 percent in years four and five. However, under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than five percent.

Figure 1-2: Projected Supply Availability as Demand Served

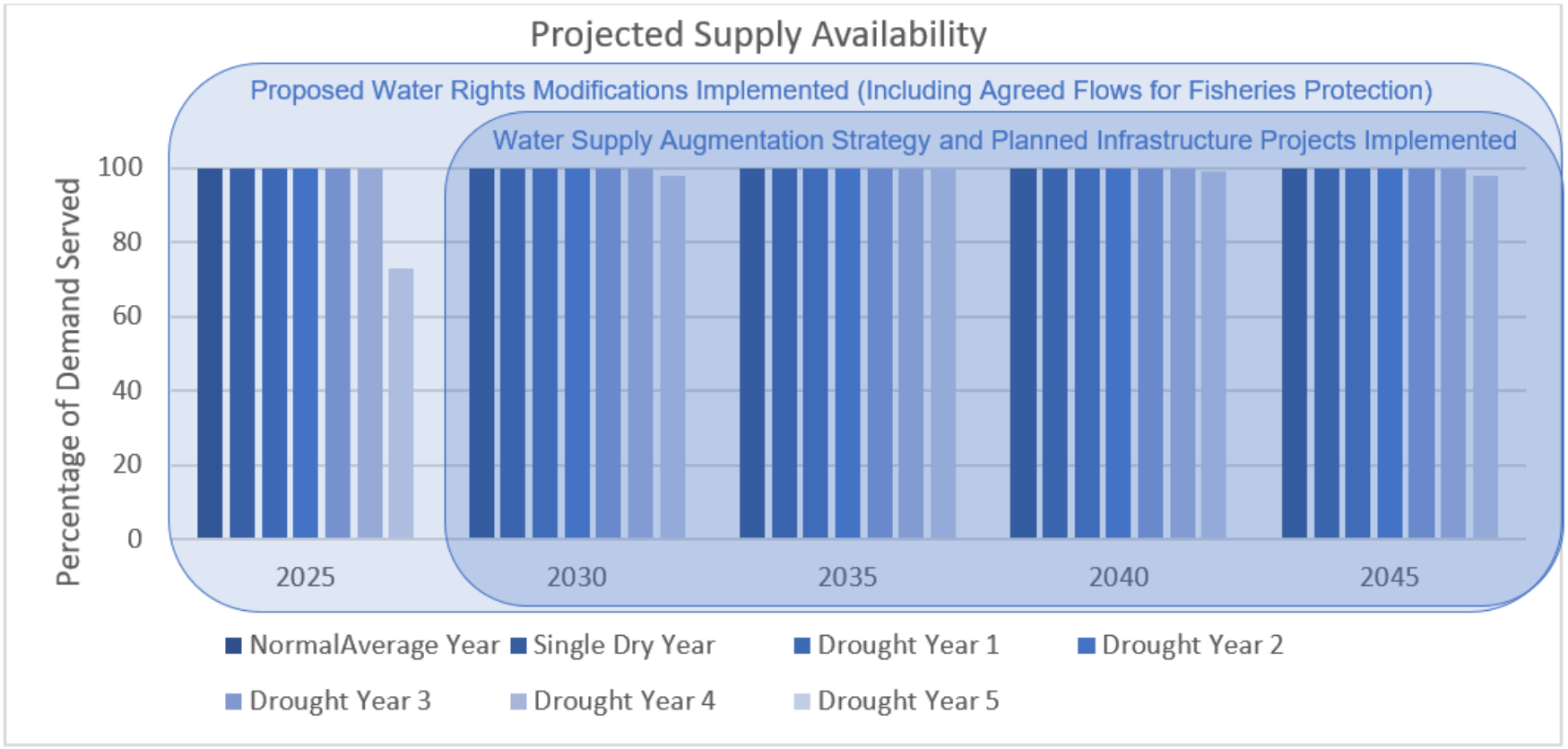
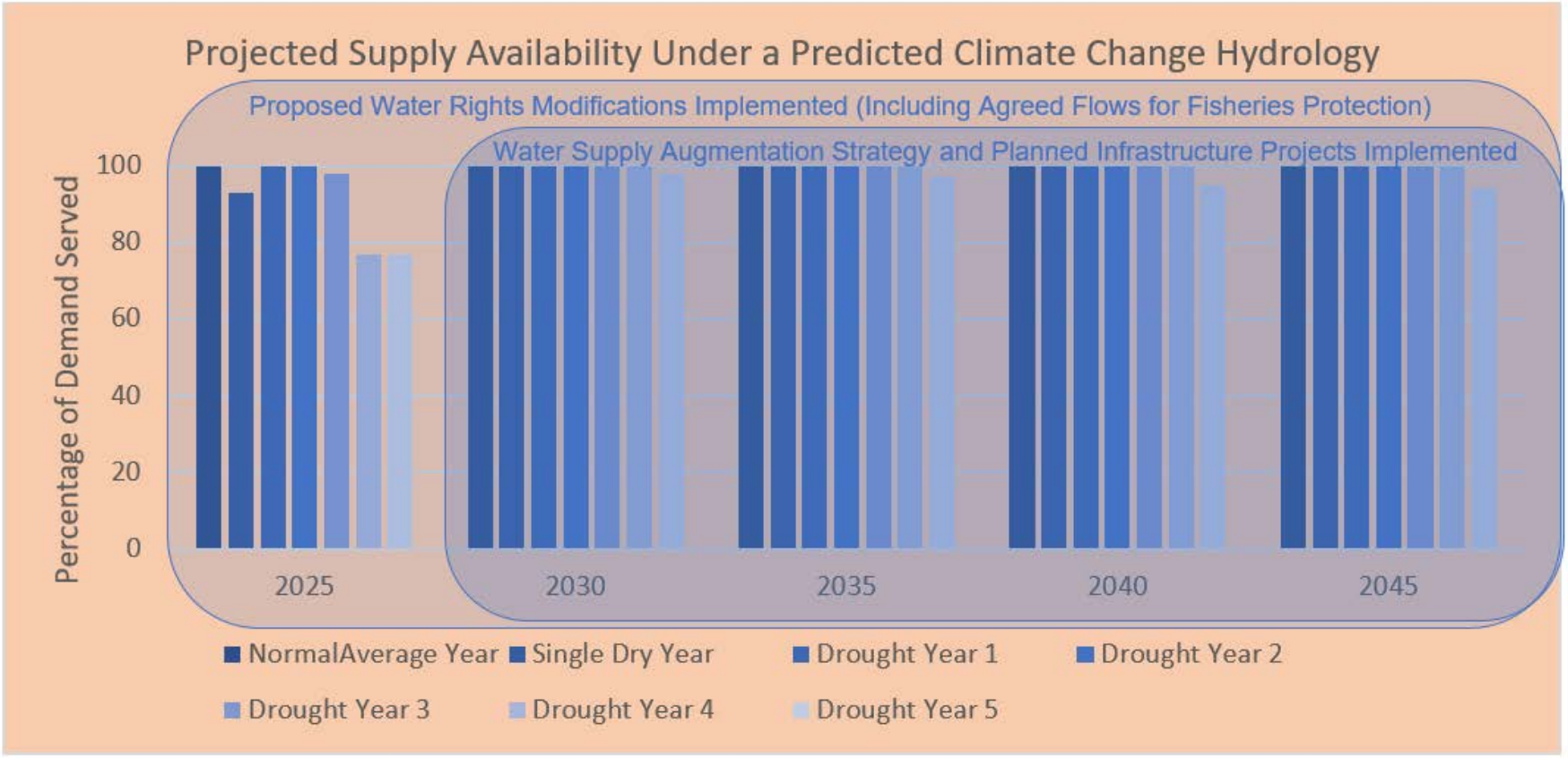


Figure 1-2C: Projected Supply Availability as Demand Served under a Projected Climate Change Hydrology



This assessment illustrates that without implementation of the future water projects described in Chapter 6, Section 6.8, the City would face critical challenges in meeting demand in a projected multi-year drought, under either hydrology consistent with historic conditions or under a climate change scenario. This is largely driven by the City's dependence on local surface water flows and the lack storage with the supply system. The ongoing implementation of the WSAS, including the Santa Cruz Water Rights Project, and Santa Cruz Water Program are critical and necessary elements to secure the City's existing and future water supply reliability.

For additional details on these analyses, see Chapter 7 of this Urban Water Management Plan.

1.6.6 Strategies for Managing Reliability Risks.

As described above, the City of Santa Cruz water system reliability is vulnerable to multiple consecutive dry years in the near term due to the high reliance on surface water sources and limited storage within the system. To address these reliability challenges, the City is pursuing the WSAS including future water projects such as the Santa Cruz Water Rights Project, and the Santa Cruz Water Program.

As required by California Water Code and to manage risks due to water supply shortages that can be expected in the future, this Urban Water Management Plan includes a Water Shortage Contingency Plan. The Water Shortage Contingency Plan presents information about how the City of Santa Cruz manages the water system during a water shortage emergency that arises as a result of drought. It also describes water supply and demand assessment procedures, compliance and enforcement strategies, and actions that would be undertaken in response to a catastrophic interruption of water supplies, including a regional power outage, earthquake, or other emergency situation, legal authority, and other topics.

The Water Shortage Contingency Plan (WSCP) includes six standard water shortage levels and actions that would be taken to reduce demand at each level. Shortage stages in this WSCP are based on peak season demand and correspond to the six standard shortage levels defined in Water Code of up to ten, twenty, thirty, forty, fifty and greater than fifty percent shortage, as summarized in Table 1-1.

Table 1-1: Water Shortage Contingency Plan Levels

Water Shortage Contingency Plan Levels		
Shortage Level	Percent Shortage Range	Shortage Response Actions
1	Up to 10%	Water Shortage Warning. Stage 1 applies to relatively minor water shortage that requires up to a 10% level of demand reduction. The allocation system applies to all stages. At Stage 1, allocations are provided to customers but excess use penalties are not yet implemented.
2	Up to 20%	Water Shortage Alarm. Stage 2 applies to moderate water shortages with a demand reduction requirement of up to 20%. This condition requires more vigorous public information and outreach. The primary demand reduction measure that will be implemented at this stage and all stages going forward is the use of excess use penalties for water use above customer allocations.
3	Up to 30%	Water Shortage Emergency. Stage 3 applies to a serious water shortage with a demand reduction requirement of up to 30%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 3 levels.
4	Up to 40%	Severe Water Shortage. Stage 4 applies to a serious water shortage with a demand reduction requirement of up to 40%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 4 levels. The water supply conditions that would trigger Stage 4 parallel the difficult situation the City experienced in the drought of late 1970s. Under this scenario, virtually all available water must be reserved either for health and safety purposes or to sustain local business.
5	Up to 50%	Critical Water Shortage. Stage 5 represents an imminent and extraordinary crisis threatening health, safety, and security of the entire community. Under this dire situation, extreme measures are necessary to cut back water use by up to half the normal amount. Not enough water would exist even to meet the community's full health and safety needs, the top priority. All water should be reserved for human consumption, sanitation, and fire protection purposes and any remaining amount allocated to minimize economic harm. A shortage of this severity could be expected to generate stress and confusion, much the same as any major emergency and at some point could transform into a full blown natural disaster that can no longer be governed by local ordinance and may need to be managed by the basic principles and command structures of the state Standardized Emergency Management System. The City has experienced water shortages in the past but never one of such large proportion.
6	>50%	Catastrophic Water Shortage. For Stage 6, Santa Cruz takes the position that this level of shortage would most likely only occur due to a major disaster that caused significant damage to our water treatment and/or distribution infrastructure. In such a disaster, such as a large earthquake, the Santa Cruz response would not come from this WSCP, but rather from the main Santa Cruz Water Department Emergency Response Plan.

The very low system-wide water use in the City of Santa Cruz Water System described in Sections 1.6.1 and 1.6.2 above is beneficial from the perspective of meeting demands and preserving water resources, but it also represents a “hardened demand” that presents limited opportunity for further per capita demand reductions. These new demand characteristics mean that reductions at higher stages will be difficult to achieve. In the view of the Santa Cruz Water staff, curtailments beyond Stage 2 of this plan are not really feasible to implement without significant impacts to public health and safety and the Santa Cruz economy. The City is actively implementing its WSAS as the solution to dealing with larger shortages rather than demand curtailment.

Under implementation of the WSCP, the City of Santa Cruz will rely primarily on demand reduction through the implementation of allocations to address shortages at each WSCP stage, the plan also includes outreach, operational changes, mandatory restrictions, and other actions to be implemented at each stage.

For additional details on the WSCP see Chapter 8 and Appendix O of this Urban Water Management Plan.

1.6.7 Challenges Ahead

As with elsewhere in California, the challenges for managing water supply and demand in the central coast region are dynamic. This plan describes in detail the water system as of 2020 and projects future conditions based on known factors, but also acknowledges that the future is both variable and uncertain and that change will continue to occur. Continued implementation the WSAS and planned projects to support improved system reliability including the Santa Cruz Water Rights Project, and Santa Cruz Water Program is essential to securing the future of the Santa Cruz water system to face the challenges ahead.

Chapter 2

PLAN PREPARATIOIN

2.1 Basis for Preparing a Plan

In accordance with the California Water Code, every urban water supplier with 3,000 or more service connections or supplying more than 3,000 acre-feet of water per year are required to prepare an Urban Water Management Plan every five years. With 24,592 active service connections, the City of Santa Cruz clearly meets the definition of "Urban Water Supplier" and therefore must prepare a plan.

The Santa Cruz water system also qualifies under the California Health and Safety Code, Section 116275, as a "Public Water System" that provides drinking water for human consumption and is regulated by the State Water Resources Control Board, Division of Drinking Water. The City operates a single, retail drinking water system. It receives no water from any wholesale supplier nor does it supply either raw or treated water to another agency at the present time, except under a pilot transfer project as described in Chapter 6 of this document.

Table 2-1: Water System Identification (submittal table 2-1R)

Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Supplied 2020 (MG)
CA4410010	Santa Cruz Water Department	24,592	2,606
	TOTAL	24,592	2,606
NOTES: Volume of water supplied is presented in million gallons (MG)			

2.2 Regional Planning and Compliance

The City of Santa Cruz actively participates in several regional, interagency, groundwater and watershed basin management efforts. As indicated in Table 2-2, however, the City is choosing to prepare an individual Urban Water Management Plan.

Table 2-2: Plan Identification (submittal table 2-2)

Plan Identification		
Select Only One	Type of Plan	
☑	Individual Urban Water Management Plan (UWMP)	
	☐	Water Supplier is also a member of a RUWMP
	☐	Water Supplier is also a member of a Regional Alliance
☐	Regional Urban Water Management Plan (RUWMP)	

Similarly, for the purpose of determining, reporting, and assessing compliance with its urban water use baselines and targets as described in Chapter 5, the City of Santa Cruz is choosing to report as an individual supplier.

2.3 Reporting Year and Units of Measure

All information in this plan, except where otherwise noted, is reported on a calendar year basis, and volumes are expressed in units of million gallons.

Table 2-3: Supplier Identification (submittal table 2-3)

Supplier Identification	
Type of Supplier	
☐	Supplier is a wholesaler
☑	Supplier is a retailer
Fiscal or Calendar Year	
☑	UWMP Tables are in calendar years
☐	UWMP Tables are in fiscal years
Units of measure used in UWMP	
Unit	Million Gallons (MG)

2.4 Coordination and Outreach

2.4.1 Wholesale and Regional Coordination

The City of Santa Cruz does not receive a water supply from any wholesaler; therefore, wholesaler reporting is not required. Accordingly, Submittal Table 2-4, Water Supplier Information Exchange is not included in this plan.

2.4.2 Coordination with Other Agencies and the Community

Water Department staff prepared the draft urban water management plan in winter, spring, and summer of 2021 with the by following the guidance outlined in the state's *Urban Water Management Plan Guidebook 2020* (DWR, 2021). Throughout development of this plan, staff was communicating and coordinating with neighboring water agencies, city and county land use agencies within the service area, as well as the staff from the City's wastewater treatment facilities, City of Scotts Valley, and the Santa Cruz County Sanitation District in accordance with section 10620(d)(2) of the Act.

Written notice regarding the plan review and update was sent to both the City of Capitola and the County of Santa Cruz in January 2021, more than 60 days prior to the public hearing, as required by Section 10621(b) of the Act (Appendix B). Notices were provided both to the City Manager/County Administrative Officer and the Community Development Director/Planning Director of these two jurisdictions.

In February 2021, the City conducted outreach to all major public water agencies, wastewater utilities, and land use agencies in Santa Cruz County. This effort included the following organizations:

- Association of Monterey Bay Area Governments
- Central Water District
- City of Capitola
- City of Scotts Valley
- City of Watsonville
- City of Watsonville, Water Division
- County of Santa Cruz
- Local Agency Formation Commission of Santa Cruz County (Santa Cruz LAFCO)
- Pajaro Valley Water Management Agency
- Regional Water Management Foundation
- Resource Conservation District of Santa Cruz County
- San Lorenzo Valley Water District
- Santa Cruz Mid-County Groundwater Sustainability Agency

- Santa Margarita Groundwater Sustainability Agency
- Scotts Valley Water District
- Soquel Creek Water District

Additional coordination focusing on projected population and demand was conducted through a series of meetings with the County of Santa Cruz, City of Capitola, and the University of California, Santa Cruz. Additional coordination regarding wastewater and recycled water was conducted with County of Santa Cruz, City of Scotts Valley, Scotts Valley Water District, and the Pasatiempo Golf Course. As a department of the City of Santa Cruz, the Water Department also coordinated with staff from the City's Planning and Community Development, Economic Development, and Public Works departments during the development of this Urban Water Management Plan.

All of these entities were notified of availability of the Draft Urban Water Management Plan when it was released in September 2021 and directed to an electronic copy of the draft plan on the department website.

The active involvement of the local community within our service area was also encouraged during the development of the Urban Water Management Plan. Plan development and various specific plan elements were presented at public Santa Cruz Water Commission meetings in 2020 and 2021 where the public was given the opportunity to provide input and comment. Water Commission meetings addressing topics covered in this Urban Water Management Plan included the following:

- February 3, 2020: Water Shortage Contingency Plan Update: Data Analysis and Plan Development Process
- July 6, 2020: Analysis of the Probability and Size of Potential Future Water shortages
- September 14, 2020: Working Draft of the Water Shortage Contingency Plan
- December 7, 2020: Draft Water-Sewer Affordability Analysis
- January 4, 2021: Updated Water Shortage Contingency Plan
- February 1, 2021: Preliminary Long-Term Water Demand Forecast Update
- March 1, 2021: Urban Water Management Plan – Approach to Water Service Reliability and Drought Risk Assessment
- April 5, 2021: Urban Water Management Plan: Results of Drought Risk Assessment and Water Supply Reliability Assessment

The process of plan adoption, submittal, and implementation, including associated public hearings, is described in Chapter 10.

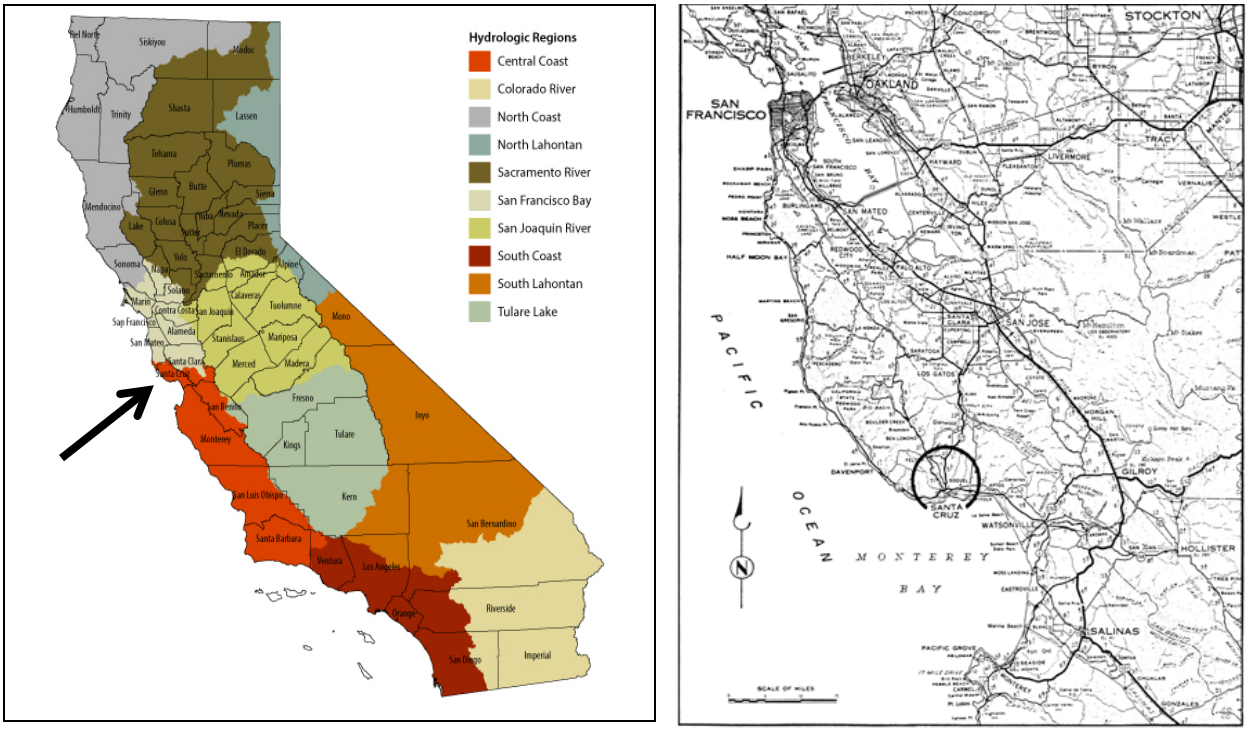
Chapter 3

SYSTEM DESCRIPTION

3.1 General Description of Service Area

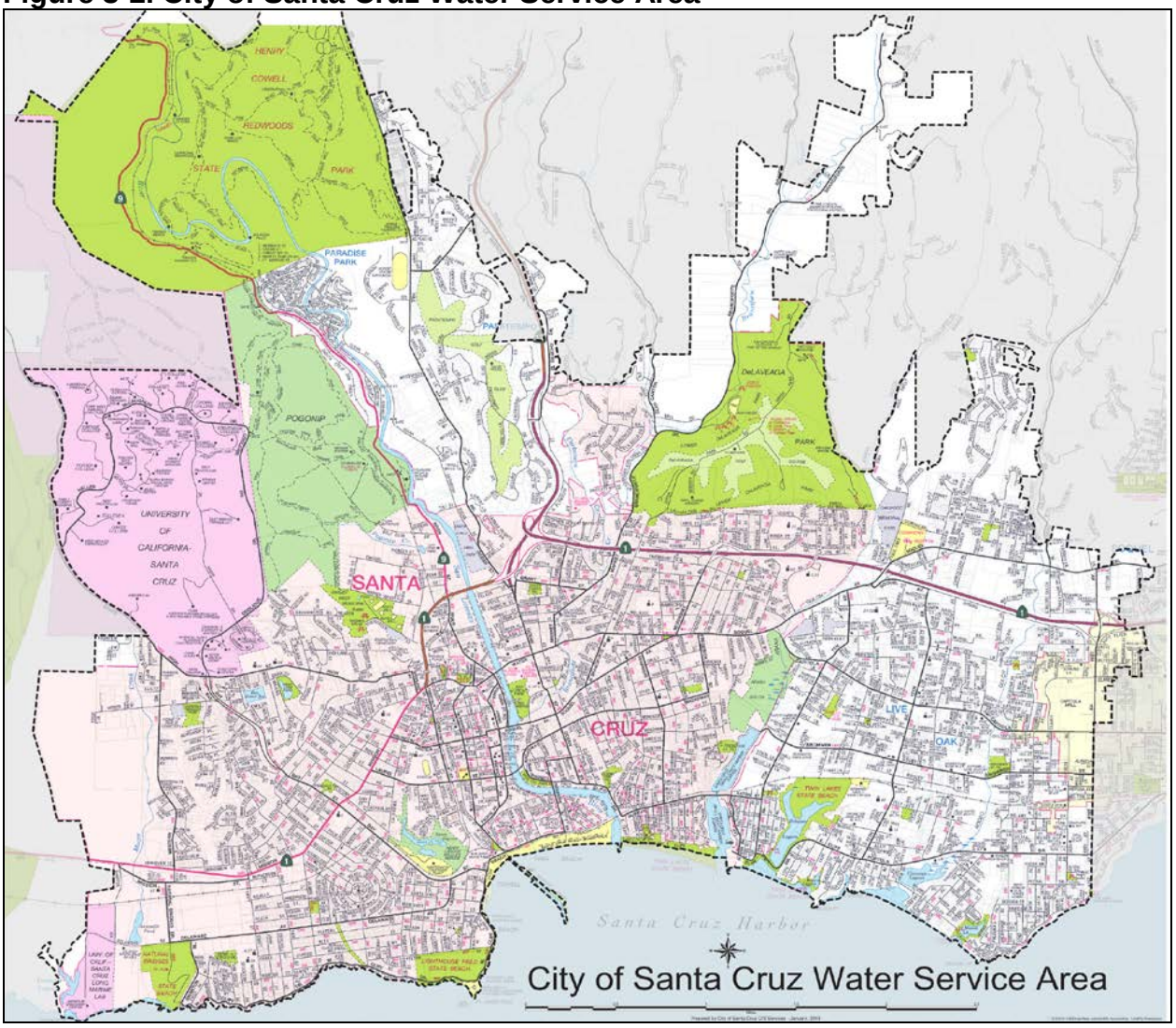
The City of Santa Cruz is located on the central coast of California along the northern shore of Monterey Bay. The City's position on the northern end of the state's Central Coast Hydrologic Region (Region 3) and vicinity relative to the San Francisco Bay Area are shown below in Figure 3-1.

Figure 3-1. California Hydrologic Region and Vicinity Maps



Water service is provided to an area approximately 20 square miles in size, including the entire City of Santa Cruz, adjoining unincorporated areas of Santa Cruz County, a small part of the City of Capitola, and coastal agricultural lands north of the city. A generalized map of the water service area, excluding the coastal agricultural lands north of the City, is provided in Figure 3-2. No significant changes to the City's service area boundary have occurred in many years.

Figure 3-2. City of Santa Cruz Water Service Area



People are drawn to the Santa Cruz area for its recreational attractions, its small town ambiance and sense of community, its pleasant weather, its natural beauty and scenic coastline, and its higher education facilities. The sandy beaches and nearby mountains attract millions of visitors to the region every year. The City is bounded by several state parks and open-space lands that provide facilities for bicycling, hiking and other outdoor activities. The seashore and ocean waters of the Monterey Bay National Marine Sanctuary serve as a prime destination in the summer months for sunbathers, surfers, and tourists. Other visitor attractions include the Santa Cruz Beach Boardwalk, Municipal Pier, and Pacific Avenue Mall.

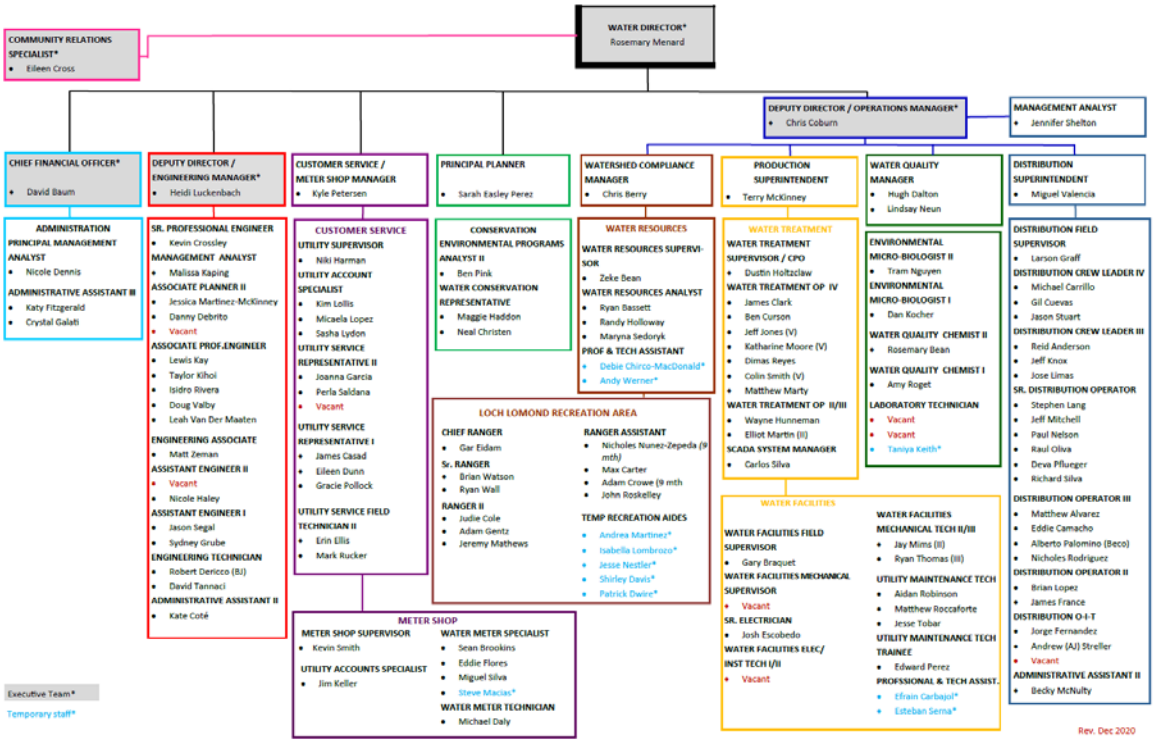
The University of California, Santa Cruz is situated atop the upper west side of the City overlooking downtown and the Monterey Bay. During the 2020 academic year, enrollment was slightly higher than 19,000 undergraduate and graduate students (UCSC, 2021).

3.2 Water Department

The Santa Cruz Water Department (Water Department) is a municipal utility that is owned and operated by the City of Santa Cruz. It is led by a Director who is appointed by the City Manager. The governing body for the Water Department is the seven-member City Council. A seven-member Water Commission advises the Council on policy matters involving the operations and management of the water system. The Commission is composed of six members who reside within the City limits and one member who resides in the unincorporated portion of the water service area.

The Water Department is organized into eight sections. These include Administration, Customer Service and Meter Shop, Water Conservation, Engineering, Water Resources/Recreation, Water Production, Water Quality, and Water Distribution. There is currently the equivalent of 116.5 full-time staff positions in the Water Department. An organization chart of the Water Department in December 2020 is shown in Figure 3-3.

Figure 3-3. Water Department Organization



The Water Department's mission statement is as follows:

> ***"To provide a safe, clean, and continuous supply of water for municipal and fire protection purposes that meets or exceeds local, State, and Federal standards for public health and environmental quality, and to provide courteous, responsive, and efficient service in the most cost-effective manner to our customers".***

The Water Department's major water infrastructure facilities include three water treatment plants, including the Graham Hill Water Treatment Plant and two groundwater treatment plants related to the Beltz well system; four raw water pump stations; ten treated water pump stations; 15 distribution tanks with a total maximum capacity of 21.2 million gallons of treated water storage; seven surface water diversions; seven production wells[1]; and approximately 300 miles of treated and raw water pipelines interconnecting the entire system.

The Water Department operates financially as an enterprise in which all the costs of running the system are paid by water rates, service charges, and related revenues. The Water Fund receives no tax or general fund revenues. In addition to providing water service, the Water Department has responsibility for billing and customer service functions related to sewer, refuse, and recycling services inside the City limits.

Long-range goals and policies for guiding growth and development in the City, including civic and community facilities like the water system, are contained in the City's 2030 General Plan. The General Plan includes a series of policy statements regarding water service that support and promote the General Plan's overarching goal of achieving a safe, reliable, and adequate water supply. (Appendix C). Because these policies have not been updated since the development of the City's Water Supply Augmentation Strategy (described in Chapter 6, Section 6.8), some of these policies require updating to reflect the City's current direction for water supply planning.

[1] The City operates four groundwater production wells within the Beltz well system and three production wells at the Tait Diversion wells that are assumed to be hydraulically connected to surface water and considered to be tied to the City's appropriative rights for surface diversion.

3.3 Service Area Climate

Santa Cruz enjoys a pleasant Mediterranean climate that is characterized by warm, mostly dry summers and mild, wet winters. Due to its proximity to Monterey Bay, fog and low overcast are common during the night and morning hours, especially in the summer. Monthly and annual climate data for Santa Cruz are shown in Table 3-1 below.

Mean monthly temperatures range between 52 to 65 degrees Farenheit (F), with the warmest weather usually occurring during August and September. Extreme temperatures are rare and short-lived, with weather conditions being moderated by the oceanic influence and presence of summer fog.

Rainfall in Santa Cruz averages 31.35 inches annually, but varies considerably from year to year as shown in Table 3-1. The bulk of seasonal rainfall occurs between November and March. In the watershed above the City's Loch Lomond reservoir in the Santa Cruz Mountains, rainfall averages nearly 50 inches per year.

Table 3-1: Climate Data for Santa Cruz (Current 30-year Normal)

Climate Data for Santa Cruz													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean High Temp (F)	62.2	64.4	66.4	69.5	71.9	74.7	75.3	76.2	76.4	73.2	66.8	61.9	69.9
Mean Low Temp (F)	41.3	43.3	44.4	46.0	48.9	51.8	54.0	54.3	53.0	49.5	44.9	41.2	47.7
Mean Temp (F)	51.9	53.8	55.4	57.8	60.4	63.2	64.7	65.2	64.7	61.4	55.8	51.5	58.8
Precipitation (in)	6.28	6.24	4.63	1.97	0.84	0.19	0.01	0.04	0.27	1.45	3.75	5.68	31.35
Evapotran-spiration (in)	1.5	1.8	2.6	3.5	4.3	4.4	4.8	4.4	3.8	2.8	1.7	1.2	36.6
NOTES: National Climatic Data Center 1981-2010 Monthly Normals; CA Department of Water Resources													

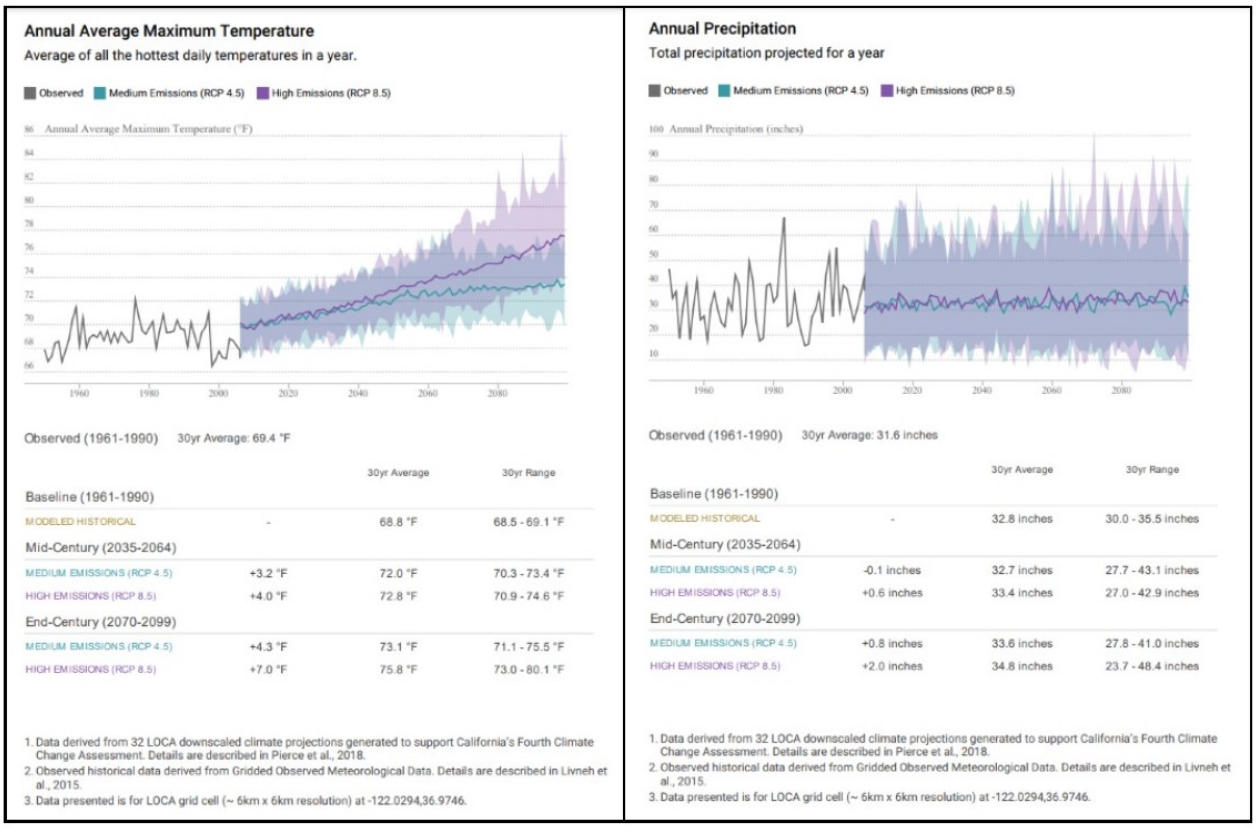
Reference evapotranspiration - a standard measurement of environmental parameters used for determining irrigation needs - averages 39.0 inches per year in Santa Cruz. Average monthly evapotranspiration varies seasonally from a low of 1.2 inches in December and January to a high of 5.1 inches in June (DWR, 2012).

Like other coastal communities, the marine influence on local air temperature, humidity, and cloud cover helps keep demand for water relativity low in the City's service area.

The presence of summer fog moderates outdoor water use during peak summer season compared to inland locations within Santa Cruz County and elsewhere in California.

Future average temperatures in Santa Cruz are expected to increase due to the effects of climate change. Figure 3-4 below shows two projections of mean temperature to 2100 under different climate change scenarios from the Cal-Adapt Local Climate Change Snapshot (Cal-Adapt.org, 2021) [2]. A temperature increase of between 4.3 and 7.0 degrees F compared to the historic average is predicted by the end of the century. Cal-Adapt models of future mean annual precipitation also show a slight increase over time. An increase in precipitation ranging from 0.8 inches to 2.0 inches compared to the historic average is predicted by the end of the century.

Figure 3-4. Projected Mean Temperature and Annual Precipitation for Santa Cruz



Source: Cal-Adapt, 2021

[2] The Local Climate Change Snapshot tool was generated by Cal-Adapt to support California's Fourth Climate Change Assessment. For water supply planning purposes, the City utilizes the CMIP5 climate change model for analyses in this Urban Water Management as described in Chapter 6. Section 6-10.

The City's Climate Adaptation Plan Update 2018-2023, and appendix to the City's Local Hazard Mitigation Plan Five Year Update 2018-2023 indicates changing temperatures and precipitation will impact ecosystems, fire risk, water quality and quantity, human and environmental health (City of Santa Cruz, 2018). As a coastal community, the City of Santa Cruz recognizes the significance of climate change to the City's economic well-being, public health, and environment, and has begun taking steps as a local agency to respond. Impacts of ongoing climate change on water demand, water supply, and water system reliability are discussed further in Chapters 4, 6, and 7.

3.4 Service Area Population and Demographics

The current population residing in the Santa Cruz water service area is estimated to be 96,186 people. Approximately two thirds of the total population, over 64,000, lives inside the City limits. The University of California, Santa Cruz campus houses about 9,000 students on campus within City limits; although a majority of the campus was closed during 2020 due to the COVID-19 pandemic[3]. It is estimated that almost 32,000 people, or about one third of the service area population, live outside the City limits. Since the 2010 US Census, the water service area population has grown by almost 5,000 persons, mostly inside the City limits.

Table 3-2 shows the current and projected population for the water service area out to 2045, in five-year increments.

The 2020 population estimate is based upon California Department of Finance estimates for population within the City of Santa Cruz, and a "persons-per-connection" method for population outside City limits, consistent with methodology required to demonstrate compliance with SB X7-7 (see Chapter 5). Population projections were developed by M.Cubed as part of the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (Appendix D) and are based on the Association of Monterey Bay Area Governments (AMBAG) 2022 Regional Growth Forecast (AMBAG, 2020) and coordination with local jurisdictions[4]. According to the forecast, the total number of people receiving water service is expected to grow by about 17,500 people and reach slightly more than 113,500 in 2045. This equates to a population growth rate of less than one percent per year.

[3] For information on COVID-19 related impacts to water demand in 2020, see Chapter 4, Section 4.4.
[4] Future housing growth in within the service area in City of Capitola is expected to be driven by the proposed Capitola Mall redevelopment project. The project could to add 637 new housing units, and this forecast assumes this new housing will in use by 2030.

Table 3-2: Population Current and Projected (submittal table 3-1R)

Population - Current and Projected						
Population Served	2020	2025	2030	2035	2040	2045
	96,168	101,964	106,072	109,193	112,853	113,650
NOTES: 2020 population from City of Santa Cruz. Population projections from Update of the City of Santa Cruz's Long-Range Water Demand Forecast prepared by M.Cubed (M.Cubed, 2021) (UWMP Appendix D).						

Demographic information is presented in Table 3-3. In addition to information for the City of Santa Cruz, information for the State of California is included for comparison.

Table 3-3: Demographics for City of Santa Cruz and California

Demographics (2019)		
	City of Santa Cruz	California
Median Age (years)	28.8	36.5
Racial Makeup – race alone or in combination with one or more other races (%)		
White	78.3	63.6
Black or African American	4.7	7.0
American Indian and Alaska Native	3.0	2.0
Asian	13.9	17.1
Native Hawaiian	0.3	0.8
Some other race	8.8	14.9
Hispanic or Latino of any race (%)	25.6	39.4
Mexican	18.8	32.6
Puerto Rican	0.8	0.6
Cuban	0.3	0.2
Other Hispanic or Latino	5.8	6.0
Educational Attainment (%)		
Bachelor's Degree or Higher	53.8	33.9
Primary Language Spoken at Home (%)		
English Only	93.8	82.2
Limited English-Speaking Households	2.7	8.9
Median Household Income ($)	77,921	75,235
Population below Federal Poverty Level (%)	20.9	13.4

Source: American Community Survey (ACS) Data: https://data.census.gov/cedsci/

3.5 Land Use and Housing

All three jurisdictions served by the Santa Cruz water system (Cities of Santa Cruz and Capitola and the County of Santa Cruz) have general plans, local coastal programs, zoning regulations, and development standards that determine the location, type, and density of growth allowed in the region. The General Plan serves as the principal policy and planning document guiding long-range land use and conservation decisions in cities and counties.

The cities of Santa Cruz and Capitola have both completed comprehensive updates to their General Plans within the last ten years. The City of Santa Cruz General Plan timeline extends to 2030, and the Capitola General Plan, updated in 2019, has a 20 to 30 year planning horizon. The County is currently developing a comprehensive update to its General Plan which was adopted in 1994. The Sustainability Policy and Regulatory Update (Sustainability Update), is expected to be completed in 2022 and also includes updates to the County's Local Coastal Program and modernization of the County Code. The County has also adopted a Sustainable Santa Cruz County plan addressing sustainable land use, housing, economic development, and transportation objectives in the urban area of the County, part of which is served by the City's water system (Santa Cruz County, 2015). The time horizon of that plan is through 2035.

In addition to city and county General Plans, the University of California, Santa Cruz has Long Range Development Plans (LRDPs) for both its main campus (UCSC, 2005) and its marine science campus (UCSC, 2008, revised 2013) located on the southwestern edge of the City. These plans provide a comprehensive framework to guide physical development, land use, and resource protection to meet the University's academic and institutional objectives through the year 2020. The University released an updated draft 2021 LRDP for its main campus and an associated Draft Environmental Impact Report (EIR). The University is currently in the process of finalizing the LRDP and EIR, but information from the draft 2021 LRDP was used here to inform the development of projected population and demand estimates (Appendix D).

The size of the City water service area has remained relatively fixed over time due to a long-standing prohibition against new water connections along the north coast, the acquisition of open space lands which created a greenbelt around the City, and the County's urban services boundary, all of which have served to inhibit urban sprawl. Accordingly, most growth and redevelopment that does happen going forward is expected to be concentrated within the confines of the existing service area boundary. Any proposed changes to the City's service area boundary that do come forward are

subject to approval by both City Council and the Santa Cruz Local Agency Formation Commission (Santa Cruz LAFCO).

The City's land use patterns are the result of historic development, the establishment of the University of California, Santa Cruz campus in 1964, and more recent land use policies established by the City. The Water Department serves all areas within the City. Land use within the City consists of a mix of residential, commercial, mixed use, office, industrial, public and institutional, park, open space, parking, and vacant land uses. Within the County of Santa Cruz, the areas served by the Water Department include a portion of the Live Oak Plan area, including all of the Pleasure Point Community Plan area. Land use in this area is predominantly residential with a mix of commercial, office, light industrial, open space, parks and public facilities. Within the City of Capitola, the Water Department serves a portion of the 41st Avenue West Capitola residential neighborhood and a portion of the 41st Avenue/Capitola Mall commercial district which includes the Capitola Mall (a region serving shopping plaza), an auto plaza, two hotels as well as a variety of other retail, office, and service establishments within the service area.

Within the City of Santa Cruz, only a small amount of land remains undeveloped. The same is true in the parts of the County and City of Capitola served by the City. Because of the relative scarcity of undeveloped land, the majority of future growth in the area is likely to be achieved through redevelopment, remodeling, increased density on underutilized land, and infill development in the urban core and along major transportation corridors, along with new construction on the limited amount of undeveloped land remaining. Within the City of Capitola, the Capitola Mall is a region serving shopping plaza planned for redevelopment currently including 637 new residential units proposed at conceptual level design.

Many of the major decisions made by local governing bodies about public improvements and private development are also subject to the review and oversight of, or may be appealed to, the California Coastal Commission. Accordingly, major changes within the City water service area tend to occur slowly, if at all, and only after exhaustive public process.

According to utility billing records, there are some 37,701 housing units within the City's water service area. The number of housing units, broken down by account type and jurisdiction is shown in Table 3-4 below. Approximately 19,095, or a little over half of all

households in the service area are classified as single family accounts[5]. The other 18,606 homes are multiple family dwelling units consisting of various housing types including duplexes, condominium and townhouse complexes, apartments, mobile homes and alternative housing types such as live/work units, mixed use development, single room occupancy, and accessory dwelling units. A large proportion of the local housing stock (over 50 percent) is rented. The figures below do not include dormitory rooms, apartments, and other housing units located on the UC Santa Cruz main campus, nor does it include residential units associated with mixed use/commercial accounts.

Table 3-4: Housing Units within Area Served

Housing Units, by Account Type and Jurisdiction			
Jurisdiction	Single Family	Multi-family	Total
City of Santa Cruz	12,287	10,568	22,852
County of Santa Cruz	6,665	7,919	14,584
City of Capitola	146	119	265
Total within Area Served	19,095	18,606	37,701
NOTES: 2020 Annual Sales Report, EDEN Multi-residential units counts report Jul 22, 2021			

Each of the three jurisdictions served by the City has an adopted Housing Element that addresses its required regional fair share of the statewide housing needs established by AMBAG. These documents set forth goals and objectives for housing construction, rehabilitation, and conservation for the period through 2023.The housing elements include regional housing goals for the three jurisdictions served by the City. For this housing element cycle, the City is planning for an additional 747 units. The County is planning for a total of 1,837 units to be built Countywide through 2023. Capitola has a goal to construct 143 units by 2023 in its housing element. Only a portion of the housing within the County and City of Capitola is expected to be within the Santa Cruz Water Department service area. Together, these Housing Elements project a total residential development potential in the near term of about 1,149 new homes within the service area, of which an estimated 414, about one-third, are planned for low-income categories.

[5] Water account categories are not the same as housing type. A single family account has one dwelling unit per meter, but may be any type of residence. A multifamily account has two or more dwelling units per meter.

The Update of the City of Santa Cruz's Long-Range Water Demand Forecast (Appendix D), includes an updated housing estimate for 2020 and a forecast through 2045 broken down by forecasts for housing growth in the service area by inside-City and outside-City. In 2020, total combined occupied and unoccupied housing units within the service area were estimated to be 38,751, and the total number of housing until is projected by 2045 to grow by 3,575 to 42,326.

It is important to note that while each jurisdiction must demonstrate it has land zoned that can accommodate its fair share of the regional housing needs, it does not necessarily mean such housing actually will be constructed. Some of the units projected above are already permitted and under construction. In the last five years, 70 new single-family accounts and 634 multifamily accounts have been added to the service area. The City now incentivizes smaller, more vertical, mixed-use or multifamily-type housing units along its major transportation corridors, and State law has streamlined approvals of Accessory Dwelling Units. What type of housing is ultimately built, though, will depend largely on market forces. And despite the collective vision for increased housing in the community, actual progress remains slow.

3.6 Employment and the Economy

Overall, the University of California, Santa Cruz is a key component of the region's economic fabric in terms of employment, spending, research, and business creation. It is the area's largest single employer. Other top employers include the County of Santa Cruz, City of Santa Cruz, Plantronics, and the Santa Cruz Beach Boardwalk. Tourism and lodging are additional major economic drivers in the community. Commercial development is centered in downtown Santa Cruz including River Street, around 41st Avenue in Capitola, and along the major transportation corridors including Mission, Ocean and Water Streets, and Soquel Avenue. The Harvey West area and west side of Santa Cruz support a diverse mix of light industry, retail, high tech, research, and consumer goods and service enterprises. Regional hospitals, medical and health care facilities and services are concentrated along Soquel Drive in unincorporated Santa Cruz County. Like other coastal communities, housing supply in the service area remains limited and housing affordability is a major economic, political, and social issue for families, residents, and employers alike.

The State Employment Development Department estimates employment within the City's water service area in the second quarter of 2020 (the most recent quarter for which complete data exists) to be about 38,061. The three largest employment sectors are health care and social assistance, educational services, and retail trade (Table 3-5). There are significant reductions in employment noted since 2015, particularly in the retail trade sector likely due to the impact of the global COVID-19 pandemic and economic shut down which occurred in spring of 2020.

Nationally, the U.S. economy lost 22 million jobs between February and April 2020, and the job loss in March and April of 2020 had no precedent since the end of World War II (U.S. Bureau of Labor Statistics, 2020). The City saw an increase in unemployment of more than 7% between the end of 2019 and the end of 2020. Likewise, the City saw decreases in new small businesses and significant decreases in hotel occupancy rates (50 to 75 percent between March and June 2020). Commercial vacancy rates in the City of Santa Cruz increased more than four-fold between the fourth quarters of 2019 and 2020, while the City of Capitola and County of Santa Cruz saw vacancy rates double over the same timeframe. COVID-19 impacts on business water use are discussed in Chapter 4.

Table 3-5: Employment within the Service Area

Employment in Santa Cruz Water Service Area, 2020 second quarter		
Major Industry NAICS Sector	Business Establishments	Employment
AGRICULTURE, FORESTRY, FISHING & HUNTING	15	97
MINING	1	**
UTILITIES	2	**
CONSTRUCTION	290	1,600
MANUFACTURING	131	1,794
WHOLESALE TRADE	104	652
RETAIL TRADE	382	4,604
TRANSPORTATION & WAREHOUSING	46	948
INFORMATION	51	288
FINANCE & INSURANCE	99	707
REAL ESTATE & RENTAL & LEASING	167	496
PROFESSIONAL, SCIENTIFIC, & TECHNICAL SERVICES	419	2,274
MANAGEMENT OF COMPANIES AND ENTERPRISES	9	627
ADMIN & SUPPORT & WASTE MGMT & REMEDIATION	134	1,291
EDUCATIONAL SERVICES	107	6,381
HEALTH CARE & SOCIAL ASSISTANCE	1,158	8,502
ARTS, ENTERTAINMENT, & RECREATION	59	885
ACCOMMODATION & FOOD SERVICES	331	3,266
OTHER SERVICES	250	1,359
NON-CLASSIFIED	*	*
GOVERNMENT	18	2,273
TOTAL	3,773	38,061

NOTES: Data and GIS analysis by Labor Market Division of the California Employment Development Department. www.labormarketinfo.edd.ca.gov . April 2021.

* No data
** Data are confidential and suppressed

Chapter 4

SYSTEM WATER USE

This chapter describes the City's customer classification system, summarizes trends in water consumption, and presents projections of water use out to the year 2045. It also covers water for low-income housing units, future water savings, expected water savings from plumbing codes and standards, and information on distribution system losses.

4.1 Customer Classification System

The City divides its water customers into eight major classes and one miscellaneous category, as follows. In addition to designating accounts into various customer classes. As of 2020, the City also grouped its customers into either "inside-City" or "outside-City" categories for billing purposes.

Single-Family Residential: Individually metered residential units (regardless of housing type).

Multiple-Family Residential*:* Any residential account with more than one dwelling unit served by one water meter.

Business: Commercial establishments including restaurants, hotel/motel, retail, medical, schools, offices, churches and mixed-use buildings. This category also includes county and state government accounts.

Industry/UCSC: This category is comprised of one primary customer - the University of California, Santa Cruz - and a small number of manufacturing businesses.

Municipal: These are City-owned and operated facilities such as city offices, parks, police and fire stations, a wastewater treatment plant, street medians, and parking lots.

Irrigation: Dedicated water services for landscape irrigation associated with large multiple residential complexes and homeowners associations, or with commercial, industrial, and institutional sites, including schools, churches, parks, etc.

Golf Irrigation: Accounts serving the two golf courses in the service area.

Coast Irrigation: Agricultural accounts receiving untreated or “raw” water on the north coast.

Other: Miscellaneous uses such as temporary construction accounts, hydrant meters, and bulk water sales.

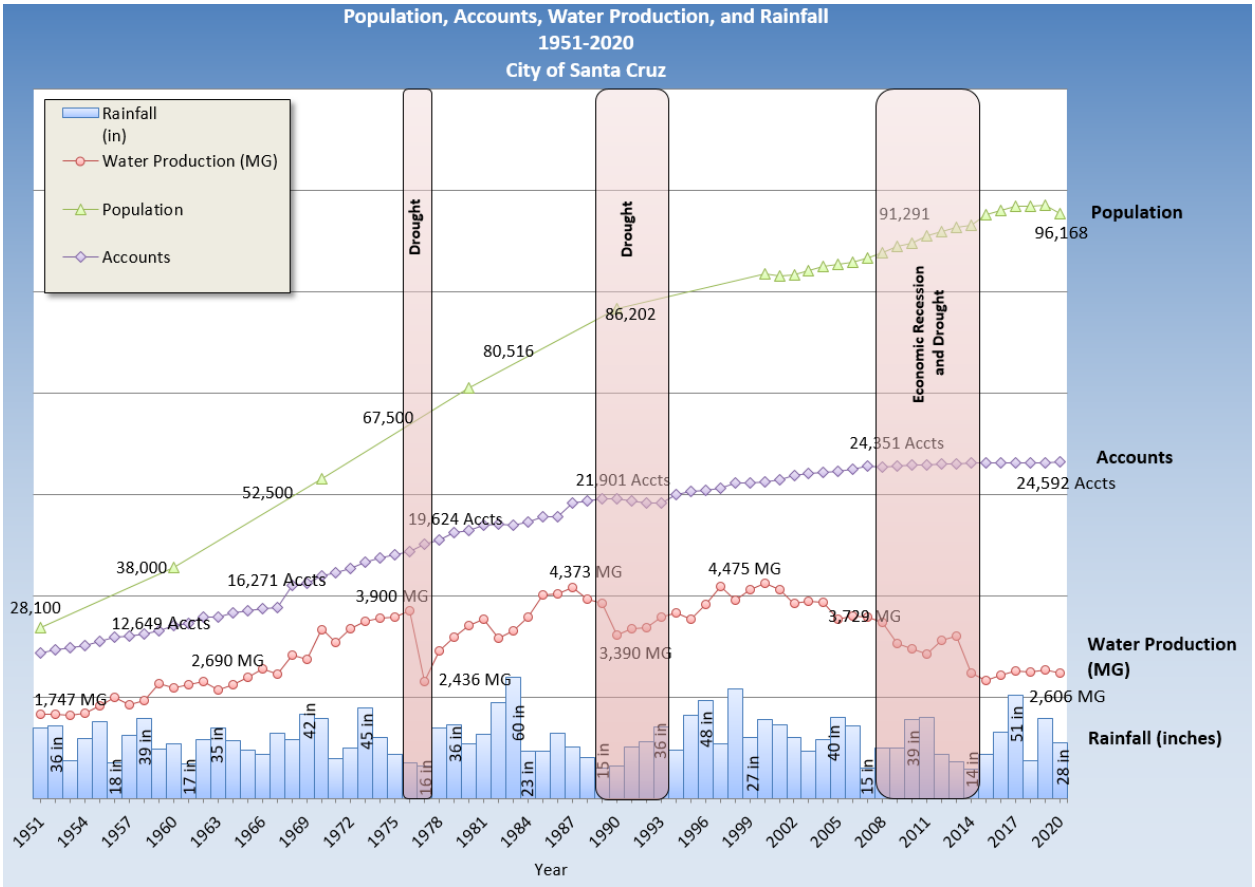
While not customer classes, water transfers and ASR are accounted for in consumption data. As part of the City’s implementation of the Water Supply Augmentation Strategy (WSAS) (see section 6.8), beginning in 2018, the City began piloting water transfers to the Soquel Creek Water District under the “Cooperative Water Transfer Pilot Project for Groundwater Recharge and Water Resource Management”, and beginning in 2019, the City began piloting aquifer storage and recovery (ASR) at existing groundwater wells in the Beltz well system.

Except for coast irrigation accounts that receives raw water, all water supplied is potable water. The City does not currently provide recycled water within its service territory; although, recycled water is supplied to the Pasatiempo Golf Course, which is within the City of Santa Cruz service area, through an agreement with the City of Scotts Valley.

4.2 Historical Water Use

The overall trend in population, number of accounts and total annual water use going back to the 1950s is presented in Figure 4-1.

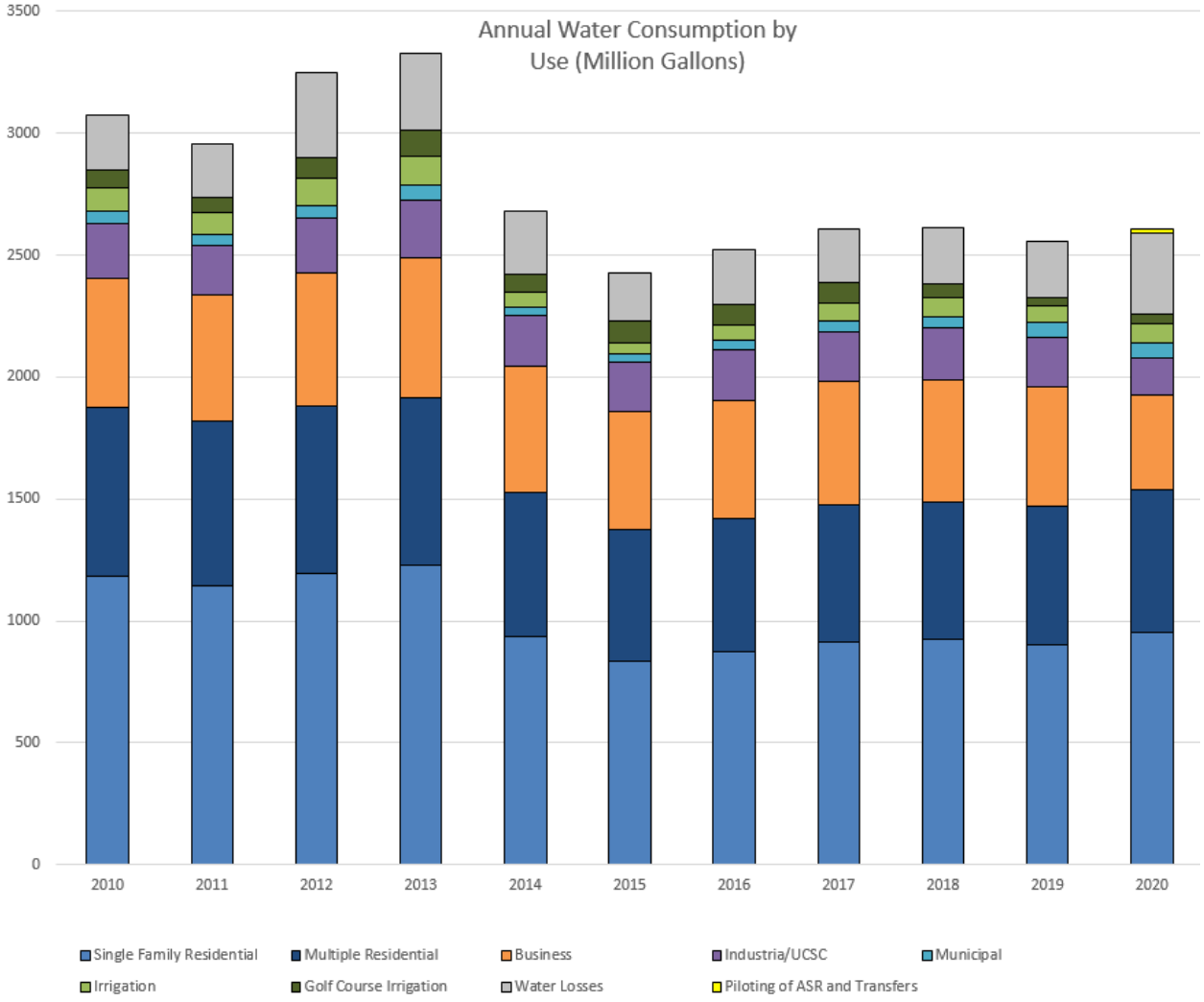
Figure 4-1: Historic Trends for City of Santa Cruz



Until the early 2000s, the general trend in system demand was one in which water use rose roughly in parallel with account and population growth over time, except during two major drought periods in the late 1970s and the early 1990s. Around 2000, this pattern changed and system demand began a long period of decline, accelerated by pricing changes, drought, economic downturn, and other factors including the influences of active conservation programs and updated plumbing codes.

In 2015, after two years of water rationing, annual water use fell to a level of about 2.5 billion gallons, similar to the level experienced during the 1970s drought. In 2020, demand was still at a similar level as 2015, about 2.6 billion gallons, despite several years above long-term average rainfall from 2016 and 2020. While demand did rebound following droughts in the 1970s and 1980s, demand has not rebounded to pre-drought conditions following 2014, contrary to previous projections. A breakdown of annual water consumption by the City's major customer classes since 2010, along with system water losses, is illustrated in Figure 4-2.

Figure 4-2: Annual Water Consumption by Use (million gallons)



4.3 2020 Demands by Sector

Actual demands for potable and non-potable water in calendar year 2020 are reported by use type in Table 4.1 below.

Table 4-1: Demand for Potable and Non-Potable Water (submittal table 4-1R)

Demands for Potable and Non-Potable[1] Water – Actual			
Use Type	2020 Actual		
	Additional Description (as needed)	Level of Treatment When Delivered	Volume (MG)
Single Family	Individually metered dwellings	Drinking Water	952
Multi-Family	2 or more dwelling units	Drinking Water	588
Commercial	Business	Drinking Water	388
Industrial		Drinking Water	39
Industrial	University of California, Santa Cruz -Main Campus	Drinking Water	4
Industrial	University of California, Santa Cruz - Coastal Campus	Drinking Water	106
Institutional/Governmental	Municipal	Drinking Water	66
Landscape	Dedicated irrigation accounts	Drinking Water	77
Landscape	Golf irrigation - potable water	Drinking Water	39
Other Potable	Piloting Aquifer Storage and Recovery at Betlz Well 8	Drinking Water	4
Sales/Transfers/Exchanges to other Suppliers	Piloting Transfers t to Soquel Creek Water District	Drinking Water	13
Losses		Drinking Water	331
		TOTAL	2,606

[1] *Recycled water demands are not reported in this table.*

NOTES: System water losses are considered provisional until 2020 annual water audit is completed. High losses could be attributable to meter failures. A system-wide meter replacement program is underway in 2021. Figures above do not include raw water sales of 6MG in 2020 for coastal irrigation. No drinking water was otherwise used for groundwater recharge, saline water intrusion barrier, or wetlands or wildlife habitat.

In addition to the potable water demand listed below, the City also supplied 6 million gallons of raw water to coast irrigation accounts in 2020. Recycled water demand at Pasatiempo Golf Course is reported separately in table 4.3 below.

Provisional water losses were reported to be 331 million gallons representing a noticeable increase over the long-term average. While, this value is considered provisional until the 2020 annual water audit is completed, the increased water loss is believed to be attributable to an increasing number of meter failures throughout the system. The City is slated to begin a system-wide replacement of its metering system in fall 2021. This project will replace all meters that are older than three years and outfit all meters with an Advanced Metering Infrastructure (AMI) radio over a 15-month period.

4.4 Water Demand Projections

The forecast of future water demand is a foundational component of any Urban Water Management Plan. In 2014 and 2015, the City of Santa Cruz worked with M.Cubed to develop a long-term water demand forecast using econometric forecasting for the first time that was used in the 2015 Urban Water Management Plan, and that demand forecast was updated in 2021 for use in this 2020 Urban Water Management Plan. Appendix D includes a summary and results from M.Cubed's forecasting work.

Econometric demand forecasting develops statistically-based models of average water use per service by customer class. The 2015 demand forecast was developed based on these models and incorporating empirical relationships between water use and key explanatory variables, including season, weather, water rates, household income, employment, conservation, and drought restrictions. Monthly models of water demand were then combined with service and housing growth forecasts to predict future water demands. The approach built on similar models of water demand developed for the California Urban Water Conservation Council (Western Policy Research, 2011), Bay Area Water Supply and Conservation Agency (Western Policy Research, 2014), California Water Service Company (A&N Technical Services, 2014, M.Cubed 2015), and Contra Costa Water District (M.Cubed 2014).

Water use was rationed by the City of Santa Cruz in 2014 and 2015 due to severe drought conditions. In the years following the end of rationing, water sales remained significantly below the long-term projections included in the 2015 Urban Water Management Plan. Following up on the 2015 work, M.Cubed prepared a comparative analysis for the calendar year 2018 to analyze the divergence between projected and actual sales. After normalizing for weather, the forecast was found to be approximately 19% greater than actual sales in this year. The divergence of the forecast from actual sales coincided with changes to the City's water rate structure adopted in 2016. The

new rate structure resulted in significant increases in the marginal cost of water service. Most of the forecast error was found to be driven by the increase in the marginal cost of water service. Weather was not found to be a significant explanatory factor, nor were differences in actual and projected sales to large customers (UCSC and the two golf courses).

Subsequently, M.Cubed updated its long-term forecast for this 2020 Urban Water Management Plan in 2021, adjusting to reflect the higher marginal cost of water service and incorporating other updated information. This update included:

- Updated service area population, land use and housing projections consistent with Association of Monterey Bay Area Governments projections[1],
- Updated baseline estimates of average water use per service connection by customer class based on customer-level billing data,
- Adjustment to baseline averages use estimates to account for the effects of plumbing codes, on-going conservation, and marginal water service cost,
- Adjustment to projections for future water demands of the University of California Santa Cruz, based on their 2020 draft Long-Range Development Plan, and
- Accounting for COVID-19 pandemic on current and future water use.

The resulting water demand projection predicated on average weather and normal (predicted) income and growth, by customer class, is presented in Table 4-3. For reference, the 2015 demand forecast projected stable demand of 3.4 billion gallon per year for 2020 through 2035 with only very slight increase in demand over this period. As summarized below, current expectation for water system demands are for demand to increase at a slow rate from about 2.6 billion gallons per year in 2020 to about 2.7 billion gallons per year with total water use projected to be about 2.8 billion gallons per year in 2045.

[1] Future housing growth in within the service area in City of Capitola is expected to be driven by the proposed Capitola Mall redevelopment project. The project could to add 637 new housing units, and this forecast assumes this new housing will in use by 2030.

Table 4-2: Projected Water Use (submittal table 4-2R)

Use for Potable and Non-Potable[1] Water - Projected						
Use Type	Additional Description (as needed)	Projected Water Use (MG) *Report To the Extent that Records are Available*				
		2025	2030	2035	2040	2045
Single Family	Individually metered dwellings	954	952	958	966	974
Multi-Family	2 or more dwelling units	604	608	602	607	611
Commercial	Business	504	488	464	458	462
Industrial		37	37	37	37	37
Institutional/Governmental	Municipal	54	51	47	47	47
Landscape	Dedicated irrigation accounts	77	69	59	58	59
Landscape	Golf irrigation - potable water	44	40	36	35	35
Institutional/Governmental	University of California, Santa Cruz - Main Campus	10	15	21	26	26
Institutional/Governmental	University of California, Santa Cruz - Coastal Campus	152	199	245	292	292
Losses		197	199	200	204	206
TOTAL		**2,633**	**2,659**	**2,668**	**2,730**	**2,749**

[1] *Recycled water demands are NOT reported in this table.*

NOTES: Excludes 12 MG of projected raw water use for North Coast agriculture projected for 2025 through 2045. Raw water demand is not incorporated into the City's Confluence water supply model. Projected water use is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (UWMP Appendix D).

Compared to water use in pre-pandemic years 2018-2019, water use in 2020 during the global COVID-19 pandemic was significantly lower for business use and slightly higher for residential water use. The change in business water use is thought to be a consequence of the Governor's shelter-in-place order and business restrictions put in place in response to the pandemic. Observed changes in residential water use can be attributed to both the pandemic and to weather differences. See Chapter 3, Section 3.6 for additional discussion of local economic impacts of the COVID-19 pandemic.

Current and projected total water use, including recycled water use as described in Chapter 6, are presented in Table 4-3.

Table 4-3: Total Water Use (submittal table 4-3R)

Total Water Use (Potable and Non-Potable)						
	2020	2025	2030	2035	2040	2045
Potable Water, Raw, Other Non-potable	2,606	2,633	2,659	2,669	2,730	2,749
Recycled Water Demand	36	35	35	35	35	35
TOTAL WATER USE	2,642	2,668	2,694	2,704	2,765	2,784
NOTES: Projected water use is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (UWMP Appendix D).						

4.5 Estimating Future Water Savings

Current levels of customer demand and the long term forecast indicate that the Santa Cruz community has already achieved levels of water conservation well beyond the levels of anticipated in the 2015 Urban Water Management Plan and well beyond the levels forecasted by implementation of the City's 2017 Water Conservation Master Plan (WCMP), and has done so without the anticipated spending on implementation the WCMP.

As described in Appendix D, the City of Santa Cruz Updated Long-Range Water Demand Forecast includes passive savings from plumbing code effects. In the forecast, the baseline average water use per service was developed based on observed water use in each customer category. Baseline average use was then adjusted over the forecast period for the effects of plumbing codes, and changes in marginal water service costs. Indoor residential water use was adjusted for plumbing code effects, with a floor of 36 gallons per capita day (gpcd) set. This floor is set because 36 gpcd is the average water use of highly efficient WaterSense retrofitted households, as measured by the 2016 Residential End Uses of Water Study (Water Research Foundation 2016), and average indoor water use is not expected to fall below this already highly efficient level. Non-residential baseline water use per service, other than Industrial, was also adjusted for plumbing codes effects.

In this demand projection, water savings from the City of Santa Cruz water conservation programs were assumed to be subsumed within adjustments made to marginal water costs. This is because as marginal water cost increases, customers demand less water by forgoing consumption and by substituting other factors of production. For example, households may install more efficient water using appliances or change their landscaping and irrigation practices. Utility conservation programs, such as the City of Santa Cruz Conservation program, facilitate these transitions. In other words, the price change motivates program participation. The estimates of price elasticity used in the demand forecast capture these dynamics.

Plumbing code effects in the demand projection were derived from estimates prepared by M.Cubed for the California Department of Water Resources (M.Cubed 2016). Plumbing code and appliance efficiency standards considered include:

- AB 715, enacted in 2007, requiring standards for toilets and urinals.
- Water use standards for residential and commercial clothes washers and dishwashers established by the U.S. Department of Energy.
- CalGreen Code requirements for new construction and renovation.
- SB 407, enacted in 2009, requiring compliance with plumbing fixture standards for all buildings in California by 2019. SB 407 also requires compliance or disclosure of non-compliant plumbing to a purchaser or transferee for single family, multi-family, or commercial transactions.
- SB 837 passed in 2011, which reinforces the disclosure requirement under SB 407.

Table 4-4: Inclusion in Water Use Projections (submittal table 4-5R)

Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections?	Yes
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, or otherwise are utilized in demand projections are found.	2020 Urban Water Management Plan Chapter 4, Section 4.5
Are Lower Income Residential Demands Included In Projections?	Yes

4.6 Water Use for Lower Income Households and Affordability

In its demand forecast, the City expects over 1,000 new housing units to be built in its service area by 2045. Chapter 3, Section 3.5, Land Use and Housing, provides details about these housing units, including units that are planned for lower income categories. The water demand for these low-income units, while not separately calculated, is well within the range of housing units factored into the City's demand forecast.

The City of Santa Cruz also recently completed an updated Water/Sewer Affordability Analysis (Appendix E) to help support the City's water rate setting process. The analysis was conducted for each census block in the City's water service area and was focused on the affordability of essential water use for both single and multi-family residential customers. The analysis is planned to be updated to assess how affordability may change as a result of the proposed rate restructuring.

Key findings of the 2020 study included:

- Essential water and sewer service in Santa Cruz remain affordable for most customers.
- Approximately 20% of households served by the City of Santa Cruz are located within census blocks with high affordability ratios indicating that water and sewer service costs may constitute a financial burden.
- Approximately 16% of households are located within census blocks where the financial burden of water and sewer service costs were scored high due to both high affordability ratios and high poverty prevalence. These customers are most likely to struggle with meeting basic living expenses, of which water and sewer service are a part.

4.7 Distribution System Water Losses

The volume of total system water demand is composed primarily of metered water sales in addition to a range of authorized, metered and unmetered operational uses such as main flushing, water tank maintenance, firefighting, and sewer flushing, as well as losses due to underground leaks. The difference between the amount of water produced at the City's water treatment plants entering the distribution system and the amount of water consumed, including both metered and unmetered uses, is referred to as system water losses. System losses have two components: physical losses from leaking service lines and water mains, and apparent losses in which actual consumption is underreported due to sales meter inaccuracies and other factors.

The City has conducted audits of the distribution system annually since the late 1990's to account for unmetered water uses and to track how much water is lost to leakage over time. The City uses AWWA water balance software to help quantify and track water losses associated with the water distribution system and identify areas for improved efficiency and cost recovery. Total water losses vary from year to year, averaging 221 million gallons per year from 2015 to 2019.

The volume of water loss for calendar year 2015 through 2019, which is the most recent five years of data available, is presented in Table 4-5. In 2018, the City concluded a four-year Water Loss Control program to examine the City's water system and operations practices to better validate where losses are occurring, evaluate options, and set forth a formal strategy to improve water accountability and reduce the annual volume of Non-revenue water. Provisional water losses for 2020 are provided in Section 4.3. More information on distribution system water losses is covered in Chapter 9.

Table 4-5: Water Loss Audit Reporting (submittal table 4-4R)

Last Five Years of Water Loss Audit Reporting	
Reporting Period Start Date	Volume of Water Loss (MG)
2015	198.34
2016	226.825
2017	219.609
2018	232.296
2019	225.729
NOTES: 2020 annual audit data not yet available.	

4.8 Climate Change Impacts on Water Use

The City's analysis and exploration of potential climate change effects on water system supplies are described in Chapter 6, Section 6.10, and consideration of potential climate change effects on system reliability are further included in the analyses in Chapter 7.

Using parameters from the econometric demand models, weather effects on City water demand were investigated using historical data on sales and weather and expressed as the expected change in demand per a one degree F increase in average maximum daily air temperature over the entire year (M.Cubed, 2016). The analysis showed, based on water use patterns, demand would increase from between 0.19 to 1.38 percent for one degree increase in average daily high temperature for every customer group except industrial. Results are summarized in Table 4-6.

Golf consumption s expected to have the largest increase in demand due to change in maximum daily temperature and multifamily consumption is the least responsive. Total system demand would be expected to increase by about 0.45 percent per one degree F increase in average daily high temperature. Therefore, in the higher scenario for projected temperature for the end of the century (2070 – 2099) shown in Figure 3-4, if average temperature in Santa Cruz were to rise by 7 degrees, water demand could be expected according to this analysis to increase by 3.2 percent.

Table 4-6: Expected Change in Demand per Change in Monthly Temperature

Expected Percent Change in Demand per 1 Degree Fahrenheit Change in Monthly Average Maximum Daily Air Temperature	
SFR	0.62
MFR	0.19
BUS	0.29
MUN	1.09
IRR	0.80
GOLF	1.38
IND	0.00
Weighted Average	0.45
NOTES: M.Cubed, 2016. UCSC not listed since it was not modeled in econometric demand forecast.	

Chapter 5

SB X7-7 BASELINES AND TARGETS

This chapter provides a description and calculations for the City's baseline daily per capita water use and future water use targets, in accordance with technical methods developed by the California Department of Water Resources, as required by Water Code section 10608.

> ***CWC 10608.20***
>
> ***(e)*** *An urban retail water supplier shall include in its urban water management plan . . . the baseline daily per capita water use, urban water use target, interim water use target, along with the bases for determining those estimates, including references to supporting data.*

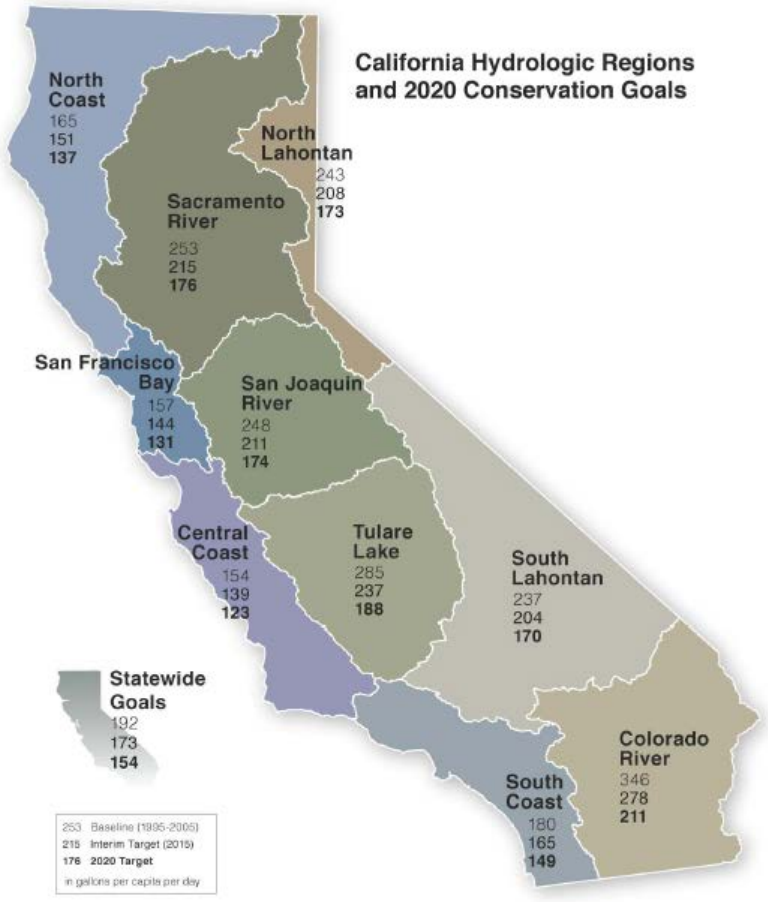
5.1 Background Information

In February 2008, the Governor introduced a seven-part comprehensive plan for improving the Sacramento-San Joaquin Delta. As part of this effort, the Governor directed state agencies to develop a plan to reduce statewide per capita water use by 20 percent by the year 2020.

The final 20x2020 Water Conservation Plan was issued February 2010 (DWR, 2010). It reported urban water use varied between 152 GPCD in the Central Coast region (Region 3) to 346 gallons per capita per day (GPCD)[1] in the Colorado River region (Region 10) and averaged 192 GPCD statewide. The report concluded that California could achieve a 20 percent reduction in urban per capita water use to an average of 154 GPCD using current and new conservation actions. It also established for water resources planning purposes baseline values and future water use targets for each of the state's ten hydrologic regions, summarized in Figure 5-1.

[1] Gallons per capita per day or GPCD is the total number of gallons used by the region divided by the population

Figure 5-1: Regional Urban Water Use Targets



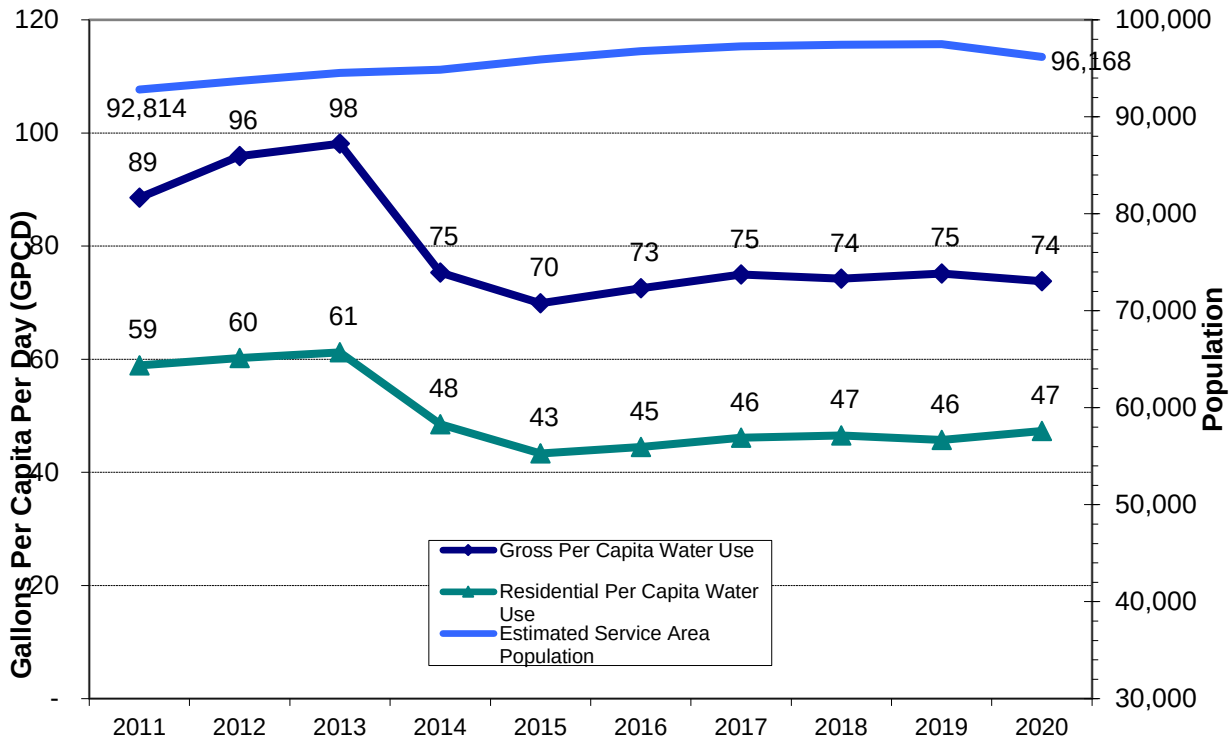
With the enactment of the Water Conservation Act of 2009, also known as SB X7-7, the state is required to set a goal to reduce urban per capita water use by 20 percent by the year 2020. Each retail urban water supplier was required to determine its baseline water use during their baseline period and also target water use for the years 2015 and 2020 in order to help the State achieve the 20 percent reduction.

To provide for consistent implementation of the law, suppliers are required to conform to Technical Methodologies prepared by the CA Department of Water Resources, which details the process that urban water suppliers are to follow and the options available for complying with the legislation (DWR, February 2016). Water suppliers have some flexibility in setting and revising water use targets. For instance, a water supplier may set its water use target and comply individually, or as part of a regional alliance. The City of Santa Cruz elects to report as an individual retail supplier. In this 2020 Plan, water

agencies must demonstrate compliance with their established water use target for the year 2020. Retail water agencies are also required to separately complete and submit the standard tables in the SB X7-7 verification form (Appendix G).

Figure 5-2 below shows the City's per capita water use and estimated population since 2011. The dark blue line labeled Gross Per Capita Water Use[2] is the metric that water agencies are required to calculate and to reduce under SB X7-7. It represents all the treated water entering the distribution system over one year's time, divided by the total population, and expressed in gallons per person per day. As explained further below, gross per capita water use includes residential and nonresidential uses of water in the community, as well as unmetered uses such as firefighting and losses that occur due to leakage on the distribution system.

Figure 5-2: Per Capita Water Use and Service Area Population



[2] Gross water use is the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier.

The bottom line labeled Residential Per Capita Water Use is included for reference only. It represents the total annual metered water consumption for single and multiple residential accounts, divided by the residential population[3]. It is intended to show the estimated average amount of water used by a person both indoors and outdoors at their home on a daily basis. This metric better approximates how most people relate to their own personal water use at their property.

The City's gross per capita water use has declined significantly since 2000 when gross per capita water use was about 127 GPCD. In the past ten years, the gross per capita water use has ranged from a high of 98 GPCD in 2013 to a low of 70 GPCD in 2015. The City's current gross per capita water to 74 GPCD in 2020.

5.2 SB X7-7 Compliance Summary

As shown in Tables 5-1 and 5-2, the City's gross per capita water use is presently far below its **2020 target of 110 GPCD,** as determined in accordance with DWR's technical methodologies. Accordingly, the City is presently in compliance with all requirements of SB X7-7.

Table 5-1: Baselines and Targets Summary (submittal table 5-1R)

Baselines and Targets Summary From SB X7-7 Verification Form				
Baseline Period	Start Year	End Year	Average Baseline GPCD	Confirmed 2020 Target (GPCD)
10-15 year	2001	2010	113	110
5 Year	2003	2007	116	

Table 5-2: Compliance Summary Table (submittal table 5-2R)

X7-7 2020 Compliance Form				
2020 GPCD			2020 Confirmed Target GPCD	Did Supplier Achieve Targeted Reduction for 2020?
Actual 2020 GPCD	2020 TOTAL Adjustments	Adjusted 2020 GPCD		
74	0	74	110	Yes

[3] Residential population differs from total population. There are several thousand students, families, and staff living on the University main campus, which is classified as an industrial account. Only the people living in residences off-campus are counted for the purpose of calculating R-GPCD.

5.3 2020 Calculated Baseline and Target

Because the Santa Cruz Water Department submitted a 2015 UWMP including the SB X7-7 Verification Form and has not had a change to its service area, the baselines and targets from the 2015 UWMP do not need to be recalculated for 2020. The City calculated its 2020 target in compliance with the Water Conservation Act of 2009 using Method 3 of the four approved methods as described in DWR's Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the Consistent Implementation of the Water Conservation Act of 2009). Refer to the 2015 Urban Water Management Plan for detailed information on this methodology.

5.4 2020 Population and Gross Water Use

Consistent with requirements for demonstrating SB X7-7 compliance, the 2020 population estimate was developed by the City based upon California Department of Finance estimates for 2020 population within the incorporated City of Santa Cruz and a "persons-per-connection" method for the population outside City limits (Appendix D). The water service area outside City of Santa Cruz limits, includes portions of the City of Capitola and portions of unincorporated Santa Cruz County.

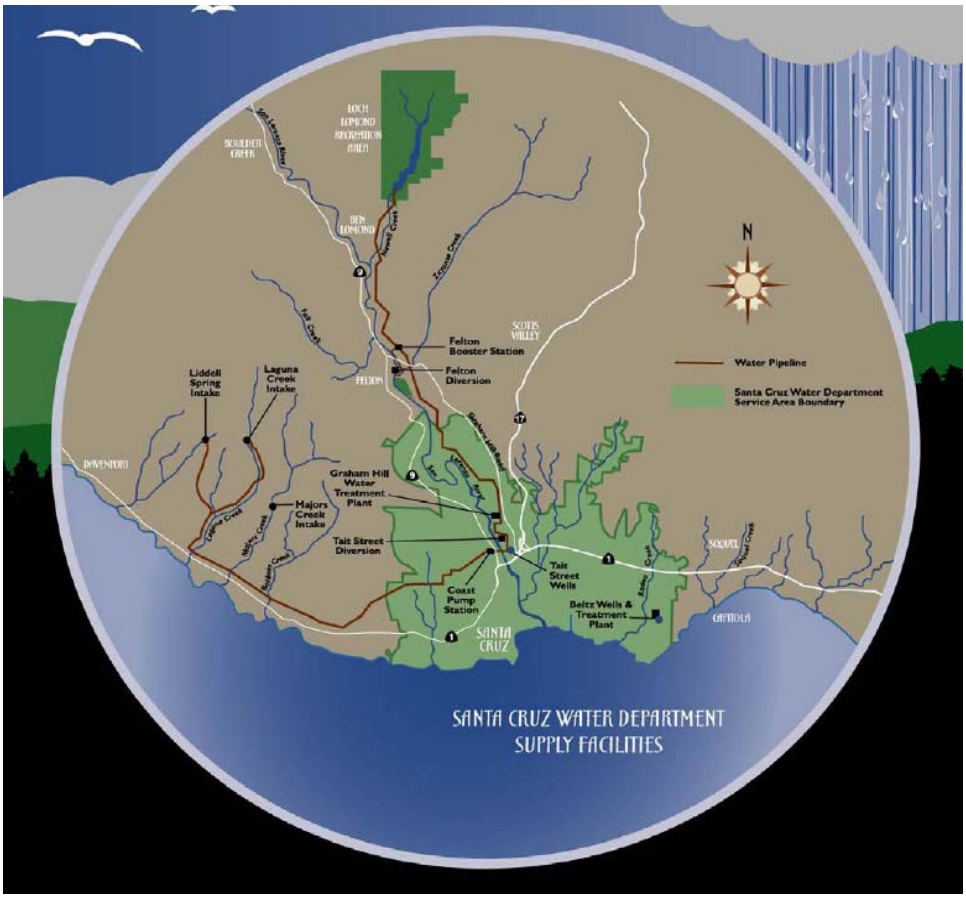
Chapter 6

SYSTEM SUPPLIES

This chapter describes the City's water supply system, discusses plans to enhance the City's existing supply portfolio, and presents current and projected supply source production volumes.

The Santa Cruz water system relies predominantly on local surface water supplies, which include the North Coast sources (Liddell Spring and Laguna, Majors, and Reggiardo Creeks), the San Lorenzo River (Felton Diversion, Tait Diversion, and Tait Wells), and Loch Lomond Reservoir. Together, these surface water sources represent approximately 95 percent of the City's total annual water production. The balance of the City's supply comes from groundwater, all of which is extracted from the Beltz Well system the Santa Cruz Mid-County Groundwater Basin. These main production elements of the City's water supply system are illustrated below in Figure 6-1.

Figure 6-1. City of Santa Cruz Water Supply System



While water supply is considered to be adequate in normal and single dry years, the water supply reliability and drought risk assessments included in Chapter 7 of this plan demonstrate a potential lack of adequate supplies during near-term multiple consecutive dry years. To address this supply vulnerability, the City is implementing its Water Supply Augmentation Strategy (WSAS), in addition to ongoing water conservation, including the development of aquifer storage and recovery (ASR) facilities, transfers and/or exchanges with neighboring water districts, and increased use of recycled water as described below.

6.1 Purchased or Imported Water

The City of Santa Cruz does not now, nor does it plan to, import water, either from outside the Central Coast Hydrologic Region, or outside the Santa Cruz County boundaries. All of its water supplies are obtained from local sources. The system relies entirely on rainfall, surface runoff, and groundwater infiltration occurring within watersheds located in Santa Cruz County. No water is purchased from state or federal sources or imported to the region from outside the Santa Cruz area.

In 2020, a small amount (2 million gallons (MG)) was imported from Soquel Creek Water District through the emergency intertie during a pipeline rupture on the City's Newell Creek Pipeline that transmits water from the Loch Lomond Reservoir to the Graham Hill Water Treatment Plant. The rupture occurred during a time of year when the City relies on the reservoir to meet demand. Upon repair of the pipeline, the import was discontinued.

6.2 Groundwater

Even though groundwater constitutes only up to about 5 percent of the entire City water supply on an annual basis, it is a crucial component of the water system for meeting peak season demands, maintaining pressure in the eastern portion of the distribution system, and for weathering periods of drought.

The Beltz Well system, or Live Oak Well system, consists of four production wells and two water treatment plants located in the eastern portion of the City water service area. The facilities were originally acquired by the City from the Beltz Water Company in 1964, and are still referred to as the "Beltz" wells. Wells 8 and 9 were installed in 1998 as replacement wells for Wells 1 and 2, which were damaged in the 1989 Loma Prieta earthquake. Well 7, which began operating in 1974, has been replaced by Well 10. The newest well, Beltz 12 and associated water treatment facilities, were completed in 2015.

6.2.1 Basin Description

The geographical area from which the City pumps groundwater is identified as the *Santa Cruz Mid-County Groundwater Basin,* Basin Number 3-001(Basin) in *California's Groundwater, Bulletin 118 Interim Update 2016*. The Basin is described in detail in the Santa Cruz Mid-County Groundwater Sustainability Plan (GSP), adopted by the Santa Cruz Mid-County Groundwater Sustainability Agency on November 21, 2019. The adopted GSP was submitted to California Department of Water Resources (DWR) for approval on January 30, 2020. DWR approved the GSP on June 3, 2021 as being found to satisfy the requirements of the Sustainable Groundwater Management Act (DWR 2021b). The Basin GSP is included as Appendix H and is posted online at the following link: https://sgma.water.ca.gov/portal/gsp/all.

The Basin was consolidated from all or part of four previously existing basins: Soquel Valley (Basin Number 3-1), West Santa Cruz Terrace (Basin Number 3-26), Santa Cruz Purisima Formation (Basin Number 3-21), and Pajaro Valley Basins (Basin Number 3-2). The Purisima Formation and Aromas Red Sands are the two main geographic formations within the basin. The Basin is defined by both jurisdictional and geologic boundaries and is intended to include all areas that constitute the shared groundwater resources in the stacked aquifer system of the Purisima Formation, as well as the Aromas Red Sands and some other units underlying the Purisima Formation.

The Basin lies within the Central Coast hydrologic region that covers 36,290 acres and stretches from the Santa Cruz Mountains to the Pacific Ocean and from Live Oak to La Selva Beach along the coast of the Monterey Bay. The Basin is comprised of a portion of the City of Santa Cruz, all of the City of Capitola, and portions of unincorporated Santa Cruz County (Groundwater Exchange, 2021). A map of the Basin is shown in Figure 6-3. The City's Betlz Well system is the western side of the Basin, shown in the green area labeled Live Oak.

The majority of land use in the Basin is residential and open space, with limited amounts of commercial and agricultural lands. Urban and suburban areas are concentrated along the coastal terraces with rural communities and lower population densities in the foothills and mountains.

Groundwater is the primary water supply for most residents within the Basin, except for the approximately 32,000 residents that are supplied by the City water system. As described above, customers of the City water system rely primarily on surface water but with a critical portion of water supply coming from groundwater supply from the Beltz Well system in the Basin.

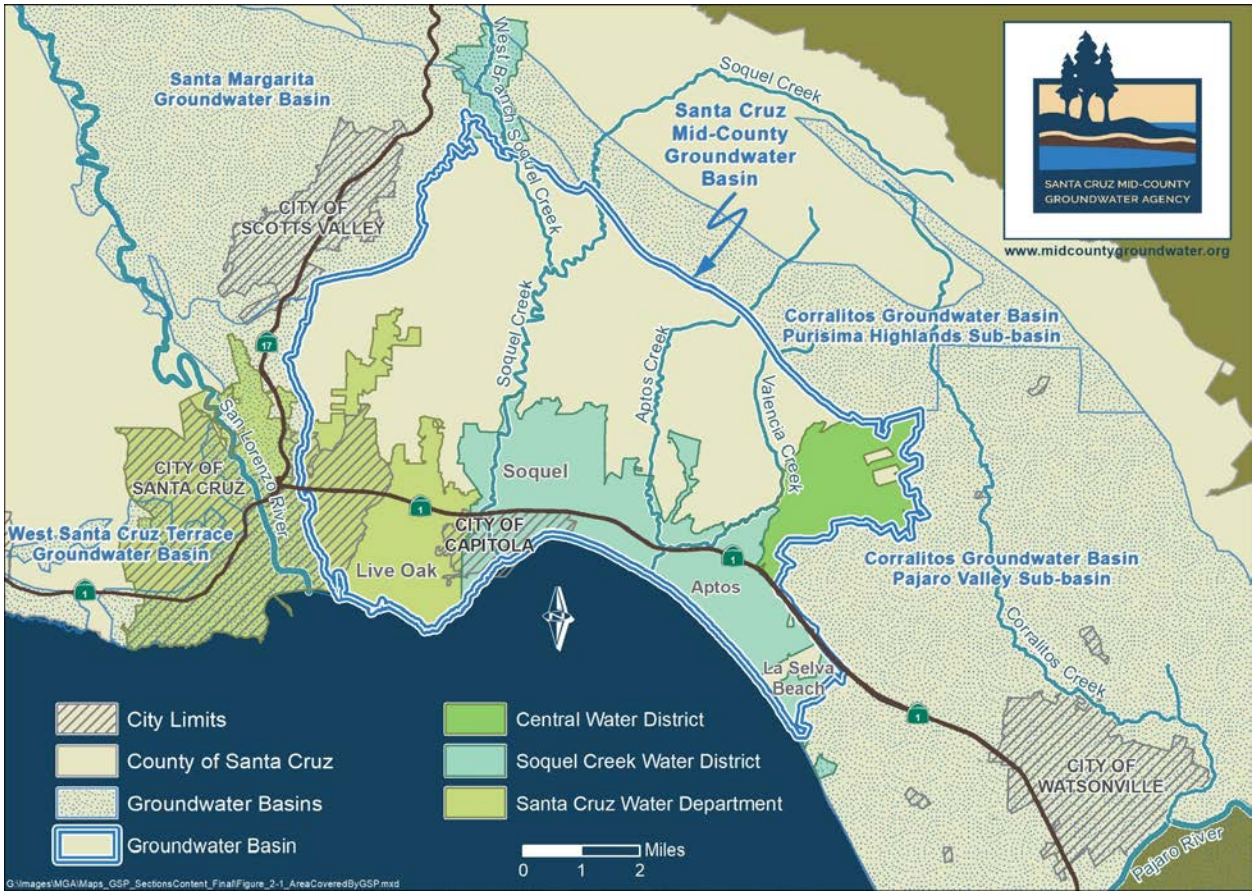
The entire production of the City's Beltz Well system is derived from the Purisima Formation, which is the primary groundwater aquifer underlying the Basin. Groundwater from the Purisima Formation is used by the City, Soquel Creek Water District, Central Water District, several small water systems, and numerous private rural water wells.

The Purisima Formation is a collection of distinct geologic units composed of sandstone interbedded with layers of siltstone and claystone. These units, designated as AA through FF, vary in thickness and hydrogeological characteristics, with AA being the deepest and oldest unit. The formation is relatively shallow under the City's water service area, but dips southeast, becoming deeper and thicker towards Capitola and Aptos and outcrops at the cliffs along the Monterey Bay shoreline. The A zone is the primary supply for both the City's Beltz Well system and the Soquel Creek Water District's Service Area 1 wells and is continuous and connected between these areas of groundwater extraction. Recharge is thought to occur from deep percolation of rainfall in the upper watersheds and along streambeds of Branciforte Creek, Arana Gulch, Rodeo Creek and Soquel Creek.

To better understand how the Purisima Formation responds to pumping stresses and to detect seawater intrusion, the City has installed and maintains a network of 36 monitoring wells at 14 sites, contributing to a network of 174 wells within the Basin that are monitored at least twice a year (MGA, 2019). Groundwater levels and water quality parameters, including chlorides, pH, total dissolved solids, general minerals, and other constituents are measured. Data collected from these monitoring wells are shared with adjoining public water agencies interested in management and planning of groundwater supply.

The Basin contains no areas with adjudicated groundwater rights.

Figure 6-3. Santa Cruz Mid-County Groundwater Basin



Source: Santa Cruz Mid-County Groundwater Sustainability Agency, 2019

6.2.2 Groundwater Management

The California Department of Water Resources (DWR) classifies the Basin as a high priority basin in a state of critical overdraft because of active seawater intrusion. Over pumping of the Basin has led to lower groundwater levels in coastal areas and seawater intrusion into coastal portions of the groundwater aquifers. Without active management, there is a threat of more widespread seawater contamination of groundwater in the Basin.

The City has participated in regional evaluation, monitoring, and management activities in the basin for over 50 years. The first major study of regional groundwater resources was conducted in late 1960s by the United States Geological Survey in collaboration with the County of Santa Cruz, the Soquel Creek Water District, and the City of Santa Cruz (Hickey, 1968). The study identified the importance of the Purisima Formation for regional water supply and recognized seawater intrusion into the aquifer as the greatest threat to regional groundwater supplies. Since that time and prior to the passage of the Sustainable Groundwater Management Act (SGMA) in 2014, the City and other agencies that rely on groundwater from the Basin have continued engagement in monitoring and pursued

various management strategies to help prevent the intrusion of seawater into groundwater supplies.

With the passage of SGMA came the formation of the Santa Cruz Mid-County Groundwater Sustainability Agency (MGA) in May 2016 under a Joint Exercise of Powers Agreement. The MGA now oversees groundwater management activities in the Basin and is comprised of four member agencies representing the principal public agencies that extract groundwater or regulate groundwater extraction and/or land use in the Basin: Central Water District, City of Santa Cruz, County of Santa Cruz, and Soquel Creek Water District .The MGA is governed by an eleven-member board of directors including two representatives from each member agency and three private well owner representatives, in addition to alternates. The City of Santa Cruz representatives are appointed by City Council. In 2020, they were former Water Commissioner David Baskin and City Councilmember Justin Cummings.

The GSP describes the projects and management actions that the MGA has developed to achieve Basin groundwater sustainability, primarily focused on avoidance of seawater intrusion, with related benefits to surface water and groundwater dependent ecosystems. Because the City's water system relies heavily on surface water, an additional focus of the project and management actions is development of a supplemental drought supply to improve the City's water supply reliability, consistent with the City's WSAS (see section 6.8) and Basin sustainability. The individual member agencies, including the City, have responsibility for implementing the various projects and management actions described in the GSP, including permitting, funding, and oversight.

The project and management actions are categorized into three groups based on how and when they will be implemented and are described below:

Baseline Projects and Management Actions (Group 1)
This group includes existing groundwater management activities and commitments by the MGA member agencies. These activities were already being implemented when the GSP was developed and are expected to continue to be implemented to help achieve groundwater sustainability in the Basin. Group 1 includes the following:

- Water conservation and demand management, implemented by all member agencies
- Installation and redistribution of municipal groundwater pumping, implemented by the City and Soquel Creek Water District

Projects and Management Actions Evaluated Against the Sustainable Management Criteria (Group 2)

This group includes projects and activities planned for near-term implementation. These activities have been developed and fully vetted by the MGA member agencies. Group 2 includes the following:

- Pure Water Soquel (Basin replenishment through injection of advanced purified water treated to drinking water standards), implemented by Soquel Creek Water District
- Aquifer storage and recovery (ASR), implemented by the City
- Water transfers/in-lieu groundwater recharge, implemented by the City and Soquel Creek Water District
- Distributed storm water managed aquifer recharge, implemented by County of Santa Cruz and Soquel Creek Water District

Identified Projects and Management Actions that May be Evaluated in the Future (Group 3)
This group includes projects and management activities that could be pursued by member agencies in the event that Group 2 activities either fail to be implemented or do not achieve the expected sustainability results. Selection from the projects and management actions in Group 3 will be pursued if and as needed. Criteria for selection and implementation would include factors such as magnitude of water shortage, speed of implementation, and the scale of regulatory and political hurtles. Group 3 projects include:

- Recycled water - groundwater replenishment and reuse
- Recycled water - surface water (reservoir) augmentation
- Recycled water - direct potable reuse
- Desalination implemented through a local or regional project
- Groundwater pumping curtailment and/or restrictions

For more detailed information on specific project and management actions, refer to the GSP (Appendix H), Section 4. For a full description of the City's current and planned activities, see descriptions of the City's water conservation and demand management program in Chapter 9 and the City's Water Supply Augmentation Strategy in Section 6.8.

6.2.3 Groundwater Pumping

The Beltz Well system is utilized during the peak season which is the months of May through September. Table 6-1 below shows the actual volume pumped from the City's Beltz Well system over the last five years. Average volume over this time was 140 million gallons per year (MGY). The current understood sustainable yield volume is 170 MGY which is utilized by the City when planning for the operation of the Beltz Well system.

Table 6-1: Groundwater Volume Pumped (submittal table 6-1R)

Groundwater Volume Pumped (MG)						
Groundwater Type	Location or Basin Name	2016	2017	2018	2019	2020
Alluvial Basin	Santa Cruz Mid-County Basin (3-001)	156	169	165	57	147
	TOTAL	156	169	165	57	147

NOTES: Note in 2020, pilot testing of Aquifer Storage and Recovery at Beltz Well 8 included injection of 4 MG of treated surface water and subsequent extraction and disposal of 6 MG during the pilot testing. The 6 MG extraction is included in 2020 total. In 2019, pilot testing of Aquifer Storage and Recovery at Beltz 12 included injection of 21 MG of treated surface water and subsequent extraction of 25 MG. Of the 25 MG extraction volume, 7 MG was disposed of and 18 MG entered into the distribution system. The full 25 MG of extraction is included in 2019 total.

6.3 Surface Water

As presented in Chapter 3, the surface water system supplies are located both within and outside of the City of Santa Cruz with a mix of flowing sources and a storage reservoir. The introductory section of the map provided in Figure 6-1 illustrates the various surface water sources and the conveyance systems that comprise the supply facilities of the City. Each of the surface water sources are briefly described in the following sections.

6.3.1 North Coast Creeks and Spring

The North Coast sources consist of surface diversions from three coastal streams and a natural spring located approximately six to eight miles northwest of downtown Santa Cruz. These sources are: Liddell Spring, Laguna Creek, Reggiardo Creek, and Majors Creek. The use of these sources by the City dates back as far as 1890.

Figure 6-4. Laguna Creek Diversion Dam

6.3.2 San Lorenzo River

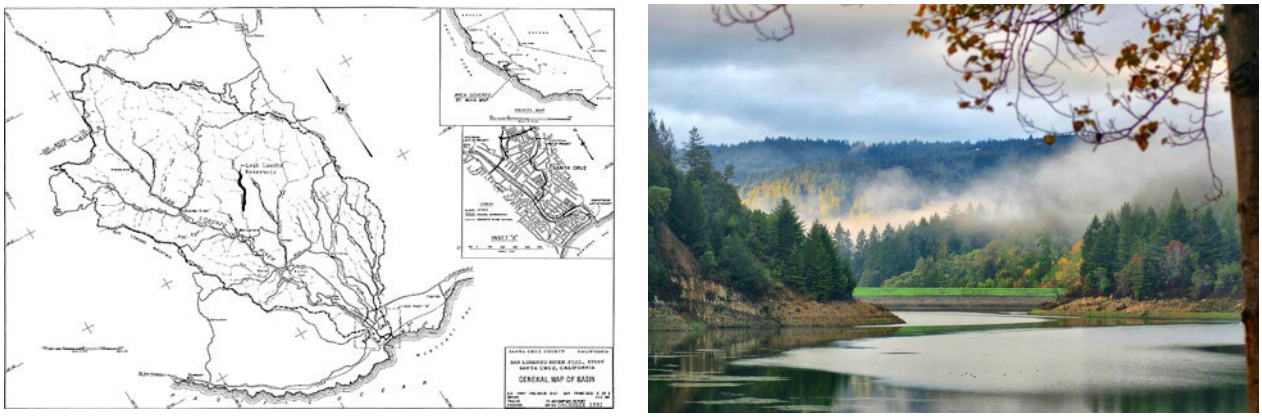
The San Lorenzo River is the City's largest source of water supply. The main surface water diversion is the Tait Diversion near the City limits just north of Highway 1. Use of this source dates back to the 1870s and was consolidated under public ownership in 1917. The Tait Diversion is supplemented by shallow, auxiliary wells located directly across the river referred to as the Tait Wells. These wells are assumed to be hydraulically connected to the river and considered to be tied to the City's appropriative rights for surface diversion. The drainage area above the Tait Diversion is 115 square miles.

Figure 6-5. San Lorenzo River Tait and Felton Diversions

The other diversion on the San Lorenzo River is Felton Diversion, which is an inflatable dam and intake structure built in 1974 that is located about six miles upstream from the Tait Diversion. Water is pumped from this diversion through the Felton Booster Station to Loch Lomond Reservoir. The facility is used to augment storage in the reservoir during dry years when natural inflow from Newell Creek is low.

While the City is the largest user of water from the San Lorenzo River basin, two other water districts, several private water companies and numerous individual property owners share the San Lorenzo River watershed as their primary source for drinking water supply (Figure 6-6).

Figure 6-6. San Lorenzo River Watershed and Loch Lomond Reservoir



6.3.3 Newell Creek and Loch Lomond Reservoir

Loch Lomond Reservoir is located near the town of Ben Lomond in the Santa Cruz Mountains. The reservoir was constructed in 1960 and has a maximum capacity of 2,810 million gallons (MG). In addition to providing surface water storage, the reservoir and surrounding watershed are used for public recreation purposes, including fishing, boating, hiking, and picnicking (swimming and wading are prohibited). The Newell Creek watershed above the reservoir is about nine square miles. In addition to the City, the San Lorenzo Valley Water District is entitled by contract to receive a portion of the water stored in Loch Lomond.

Water System Operations and Water Rights

The City of Santa Cruz follows a variety of policies, procedures, and legal restrictions in operating the water supply system. In general, the system is managed to use available flowing sources to meet daily demands as much as possible. Groundwater and stored water from Loch Lomond are used mainly during the summer and fall months when flows in the coast and river sources decline and additional supply is needed to meet higher daily water demands. Water from Loch Lomond is also used during winter storms and high stream and river flows when water from surface water sources is too turbid to treat at the Graham Hill Water Treatment Plant.

The amount of water produced from each of the City surface water sources is controlled by different water rights. A summary of these existing water rights is presented below.

Summary of Water Rights Held by the City of Santa Cruz

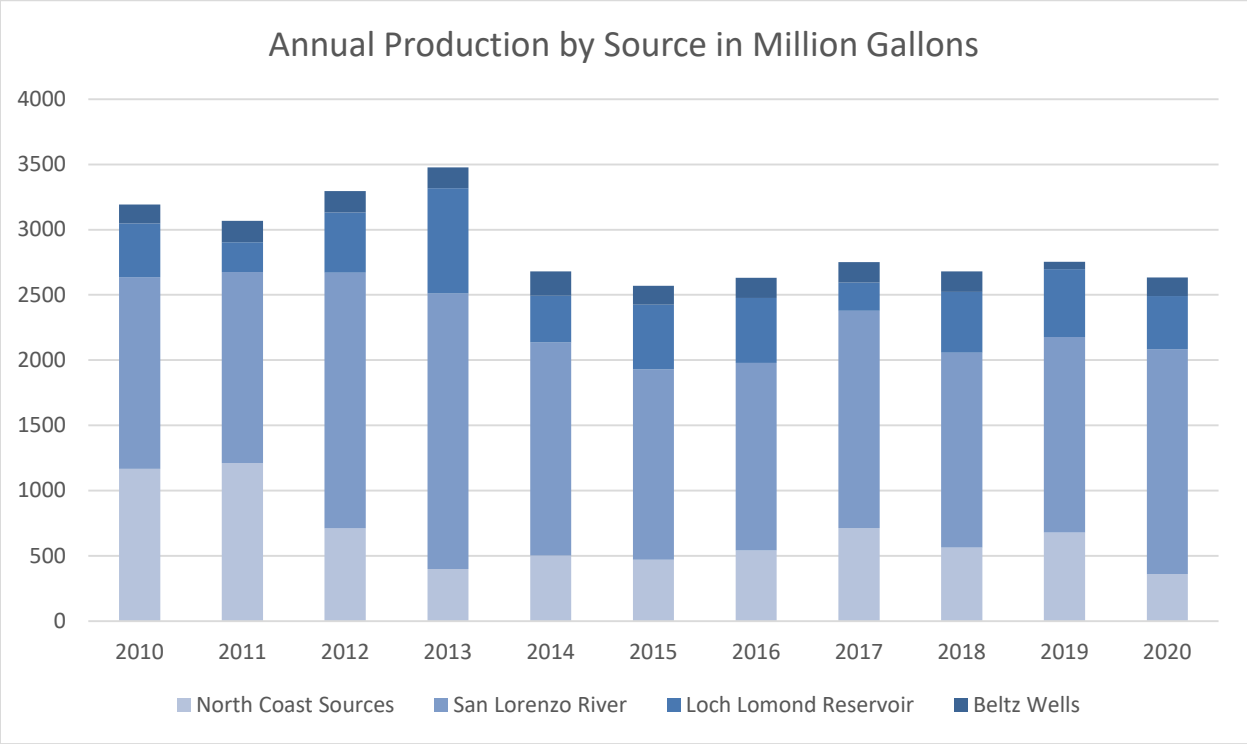
Source	Date of First Use/Priority	Season of Diversion	Maximum Diversion Rate (CFS)	Byapss Requirement (CFS)	Annual Diversion Limit (MG)
North Coast: Liddell Spring: Statement of Water Diversion and Use S002043 Laguna Creek: Statement of Water Diversion and Use S002042 Majors Creek: Statement of Water Diversion and Use S002044 Reggiardo Creek: Statement of Water Diversion and Use S008610	Pre-1914	Year round	No limit	None	None
San Lorenzo River: Tait Diversion: License 1553 (A004017) and License 7200 (A005215)	1924 and 1926	Year-round	12.2	None	None
San Lorenzo River: Felton Diversion: Permit 161233 (A022313) and Permit 166013 (A023710)	1965 and 1971	Sept	7.8	10	977
		Oct	20	25	
		Nov-May	20	20	
		Jun-Aug	0	--	
Newell Creek (Loch Lomond Reservoir): License 9847 (A017913)	1957	Sept-Jun	No limit	1 (released from Newell Creek Dam)	Max collection: 1,825 Max withdrawal: 1,042

The City In 2007, the City began voluntarily releasing in-stream flows from the North Coast system in connection with ongoing development of a Habitat Conservation Plan (HCP) for federal Endangered Species Act and California Endangered Species Act compliance for water system operations and maintenance activities that may adversely affect local special-status anadromous salmonids (coho salmon and steelhead trout). Over the last 13 years, the City has dramatically reduced its diversion of water from Laguna Creek and increased instream flow releases on the San Lorenzo River to benefit fisheries habitat.

The City is currently working with the State Water Resources Control Board to revise the City's existing water rights to allow more options for where and how the City can use its existing rights while enhancing stream flows for local anadromous fisheries. The Santa Cruz Water Rights Project would improve flexibility in operation of the City's water system and include for all City surface water sources fish flow bypass requirements developed in coordination with the National Marine Fisheries Service and California Department of Fish and Wildlife for the HCP. See description of this project of in Section 6.8.2.

Gross annual production volumes from the City's surface and groundwater sources over the past ten years are shown in Figure 6-7, broken down by source of supply. During the past decade, the North Coast sources represented 23 percent of the total water supply, the San Lorenzo River represented 56 percent, Loch Lomond Reservoir (Newell Creek) represented 15 percent, and Beltz Well system contributed the remaining 5 percent.

Figure 6-7. Annual Production Volumes by Supply Source



6.4 Storm Water

At this time, local urban storm runoff is not used by the City to meet its urban water demands. The City is regulated, however, by the California Regional Water Quality Control Board and has responsibility to reduce the amount of pollutants discharged in urban runoff, and to improve and protect water quality. The City is currently covered under the State's General Permit for Storm Water Discharges from Small Municipal Storm Sewer Systems (MS4s). The General Permit requires the City to develop and implement a comprehensive Storm Water Management Program (SWMP). A complete description of this program is provided in the Storm Water Annual Report.

The City of Santa Cruz, through its Public Works Department, maintains seven miles of underground storm water pipeline, eight miles of surface storm water ditches, six storm water pump stations, approximately 1,500 catch basins, and 125 outfalls. The City also maintains the U.S. Army Corps of Engineers flood control channel and levee system on the San Lorenzo River, which is approximately three miles long with five pump stations. The City's operations and maintenance program for the flood control facilities on the San Lorenzo River includes the removal of sand and silt from the channels of the river and Branciforte Creek; maintenance of pumps, gates and levees; and removal of weeds and growth in drainage ditches and catch basins. As a best management practice, the City has routine street sweeping and regularly cleans the storm drain pipeline system, among other activities.

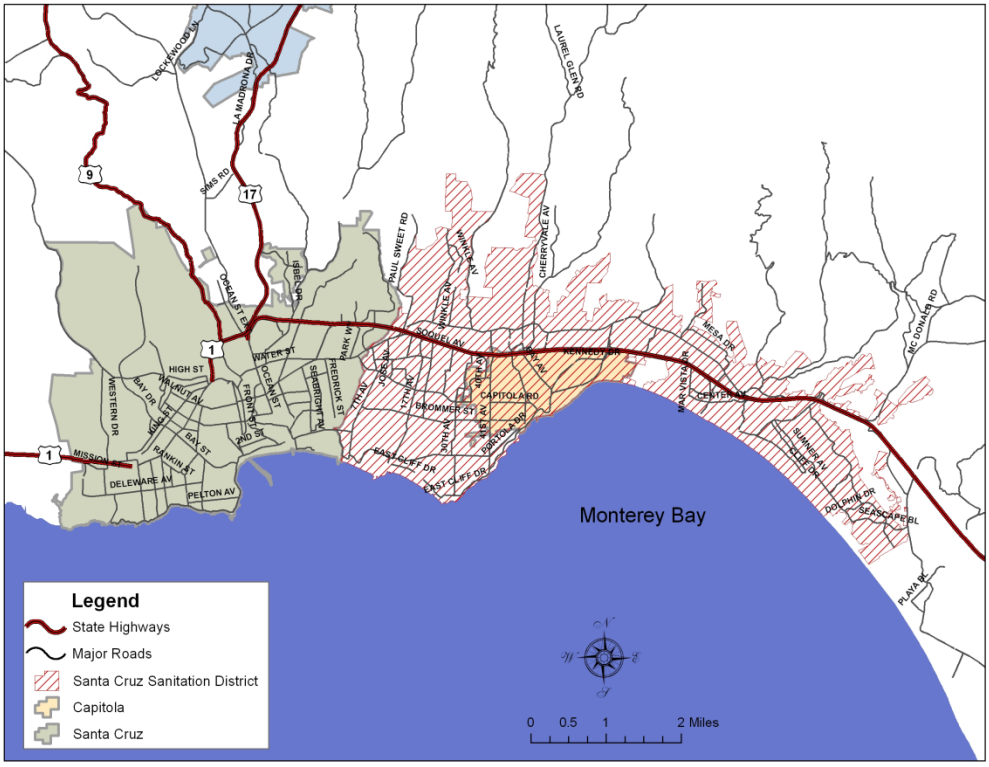
Storm water system management maintenance in the unincorporated area and Capitola is provided by the Santa Cruz County Flood Control and Water Conservation District, Zone 5, operated through the County Public Works Department. The County Board of Supervisors serves as the Board of Directors for the District. Facilities include underground storm drain systems and above ground ditches and watercourses.

6.5 Wastewater and Recycled Water

The City of Santa Cruz owns and operates a City-wide wastewater collection and regional wastewater treatment and disposal facility providing service to a total urban population of approximately 130,000 people in an area extending from Santa Cruz out to the communities of Seascape and Aptos in unincorporated Santa Cruz County (Figure 6-8).

The City's Wastewater Treatment Facility (WWTF) is not currently permitted for and does not now produce recycled water for offsite reuse. Treated wastewater is reused internally within the wastewater plant to meet its major process water needs, including chemical mixing, contact and non-contact cooling water, equipment washing, heating, and cleaning. The 1998 upgrade of the plant to provide reuse water for on-site activities reduced potable water demand at the WWTF by about 90 percent. It now operates using only 3 to 4 million gallons per year for sanitary, irrigation, and other miscellaneous onsite uses. The only use of recycled water outside the WWTF has been that used by the City's Public Works crews in trucks for flushing the sanitary sewer system as a way to conserve potable water. Soquel Creek Water District is currently designing and constructing the Pure Water Soquel Project which will utilize wastewater from the WWTF, enhancing the recycled water system in the region and allowing for potential opportunities for future expansion.

Figure 6-8. Geographic Area Served by Santa Cruz Wastewater Facility



6.5.1 Wastewater

Wastewater collection, treatment, and disposal are described below.

6.5.1.1 Wastewater Collection

Municipal wastewater generated within the City limits is delivered to the treatment plant through a collection system consisting of 160 miles of gravity mains, 3.5 miles of force main, and 21 pumping stations. The City's collection system, treatment plant and ocean disposal system are managed and operated by the City's Public Works Department.

The Santa Cruz County Sanitation District, a special district operated through the Santa Cruz County Public Works Department, collects wastewater from the Live Oak, Capitola, Soquel, Aptos, and Seacliff areas through a system consisting of 220 miles of gravity main, 14 miles of force main, and 35 pump stations. It transports wastewater from a central pumping facility in Live Oak to the Santa Cruz WWTF for treatment and disposal. This wastewater is generated from outside the service area of the City of Santa Cruz and is treated within the service area.

In addition to the City and County Sanitation District, one small County Service Area serving the community of Woods Cove and a portion of the community of Rollingwoods and is connected to the City's wastewater system. Dry weather flows from Neary Lagoon are

also diverted through the WWTF to help protect water quality at local beaches for public health and recreation.

A third-party organization is not operating a facility under contract in the Santa Cruz service area. With the exception of some outlying areas and individual parcels that have onsite wastewater systems, the vast majority of the estimated people residing in the City of Santa Cruz water service area are served by these two wastewater collection systems. Table 6-2 summarizes wastewater collected from these two agencies in 2020.

Table 6-2: Wastewater Collected Within Service Area in 2020 (submittal table 6-2R)

Wastewater Collected Within Service Area in 2020						
Wastewater Collection			Recipient of Collected Wastewater			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2020 (MG)	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
City of Santa Cruz	Metered	1,395	City of Santa Cruz	Wastewater Treatment Facility	Yes	No
Santa Cruz County Sanitation District	Metered	1,218	City of Santa Cruz	Wastewater Treatment Facility	Yes	No
Total Wastewater Collected from Service Area in 2020:		2,613				

6.5.1.2 Wastewater Treatment

The City's treatment plant was modernized in the late 1990's from the advanced primary level to provide full secondary treatment in order to meet State and Federal waste discharge requirements (Figure 6-9).

The treatment process consists of screening, grit removal, primary sedimentation, biological treatment (trickling filters), secondary clarification, and disinfection (UV). Bio-solids removed from the wastewater stream are treated by gravity thickening, anaerobic digestion, and dewatering by centrifuges.

Figure 6-9. City of Santa Cruz Wastewater Treatment Facility

The City's WWTF is designed to treat an average dry weather flow of 17 million gallons per day (MGD) and can accommodate peak wet weather flows of up to 81 MGD. Due to conservation measures and reduced demand in recent years, the amount of wastewater generated in the City and the Sanitation District's service areas has dropped substantially, averaging 6.5 MGD during the dry season and totaling 2,613 million gallons in 2020.

6.5.1.3 Wastewater Disposal

Wastewater effluent from the WWTF is disinfected with UV prior to being discharged to the Pacific Ocean through a deep water outfall extending 12,250 feet on the ocean bottom and terminating one mile offshore at a depth of approximately 110 feet below sea level. A 2,100 foot diffuser at the end of the pipe provides a minimum initial dilution of 139 parts seawater to one part wastewater.

The City's wastewater facility is regulated under a waste discharge permit issued by the California Regional Water Quality Control Board, Central Coast Region (Order No. R3 - 2017 - 0030). Monterey Bay and surrounding ocean waters was designated in 1992 as a National Marine Sanctuary and is widely recognized for its unique and diverse biological characteristics and physical features. To protect receiving water quality and sanctuary resources, the wastewater influent and effluent characteristics are carefully monitored for compliance with state water quality requirements. The City also performs receiving water monitoring and participates in a regional monitoring program with other dischargers in the Monterey Bay area, known as Central Coast Long-Term Environmental Assessment Network (CCLEAN). The City of Scotts Valley treats its wastewater separately and

transmits secondary treated effluent to Santa Cruz for combined disposal through the City's ocean outfall.

Table 6-3 below provides the total amount of wastewater treated and disposed by the City's wastewater treatment facility in 2020.

Table 6-3: Wastewater Treatment and Discharge in 2020 (submittal table 6-3R)

Wastewater Treatment and Discharge Within Service Area in 2020							
Wastewater Treatment Plant Name	Discharge Location Name or Identifier and Discharge Location Description	Wastewater Discharge ID Number	Method of Disposal	Treat Wastewater Generated Outside the Service Area?	Treatment Level	2020 volumes (MG)	
						Wastewater Treated	Discharged Treated Wastewater
Wastewater Treatment Facility	Monterey Bay/Pacific Ocean Bay Outfall Deep water outfall	3-440102001	Ocean outfall	yes	Secondary, Undisinfected	2,613	2,613
					Total	2,613	2,613

NOTES: Volumes for wastewater treated and discharged treated wastewater are presented as equal to satisfy the objective of this table. The recycled water that is reused wihtin the facility is not considered eligible for designation as recycled water under current Title 22 requirements. Figures presented do not include City of Scotts Valley waste discharge volumes.

6.5.2 Recycled Water

Since 2000, the City has been examining the use of recycled water through commissioned engineering studies regarding potential uses of recycled water for agricultural irrigation, landscape irrigation, groundwater recharge, direct potable reuse, and use of recycled water from neighboring water districts. These studies include the following:

- Alternative Water Supply Study (Carollo Engineers, 2000)
- Evaluation of Regional Water Supply Alternatives (Carollo Engineers, 2002)
- Integrated Water Plan Environmental Impact Report (EIR) (City of Santa Cruz, 2005)
- Opportunities and Limitations for Recycled Water Use (Kennedy/Jenks, 2010)
- Current and Potential Future Opportunities for Indirect and Direct Potable Reuse of Recycled Water Use (Kennedy/Jenks, 2010)
- Regional Recycled Water Facilities Planning Study, Phase 1 (Kennedy/Jenks, 2018)

The City of Santa Cruz is continuing to actively investigate the feasibility of recycled water though an ongoing Santa Cruz Recycled Water Feasibility Study Phase 2 with Kennedy/Jenks as further described below.

6.5.2.1 Recycled Water Coordination

As presented in Section 2.4, preparation of this 2020 UWMP was coordinated with all local water, wastewater, groundwater, and planning agencies throughout the water service area and Santa Cruz County. Coordination regarding recycled water use and planning studies has involved working with the following entities:

- Santa Cruz Public Works Department (regional WWTF operator)
- Santa Cruz County Sanitation District (local wastewater collection agency)
- City of Scotts Valley Public Works (local WWTF operator)
- Scotts Valley Water District
- Soquel Creek Water District
- Pasatiempo Golf Course
- County of Santa Cruz
- University of California, Santa Cruz
- State Water Resources Control Board's Water Recycling Funding Program

6.5.2.2 Recycled Water System

The City does not currently operate a recycled water system in its service area. The Pasatiempo Golf Course, located within the City's service area, receives disinfected secondary effluent from the City of Scotts Valley, which it treats to tertiary standards at the Pasatiempo Golf Course Tertiary Plant for use as golf course irrigation, reducing the demand for potable water that would otherwise be used for irrigation. Additionally, Soquel Creek Water District is designing and constructing the Pure Water Soquel Project, which will enhance the recycled water system in the region and allow for potential opportunities for future expansion. See description in 6.5.4.1 below.

6.5.2.3 Recycled Water Beneficial Uses

Title 22 (California Code of Regulations, Division 4, Chapter 3, Sections 60301-60355) is the regulation overseeing the reuse or recycling of municipal wastewater to protect public health. Level of treatment and bacteriological water quality standards define what beneficial uses are legally allowed. The quality of waste water produced at the City's treatment plant currently would be best classified under the Title 22 criteria as "Secondary, Undisinfected", even though the wastewater plant provides ultraviolet disinfection, and the City consistently meets its receiving water limitations contained in its NPDES permit for bacteriological objectives. The City's treated wastewater is therefore potentially suitable for only very limited agricultural applications and for flushing sanitary sewers according to the standards in Title 22.

The present level of wastewater treatment is not sufficient for the water to be used for unrestricted use on playgrounds, parks, schoolyards, construction, cooling and other non-contact industrial processes, or general landscape irrigation. Additional treatment above that currently provided would be needed to meet the state public health and safety requirements. In addition to the treatment upgrades, a separate distribution system, including pumps, storage facilities, and piping would be required to convey recycled water to potential customers.

6.5.2.4 Current Use and Planned Uses of Recycled Water

Current Use

In 2017, the Pasatiempo Golf Course, located within the City's service area, entered into an agreement with the City of Scotts Valley to provide disinfected secondary effluent to golf course where it is further treated to tertiary standards and used for golf course irrigation. City of Scotts Valley agreed to provide up to 35 million gallons per year for 30 years with the option for the golf course to purchase more if available. The golf course received and utilized the following annual quantities of recycled water:

- 2018 – 36 million gallons
- 2019 – 56 million gallons
- 2020 – 36 million gallons

The City of Santa Cruz continues to supply the remainder of the Pasatiempo golf course water demand as needed for potable water uses and as supplemental water for irrigation.

Planned Use

In 2018, the City completed a regional Recycled Water Facilities Planning Study (RWFPS) under a contract with Kennedy/Jenks Consultants (Appendix I). The RWFPS is intended to help guide the City to identify a preferred recycled water project(s) for the future.

The RWFPS was a joint project between the Santa Cruz Water Department, the Santa Cruz Public Works Department, which operates the WWTF, and the State of California, who is funding a portion of the project through the State Water Resources Control Board's Water Recycling Funding. Study Contributors include Soquel Creek Water District, Scotts Valley Water District, the University of California Santa Cruz (UCSC), the County of Santa Cruz, and the Santa Cruz County Sanitation District. The study also recognized the potential to develop future partnerships with the aforementioned regional agencies, and possibly the San Lorenzo Valley Water District, to increase reuse in the region.

The preferred project developed in the RWFPS is a phased approach that provides for near-term local action while leaving the door open for increased regional coordination in the

future as more information is available on all the alternatives. The recommendation includes two projects that would provide non-potable reuse in the City:

- **Santa Cruz Public Works Department (SCPWD) Title 22 Upgrade Project –** implement a near-term non-potable reuse project to meet in-plant demands, develop a bulk water station and serve the near-by La Barranca and Neary Parks.
- **BayCycle Project** – expand the SCPWD Title 22 Upgrade Project to increase production and non-potable reuse to serve UCSC and City customers along the way.

The City is also committed to exploring other reuse opportunities, including:

- **Coordination with Pure Water Soquel** – continue to work closely with Soquel Creek Water District to support the evaluation of the Pure Water Soquel project, described below, including, but not limited to, the delivery of source water and considerations for benefits of shared infrastructure.
- **Explore Groundwater Replenishment Reuse at Beltz Wellfield** – to replenish the Santa Cruz Mid-County Groundwater Basin in the Beltz Well system area, through a collaborative project with Pure Water Soquel or as an independent City led project.
- **Explore Groundwater Replenishment Reuse in Santa Margarita Groundwater Basin**– continue regional discussions related to the benefits and limitations for a regional groundwater replenishment reuse project in the Santa Margarita Groundwater Basin, which has the potential to make the region more resilient in the long term.

Additionally, in 2018, further study of recycled water was prioritized over seawater desalination in a motion by the City Council, with direction to perform additional analysis on identified recycled water projects and to support continued evaluation of improvements to the WWTF to provide tertiary treatment that would be necessary for any beneficial use of recycled water.

Following this direction, the City is continuing to investigate the feasibility of recycled water though an ongoing Santa Cruz Recycled Water Feasibility Study Phase 2. This includes ongoing evaluation of potential regional reuse project supported by Soquel Creek Water District's Pure Water Soquel Project. Other planned and potential uses for recycled water are landscape irrigation, bulk-water fill stations, and to fulfill onsite needs at the wastewater treatment facility.

Soquel Creek Water District is currently in design and initial phases of constructing the Pure Water Soquel Project, which will utilize wastewater from the City's wastewater treatment facility that has been treated to drinking water standards for groundwater replenishment within the Santa Cruz Mid-County Basin. The project includes an advanced purification water treatment facility and upgrades to the City's wastewater treatment facility,

conveyance infrastructure, and the construction of three seawater intrusion prevention wells and associated monitoring wells.

Soquel Creek Water District has identified 490 million gallons per year as the goal for groundwater replenishment, and has sized the Pure Water Soquel conveyance infrastructure to accommodate up to 980 million gallons per year for possible future expansion and potential partnership with the City and other local water suppliers.

The current and projected uses of recycled water within the City's service area are presented in Tables 6-4a and 6-4b.

Table 6-4a: Recycled Water Direct Beneficial Uses (submittal table 6-4R)

Recycled Water Direct Beneficial Uses Within Service Area								
Name of Supplier Producing (Treating) the Recycled Water:				City of Scotts Valley and Pasatiempo Golf Course				
Name of Supplier Operating the Recycled Water Distribution System:				City of Scotts Valley				
Beneficial Use Type	General Description of 2020 Uses	Level of Treatment	2020	2025	2030	2035	2040	2045
Golf course irrigation	Pasatiempo Golf Course	Golf course irrigation	36	35	35	35	35	35
		Total:	36	35	35	35	35	35

Table 6-4b: Recycled Water Direct Beneficial Uses (submittal table 6-4R)

Recycled Water Direct Beneficial Uses Within Service Area		
Name of Supplier Producing (Treating) the Recycled Water:		City of Santa Cruz and/or Soquel Creek Water District
Name of Supplier Operating the Recycled Water Distribution System:		City of Santa Cruz and/or Soquel Creek Water District and/or City of Scotts Valley
Beneficial Use Type	**Potential** Beneficial Uses of Recycled Water	Amount of **Potential** Uses of Recycled Water
Landscape irrigation (exc golf courses)	**Title 22 Upgrade Project** - landscape irrigation at La Barranca and Neary Parks, and **BayCycle Project** - landscape irrigation at City Facilities and University of California, Santa Cruz (UCSC)	57.9 MG per year
Golf course irrigation	**Coordination with Pure Water Soquel** - Delavega Golf Course Irrigation	42 MG per year
Commercial use	**Title 22 Upgrade Project** - Bulk Water Station	1.8 MG per year
Industrial use	**BayCycle Project** - UCSC cooling towers and dual-plummed institutional buildings at UCSC	7.5 MG per eyar
Groundwater recharge (IPR)	**Groundwater Replenishment** Reuse at Beltz Wellfield and/or in Santa Margarita Groundwater Basin	328.5 MG per year

6.5.2.5 Planned Versus Actual Use of Recycled Water

Recycled water, as defined by the California Department of Water Resources, was not used by the City in 2015. The 2015 projected recycled water use for 2020 was 40 MG. While the 35 MG of projected golf course irrigation use was achieved, the 1 MG and 4 MG respectively for landscape irrigation and commercial uses were not achieved. A comparison of actual versus projected use is provided in Table 6-5.

Table 6-5: Recycled Water Use Projection Compared to Actual (submittal table 6-5R)

2015 UWMP Recycled Water Use Projection Compared to 2020 Actual		
Beneficial Use Type	2015 Projection for 2020 (MG)	2020 Actual Use (MG)
Landscape irrigation (excluding golf courses)	1	
Golf course irrigation	35	36
Commercial use	4	
Total	40	36

6.5.2.6 Actions to Encourage Future Recycled Water Use

Currently the City does not produce recycled water for use outside its wastewater treatment plant, therefore actions to encourage the use, including financial incentives, and development of a plan to optimize the use of recycled water in the City's service area do not apply at this time. The steps and actions to encourage and optimize recycled water will be defined in the future.

Table 6-6: Methods to Expand Future Recycled Water Use (submittal table 6-6R)

Methods to Expand Future Recycled Water Use			
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Santa Cruz Recycled Water Feasibility Study Phase 2	Contract with Kennedy/Jenks to further evaluate potential uses of recycled water	TBD	TBD

6.6 Desalinated Water Opportunities

For a decade or more, the City pursued a 2.5 mgd desalination facility as a regional project with Soquel Creek Water District to diversify both agencies' water supply portfolio. The WSAS, described in Section 6.8, includes desalinated water, but only as a last resort, and after exhausting several other preferred options (City of Santa Cruz, 2015).

In 2017, the City embarked on development of a Desalination Feasibility Update Review Report to evaluate the feasibility, cost, timeliness, and approach for pursuing a seawater desalination facility. While the 2018 report (Appendix J) found such a project to be technically feasible, additional feasibility review of a collector well system would be required, and it was further determined that the City's timeliness objective would not be met. Subsequently, further study of recycled water has been prioritized over seawater desalination.

6.7 Exchanges or Transfers

In 2016, the City and Soquel Creek Water District entered into a "Cooperative Water Transfer Pilot Project for Groundwater Recharge and Water Resource Management" agreement to transfer a small amount of water to Soquel Creek Water District in the winter months when excess surface water from the North Coast is available. The pilot agreement was extended in 2021 through 2026 (Appendix K). The agreement represents a first step in the implementation of the Water Supply Augmentation Strategy, described in Section 6.8, and serves to further study and determine the potential benefits of local exchanges and transfers as a groundwater management tool and supply reliability strategy.

Following successful completion of preliminary water quality studies, pilot transfers began in December 2018 and continued into March 2019. Ongoing water quality monitoring was conducted throughout the transfers and these data confirmed the results of the pre-transfer studies. Some additional transfers occurred in the winter of 2019-2020. Dry conditions have limited the City's ability to transfer water since the end of January 2020. Yearly totals for transfers of treated surface water to Soquel Creek Water District are as follows:

- In 2018, a total of 9 MG was transferred,
- In 2019, a total of 68 MG was transferred, and
- In 2020, a total of 13 MG of was transferred.

6.8 Future Water Projects

Future water projects are a critical to ensuring future water supply reliability for City of Santa Cruz Water customers. These projects are described below.

6.8.1 Water Supply Augmentation Strategy

Since 2015, the City of Santa Cruz has been pursuing its WSAS developed by the Water Supply Advisory Committee as described in the 2015 Urban Water Management Plan. The Water Supply Advisory Committee was formed in 2014 when the City Council approved formation and membership of the citizen committee with the charge to "explore, through an iterative, fact-based process, the City's water profile, including supply, demand and future risks; analyze potential solutions to deliver a safe, adequate, reliable, affordable and environmentally sustainable water supply; and, to develop recommendations for City Council consideration" (WSAC, 2015). The committee developed the Water Supply Advisory Committee Final Report on Agreements and Recommendations (October 2015), which was accepted by the City Council in November 2015. The Final Report was incorporated by reference into the 2015 Urban Water Management Plan, and the guiding recommendations continue to serve as the water supply management strategy for the City.

The WSAC recommendations are designed to address the "Problem Statement" included in the WSAC Final report:

> "Santa Cruz's water supply reliability issue is the result of having only a marginally adequate amount of storage to serve demand during dry and critically dry years when the system's reservoir doesn't fill completely. Both expected requirements for fish flow releases and anticipated impacts of climate change will turn a marginally adequate situation into a seriously inadequate one in the coming years. Santa Cruz's lack of storage makes it particularly vulnerable to multi-year droughts. The key management strategy currently available for dealing with this vulnerability is to very conservatively manage available storage. This strategy typically results in regular calls for annual curtailments of demand that may lead to modest, significant, or even critical requirements for reduction. In addition, the Santa Cruz supply lacks diversity, thereby further increasing the system's vulnerability to drought conditions and other risks…" (WSAC, 2015)

The overarching goal of the WSAS is to provide significant improvement in the sufficiency and reliability of the City water supply. As presented in the 2015 UWMP, the WSAS portfolio elements include the following (WSAC 2015):

- Element 0: Demand Management. Additional water conservation with a goal of achieving an additional 200 to 250 million gallons per year (MGY) of demand reduction by 2035 by expanding water conservation programs.
- Element 1: Transfers and Exchanges. Passive recharge of regional aquifers by working to develop agreements for delivering surface water to the Soquel Creek Water District and/or the Scotts Valley Water District so they can rest their groundwater wells, help the aquifers recover, and potentially store water for use by the City in dry periods.
- Element 2: Aquifer Storage and Recovery. Active recharge of regional aquifers by using existing infrastructure and potential new infrastructure in the Purisima aquifer in the Soquel-Aptos Basin (now referred to as the Santa Cruz Mid-County Groundwater Basin), in the Santa Margarita/Lompico/Butano aquifers (now referred to as the Santa Margarita Groundwater Basin) in the Scotts Valley area, or in both to store water that can be available for use by the City in dry periods.
- Element 3: Recycled Water or Desalination. A potable water supply using advanced-treated recycled water as its source as a supplemental or replacement supply in the event the groundwater storage strategies described in Element 1 and Element 2 prove insufficient to meet the goals of cost-effectiveness, timeliness, or yield. In the event advanced-treated recycled water does not meet the City's needs, desalination would become Element 3.

The Santa Cruz Water Department has been actively pursuing these recommendations since 2015 and continues to make steady progress. Conservation, or demand management, is not considered a water supply for the purposes of the UWMP. Details on this program can be found in Chapter 9. The current WSAS implementation schedule is included as Appendix M. Progress toward implementation of Elements 1 through 3 is described below.

6.8.1.1 Implementation of Transfers and Exchanges (Element 1)

The City has been working with Soquel Creek Water District to evaluate the feasibility of water transfers and exchanges since 2015 through the development of a formal pilot agreement, studies to assess the compatibility of surface and groundwater resources in distribution systems, and eventually piloting of water transfers in 2018 – 2020 as described in Section 6.7. The transfer agreement has been extended for an additional five years, 2021 – 2026, and additional piloting will continue as water supply conditions allow.

Future transfers and exchanges with local agencies, including Soquel Creek Water District, Central Water District, Scotts Valley Water District, and San Lorenzo Valley Water District would be facilitated by the water rights modifications to place of use proposed in the Santa Cruz Water Rights Project described in Section 6.8.2 below. The Santa Cruz Water Rights Project Draft EIR additionally examines implementation of water transfers and exchanges with local agencies. Limitations of this strategy include that it is limited both by availability of surface water for transfer and by the demand of other-agency systems to utilize transferred water when available. Transfers with Soquel Creek Water District may be further limited by the implementation of Pure Water Soquel due to potential operational constraints that are still being explored.

6.8.1.2 Implementation of Aquifer Storage and Recovery (Element 2)

The City has been evaluating the feasibility of ASR in both the Santa Cruz Mid-County and in the Santa Margarita Groundwater Basins, with current work primarily focused on the portion of Santa Cruz Mid-County Basin within the City of Santa Cruz service area. The City has completed groundwater modeling of over 20 scenarios, a well siting study, and a geotechnical study. Pilot testing has been conducted at the existing Beltz 12 well facility in 2019 and the existing Beltz 8 well facility in 2020 to better understand potential water quality and operational constraints. Additionally, the effects of implementation of the Pure Water Soquel Project, which was not anticipated when the WSAS was developed but is expected to improve basin sustainability, on future ASR project are being explored.

ASR in both basins would be facilitated by the water rights modifications proposed in the Santa Cruz Water Rights Project described in Section 6.8.2 below. The Santa Cruz Water

Rights Project Draft EIR additionally examines implementation of ASR. Next steps include consideration of longer-term demonstration of ASR at existing Beltz Well system facilities.

6.8.1.3 Implementation of Recycled Water or Desalination (Element 3)

As described in Section 6.7, further study of recycled water has been currently prioritized over seawater desalination. The City's evaluation of recycled water use is covered in detain in Section 6.4.

Table 6-7: Expected Future Water Supply Projects or Programs (submittal table 6-7R)

Expected Future Water Supply Projects or Programs					
Name of Future Projects or Programs	Joint Project with other suppliers?	Description	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Supplier (MG)
Water Supply Augmentation Strategy (WSAS): • Element 1: In Lieu. This alternative could include the sale of water to other agencies with or without the assumption of additional water back to the City during droughts. • Element 2: Aquifer Storage and Recovery. Evaluations of both the Mid-County and Santa Margarita Groundwater Basins are being conducted. • Element 3: Advanced Treated Recycled Water or Seawater Desalination.	Yes. Some elements could be developed in coordination with neighboring water districts including Soquel Creek Water District, Scotts Valley Water District, and/or San Lorenzo Valley Water District	See 2020 UWMP Section 6.8 for full description	2030	All Year Types	0 - 1200
NOTES: Some future water supply projects are not compatible with this table and are described in the narrative.					

6.8.2 Santa Cruz Water Rights Project

This project supports the implementation of the WSAS and involves the modification of the City's existing water rights to increase the flexibility of the water system by improving the City's ability to utilize surface water within existing allocations. This project also adds into the City's water rights Agreed Flows bypass flow requirements for all of the City's surface water sources which are protective of local anadromous fisheries. (See Chapter 7, Section 7.1.2 for additional description of the Agreed Flows). The success of this project is necessary for fisheries protection and to facilitate future water supply projects. The primary components of the Santa Cruz Water Rights Project include:

1. Water rights modifications related to place of use, method of diversion, points of diversion and rediversion, underground storage and purpose of use, extension of time, and Agreed Flows stream bypass requirements for fish habitats;
2. Water supply augmentation components, including new aquifer storage and recovery (ASR) facilities at unidentified locations, ASR facilities at the existing Beltz well facilities, water transfers and exchanges and intertie improvements; and
3. Surface water diversion improvements, including the Felton Diversion fish passage improvements and the Tait Diversion and Coast Pump Station improvements.

State Water Resources Control Board noticed the City's water rights change petitions on February 10, 2021. Subsequently, the project's Draft EIR was released for public review in summer 2021. The Final EIR, to be prepared addressing comments received on the Draft EIR, is expected to be completed in late 2021 or early 2022. Once completed, the Santa Cruz City Council will consider project approval and certification of the EIR and the State Water Resources Control Board will consider action on the City's water rights change petitions. The Santa Cruz Water Rights Project Community Guide is included as Appendix L.

6.8.3 Santa Cruz Water Program (Capital Investment Program)

City of Santa Cruz has embarked on ambitious capital investment program, the Santa Cruz Water Program, to secure our future water supply portfolio, to improve reliability and resiliency in the face of climate change, and to address aged infrastructure. Major investments are planned in the coming years to advance toward a twenty-first century water system. Staff has been working with HDR Engineering to implement the Water Program. Some elements of the program will help contribute to the WSAS and and support water supply reliability such as improvements to the Graham Hill Water Treatment Plant, raw water pipeline improvements, Tait diversion, as described below. Information on all projects included in the Program is included in Appendix N.

6.8.3.1 Graham Hill Water Treatment Plant Projects

Upgrades to the City's Graham Hill Water Treatment Plant are critical to the implementation of the WSAS to allow treatment of higher turbidity source water that otherwise would need

to be bypassed during period high flow periods such as during and after storm events. Recent and ongoing projects include major maintenance repairs to the flocculation, sedimentation and filtration basins, and replacement of three of the four concrete tanks. Simultaneous with these component repair and replacement projects, staff has been developing the Facilities Improvement Project. This project is a comprehensive evaluation of the treatment plant that identifies the most cost-effective improvements to meet water treatment objectives and improve the overall reliability and resiliency of the plant. Staff have been working since December 2017, completing a comprehensive condition assessment of the facility, evaluating alternative treatment processes, performing pilot testing, jar testing, and bench-top studies to analyze treatment alternatives as well as developing a plan for identified non-treatment items such as deficient office space and seismic upgrades to the operations building. These investments are designed to address aging infrastructure, prevent noncompliance with drinking water standards under anticipated future conditions, and support mission-critical values of supplying adequate, safe, and reliable water for the City's customers.

6.8.3.2 Raw Water Transmission Pipeline Projects

The City is planning improvements to raw water conveyance by upgrades to both the Newell Creek Pipeline and segments of the North Coast system. These projects will improve reliability and reduce hydraulic constraints to improve delivery of raw water to the Graham Hill Water Treatment Plant.

6.8.3.3 Tait Diversion Improvements

The City is also investigating improvements to the Tait Diversion facility that would improve reliability and fish screening. As described in the Santa Cruz Water Rights Project Draft EIR, if the Tait Diversion is added as a new point of diversion to existing Felton water rights, Tait Diversion capacity would be increased to accommodate the combined diversion of water under both the Tait and the Felton water rights at this facility.

6.9 Summary of Existing and Planned Sources of Water

6.9.1 Existing Sources of Water

The City's existing sources and actual production volumes for 2020 are presented in Table 6-8. The figures represent production volumes experienced during the exception COVID-19 global pandemic. As analyzed in Appendix D, 2020 saw residential water use in Santa Cruz slightly higher and business water use significantly lower than expected. The change in business water is thought to be a consequence of the shelter-in-place order and business restrictions mandated in response to the pandemic. Pandemic-related changes in residential water use on the order of 3-5 gallons per capital per day in other parts of California were measured (DWR, 2021a). Observed increases in Santa Cruz residential

water use between 2017-19 and 2020 were on the order of two gallons per capital per day. Some of this increase may also be attributed to weather differences.

Table 6-8: Water Supplies – Actual (submittal table 6-8R)

Water Supplies — Actual			
Water Supply	Additional Detail on Water Supply	2020	
		Actual Volume*	Water Quality
Surface water (not desalinated)	North Coast	360	Drinking Water
Surface water (not desalinated)	San Lorenzo River	1,724	Drinking Water
Supply from Storage	Loch Lomond	408	Drinking Water
Groundwater (not desalinated)	Beltz Well System	141	Drinking Water
Purchased or Imported Water	Emergency Intertie	2	Drinking Water
Recycled Water	Produced by City of Scotts Valley/ Pasatiempo Golf Course	35	Recycled Water
	Total	2,670	
NOTES: Net production. Source: Annual production data 2020.			

6.9.2 Planned Sources of Water

Table 6-9 provides an estimate of the volume of water, by source, that is reasonably projected to be available from 2025 to 2045. These volumes are based on deliveries for average years, projected water demands, available surface water flows consistent with ecosystem protection goals, and future water projects according to the City's water supply planning operations model, Confluence ®.

The City is safeguarding against future water shortages by and actively implementing future water projects as described in Section 6.8. Implementation of these projects is therefore assumed in the City's water supply planning process. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies described in this Urban Water Management Plan.

- In 2025, the City will have implemented proposed water rights modifications, including implementation of the Agreed Flows which are protective of local anadromous fisheries, as described in the Santa Cruz Water Rights Project Draft EIR (see Section 6.8.2) and
- In 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects:
    - Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft EIR,
    - Improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft EIR and as included in the Santa Cruz Water Program (see Section 6.8.3),
    - Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and
    - Replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program.

Table 6-9: Water Supplies – Projected (submittal table 6-9R)

Water Supplies — Projected						
Water Supply	Additional Detail on Water Supply	Projected Water Supply				
		2025	2030	2035	2040	2045
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Surface water*	North Coast	346	346	346	346	346
Surface water*	San Lorenzo River	1,847	1,877	1,887	1,948	1,967
Supply from Storage	Loch Lomond	349	331	331	331	331
Groundwater*	Beltz Well System	91	87	87	87	87
Recycled Water	Produced by City of Scotts Valley/ Pasatiempo Golf Course	35	35	35	35	35
Other	Aquifer Storage and Recovery	0	18	18	18	18
	Total	2,668	2,694	2,704	2,765	2,784
***Not desalinated**						

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. Projected water supply is based on normal year type. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program.

6.10 Climate Change Impacts to Water Supply

As the City of Santa Cruz water supply consists of only local sources maintained and recharged by natural processes, the potential weather conditions related to climate change could greatly impact the sources of supply. Prior to approximately 2013, water supply planning and the estimation of future water shortages for the City of Santa Cruz (City) were based solely on the 73 years of hydrologic record available for the Santa Cruz region. Using temperature and precipitation data and resulting hydrology from the past 73 years, the City used available tools and experience to predict future conditions. While this approach allowed the City to simulate longer droughts by synthetically creating time-sequences of dry periods, it was not capable of incorporating more severe droughts in terms of dryer, warmer climates.

Ongoing studies including evaluations of paleoclimate records and future climate model projections indicate that longer-term drought conditions have occurred in the past and are likely to occur again. Additionally, the 73-year period of record is characterized by rainfall patterns well above long-term averages and therefore the worst droughts reflected in the past 73 years likely understate future conditions.

During the Water Supply Advisory Committee process, which concluded in 2015, the City began incorporation of consideration of possible climate change hydrologies, in addition to the historic hydrology, into water supply planning. A goal of the process was to develop a supply augmentation work plan that was adaptable to future climate conditions. Through the supply planning work and the initial development of the pending HCP, the City focused on a worst-case climate change dataset, which for the Cal-Adapt datasets was the downscaled Geophysical Fluid Dynamics Laboratory Coupled Model (GFDL2.1 or CMIP3) for the A2 emissions scenario. It should be noted that the Cal-Adapt program was just getting up and running at that time to help state agencies respond to climate change.

The experiences and insights of the Water Supply Advisory Committee technical team have shown that the City's current supply system is vulnerable to future climate conditions projected in this region. By relying on local sources that are dominated by surface water and limited by a single reservoir, the City water system is vulnerable to any combination of conditions that result in drier or warmer climate, more intense rainfall over shorter periods of time, etc.

After completion of the process, the City has continued the evaluation of supply reliability under climate change conditions with additional model scenarios including but not limited to the use of the Coupled Model Intercomparison Project 5 (CMIP5) data set, including modified scenarios. An objective of this work is to understand the reasonable boundaries of future climate conditions with respect to timing, duration, and depth of supply deficits. The findings, whereas different in terms of magnitude of shortage and reliability of existing

supplies among the scenarios, all conclude that the City's current water supply situation is inadequate for meeting the longer-term challenges of climate change.

For the purposes of assessing climate change considerations in this Urban Water Management Plan, the water supply modeling for the supply reliability assessments presented in Chapter 7 were prepared using the City's water supply operations model, Confluence, utilizing both historic hydrology and CMIP5 climate change hydrology. The CMIP scenario used in the CMIP5 50-99 scenario which has been adjusted to include warmer air temperatures. It is important to note that this CMIP5 climate change hydrology represents a single possible future under climate change conditions that the City has selected to represent a reasonable prediction of future conditions. In this way, it is one useful way to think about climate change, but actual climate change could unfold in many different ways.

To address this type of uncertainty, moving forward, the City is adopting a new approach working with the Hydrosystems Group at the University of Massachusetts, Amherst to conduct a vulnerability assessment and develop an adaptation plan to understand the limitations of the current water supply system and evaluate adaptation options to mitigate effects of climate change to meet the City's water demand. This is being conducted through assessing the vulnerability of our system through an extensive exploration of future conditions to stress test the water system. What is expected to come from this analysis is a better understanding of the capabilities of the current system to meet future climate conditions, and under what conditions the current system begins to break down. This work, which is expected to ultimately replace the City's Confluence water supply operations model, is currently underway.

6.11 Energy Use

The City of Santa Cruz tracks municipal energy use, including Water Department energy use, on an online public energy dashboard as part of the City's ongoing climate action program. As summarized in Table 6-10, the City utilized about 5,800,000 kilowatt hours of energy system wide in 2020. This energy was used in the production, conveyance, treatment, and distribution of water within the water system. This results in a calculated energy intensity of 2,227 kilowatt hours per million gallons. Additionally, the Water Department generated about 600,000 kilowatt hours of self-generated renewable energy from solar arrays at the Graham Hill Water Treatment Plant and Bay Street Tanks site in 2020.

Table 6-10: Energy Reporting (submittal table O-1b) Recommended Energy Reporting - Total Utility Approach

Enter Start Date for Reporting Period	1/1/2020	Sum of All Water Management Processes		
End Date	12/31/2020			
		Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (MG)		*2604*		*2604*
Energy Consumed (kWh)		*5,799,263*		*5799263*
Energy Intensity (kWh/vol. converted to MG)		*2227.1*	*0.0*	*2227.1*

Quantity of Self-Generated Renewable Energy:
637,882 kWh

Data Quality:
Metered Data. No upstream data embedded.

Data from City of Santa Cruz Energy Dashboard for water production during the year 2020. The energy dashboard is publicly available online at:
https://app.powerbi.com/view?r=eyJrIjoiYTk4Yzk0NjctYTcyZC00YzYyLTkzYzUtMjY4M2JhNzM4NjE0IiwidCI6IjRjYTJkNDI0LTBlMmYtNDM3My04MGQwLTdiZjMwNWQwYmRiOCIsImMiOjZ9&pageName=ReportSection

Narrative for All Water Supply:
~Extraction and Diversion - energy is use to operate equipment at diversion facilities and wells
~Conveyance - energy is use at booster and pump stations to convey raw water
~Treatment - energy is used at surface water and groundwater treatment facilities
~Distribution - energy is used at pump stations to convey treated water and at reservoir/tank sites within the distribution system
~Self-generated renewable energy is produced from solar arrays at the Graham Hill Water Treatment Plant and the Bay Street Tanks site (distribution system)

Chapter 7

WATER SUPPLY RELIABILITY AND DROUGHT RISK ASSESSMENT

This chapter characterizes the City's water service reliability through assessments of forecasted supply relative to forecasted demand. Short-term reliability planning that requires immediate action, such as drought or a catastrophic supply interruption, is addressed in Chapter 8, Water Shortage Contingency Planning, and Appendix O, Water Shortage Contingency Analysis and Implementation.

7.1 Constraints on Water Sources

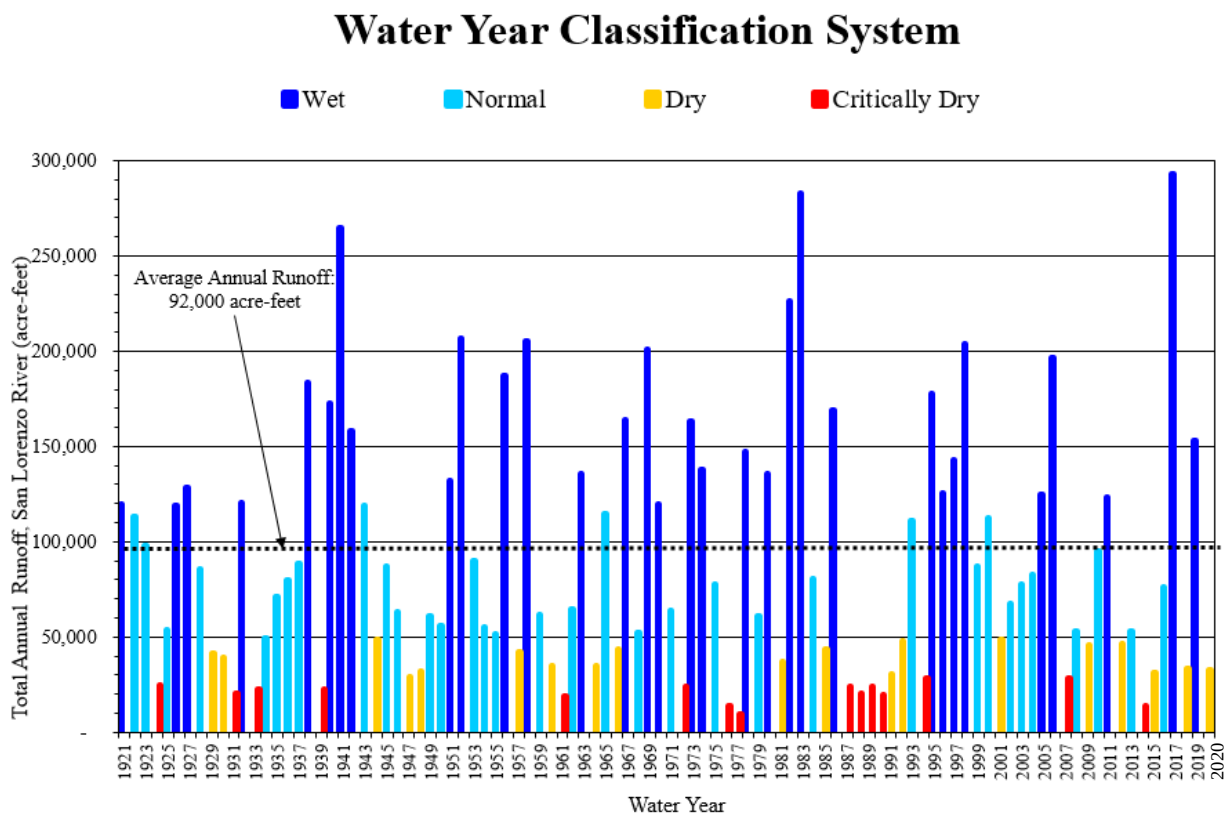
The City of Santa Cruz faces several obstacles in meeting its present and future water supply needs that necessitate future water supply projects. While each constraint presents a unique set of water management challenges, the common theme is the limitation in when and how much water is available to meet the area's water service needs, particularly during years when rainfall is below average, exacerbated by a lack of storage within the system. The following sections outline the known constraints on supply. Refer to Chapter 6, Section 6.8 for a discussion of the future water projects that the City is actively engaged in to address these identified constraints.

7.1.1 Local Supply Variability and Limited Storage

As explained in Chapter 3, the City water system draws almost exclusively on local surface water sources, whose yield varies from year to year depending on the amount of rainfall received during the winter season and generated runoff that provides beneficial inflows.

Figure 7-1 below shows the total annual runoff for the San Lorenzo River over the 90-year period from 1921 to 2020 and the classification for each water year. The graph illustrates the dramatic variation in discharge from year to year. This natural variation in the level of runoff available in local streams and rivers, from which the City draws the majority of its supply, is the major factor that results in an inconsistent level of water supply from year to year. Ultimately, the only water available to the City is that which originates from rain that falls on the ocean side of the Santa Cruz Mountains. In normal and wet years, when rainfall and runoff are abundant, the water system is capable of meeting the community's current total and anticipated annual water requirements.

Figure 7-1 Total Annual Stream Discharge from the San Lorenzo River



The system is highly vulnerable to shortage in extended dry periods or critically dry years, when the flow in local streams and river sources runs low. Moreover, like other communities on California's central coast, the Santa Cruz water system is physically and geographically isolated. Emergency interconnections with neighboring districts is limited by the lack of existing interties with neighboring districts. Due to the nature of the critically over drafted Santa Cruz Mid-County Groundwater Basin, the primary function of the existing intertie with the Soquel Creek Water District has been to send water to the District rather than from the District to the City.

Water is currently stored in the City's single reservoir, Loch Lomond Reservoir (impounded by the Newell Creek Dam), to serve peak season demands. This reservoir is an integral part of the supply system. Some amount of storage is used each year, mainly in the summer and fall months when the flows in the coast and river sources decline and additional supply is needed to meet higher daily water demands than during winter and spring. Storage is also used in winter months during storm events when water quality concerns prevent the use of the City's flowing sources.

During dry years, the system relies more heavily on water stored in Loch Lomond to satisfy demand, which draws down the reservoir level lower than usual and depletes available storage. In multi-year or critical drought conditions, the combination of very low surface flows in the coast and river sources and depleted storage in Loch Lomond Reservoir reduces available supply to a level that cannot support average dry season demands. Compounding the situation is the need to retain a certain amount of water in the reservoir if drought conditions continue into the following year. The existing system is not able to provide a reliable supply during multi-year droughts or prolonged periods of drier than normal hydrologic conditions within the source watersheds.

7.1.2 Ecosystem Restoration and Protected Species

Since 2002, the City of Santa Cruz has been working toward the development of a Habitat Conservation Plan (HCP) that covers operation and maintenance activities at the North Coast streams and San Lorenzo River diversions as well as other activities which may result in "take" of threatened and/or endangered species. An HCP is an operational avoidance and minimization and mitigation plan prepared under Section 10 of the Federal Endangered Species Act (FESA) and Section 2081 of the California Endangered Species Act (CESA) by nonfederal parties seeking to obtain a permit for incidental take of federally or state-listed threatened and endangered species.

The City initiated the HCP process because the streams from which the City diverts water currently support steelhead (*Oncorhynchus mykiss*) and the San Lorenzo River and Laguna Creek support coho (*Oncorhynchus kisutch*). Within the Central California Coast Region, steelhead is currently listed as "threatened" and coho is listed as "endangered" on the ESA federal list and Coho salmon are also listed as "threatened" under CESA.

Numerous studies undertaken in support of the HCP have evaluated what limiting factors may be affecting fish in these streams. Among other things, this includes evaluation of instream flow needs during all freshwater life phases (migration, spawning, incubation and rearing) over a range of hydrologic year types. Because these studies indicated that habitat conditions in these streams could be improved with increased instream flows, the City began voluntarily diverting less flow in 2007 on an interim basis in connection with the pursuit of the HCP.

The HCP conservation strategy has been designed to avoid, minimize, and fully mitigate the effects of the City's "Covered Activities" on "Covered Species" (steelhead and coho) and their habitat in support of the long-term viability of these populations within streams

affected by the HCP Covered Activities.[1] The ultimate fate of these populations depends on the actions of many other entities and natural processes both within and beyond areas under the City's control. The conservation strategy recognizes that the City's efforts will support and coordinate with overarching efforts to preserve these species within Santa Cruz County and the larger habitat boundaries for these species. The HCP biological goals and objectives address key limiting conditions in the Santa Cruz Mountains diversity stratum, particularly the effects of surface water diversions, as identified in the recovery plans for steelhead and coho (NMFS 2012, 2016).

The City has negotiated long-term minimum bypass flow requirements (Agreed Flows) for all City surface water sources with California Department of Fish and Wildlife (CDFW) and National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) as part of the HCP process. In particular, the HCP seeks to optimize habitat conditions for all life-stages of the subject species within the natural variability of the hydrologic regime. Any impacts to coho would be of particular concern because coho populations south of the Golden Gate Bridge are on the brink of extirpation. Provision of the Agreed Flows would generally require reduced diversions from the North Coast sources and from the San Lorenzo River at certain times and corresponding increased use of stored water from Loch Lomond Reservoir and use of groundwater. This would result in reduced storage in Loch Lomond Reservoir available for use during dry and drought periods. Overall, the implementation of the Agreed Flows would further reduce the City's dry-year water supply reliability, as it would further limit the amount of water that the City can divert.

The HCP was submitted to CDFW and NMFS for agency review in spring 2021 (City of Santa Cruz, 2021). Initiation of environmental review for the HCP and associated permit applications is expected to commence in fiscal year 2022 with the goal of permit process completion by late 2022 or early 2023.

The City's adoption of the HCP will be subject to review under the California Environmental Quality Act, and NMFS's processing of the HCP as a Section 10 permit application will be subject to a separate environmental review under the National Environmental Policy Act. However, as both CDFW and NMFS have tentatively agreed on the bypass flow requirements, the City has independently committed to implement the Agreed Flows as part of the Santa Cruz Water Rights Project (see Section 6.8.2), regardless of the final outcome of the HCP process. Under the Agreed Flows, less water will be available from the City's flowing sources for supply in future years

[1] The HCP Covered Activities include operation, maintenance, and rehabilitation of the City's water supply and water system facilities, including surface water diversions, operation and maintenance of the City's municipal facilities, and management of City lands.

compared, and as such, there will be greater reliance on water stored in Loch Lomond Reservoir to meet the community's annual water needs and the aforementioned vulnerability to shortage could be exacerbated.

7.1.3 Water Rights Constraints

As described in Chapter 6, the City of Santa Cruz holds pre-1914 water rights to its North Coast Sources and post-1914 licenses and permits for its water rights on the San Lorenzo River and Newell Creek. Through planning processes including the development of the draft HCP and City's Water Supply Augmentation Strategy (WSAS), the City has identified the need to improve flexibility in operation of the City's water system while enhancing stream flows for local anadromous fisheries. Incorporating the Agreed Flows into all City water rights is necessary to benefit local fisheries, specifically for coho and steelhead, but will further constrain the City's limited surface water supply. Consequently, the City has a need to improve the operational flexibility of the water system within existing rights, permits, and licenses to allow more effective use of limited water resources. To do this, the City is proposing water rights modifications to its existing rights, permits, and licenses to expand the authorized place of use (POU), to better utilize existing diversions, and to extend the City's time to put water to full beneficial use.

The Santa Cruz Water Rights Project, described in Chapter 6, Section 6.8.2, includes the following objectives to address current water rights constraints:

1. Improve the flexibility with which the City operates the water system to facilitate the City's ability to meet drinking water demand while providing flow conditions protective of coho and steelhead.
2. Provide flow conditions that are protective of coho and steelhead within all streams from which the City diverts water, as negotiated with CDFW and NMFS during the preparation of the pending HCP, which is the habitat conservation plan being developed under the federal ESA and CESA.
3. To improve the City's limited storage and support the implementation of the City's WSAS Element 1 (passive recharge of regional aquifers via water transfers and exchanges) and Element 2 (active recharge of regional aquifers via aquifer storage and recovery (ASR)) in order to deliver a safe, adequate, reliable and environmentally sustainable water supply.
4. Facilitate opportunities within the City and regionally for conjunctive use[2] of the City's surface water rights in combination with groundwater, including by addressing significant barriers to implementing conjunctive use due to the place of use associated with the City's water-right permits and licenses to, among other

[2] Conjunctive use refers to a range of actions and projects that provide for the coordinated management of surface water and groundwater supplies to increase total supplies and enhance water supply reliability. Conjunctive use actions and projects can also be used to sustainably manage groundwater supplies.

things, assist in implementation of the "Water Transfers/In Lieu Groundwater Recharge" element of the Santa Cruz Mid-County Groundwater Basin Groundwater Sustainability Plan (GSP).

5. Provide more options for where and how the City can utilize its existing appropriative water rights.
6. Provide for the underground storage of surface water primarily to support more reliable and improved water supply by allowing the City to use such stored water during dry periods and also to contribute to the protection of groundwater quality from seawater intrusion per the Santa Cruz Mid-County Groundwater Basin GSP and to allow for the implementation of the "Aquifer Storage and Recovery" element of the Santa Cruz Mid-County Groundwater Basin GSP.
7. Remove potential operational constraints on City water rights that do not explicitly recognize direct diversion.
8. Allow additional time for the City to fully reach beneficial use under existing water-right permits at Felton.
9. Improve fish screening at the Felton Diversion and Tait Diversion and improve fish passage at the Felton Diversion. Consideration of fish passage improvements at Tait Diversion would be incorporated into future projects as required.
10. Address reliability and operational deficits at the Tait Diversion and Coast Pump Station to meet other project objectives.
11. Implement state policy favoring integrated regional water management by involving the City and other local agencies in "significantly improving" the "reliability of water supplies" by "diversifying water portfolios, taking advantage of local and regional opportunities, and considering a broad variety of water management strategies," specifically by making more extensive conjunctive use of the surface-water, groundwater and groundwater-storage resources available to the City and, when Agreed Flows and City demands are met, making excess surface water under the City's surface-water rights available to neighboring agencies who are dependent on overdrafted groundwater basins. (Water Code Section 10531[c].)
12. Consider other related actions or activities that would be foreseeable as a logical part in a chain of contemplated actions should the project be approved, including facilities that would provide for ASR, water transfers, and water exchanges.

7.1.4 Source Water Quality and Treatment Capacity

The City's Graham Hill Water Treatment Plant (GHWTP) currently complies with all drinking water standards set by the US Environmental Protection Agency and the State Water Resources Control Board Division of Drinking Water. These regulations require monitoring of water sources, watershed protection, treatment techniques, and extensive monitoring of treated water quality throughout the distribution system.

The primary issues with respect to water quality are treatment challenges posed by future changes in our source water mix driven in part by ecosystem protection requirements and to accommodate the WSAS. The treatment plant is a conventional surface water treatment plant that was commissioned in 1960 as a 12 million gallons per day (MGD) plant and has undergone an expansion and a number of improvements over the last 50 years. Except for groundwater from the Beltz Well system, all water delivered through the City system is treated at this plant. In other words, it must operate properly 100 percent of the time to maintain water service throughout the entire system. Following the last major expansion the plant can process up to 24 MGD. Currently, the plant's ten-year average production is between 7 MGD and 8 MGD.

In addition to addressing aging infrastructure at the treatment plant, the City has been evaluating improvements to address a variety of changing conditions, including climate change considerations. This includes changing the mix of source water when accommodating the Agreed Flows, treating more turbid flows and providing potential higher daily plant output in winter to support the WSAS, accommodating changing storm patterns that may deliver regional rainfall in higher volumes over shorter periods of time, and evolving water quality regulations.

7.2 Drought Risk Assessment

The Drought Risk Assessment (DRA) is a new requirement in the 2020 Urban Water Management Plan. The assessment includes a supply and use comparison looking ahead assuming drought conditions over the next five years. The DRA can be modified or updated on an interim cycle, as such, it is required to include a description of the basis for assessment, an analysis of reliability for individual water sources, as well as a comparison of total water supply and use comparison over a five year drought period, even if this information is provided in detail elsewhere in the Urban Water Management Plan.

7.2.1 Basis for Assessment

The data, methods, and basis for assumed water shortage conditions are consistent with those used throughout this 2020 Urban Water Management Plan. Specifically, projected demand is based upon the long-term demand forecast prepared for the City by M.Cubed. In 2014 and 2015, the City of Santa Cruz worked with M.Cubed to develop a long-term water demand forecast using econometric forecasting, and that demand forecast was updated in 2021 for use in this Urban Water Management Plan (Appendix D).

The City of Santa Cruz utilizes the Confluence® model to analyze the variability of water supplies to determine potential water supply shortages. The City has been utilizing the Confluence® model to support water supply planning activities since 2003 and this model was also used to generate the results for the 2010 and 2015 UWMP. The model takes into account the variation in demand both within and between years, the availability of water from various sources, and the capacity of infrastructure to pump and treat the water. The results presented in this section provide perspective on the City's drought risk and water supply reliability based on accepted assumptions and projected conditions in the water system under historic hydrology and a selected climate change hydrology.

In this Urban Water Management Plan, the period 1973 – 1977 is used as the DRA and five-consecutive-year drought in the reliability assessment described below because it is the period in the historic record that would pose the greatest challenge to the City's water supply system. Even though the sequence began with wet and normal years, the extremely dry period that occurred in the final two years of the sequence in 1976 and 1977 would result in greatest water supply shortages of any five-year period in the historical record. The sequencing of year types in this period is as follows:

- Year One (1973) – Wet
- Year Two (1974) – Wet
- Year Three (1975) – Normal
- Year Four (1976) – Critically Dry
- Year Five (1977) – Critically Dry

By way of comparison, the drought of 1987 – 1991 was a period of more consecutive years classified as either dry or critically dry, but the hydrology of the period of 1973 – 1977 would result greater supply shortages for the City's supply system.

The City has chosen to conduct this analysis using both historic hydrology and a selected climate change hydrology, CMIP-5, similar to the approach utilized for the reliability assessment described below. The scenario used is the CMIP5 50-99 scenario which has been adjusted to include warmer air temperatures. The five-year consecutive drought period was selected as the driest period identified from the climate change hydrology resulting in the greatest projected supply shortages.

Based on anticipated timing of certification of the Santa Cruz Water Rights Project Environmental Impact Report and action by the State Water Resources Control Board on proposed water rights modifications, the City's proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report (see Chapter 6, Section 6.8.2), including implementation of the Agreed Flows which are protective of local anadromous fisheries, are assumed for 2022 through 2025 of the DRA, but are not assumed in the first year of the analysis. Neither implementation of ASR of planned infrastructure projects are assumed to be implemented within the timeframe of this analysis.

7.2.2 Total Water Supply and Use Comparison

Table 7-1 presents the results of the DRA. This analysis shows that projected supply would meet projected demand for the first four years of the extended five-year drought, but that in the fifth year, a substantial, 27 percent, shortage is projected. This projected shortage would require aggressive reduction savings according to the City's Water Shortage Contingency Plan. During an extended drought period, however, the City would likely utilize the Water Shortage Contingency Plan and implement demand reduction requirements in earlier years before an actual shortage is experienced, to ensure adequate supplies remain in Loch Lomond Reservoir, thereby potentially reducing the depth of shortage experienced in the fifth year.

Table 7-1C presents the DRA under the selected climate change hydrology. Under these conditions, a minor shortage of 3% would be expected in the second year, but substantial shortages of 25 percent and 23 percent would be expected during the fourth and fifth years of the extended drought scenario respectively. These projected shortages would require high levels reduction savings implemented per the Water Shortage Contingency Plan.

These near-term drought risks underline the City's need for water supply augmentation and for the pursuit of its WSAS and Water Program described in Chapter 6, Section 6.8.

Table 7-1: Five-Year Drought Risk Assessment (submittal table 7-5R)

Five-Year Drought Risk Assessment	
2021	Total
Total Water Use (MG)	2,646
Total Supplies (MG)	2,646
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2022	Total
Total Water Use (MG)	2,652
Total Supplies (MG)	2,652
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from action	0%
2023	Total
Total Water Use (MG)	2,657
Total Supplies (MG)	2,657
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2024	Total
Total Water Use (MG)	2,663
Total Supplies (MG)	2,663
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2025	Total
Total Water Use (MG)	2,668
Total Supplies(MG)	1,948
Surplus/Shortfall w/o Action (MG)	(720)
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	720
Resulting % Use Reduction from Action	27%

Table 7-1C: Five Year Drought Risk Assessment Table under a Projected Climate Change Hydrology

Five-Year Drought Risk Assessment Under a Projected Climate Change Hydrology	
2021	Total
Total Water Use (MG)	2,646
Total Supplies (MG)	2,646
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2022	Total
Total Water Use (MG)	2,652
Total Supplies (MG)	2,652
Surplus/Shortfall w/o Action (MG)	0
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	
Resulting % Use Reduction from Action	0%
2023	Total
Total Water Use (MG)	2,657
Total Supplies (MG)	2,586
Surplus/Shortfall w/o Action (MG)	(71)
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	71
Resulting % Use Reduction from Action	3%
2024	Total
Total Water Use (MG)	2,633
Total Supplies (MG)	2,005
Surplus/Shortfall w/o Action (MG)	(628)
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	628
Resulting % Use Reduction from Action	25%
2025	Total
Total Water Use (MG)	2,668
Total Supplies (MG)	2,089
Surplus/Shortfall w/o Action (MG)	(581)
Planned WSCP Actions (use reduction)	
WSCP - use reduction savings benefit (MG)	581
Resulting % Use Reduction from Action	23%

7.2.3 Individual Water Source Reliability and Determination

The DRA includes an assessment of the reliability of and determination on each water source over the five-consecutive year drought. The DRA captures a period when the City will be implementing Agreed Flows, which are protective of local anadromous fisheries, but before WSAS projects to augment water supply are operational. Figure 7-2 illustrates the water supply by source for each year in the drought risk assessment. The City's flowing sources, the North Coast streams and San Lorenzo River, comprise the majority of the City's water supply. After 2022, assuming implementation of proposed water rights modifications, these sources will be managed according to Agreed Flows bypass requirements which are protective of local anadromous fisheries and will limit the ability for the City to divert from flowing sources compared to historical practices. These flowing sources are also highly susceptible to reduced flow availability during drought conditions.

Reduced water availability from the flowing sources results in increased reliance during dry years on the Beltz Well system for groundwater and Loch Lomond Reservoir for supply from storage. The Beltz Well system, however, is constrained by the limited capacity of the four groundwater wells and is managed as a basin in critical overdraft per the Santa Cruz Mid-County Groundwater Basin Groundwater Sustainability Plan (Appendix H). Furthermore, Loch Lomond Reservoir is currently the City's only supply storage, and as such, it must be managed conservatively to ensure sufficient supplies are available to address the possibility of extended drought. Because of this, the City will typically activate its Water Shortage Contingency Plan as described in Chapter 8 during single dry years, when supplies may otherwise be sufficient to meet current-year demand, to hold as much storage as possible for possible subsequent dry years without opportunity to refill the reservoir during winter rains.

Recycled water used within the system is currently limited to irrigation of the Pasatiempo Golf Course and is supplied from the City of Scotts Valley. This recycled water supply is not expected to be impacted by drought conditions.

The City additionally conducted the Drought Risk Assessment utilizing the selected climate change projection. Figure 7-2C illustrates the City's water supply by source that is projected to be utilized under this scenario. The vulnerability of flowing sources, the North Coast Streams and San Lorenzo River, to drought can be seen in the rapid drop of availability of these sources between years two and three in this scenario. Subsequently, the inability to refill Loch Lomond Reservoir during ensuing dry years, leads to two successive years of significant projected supply shortages.

Figure 7-2: Drought Risk Assessment Supply by Source

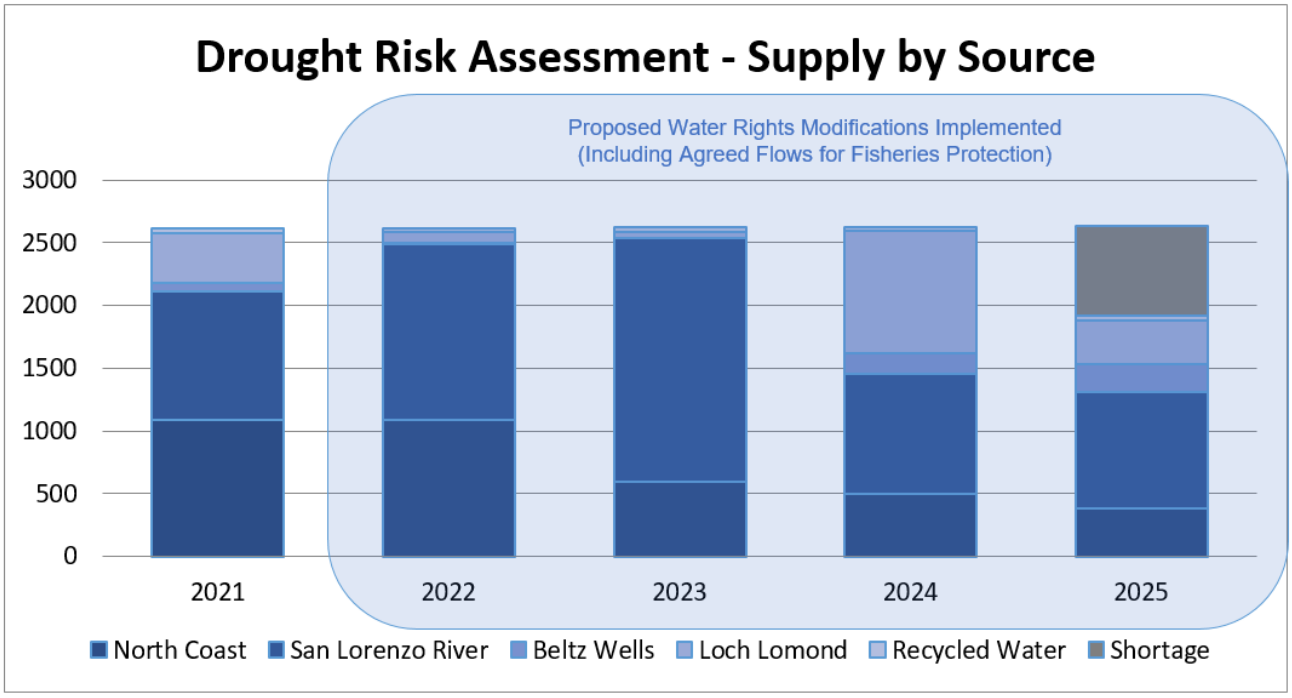
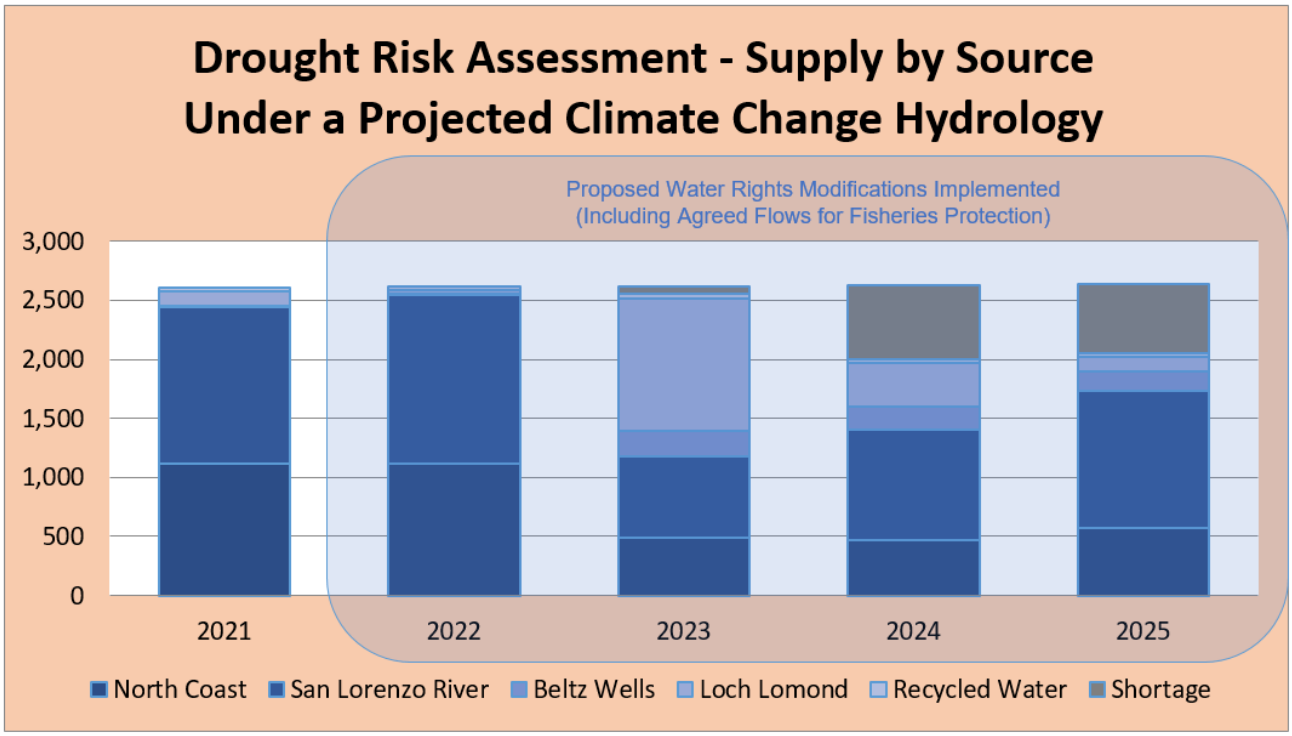


Figure 7-2C: Drought Risk Assessment Supply by Source under a Projected Climate Change Hydrology



7.3 Reliability by Type of Year

For the purposes of assessing water system reliability, the California Department of Water Resources uses the following definitions for determining year type:

Average/Normal Year: This condition represents the water supplies available during normal conditions. This could be a single year or averaged range of years that most closely represents the average water supply available. In this reliability assessment, the year 2010 is used to represent the average year because flows in the San Lorenzo River during this year were very close to the historical average.

Single-dry Year: A year that represents the lowest water supply available to the agency. In this reliability assessment, the year 1977 is used as the single dry year because it was the single driest year in this historical record.

Five-Consecutive-Year Drought: The five-consecutive-year drought represents the driest five year historical period for the supplier. In this reliability assessment, the period 1973 – 1977 is used as the five-consecutive-year drought because it is the period in the historic record that was most challenging from a water supply perspective, particularly due to the extremely dry two years of 1976 to 1977 as described in Section 7.2.1 above.

While the Urban Water Management Plan requires that reliability assessments be conducted utilizing the historic record as the basis for analysis, the City also elected to conduct the reliability assessments using a selected climate change hydrology, a modified CMIP-5 scenario, as described in Chapter 6, Section 6.10. Average, single-dry, and a five-year consecutive drought period were selected as representative from the climate change hydrology, and are presented in Table 7-1C.

Table 7-2: Basis of Water Year Data (submittal table 7-1)

Basis of Water Year Data (Reliability Assessment)			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		☐	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP.
		☑	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available (MG)	% of Average Supply
Average Year	2010	2785	100%
Single-Dry Year	1977	2785	100%
Consecutive Dry Years 1st Year	1973	2785	100%
Consecutive Dry Years 2nd Year	1974	2785	100%
Consecutive Dry Years 3rd Year	1975	2785	100%
Consecutive Dry Years 4th Year	1976	2684	96%
Consecutive Dry Years 5th Year	1977	1954	70%

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply planning) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

Table 7-2C: Basis of Water Year Data under a Projected Climate Change Hydrology

Basis of Water Year Data (Reliability Assessment) Under a Projected Climate Change Hydrology			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		☐	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP.
		☑	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available (MG)	% of Average Supply
Average Year	n/a	2785	100%
Single-Dry Year	n/a	2486	89%
Consecutive Dry Years 1st Year	n/a	2785	100%
Consecutive Dry Years 2nd Year	n/a	2785	100%
Consecutive Dry Years 3rd Year	n/a	2607	94%
Consecutive Dry Years 4th Year	n/a	2060	74%
Consecutive Dry Years 5th Year	n/a	2060	74%

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing a modeled climate change hydrology (CMIP-5). The Confluence model utilizes system demands to model available water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

7.4 Supply and Demand Reliability Assessment

To demonstrate supply reliability over time for each base year type modelled, Figure 7-3 illustrates projected supply available relative to demand over the 25-year planning horizon of this assessment. As further described below and consistent with the City's WSAS, implementation of pending water rights modifications, including Agreed Flows which are protective of local anadromous fisheries, is assumed after 2025. Improved reliability is projected after 2030 due to implementation of ASR and planned infrastructure projects.

As will be expanded on in the following section, the City projects having sufficient water supply available in normal years and single dry years to serve anticipated demand throughout the 2025 – 2045 analysis period.

Under multi-year drought conditions in the near term (2025), with proposed water rights modifications but before implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the multi-year drought scenario, but would fall short of demand by 27 percent in year five. While the analysis characterizes this vulnerability for year five of the drought period, depending on sequencing of rain years, in reality it is possible that such a shortage could occur sooner and persist longer through a multiple dry year period. Under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the mutli-year drought scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than a negligible two percent.

Figure 7-3C shows the projected supply available relative to demand under the modeled climate change hydrology. Compared to historic hydrology, there is potential for decreased reliability under a single dry year and under multi-year drought conditions under the climate change scenario. The City projects having sufficient water supply available in normal years under the climate change hydrology.

In single dry year conditions in the near term (2025), with proposed water rights modifications but before implementation of the ASR and planned infrastructure projects, supply would fall short of projected demand by seven percent. Under multi-year drought conditions in the near term available supplies would meet projected demand in years one and two of the multi-year drought scenario, but would fall short of system demands by two percent in year three and by 23 percent in years four and five. However, under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than five percent.

Figure 7-3: Projected Supply Availability as Demand Served

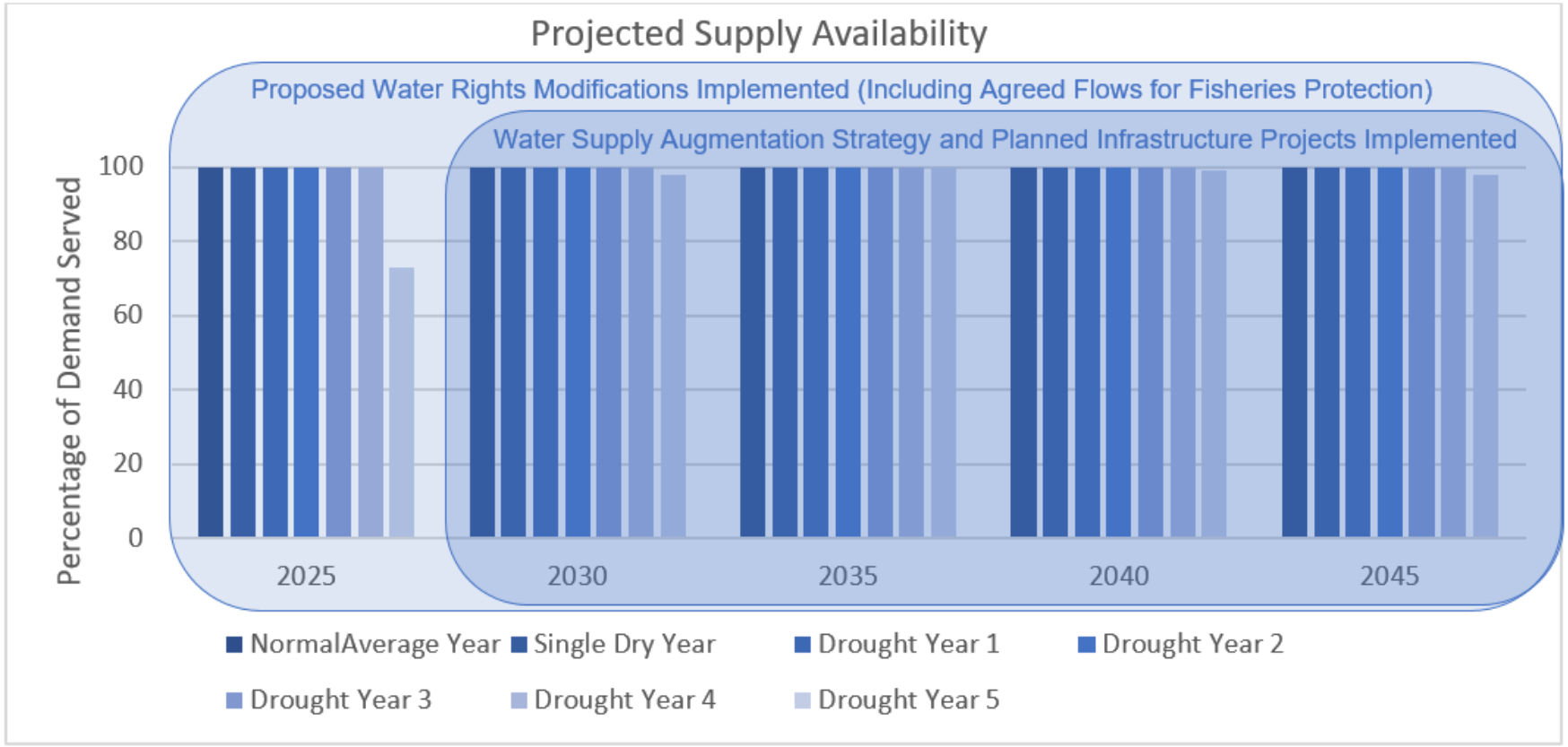
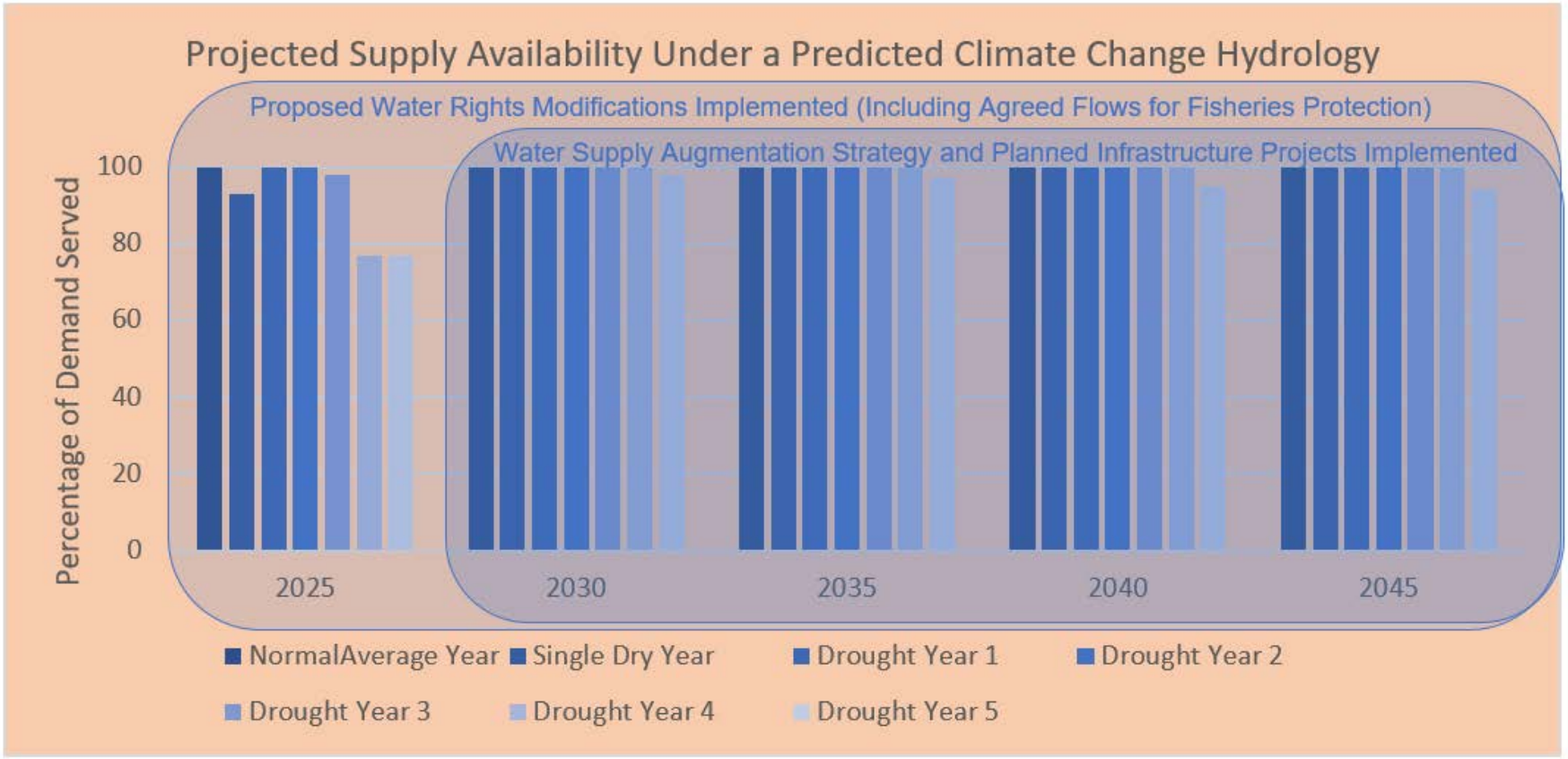


Figure 7-3C: Projected Supply Availability as Demand Served under a Projected Climate Change Hydrology



As described in Section 7.2.1, the City of Santa Cruz utilizes the Confluence® model to analyze the variability of water supplies to determine potential water supply shortages. The model takes into account the variation in demand both within and between years, the availability of water from various sources, and the capacity of infrastructure to pump and treat the water. The results provide perspective on the City's water supply reliability based on accepted assumptions and projected conditions in the water system. Similar to the DRA, the results presented in this section provide perspective on the City's water supply reliability based on accepted assumptions and projected conditions in the water system under historic hydrology and a selected climate change hydrology.

The City is safeguarding against future water shortages by actively implementing future water projects as described in Chapter 6, Section 6.8. Implementation of these projects is therefore assumed in the City's water supply planning process. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies over the 25-year planning horizon of this Urban Water Management Plan.

- In 2025, the City will have implemented proposed water rights modifications, including implementation of the Agreed Flows which are protective of local anadromous fisheries, as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report (see Section 6.8.2) and
- In 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects:
    - Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 MGD injection and 8.0 MGD extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report,
    - Improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program (see Section 6.8.3),
    - Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and
    - Replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program.

7.4.1 Normal/Average Water Year

After selecting the representative normal year (2010) from the 78-year period of record, average conditions were projected for the future five-year intervals through 2045. The summary results of this assessment, showing no shortages over the planning period with implementation of future water projects, are presented in Table 7-2 below for historic hydrology and Table 7-2C for the projected climate change hydrology.

Table 7-3: Normal Year Supply and Demand Comparison (submittal table 7-2R)

Normal Year Supply and Demand Comparison					
	2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
Supply totals	2,668	2,694	2,704	2,765	2,784
Demand totals	2,668	2,694	2,704	2,765	2,784
Difference	0	0	0	0	0

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

Table 7-3C: Normal Year Supply and Demand Comparison under a Projected Climate Change Hydrology

Normal Year Supply and Demand Comparison Under a Projected Climate Change Hydrology					
	2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
Supply totals	2,668	2,694	2,704	2,765	2,784
Demand totals	2,668	2,694	2,704	2,765	2,784
Difference	0	0	0	0	0

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing a modeled climate change hydrology (CMIP-5). The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

7.4.2 Single Dry Water Year

This assessment presents water supply available to the City as reflecting conditions comparable to water year 1977, which was the driest year in the historical record. As shown in Table 7-3, water supply during a single dry year is sufficient to meet the demand over the planning horizon through 2045 with implementation of future water projects.

The same analysis using the driest year in the projected climate change hydrology indicates a potential supply shortage of about seven percent in the near term, 2025 as indicated in Table 7-3C. As described above, in 2025, the analysis assumes proposed water rights modifications including implementation of the Agreed Flows bypass requirements which are protective of local anadromous fisheries and will limit the ability for the City to divert from flowing sources compared to historical practices, but implementation of the WSAS and planned infrastructure projects is not anticipated or assumed in the analysis until the year 2030. With both the proposed water rights modifications and water supply augmentation in place in 2030 and beyond, no water supply shortages are expected under the single dry year scenario under projected climate change hydrology conditions.

Table 7-4: Single Dry Year Supply and Demand Comparison (submittal table 7-3R)

Single Dry Year Supply and Demand Comparison					
	2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
Supply totals*	2,668	2,694	2,704	2,765	2,784
Demand totals*	2,668	2,694	2,704	2,765	2,784
Difference	0	0	0	0	0

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

Table 7-4C: Single Dry Year Supply and Demand Comparison under a Projected Climate Change Hydrology

Single Dry Year Supply and Demand Comparison Under a Projected Climate Change Hydrology					
	2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
Supply totals*	2,486	2,694	2,704	2,765	2,784
Demand totals*	2,668	2,694	2,704	2,765	2,784
Difference	182	0	0	0	0

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing a modeled climate change hydrology (CMIP-5). The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

7.4.3 Multiple Dry Water Year Period

The City chose to present the estimated water supply available during the multiple-dry water-year period of a five-year drought sequence using hydrology from 1973 through 1977 even though the first two years of this period were categorized as wet . As described above, the extreme critical dry years in years four and five (1976 and 1977) of the scenario make this period the most challenging period for the City's water supply system in the historical record. The results of the multiple dry year supply and demand comparison are provided as totals and overall differences in Table 7-5.

In an extreme five-year drought similar to the 1973 to 1977 event, the estimated water supply available to the City in the near term, 2025, during the fourth year would meet over 99 percent of projected demand, but during the fifth year only 73 percent of projected demand would be met. As described above, the analysis assumes proposed water rights modifications including implementation of the Agreed Flows bypass requirements which are protective of local anadromous fisheries and will limit the ability for the City to divert from flowing sources compared to historical practices, but implementation of the WSAS and planned infrastructure projects is not anticipated or assumed in the analysis until the year 2030. While the analysis characterizes this vulnerability to shortage for the final year of the extended drought period, depending on sequencing of rain years, in reality such a shortage could occur sooner and persist longer through a multiple dry-year period. Additionally, during an extended drought period, the City would likely implement demand reduction requirements per the City's Water shortage Contingency Plan in earlier years before an actual shortage is experienced to ensure adequate supplies remain in Loch Lomond Reservoir, thereby potentially reducing the depth of shortage experienced in later year(s).

With implementation of both WSAS and planned infrastructure projects, along with the proposed water rights modifications, in all place by 2030 and beyond, projected supply would meet projected demand, except for very small projected shortages during the fifth year of the extended drought during the 2040 – 2045 timeframe. During this period in the fifth year of the extended drought, supply is projected to be able to meet 98 percent of demand.

Under the projected climate change hydrology, greater shortages are projected in both the near and long term as compared to the analysis using historic hydrology. Under this scenario, shortages would be expected during years three through five of the five-year drought in the near term, 2025. Shortages would range from two percent in the third year to 23 percent in years four and five. In the period from 2030 to 2045, with subsequent implementation of proposed water supply augmentation and planned infrastructure projects, the City could expect small shortages of two to five percent during the fifth year of the extended drought sequence under the selected climate change conditions. The results of the multiple dry year supply and demand comparison under the selected climate change scenario are provided as totals and overall differences in in Table 7-4C.

Table 7-5: Multiple Dry Year Supply and Demand Comparison (submittal table 7-4R)

Multiple Dry Years Supply and Demand Comparison						
		2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
First year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Second year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Third year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Fourth year	Supply totals	2,660	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(8)	0	0	0	0
Fifth year	Supply totals	1,954	2,694	2,704	2,723	2,723
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(714)	0	0	(42)	(61)

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing historic hydrology. The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

Table 7-5C: Multiple Dry Years Supply and Demand Comparison under a Projected Climate Change Hydrology

Multiple Dry Years Supply and Demand Comparison Under a Projected Climate Change Hydrology						
		2025 (MG)	2030 (MG)	2035 (MG)	2040 (MG)	2045 (MG)
First year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Second year	Supply totals	2,668	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	0	0	0	0	0
Third year	Supply totals	2,607	2,694	2,704	2,765	2,784
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(6`)	0	0	0	0
Fourth year	Supply totals	2,060	2,681	2,693	2,755	2,773
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(608)	0	0	0	0
Fifth year	Supply totals	2,060	2,630	2,630	2,630	2,630
	Demand totals	2,668	2,694	2,704	2,765	2,784
	Difference	(608)	(64)	(74)	(135)	(154)

NOTES: Projected water supply values shown in this table represent output values from the City's Confluence (water supply) model utilizing a modeled climate change hydrology (CMIP-5). The Confluence model utilizes system demands to model water supply from City sources. Consistent with the WSAS, the following assumptions about future water projects have been used in developing projected water supplies. In 2025, the City will have implemented proposed water rights modifications as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, and in 2030, the City will have implemented the following components of the WSAS and planned infrastructure projects: Aquifer Storage and Recovery in the Santa Cruz Mid-county Groundwater Basin and/or the Santa Margarita Groundwater Basin, sized for up to 4.5 mgd injection and 8.0 mgd extraction as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report, improvements to the Tait Diversion on the San Lorenzo River as described in the Santa Cruz Water Rights Project Draft Environmental Impact Report and as included in the Santa Cruz Water Program, Facility improvements at the Graham Hill Water Treatment Plan that will allow treatment of more turbid water as included in the Santa Cruz Water Program, and replacement of major transmission pipelines on the North Coast and the Newell Creek Pipeline as included in the Santa Cruz Water Program. Projected demand is based upon the Update of the City of Santa Cruz's Long-Range Water Demand Forecast (M.Cubed, 2021) (Appendix D).

This assessment illustrates that without implementation of the future water projects described in Chapter 6, Section 6.8, the City would face critical challenges in meeting demand in a projected multi-year drought, under either hydrology consistent with historic conditions or under a climate change scenario. This is largely driven by the City's dependence on local surface water flows and the lack storage with the supply system. The ongoing implementation of the WSAS and associated Santa Cruz Water Rights Project and Santa Cruz Water Program are critical and necessary elements to secure the City's existing and future water supply reliability.

7.5 Regional Supply Reliability

The City of Santa Cruz continues to focus its supply planning and reliability efforts on programs and projects that emphasize the maximization of available resources. To date, the City has not pursued supply planning that included importing water from outside the Central Coast hydrologic region but is concentrating on options within Santa Cruz County.

Currently, all of the City's water resources are obtained from local sources. In order to build drought supply reliability, the City continually works to develop partnerships within the region that promote responsible and sustainable water resource management. A known constraint on the regional supply are the over drafted, threatened, and recovering aquifers. The City's future supply vision includes projects serving to benefit regional aquifer recovery and increased reliability of groundwater sources. Recognizing the path toward regional reliability requires a comprehensive framework that supports dependability of all recognized supplies within the region and the types of tools being proposed and evaluated at present seek to benefit multiple stakeholders.

At this point in time, the City is actively participating in regional teams formed to increase coordination of activities among resource agencies. Further, the City's WSAS necessitate collaborative work with regional partners and benefits from participation of stakeholders that include government and non-government resource management agencies. The City is one of four members of the Santa Cruz Mid-County Groundwater Agency (MGA), as discussed in Chapter 6, and participates on the Board of Directors for the Santa Margarita Groundwater Agency (SMGA). The City is also engaged with the Santa Cruz Integrated Regional Water Management Group (IRWM), an organization made up of nine local agencies.

Chapter 8

WATER SHORTAGE CONTINGENCY PLANNING

This chapter presents information about how the City of Santa Cruz manages the water system during a water shortage emergency that arises as a result of drought. It also describes water supply and demand assessment procedures, actions that would be undertaken in response to a catastrophic interruption of water supplies, including a regional power outage, earthquake, or other emergency situation, legal authority, and other topics.

This Chapter 8, Water Shortage Contingency Planning, and Appendix O, Water Shortage Contingency Analysis and Implementation, together comprise the City of Santa Cruz's complete Water Shortage Contingency Plan (WSCP), in compliance with the California Water Code Section 10632 and incorporated guidance from the State of California Department of Water Resources (DWR) Urban Water Management Plan Guidebook (DWR, 2021).

8.1 Water Supply Reliability Analysis

This 2020 Urban Water Management Plan includes in Chapter 7 a supply reliability analysis for a normal/average water year, a single dry water year, and a multiple dry water five-year period based on historical hydrology for the forecast period which extends through 2045. The City is safeguarding against future water shortages by actively implementing future water projects as described in Chapter 6, Section 6.8. Implementation of these projects is therefore assumed in the City's water supply planning process. In the water supply reliability analysis, consistent with the City's Water Supply Augmentation Strategy (WSAS), implementation of pending water rights modifications, including Agreed Flows which are protective of local anadromous fisheries, is assumed after 2025. Furthermore, improved reliability is projected after 2030 due to implementation of Aquifer Storage and Recovery (ASR) and planned infrastructure projects.

The water supply reliability analysis finds that the City projects having sufficient water supply available in normal years and single dry years to serve anticipated demand throughout the 2025 – 2045 planning period. Under multi-year drought conditions in the near term (2025), with proposed water rights modifications but before implementation of ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the multi-year drought scenario, but would fall short

of demand by 27 percent in year five. Under multi-year drought conditions after 2030, with implementation of the ASR and planned infrastructure projects, available supplies would meet projected demand in years one through four of the multi-year drought scenario, and the year-five shortage is anticipated to be substantially reduced with projected shortages no larger than a negligible two percent.

While the analysis characterizes vulnerability to shortage for the fifth year of the extended drought period, depending on sequencing of water year types, in reality such a shortage could occur sooner and persist longer through a multiple dry year period. Additionally, during an extended drought period, the City would likely implement demand reduction requirements in earlier years before an actual shortage is experienced to ensure adequate supplies remain in Loch Lomond Reservoir, thereby potentially reducing the depth of shortage experienced in later year(s).

This Urban Water Management Plan also includes in Chapter 7 a Drought Risk Assessment including a supply and use comparison assuming drought conditions from 2021 through 2025. This analysis assumes implementation of pending water rights modification (including implementation of the Agreed Flows which are protective of local anadromous fisheries) in years 2022 through 2025 and shows that projected supply would meet projected demand in years 2021 through 2024 of the extended five-year drought, but that in 2025, a 27 percent shortage is projected. Neither implementation of ASR of planned infrastructure projects are assumed to be implemented within the timeframe of this analysis as they not projected to be fully accomplished until 2030.

The City recognizes that the challenge of meeting demand through a multi-year drought period as the key reliability issue facing the water system. The City is actively addressing this issues through the ongoing implementation of the City's WSAS to improve system operating flexibility and long term reliability. In the short term, reliance on this Water Supply Contingency Plan may be required to reduce demand during periods of shortage.

8.2 Annual Water Supply and Demand Assessment Procedures

Every year during the winter season, the City of Santa Cruz Water Department (the Department) monitors local rainfall, runoff, and reservoir storage levels. At the end of January, which represents the mid-point of the winter wet season, staff prepares a written statement that describes current water conditions and discusses the water supply outlook for the year ahead. This initial water supply outlook is typically presented as a written memo to the Water Director and then to the Water Commission. Later on in the season, typically toward the end of March or early April, a more formal final "Water Supply and

Demand Assessment" is prepared and also presented to the Director and Water Commission. If, based on this analysis, a water shortage is anticipated, the information would be presented to the Santa Cruz City Council which could then declare a water shortage and authorize implementation of a specific stage of the WSCP. The Department has been conducting this annual water supply and demand assessment on its own for its internal purposes for decades. Now however, the same type of assessment is being required of all water suppliers. Specifically, beginning in 2022, California state law requires that all urban water suppliers prepare this type of assessment and submit it to the California Department of Water Resources (DWR) on an annual basis. DWR is in the process of developing guidance for suppliers to conduct an annual assessment, including key data inputs and the decision making process for determining if a water shortage is indicated. Although State guidance is in development, the City currently has its own procedure and format for conducting the assessment and producing the written reports that summarize the results. Santa Cruz Municipal Code Section 16.01.020 includes the following (Appendix Q):

> "The provisions of this chapter shall take effect whenever the director, upon analysis of city water supplies, finds and determines that a water shortage exists or is imminent within the city of Santa Cruz water service area and a declaration of a water shortage is made by a resolution of the city council, and they shall remain in effect for the duration of the peak season through October 31st, unless rescinded earlier or extended by city council."

8.2.1 Decision Making Process

This section describes the general inputs and process for evaluating the adequacy of supply to meet demand for year ahead and, in particular, for the peak season.

8.2.1.1 Decision Making Inputs

Rainfall, runoff, water year type, and reservoir storage are the key hydrologic indicators used by the City to evaluate water conditions. These factors affect the City's water supply and the forecasting process and management considerations used in dry years to determine whether a water shortage is expected for the year ahead.

In Santa Cruz, a water shortage occurs when the combination of low surface flows in the north coast and San Lorenzo River sources and depleted surface water storage in Loch Lomond Reservoir reduces the available supply to a level that cannot support existing demand. Ordinarily, one abnormally dry year would not create a water shortage in Santa Cruz. Usually there is sufficient storage in Loch Lomond Reservoir, even after one dry winter, to carry the system though the following summer. Based on past experience, however, a shortage might occur when the central coast region experiences multiple dry winter seasons in a row.

Rainfall

The water supply of the City of Santa Cruz originates from precipitation that falls in the form of rain on the Pacific Ocean side of the Santa Cruz Mountains during the fall, winter, and early spring. The majority of rainfall normally occurs in a five-month period between November and March. The amount of precipitation that falls is one basic indicator of whether the city is experiencing a wet or dry year. Rainfall amounts on the central coast vary widely from year to year.

Daily rainfall data is collected for water supply purposes at various sites in the Newell Creek watershed, at Ben Lomond, and in the City of Santa Cruz. The Ben Lomond and Santa Cruz sites are both official National Oceanographic and Atmospheric Administration (NOAA) weather observation stations with extended rainfall records.

The pattern in both timing and distribution of rainfall can be as important in determining water supply availability as the total amount of rainfall received. Years in which the majority of rainfall occurs early in the rainy season or is concentrated in a short time frame tend to produce lower river and stream flows during the peak summer season. Conditions where storms are spread out through the winter season or occur late into spring help sustain higher base flows in the coastal streams and the San Lorenzo River later into the year.

Runoff

Under normal operating conditions, the north coast streams and San Lorenzo River flows provide about 80 percent of the City's total annual water supply. Accordingly, runoff is a key parameter used to assess the City's water supply condition.

Stream flow in the San Lorenzo River is monitored at two locations using the United States Geological Survey (USGS) gauges located at Henry Cowell Redwoods State Park near Felton and downstream next to the Tait Diversion. The gauge in Felton is particularly important for assessing water supply conditions because the river is the City's single largest supply source and because of the long historic record that exists for the site. Real time flow records are available on the USGS website. The USGS also prepares printed reports that provide a record of average daily and monthly flows, in cubic feet per second, and stream discharge, expressed in acre-feet. Water Department staff charts monthly flows and compares them with long-term averages and the previous year's flow to assess trends. On the north coast sources, there were no stream gauges until a few years ago. Flow records are now being gathered for these sources will become valuable in future years for assessing water conditions of these sources.

In the San Lorenzo River, runoff fluctuates annually and seasonally, depending on the amount and timing of rainfall. The majority of runoff typically occurs over a three-month period from January through March, once the watershed becomes saturated. After the rainy season ends, stream flow in the San Lorenzo River gradually declines over the course of the summer dry season.

Water Year Type

The City uses a water year classification system as a primary index of its water supply conditions. Under this classification system, the water year, which runs from October 1 to September 30, is designated as one of four types, depending on the total annual stream discharge of the San Lorenzo River, measured at Felton, and expressed in acre-feet. This classification system is shown in Figure 8-1 below.

Table 8-1: Water Year Classification System

Classification	Total Annual Discharge (in acre-feet)
Wet	> 119,000
Normal	49,000 - 119,000
Dry	29,000 – 49,000
Critically Dry	< 29,000

While the current water year type is of primary consideration in assessing water conditions, the previous water year type also has some influence on summer water supply availability. An antecedent year that is classified as wet will help sustain river base flows longer into the year, whereas a previous dry year can cause river flows to decline sooner and measure below than would otherwise be expected.

Reservoir Storage

Loch Lomond Reservoir is the City's only source of stored water and has a total storage capacity of 2.8 billion gallons. In normal and wet years, reservoir storage refills naturally to full capacity with runoff from the Newell Creek watershed, usually by February or March. Storage can also be supplemented in dry years with water pumped up to the reservoir from the Felton Diversion on the San Lorenzo River. In a normal year, the reservoir will start the dry season full with 2.8 billion gallons in storage.

8.2.1.2 Determining If a Water Shortage is Imminent

In normal or wet years when the water supply outlook is favorable, there is generally a surplus of water available from the various sources to meet existing demand. A general rule of thumb is that if Loch Lomond Reservoir is at full capacity by spring, it is not necessary for the City to institute any short-term demand reduction measures the following summer. The City undertakes an annual analysis to forecast whether water supplies will be deficient relative to estimated water needs for the coming dry season. This calculation must be made

before the end of the rainy season in time to decide on appropriate actions and to provide adequate notice to the public. There is always the chance that late winter rains will change the water supply outlook, thus, the situation remains dynamic through the end of April.

The peak season as defined as May 1 through October 31, is considered the critical period for the purpose of defining the potential degree of water supply shortfall, and for selecting the appropriate demand reduction goal. This is the period when water availability in the City's flowing sources is generally lowest and water demand normally would be at its highest, potentially creating a summer water supply shortage. Past experience indicates that, even in water short years, there is generally adequate water in the City's flowing sources to meet system demands during the off-peak months between November and April, and that there is little if any need to reduce water demand this time of year when consumption is low.

There is no one single criterion, trigger, or definition that is used to determine if a water shortage exists. The determination of a shortfall involves consideration of all the parameters mentioned previously, as well as expected system demand.

8.2.2 Methodology

A detailed description of the City of Santa Cruz Annual Assessment methodology is presented below.

8.2.2.1 Forecasting Water Production

To determine the degree of shortfall, the City follows a three-step process:

1. Develop a monthly forecast of supply available from flowing sources and wells and compare the supply available from flowing sources and wells to the expected water demand and estimate production needed from Loch Lomond.
2. Calculate the monthly and seasonal drawdown on Loch Lomond Reservoir.
3. Evaluate whether the amount of water in Loch Lomond Reservoir is adequate to meet expected demand for the coming dry season and for the following year in case the dry weather pattern continues through the next winter.

Of primary importance to the system operation is the ability to forecast at the end of a winter season how the San Lorenzo River, the City's most important source, will flow through the coming summer and into the dry fall season. In dry and critically dry years, natural flows can drop below bypass flow requirements at the Tait Street intake during summer, requiring diversions from the San Lorenzo River to be scaled back. Once the water year type has been established, statistical tables are used to forecast the mean monthly flow in the San Lorenzo River through the remainder of the dry season. This technique helps to identify at what point in the year river production will likely be reduced and by how much.

Forecasting supplies available from north coast sources involves less certainty due to the lack of historic stream flow information. The technique used to forecast supplies on the North Coast supplies is to find historic water years with a similar pattern in rainfall amount and timing. The production records from those years are examined to assess the likely yield of those sources for the coming season, while taking into account any operational rules, capacity constraints, or in-stream flow releases that may have changed from those previous years.

Water production from the City's Beltz Well system is projected as a function of the production capacity for any wells in operation and duration that the wells will be operated.

The City necessarily uses a conservative estimate of yield to ensure the supply forecast for flowing sources and groundwater production is reliable. Once the forecast of supply available from surface diversions and wells is made, supplies are compared with expected water demand to determine how much lake water from the Loch Lomond Reservoir would be needed to meet unrestricted system demand. The amount of water lost from the reservoir to evaporation and released for downstream fisheries preservation is then factored in. From this analysis, a projection can be made about the expected rate of drawdown of the reservoir over the dry season; the expected lake level at the end of October; and the expected carryover storage for the following year.

8.2.2.2 Evaluation Criteria

The determination of whether a shortage exists is essentially a risk assessment regarding the predicted end of season lake level and carryover storage needed in Loch Lomond Reservoir. The City's main considerations in undertaking this assessment include the following:

- Would allowing unrestricted water use in the current year leave insufficient reserves if drought conditions continue into next year?
- Knowing that another dry year could mean the City's flowing sources would drop even lower, how much water should be withheld in the reservoir for the following year to be prudent?

There is no set formula to determine the optimal allocation. Rule curves were developed in the past to mimic how lake resources theoretically would be allocated under various water conditions. Under these rule curves, no shortage is indicated if lake storage is above 2.4 billion gallons (85 percent of capacity) on April 1 and as long as the lake is forecast to remain above 1.8 billion gallons (64 percent of capacity) though the end of September. Below these levels, a shortage is assumed to occur. The lower the lake level, the greater the shortage. One important consideration for lake storage is that the bottom 1.0 billion gallons (35 percent of capacity) in the reservoir is regarded as

minimum carry over storage necessary to hedge against a subsequent dry year. This ensures that there is always some limited amount of supply preserved in storage for the following year.

In the real world, with a water system largely dependent on surface water sources and no reliable ability to predict when a drought may end, prudent management dictates a conservative approach to shortage declarations to maintain as much water storage in the system as possible. This means generally favoring implementation of the WSCP during single dry years so that the carryover storage amount would be enough, along with other sources, to meet essential health and safety needs if the subsequent winter is as dry as the driest year on record. According to the literature, the main lesson from other utilities that have been through droughts is that they would have acted earlier to save more water, in retrospect, in order lessen the impact of implementing more severe cutbacks later on.

The ultimate decision about whether supplies are adequate in Santa Cruz for a given dry year are thus dependent not just how much water is available in that year from the City's sources of supply, but also on the level of demand exerted by customers over the coming season and management's comfort level with predicted carry over storage.

With the low levels of water demand that have been sustained since the end of the 2014-2015 drought, the water system and the City can better withstand dry conditions like the current drought of 2020-2021. The one caveat, though, is that because present use is already so conservative, there is a declining ability for increased conservation when the next shortage arises.

8.2.2.3 Modeling

The primary tool the City uses is assess water supply and demand is an Excel spreadsheet that performs a mass balance on a monthly time step to solve for the end of season storage in Loch Lomond Reservoir using a three-step process:

1. Develop a monthly forecast of supply available from flowing sources (North Coast sources and the San Lorenzo River) and the Beltz Well system;
2. Compare the supply available from the flowing sources and Beltz Well system to the expected unrestricted water demand; and
3. Calculate the monthly change in storage and end of season storage in Loch Lomond Reservoir.

Other than the beginning of season lake volume, which is a known variable, the model inputs are all estimates based on imperfect information that are subject to error and uncertainties. However, some variables are more significant than others in terms of influencing the results.

The model is to be used to create several different supply and demand scenarios to test the sensitivity of different assumptions, and to assist in decision-making. The primary purpose of this model to assist management staff in determining if a water shortage declaration is appropriate for the year ahead, and to help decide on the level of curtailment needed. Other factors used in this consideration include infrastructure constraints such as infrastructure limitations due to planned work or from known or expected facility outages.

8.2.2.4 Timing

The forecast is typically prepared in late March, when most of wet weather has already occurred for the year, but before the end of the rainy season. This is done in order to prepare a recommendation for consideration by the Water Commission to the City Council in the month of April. There is always the chance that later winter rains will improve the water supply outlook. Thus, the situation remains dynamic through the end of April and into May. The longer the forecast can be delayed, the more accurate the results will be.

The approximate times of the year when the City evaluates water supply conditions are as follows:

- October through December: Monitor rainfall, reservoir level, and runoff amounts
- Late January: Prepare written status report on water supply conditions
- Early February: Present initial estimate of water supply availability for year ahead to Water Commission
- Early March: Present revised estimate of water supply availability for year ahead to Water Commission
- Mid-March: Determine existence of water shortage (if applicable)

If it is necessary to declare a water shortage, the following approximate timing is followed, with some variability depending on weather conditions:

- Mid to late March: Determine monthly water production budget and assess the need for response
- Early April: Present shortage response recommendation to Water Commission; City Council notice of public hearing published
- Mid-April: City Council formally declares water supply shortage, adopts emergency ordinance
- May: Water shortage regulations become effective

8.3 Six Standard Water Shortage Levels

In Santa Cruz, it is typically the peak summer season during which water supplies are limited because the system's flowing surface water sources, north coast streams and San Lorenzo River which together represent about eighty percent of total system supply, are less available during the peak season than they are in the wet season, and because stored water is very limited. If winter rains have not replenished Loch Lomond's storage in a given year, peak season usage reductions are typically applied in order to ensure that water for essential uses will continue to be available throughout the peak season and into the following water year as well. Until implementation of the City's WSAS, demand management through restrictions is the only real tool the City has to manage this risk.

The peak season is defined to include the six-month period from May 1 to October 31, which is reflected in the consumption shown on the June through November utility bills. The peak season is defined within this range because water supplies are historically adequate to meet demand in November through April. In addition, water shortage regulations usually are not put into effect until May 1st or June 1st during a shortage year.

Shortage stages in this WSCP are based on peak season demand and correspond to the six standard shortage levels defined in Water Code of up to ten, twenty, thirty, forty, fifty, and greater than fifty percent shortage, as shown in Table 8-2.

Table 8-2: Water Shortage Contingency Plan Levels (submittal table 8-1)

Water Shortage Contingency Plan Levels		
Shortage Level	Percent Shortage Range	Shortage Response Actions
1	Up to 10%	Water Shortage Warning. Stage 1 applies to relatively minor water shortage that requires up to a 10% level of demand reduction. The allocation system applies to all stages. At Stage 1, allocations are provided to customers but excess use penalties are not yet implemented.
2	Up to 20%	Water Shortage Alarm. Stage 2 applies to moderate water shortages with a demand reduction requirement of up to 20%. This condition requires more vigorous public information and outreach. The primary demand reduction measure that will be implemented at this stage and all stages going forward is the use of excess use penalties for water use above customer allocations.
3	Up to 30%	Water Shortage Emergency. Stage 3 applies to a serious water shortage with a demand reduction requirement of up to 30%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 3 levels.
4	Up to 40%	Severe Water Shortage. Stage 4 applies to a serious water shortage with a demand reduction requirement of up to 40%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 4 levels. The water supply conditions that would trigger Stage 4 parallel the difficult situation the City experienced in the drought of late 1970s. Under this scenario, virtually all available water must be reserved either for health and safety purposes or to sustain local business.
5	Up to 50%	Critical Water Shortage. Stage 5 represents an imminent and extraordinary crisis threatening health, safety, and security of the entire community. Under this dire situation, extreme measures are necessary to cut back water use by up to half the normal amount. Not enough water would exist even to meet the community's full health and safety needs, the top priority. All water should be reserved for human consumption, sanitation, and fire protection purposes and any remaining amount allocated to minimize economic harm. A shortage of this severity could be expected to generate stress and confusion, much the same as any major emergency and at some point could transform into a full blown natural disaster that can no longer be governed by local ordinance and may need to be managed by the basic principles and command structures of the state Standardized Emergency Management System. The City has experienced water shortages in the past but never one of such large proportion.
6	>50%	Catastrophic Water Shortage. For Stage 6, Santa Cruz takes the position that this level of shortage would most likely only occur due to a major disaster that caused significant damage to our water treatment and/or distribution infrastructure. In such a disaster, such as a large earthquake, the Santa Cruz response would not come from this WSCP, but rather from the main Santa Cruz Water Department Emergency Response Plan.

8.4 Shortage Response Actions

The City of Santa Cruz used a core set of principles to guide the WSCP planning process. These principles, with minor adjustments, are based on the core principals developed for the 2009 WSCP. The principles are as follows:

- **Shared Contribution**: All customers will be asked to save their share in order to meet necessary reduction goals during water shortages.
- **Reduce non-essential uses first**: The plan gives priority to health and safety uses of water and targets non-essential uses for reductions first. However, even some amounts of essential use are reduced under this plan at higher stages due to the overall low levels of demand.
- **Preserve jobs and the local economy to the extent possible**: Given today's demand characteristics, the business customer class will be subject to the allocation system at each stage of shortage. However, the amount of water the business customer class will need to reduce at each stage is relatively low given that there is a substantial amount of health and safety related use in the overall usage by business customers.
- **Existing conservation measures recognized**: Customers who have already been conserving will have an easier time maintaining consumption below the allocation levels set out in the plan. This will be especially true in earlier stages of shortage. Customers who haven't conserved as much or at all will find it harder to stay within allocation amounts.
- **Communication at every stage**: A public information campaign at every level of shortage is essential for customer preparation and will encourage confidence in the City's ability to respond to water shortages.
- **Flexibility**: The Department will gauge the necessity of implementing each set of actions at each stage of shortage and evaluate whether they make sense at the time. Not all actions must be implemented simply by virtue of being listed in the plan at that stage.
- **Even-handedness**: The policies and rules developed under this plan to manage a shortage will be applied to all customer groups in a consistent, even-handed manner.

A fundamental issue any water supplier faces in managing a water shortage involves the allocation of water and how to distribute the available supply among customer categories when supplies fall short. Due to the degree of ongoing water use efficiency practices adopted by Santa Cruz consumers, staff determined that the more typically used strategies for curtailing water use would not be likely to produce the demand reductions associated with each stage of the WSCP. This reality drove the decision to use customer water allocations rather than other approaches during all stages of the plan.

The allocation system in this WSCP produces specific demand reduction/delivery goals for each major customer category at each level of shortfall based on the unique usage characteristics of each customer category.

To determine how much water would need to be curtailed for each WSCP stage[1], overall and from each customer group, the following methodology was utilized. These four steps were used to generate both the reductions required and the water remaining for use at each WSCP shortage stage. These were in turn used to develop delivery goals for each customer class at each WSCP stage.

1. Examine the level and seasonality of water use in each customer class, by breaking down water use in each sector into indoor uses and outdoor/seasonal components;
2. Divide the peak season usage into three usage priorities: 1) health and safety, 2) commerce, and 3) irrigation and other outdoor usage;
3. Determine the level of reductions required at each shortage level and from each use priority; and
4. Calculate the percentage reductions needed to develop a specific reduction goal for each customer class at each shortage stage.

Specific application of this approach is further described in Appendix O, 2021 WSCP Appendix. The resulting delivery goals for each customer class derived by required reductions are presented in Table 8-3.

[1] Curtailments were not developed for Level 6. For Level 6, Catastrophic Water Shortage, this would most likely only occur due to a major disaster causing significant damage to the water treatment and/or distribution system. In such a disaster, such as a large earthquake, the Santa Cruz response would be guided by the Water Department's Emergency Response Plan rather than this WSCP.

Table 8-3: Customer Class Delivery Goals by WSCP Stages

Customer Class	Normal Demand (Million Gallons) Jun-Nov	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
		Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)
		Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)
Single Family Residential	517	89%	79%	68%	58%	51%
		463	408	354	299	262
Multiple Residential	297	92%	84%	76%	68%	59%
		273	249	225	202	176
Business	297	95%	90%	85%	79%	60%
		282	267	252	234	178
UC Santa Cruz	91	91%	81%	72%	62%	55%
		82	74	65	57	50
Municipal	33	79%	58%	38%	17%	15%
		26	19	12	6	5
Irrigation	59	75%	50%	25%	0%	0%
		44	30	15	0	0
Golf Course Irrigation	50	82%	64%	45%	26%	10%
		41	32	23	13	5
North Coast Agriculture	13	95%	90%	85%	75%	30%
		12	12	11	10	4
Other	1	95%	90%	100%	100%	100%
		1	1	1	1	1
Overall Delivery Each Stage						
Total – All Classes	1,358	90%	80%	70%	60%	50%
		1,225	1,092	959	820	677

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In a serious shortage, it will be critical to have a system in place that not only is fair to all customer groups but is also likely to succeed. As described in chapter 4 of this Urban Water Management Plan, current and forecasted levels of customer demand indicate that the Santa Cruz community has already achieved high levels of water conservation. This very low system-wide water use is beneficial from the perspective of meeting demands and preserving water resources, but it also represents a “hardened demand” that presents limited opportunity for further per capita demand reductions. These new demand characteristics mean that reductions at higher stages will be difficult to achieve. In the view of the Water Department staff, curtailments beyond Stage 2 of this plan are not really feasible to implement without significant impacts to public health and safety and the Santa Cruz economy. The City is actively implementing its WSAS as the solution to dealing with larger shortages.

8.4.1 Demand Reduction Actions

The approach to demand reduction in this WSCP is to provide customer allocations starting at Stage 1 of the plan and reducing these allocations at each successive stage of the plan. This approach gives customers an amount of water to use each month and allows them to use that water as they see fit to meet their needs. The allocations are based upon the customer class delivery goals at each stage presented in Table 8-4. The allocation approach is designed to maximize the probability that the demand reductions required at each stage will be achieved.

Table 8-4: Allocations by WSCP Stage

Customer Class	Stage 1 Allocation (%)	Stage 2 Allocation (%)	Stage 3 Allocation (%)	Stage 4 Allocation (%)	Stage 5 Allocation (%)
Single Family Residential	89%	79%	68%	58%	51%
Multiple Residential	92%	84%	76%	68%	59%
Business	95%	90%	85%	79%	60%
UC Santa Cruz	91%	81%	72%	62%	55%
Municipal	79%	58%	38%	17%	15%
Irrigation	75%	50%	25%	0%	0%
Golf Course Irrigation	82%	64%	45%	26%	10%
North Coast Agriculture	95%	90%	85%	75%	30%
Other	95%	90%	100%	100%	100%
All Classes Combined	90%	80%	70%	60%	50%

These demand reduction allocation and other demand reduction actions to be implemented in parallel are documented in Table 8-5 below.

Table 8.5: Demand Reduction Actions (submittal table 8-2)

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 1 - Water Shortage Warning	Implement or Modify Drought Rate Structure or Surcharge	10 percent demand reduction	• Implement water allocations for all customers at the Stage 1 allocation level	No
Stage 1 - 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Create communication pieces including social media posts, direct mail, paid advertising • Create dedicated webpage • Dedicate monthly SCMU email newsletters to disseminating water shortage information • Utilize bi-annual utility newsletter • Inform large landscape/property manager/green industry of irrigation restrictions • Disseminate information for customers to learn how to read their meters	No
Stage 1 - 5	Increase Water Waste Patrols	Supports demand reduction to be achieved through implementation of water allocations	• Delegate water waste patrol duties to all field personnel	No
Stage 1 - 5	CII - Restaurants may only serve water upon request	Supports demand reduction to be achieved through implementation of water allocations	• Prohibit serving drinking water by restaurant or food service establishments except upon request	No
Stage 1 - 5	CII - Lodging establishment must offer opt out of linen service	Supports demand reduction to be achieved through implementation of water allocations	• Require hotel, motel, and other commercial lodging establishments to offer option of not laundering towels and linen daily	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 1 - 5	Other - Prohibit use of potable water for washing hard surfaces	Supports demand reduction to be achieved through implementation of water allocations	• Prohibit use of potable water for washing driveways, patios, parking lots or other paved surfaces	No
Stage 1 - 5	Other - Require automatic shut of hoses	Supports demand reduction to be achieved through implementation of water allocations	• Require hoses used for any purpose to have shut off nozzles	No
Stage 1 - 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Step up enforcement of water waste ordinance • Undertake contingency planning for continuing/escalating shortage • Coordinate water conservation actions with other City Departments and public agencies • Adopt water shortage ordinance prohibiting non-essential water use • Eliminate system water uses deemed non-essential	No
Stage 2 - Water Shortage Alarm	Implement or Modify Drought Rate Structure or Surcharge	20 percent demand reduction	• Implement mandatory water allocations for all customers at the Stage 2 allocation levels • Implement excess use penalties for use over allocation	Yes

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 2 - 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Disseminate PSAs to targeted local radio and television stations • Regularly update the public on consumption and supply numbers • Include information in City Manager's monthly email newsletter • Initiate presentations to local Chambers of Commerce, business associations, board of realtors, etc. • Inform large landscape/property managers/green industry of water budget reductions • Consult with major customers to develop conservation plans • Conduct workshops on large landscape requirements for property owners, contractors, and maintenance personnel • Disseminate PSAs to targeted local radio and television stations • Regularly update the public on consumption and supply numbers • Include information in City Manager's monthly email newsletter • Initiate presentations to local Chambers of Commerce, business associations, board of realtors, etc. • Inform large landscape/property managers/green industry of water budget reductions • Consult with major customers to develop conservation plans • Conduct workshops on large landscape requirements for property owners, contractors, and maintenance personnel	No
Stage 2 - 5	Increase Water Waste Patrols	Supports demand reduction to be achieved through implementation of water allocations	• Hire, train dispatch water waste patrol	No
Stage 2 - 5	Decrease Line Flushing	Supports demand reduction to be achieved through implementation of water allocations	• Suspend main flushing except as required for emergency and essential operations	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 2 - 5	Reduce System Water Loss	Supports demand reduction to be achieved through implementation of water allocations	• Intensify distribution system leak detection and repair	No
Stage 2 - 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Develop strategy to mitigate revenue losses • Stop issuing bulk water permits	No
Stage 3 - Water Shortage Emergency	Implement or Modify Drought Rate Structure or Surcharge	30 percent demand reduction	• Implement mandatory water allocations for all customers at the Stage 3 allocation level • Continue to implement excess use penalties for use over allocation	Yes
Stage 3 - 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Provide regular, prescriptive media briefings • Provide regular and ongoing briefings to Water Commission, City Council, and other key stakeholders • Prepare communication pieces for possible future service connection moratorium	No
Stage 3 - 5	Increase Water Waste Patrols	Supports demand reduction to be achieved through implementation of water allocations	• Expand size and coverage of water waste patrol	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 3 - 5	Moratorium or Net Zero Demand Increase on New Connections	Supports demand reduction to be achieved through implementation of water allocations	• Institute a temporary water service connection ban	No
Stage 3 - 5	Reduce System Water Loss	Supports demand reduction to be achieved through implementation of water allocations	• Increase monitoring of unauthorized use from hydrants and other sources.	No
Stage 3 - 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Further increase of water waste enforcement • Require all commercial customers to prominently display “save water” signage with specified language at specified location • Increase customer service training to address high bills and irate customers • Expand, strengthen water conservation education, activities, and program • Increase frequency of monitoring and reporting of water production and consumption • Undertake contingency planning for continuing/escalating shortage • Shut down all bulk water stations • Stop issuing construction hydrant meters	No
Stage 4 - Severe Water Shortage	Implement or Modify Drought Rate Structure or Surcharge	40 percent demand reduction	• Reduce water allocations for all customer classes to Stage 4 levels • Continue to implement excess use penalties for use over allocation	Yes
Stage 4 - 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Contract with outside PR agency to manage comprehensive public awareness campaign, including paid ads, earned media, direct mail, etc. • Promote zeroscape landscaping • Partner with other water agencies to promote appropriate grey water use, etc. • Prepare emergency messaging for possible critical water shortage utilizing Nixel, CodeRed, reverse 911	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 4 - 5	Other - Prohibit use of potable water for construction and dust control	Supports demand reduction to be achieved through implementation of water allocations	• Rescind hydrant and bulk water permits, prohibit use except by special permission	No
Stage 4 - 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Scale up administrative appeals staff to support hearing officer(s) • Expand water waste enforcement to 24/7	No
Stage 5 - Critical Water Shortage	Implement or Modify Drought Rate Structure or Surcharge	50 percent demand reduction	• Further reduce allocations for all customer classes • Continue to implement excess use penalties for use over allocation	Yes
Stage 5	Expand Public Information Campaign	Supports demand reduction to be achieved through implementation of water allocations	• Implement crisis/emergency communications including establishment of a Joint Information Center (JIC) • Deploy prepared emergency messaging on Nixel, CodeRed, reverse 911	No
Stage 5	Landscape - Prohibit all landscape irrigation	Supports demand reduction to be achieved through implementation of water allocations	• Prohibit all outdoor irrigation	No

Demand Reduction Actions				
Shortage Level	Demand Reduction Actions.	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?[1]
Stage 5	Other water feature or swimming pool restriction	Supports demand reduction to be achieved through implementation of water allocations	• No water for outdoor washing or recreational purposes; close pools, public showers	No
Stage 5	Other	Supports demand reduction to be achieved through implementation of water allocations	• Continue water waste enforcement 24/7 • Consider shifting to EOC model of command management for overall policy guidance and coordination • Coordinate with CA Division of Drinking Water, District Engineer and other emergency response agencies regarding water quality, public health issues • Coordinate with law enforcement agencies to address enforcement challenges • Delegate field staff to assist in enforcement (shut offs, flow restrictors) • Continue close monitoring and reporting of water production and consumption • Coordinate with local sanitation agencies regarding sewer line maintenance • Investigate potential for reduced in-stream release • Procure resources to utilize dead storage, if needed • Undertake emergency planning for continuing/escalating shortage	No
Stage 6 - Catastrophic Water Shortage	Other	Greater than 50 percent demand reduction	• Activate the Santa Cruz Water Department Emergency Response Plan	No

Notes:

1. The City of Santa Cruz is utilizing an allocation system as the primary means to reduce demand at all shortage levels. Excess use penalties for exceeding allocations are applied at Level 2 and higher. The allocation approach is designed to maximize the probability that the demand reductions will be achieved.

8.4.2 Other Actions to Address Shortages

As described in Chapter 6, Section 6.8, the City is actively pursuing water supply augmentation to improve long-term reliability through implementation of its WSAS, including water rights modifications (which includes Agreed Flows bypass requirements protective of local fisheries) and implementation of ASR and planned infrastructure projects such as upgrades to the Graham Hill Water Treatment Plant . Because these efforts are well underway, they are considered as future water projects and are incorporated into the reliability assessments included in Chapter 7 of this Urban Water Management Plan rather than as elements of this WSCP. With implementation the WSAS, water supply reliability will be significantly improved by 2030, eliminating projected shortages that would require implementation of this WSCP. However, in the event of projected near-term shortages before the WSAS components are fully realized, the City would pursue early implementation of strategies included in the WSAS, such as ASR and exchanges, to the extent feasible.

Table 8.6: Supply Augmentation (submittal table 8-3)

Supply Augmentation and Other Actions			
Shortage Level	Supply Augmentation Methods and Other Actions by Water Supplier	How much is this going to reduce the shortage gap?	Additional Explanation or Reference
NOTES: City of Santa Cruz is actively pursuing a Water Supply Augmentation Strategy to alleviate the City's projected water supply gap, reduce the frequency and severity of shortage experienced, and limit the need to implement this Water Shortage Contingency Plan. These activities are underway and ongoing, and as such, are not included as actions within this Water Shortage Contingency Plan.			

When implementing this WSCP, the City will rely primarily on demand reduction through the implementation of allocations to address shortages at each level. Proposed operational changes and mandatory restrictions to be implemented at each WSCP stages are embedded in Table 8-2 above. Other actions triggered by WSCP levels are described below.

8.4.3 Emergency Response Plans

The City of Santa Cruz maintains a confidential Emergency Response Plan per the requirements of the America's Water Infrastructure Act of 2018 that includes response plans to a wide range of emergency conditions including earthquake, flood/atmospheric river, landslide, and human-caused catastrophes. The procedures in this plan would be followed in the event of a catastrophic water shortage or other emergency. To comply with Water Code requirements regarding seismic risk assessment, this Urban Water

Management Plan includes as appendices following the Local Hazard Mitigation Plans (LHMP) as Appendix P:

- City of Santa Cruz LHMP Five Year Update 2018 – 2023
- City of Capitola LHMP Five Year Update 2020
- County of Santa Cruz Five 2015 – 2020 - The County of Santa Cruz was in the process of updating their LHMP at the time of drafting this Urban Water Management Plan

8.5 Communications Protocols

Timely and effective communication is a key element of the City of Santa Cruz WSCP. Specific communications protocols are documented in Table 8-2 above. The City would inform customers, the public and others regarding any shortage response actions triggered or anticipated to be triggered and other relevant communications. Communication protocols are further detailed in Appendix O.

8.6 Compliance and Enforcement

The City of Santa Cruz utilizes a variety of compliance and enforcement strategies to facilitate compliance with the requirements of the WSCP as described below.

8.6.1 Excess Use Penalties

The foundation of the demand reduction measures in this plan is the water allocation system. In order for an allocation system to work, a financial disincentive is required for customers to stay within their allocation. This is achieved through the use of Excessive Use Penalty fees for use above customer allocations. These penalties are applied to a customer's water bill when the billing system detects that usage in a month exceeds the customer's allocation. The excess use penalties begin at Stage 2 and continue on with higher stages.

Administrative enforcement of excessive use penalties is codified in Santa Cruz Municipal Code, Chapter 16.01 (Appendix Q). Specifically, Section 16.01.110 states:

> "Penalties. The purpose of the administrative penalties assessed pursuant to this section is to assure future chapter compliance by the cited customer through the imposition of increasingly significant penalties so as to create a meaningful disincentive to commit future chapter violations. In acknowledgment of the fact that the city's water is a scarce and irreplaceable commodity and that this chapter is intended to equitably distribute that commodity among water department customers and to assure that, to the extent feasible, city water is

> conserved and used only for purposes deemed necessary for public health and safety, the penalty schedule herein prescribed is not to be construed as creating a "water pricing" structure pursuant to which customers may elect to pay for additional water at significantly higher rates. To this end, a customer's repeated violation of this chapter shall result in either the installation of a flow restriction device or disconnection of the customer's property from the city's water service system at the customer's cost."

The schedule for the administrative penalties is two-tiered system as shown below in Table 8-7.

Table 8-7: Administrative Penalties

Excess Use Range	Water Use in Excess of Allotment	Excessive Us Penalty Fee[1]
A	100 cubic feet (1 CCF) over allotment up to 10%	$25
B	Greater than 10% over allotment	$50

Note:. Fee is per 1 CFF of water used in excess of allotment, in addition to all regular water consumption charges

The purpose of a two-tier excess use structure is to avoid very large penalties for households that make a good faith effort to stay within their allocation but wind up going over a little. If a customer's water use exceeds one's allocation by a large amount, though, the penalty is designed to be very steep.

8.6.2 Water School

In the drought of 2014 and 2015, the City of Santa Cruz implemented a novel approach for working with customers who had incurred large excess use penalties. A process was set up to allow for a one-time forgiveness of excess use penalties while under water rationing. To be considered for such forgiveness, the customer was required to sign up and complete a short weekend or evening course that became known as "water school". This course covered topics such as basic meter reading, leak detection, and other topics relevant to the water restrictions in place at the time. This provides financial relief to customers receiving high bills, and most importantly, gives them the opportunity, education, and tools they need to achieve ongoing compliance with water use rules and regulations for the remainder of the shortage. The process of providing penalty forgiveness for customers by attending water school will continue under this WSCP.

8.6.3 Flow Restriction

Some customers will continue to exceed their allotment regardless of the amount of their water bill. In such instances, the City is authorized to install a flow restricting device to provide minimal water flow, just enough for health and safety purposes. In these cases the customer is charged a fee to cover the staff time needed to install the flow

restrictor and another fee for its removal. The City would not use this method where fire suppression sprinklers are on the same supply line as domestic water.

8.6.4 Disconnection and Reconnection Fees

Water suppliers have the legal authority to enforce water shortage regulations by terminating service for egregious violations. In such cases, the customer would be charged for both disconnection and reconnection.

8.6.5 Enforcement of Water Waste Prohibitions

During a water shortage, in addition to complying with water allocations, customers will also need to comply with existing requirements related to water waste. In cases such as a report of water waste, City staff will take steps to communicate with the customer by telephone, letter, door tag, or by making personal contact in the field to provide information about water waste regulations. Many times this contact is all that is required to get the problem resolved. If not, enforcement progresses to a written notice of violation. Beyond this, there are several methods in the City's existing water conservation and water shortage ordinances that can be used to enforce water waste restrictions and regulations. These methods are described below.

Penalty fees for Water Waste: For repeated violations of the City's water waste ordinance, a penalty fee may be issued to a customer's utility bill. This would occur after a written notice has been sent to the customer in advance. The penalty fee would increase with subsequent violations as follows:

- 1st Violation $100
- 2nd Violation $250
- 3rd Violation $500
- 4th Violation $1,000

8.6.6 Exceptions

No water shortage plan can account for all situations. The exception procedure allows the City to provide for special or exceptional circumstances that otherwise would create undue hardship for an individual customer or class of customers.

An exception allows a customer to be relieved of a particular regulation or receive an increased allocation for the duration of the shortage. Therefore, it should be granted only when justified on specific grounds that warrant allocating more water than is allocated to other similarly situated customers and when consistent with the intent of the water shortage regulations, while providing equal treatment of all customers. For detailed explanation of the exception process, refer to Appendix O.

8.7 Legal Authority

The City of Santa Cruz is legally authorized to implement this WSCP pursuant to California Water Code Section 10632, Santa Cruz Municipal Code Chapter 16.01 (attached as Appendix Q to the Urban Water Management Plan), and pursuant to the provisions of the WSCP itself which is adopted pursuant to City Council resolution. In the event of a water shortage, the City Council shall declare a water shortage emergency, the City shall thereupon activate and implement the WSCP, and in doing so, shall coordinate with the City of Capitola and the County of Santa Cruz for their respective local water shortage proclamations.

8.8 Financial Consequences of the Water Shortage Contingency Plan

Water shortages and implementation of a WSCP have the potential to impact both expenditures and revenues of a water supplier. Expenditures can be increased due to the time and materials necessary to implement demand reduction measures, other actions necessary to address shortages, and as well as for compliance and enforcement activities to discourage excessive water use. These expenditures can range from additional staff with associated salary, benefits, office space, computer, and vehicle needs, to increased public information costs including postage, additional printed materials, new advertising on various media, and other outreach expenses. At the same time, revenues can be impacted by reduced water sales due to successful water conservation and demand reduction actions, with impacts varying depending on the water supplier's rate structure.

The City has estimated costs for implementing staffing changes associated with implementation of Stage 1 and Stage 2 shortage levels. At Stage 1, three additional temporary staff are anticipated to be needed to implement the WSCP measures. These staff and other associated expenses are estimate to be approximately $400,000 per year. At Stage 2, fourteen temporary staff in addition to the temporary staff needed at Stage 1 are anticipated to be needed to implement plan measures. Costs for these additional staff and other associated expenses are estimated to be approximately $670,000 per implementation cycle, with the assumption that all additional staff can be accommodated within existing office space. Implementation of higher plan stages, Stage 3 and above, if needed would be challenging for the community to carry out due to hardened local demand and City implementation would be expected to be even more expensive to implement.

The City of Santa Cruz mitigates for the financial consequences of implementation of the WSCP primarily through a Drought Cost Recovery Fee structure that is developed as part of its Proposition 218-compliant water rate schedule. Drought Cost Recovery Fees are stage specific and designed to recover the lost revenues associated with lowered water consumption that results from implementation of curtailments. These fees are collected as a fixed charge based on meter size and are collected over a full 12 month period to mitigate the impacts to monthly bills. Refer to Appendix O for additional information on the Drought Cost Recovery Fees.

8.9 Monitoring and Reporting

There are two general components to monitoring and reporting. One is the City's ongoing monitoring and subsequent reporting to the State. The Water Department tracks production through the water supply and distribution system on a daily, monthly, and annual time step. Water use is tracked through the customer billing system on a time step dependent on meter type and water loss is audited on an annual basis.

The City compiles, analyzes, and submits monthly production reporting to the State Water Resources Control Board covering both overall production as well as a calculation of water use in gallons per capita per day. This reporting would continue throughout any water shortage that may occur. This data is publicly available and accessible online.

Monitoring and reporting utilized specifically during a shortage includes online month-by-month presentation of usage data to customers. During a shortage of Stage 2 or higher, a dedicated drought webpage would be created to display usage data and progress on meeting reduction goals. This would be in addition to the communications protocols that would be implemented during the activation of any WSCP stage of shortage as described in Section 8.4.

8.10 Refinement Procedures

The City of Santa Cruz will review its WSCP after each year that a shortage stage is implemented and as necessary based on any identified needs for refinement. This review will focus on areas of the plan that require refinement or adaption to existing circumstances or otherwise need to be adjusted. Upon completion of such a review, staff will determine if an update to the WSCP is needed. If so, a new draft WSCP will be developed and circulated for public review as required by law before any public hearings or consideration of adoption by the Santa Cruz City Council.

8.11 Special Water Features Distinction

Water Code Section 20632 requires the separate evaluation of special water features separately from pools and spas. The City of Santa Cruz WSCP demand reduction actions rely primarily on an allocation system that requires water customers to maintain water use within a given allotment rather than providing prescriptive use restrictions. Special water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains are not specifically restricted at any WSCP stage if they are maintained with a given customer allotment. Similarly, pools and spas are not restricted at any WSCP stage if they are maintained with a given customer allotment; although, public pools and showers would be closed at Stage 5.

8.12 Plan Adoption, Submittal, and Availability

The City of Santa Cruz developed an Updated Interim WSCP in early 2021 in order to be prepared to implement the plan in the event of water shortage in the peak season of 2021. The timeline for review and adoption of that interim plan were as follows:

- Recommended by the Santa Cruz Water Commission to Santa Cruz City Council for adoption on January 4, 2021.
- Adopted by City Council on February 23, 2021 at a duly noticed public hearing.
- Implementing amendments to Chapter 16.01 of the Santa Cruz Municipal Code were adopted by City Council on April 13, 2021.

This WSCP, updated since the adoption of the Updated Interim WSCP, is comprised of this Chapter 8 and Appendix O of this Urban Water Management Plan. It is currently being made available for public review in conjunction with the public review of this Urban Water Management Plan. Details on the public hearing, adoption, public availability, and submittal to the California Department of Water Resources will be added to this Urban Water Management Plan upon completion of these processes.

Chapter 9

DEMAND MANAGEMENT MEASURES

The City of Santa Cruz has long recognized the importance of conserving water as a responsible demand management strategy to help protect the area's natural resources, to stretch existing water supplies, to help downsize and/or delay the need for costly additional water supply, treatment, and distribution upgrades, and to fulfill the City's overall goal of ensuring a safe, reliable, and adequate water supply. Since the 1980s, the City has offered a highly effective variety of programs, informational materials, and incentives to become more water-efficient, putting the City water customers among the lowest per capita water users in California. The City's very low system-wide water use is highly beneficial from the perspective of meeting demands and preserving water resources, but it also represents a "hardened demand" that presents limited opportunity for further per capita demand reductions moving forward. This section describes the City's current water demand management measures.

9.1 Demand Management Measures for Wholesale Agencies

The City of Santa Cruz currently is not a wholesale water supplier nor does it receive water from a wholesale agency. This requirement does not apply to the City.

9.2 Demand Management Measures for Retail Agencies

This section presents the City of Santa Cruz demand management measures, including water waste prevention ordinances, metering, conservation pricing, public outreach and education, programs to assess and manage distribution system losses coordination and staffing support, and other measures.

9.2.1 Water Waste Prevention Ordinances

The City's water conservation ordinance (Santa Cruz Municipal Code 16.02) has been in operation since 1981 and was updated last in 2003 (Appendix Q). Under the ordinance it is unlawful for any person to use water for any of the following:

- unauthorized use of water from a fire hydrant,
- watering of landscaping in a manner or to an extent that allows excess water running off the property,
- allowing plumbing leaks to go unrepaired,

- outdoor washing of structures, vehicles, or surfaces without the use of an automatic shut-off nozzle, and
- operation of a fountain unless water is recycled

Provisions of the ordinance regulating new development include prohibitions on:

- use of water in new ice-making machines and any other new mechanical equipment that utilizes a single pass cooling system to remove and discharge heat to the sanitary sewer,
- washing of vehicles at a commercial car wash unless the facility utilizes water recycling equipment,
- use of water for new non-recirculating industrial clothes wash systems, and
- use of potable water for dust control or soil compaction purposes in construction activities where there is a reasonably available source of reclaimed water appropriate for such use.

The ordinance is in effect at all times and is upheld mainly through communication with the responsible customer.

During declared water shortages, the City's Water Shortage Contingency Plan takes effect as codified in Santa Cruz Municipal Code 16.02 (Appendix Q). The aforementioned restrictions are repeated in 16.01, and are enforceable by a first warning, followed by a progressive series of fines from $100 to $500.

The public is also encouraged to report water waste, either by calling the Water Conservation Office's designated "leak line" (831 420-LEAK) or reporting water waste through the City website. When water waste is observed, site visits, in-person customer contact, phone, and/or mail correspondence is used to resolve the issue. Field staff will increase drive-by checks of sites receiving water waste complaints to help ensure the issue was resolved. Software acquired in 2009 was used to help document, track and manage water waste complaints, including the photo evidence of water waste incidents.

Water waste prevention is also implemented through the City's Landscape Water Conservation Ordinance as codified in Santa Cruz Municipal Code Chapter 16.16 to ensure landscapes and irrigation systems in new and renovated development are designed to avoid runoff, overspray, low-head drainage and other similar conditions where water flows off site onto adjacent property (Appendix Q). Further description of this ordinance can be found in section 9.3.1.3 of this plan.

9.2.2 Metering

All of the City's 24,592 water connections are fully metered with most using Automated Meter Reading (AMR) technology. Approximately 33 percent of all City water meters are now connected with Advanced Metering Infrastructure (AMI) technology, allowing access to hourly meter reads. Water meters are required for all new service connections. In addition, a separate, dedicated irrigation meter equipped with AMI is required for all new and renovated multi-family and commercial landscape projects with over 5,000 square feet of landscaped area.

All meters are read and billed monthly according to the volume of water consumed. Monthly billing was first instituted inside the City in 2005 mainly to facilitate rising rates for all City utilities, but it also served in aiding in leak detection and allowing for more accurate monitoring of individual account usage and categorical water consumption. Outside City customers were later transitioned to monthly billing in April 2014 to facilitate water rationing.

In 2010, the City adopted a new Meter Testing, Repair, and Replacement Policy that accelerated large meter replacement and should help improve overall meter accuracy. In 2013, the City completed a feasibility study to assess the merits of a program to switch mixed-use commercial accounts that have substantial irrigation demands by installing a dedicated landscape meter. Of the almost 1,900 commercial properties analyzed, only nine sites, mostly schools, were identified as potential commercial candidates meriting retrofitting or future sub-metering.

The City is slated to begin a system-wide replacement of its metering system in fall 2021. This project will replace all meters that are older than 3 years, and outfit all meters with an AMI radio. Pending final negotiations with various contractors, installation is scheduled to last about 15 months.

This project began in earnest with a business case evaluation from May 2018 that found strong financial justification, as well as compelling qualitative benefits for customers and staff, to pursue a full replacement of the City's aging metering system. Key financial justifications include replacement of stuck and under-registering meters, wholesale discounts on bulk purchases of meters and radios, and capture of lost revenue due to a reduction of billing adjustments due to leaks. Qualitative benefits for customers and staff include improved understanding of water use and related charges, reduced carbon footprint from drive-by meter reading, improved drought response, and standardization of metering equipment and software.

Following the installation phase of the project, the City will begin work on incorporating the myriad benefits of interval meter read data, including optimization of the meter-to-cash operation, further calibration of the hydraulic model, and expansion of distribution water loss analysis. Additionally, the City will incentivize use of an online customer portal by integrating interval data with customized leak alerts, budget-based alerts, or—during declared water shortages—over-allotment alerts.

9.2.3 Conservation Pricing

The Santa Cruz Water Department Customer Service section, also referred to as "Santa Cruz Municipal Utilities," provides customer service and handles utility billing for water, sewer, refuse, and recycling services to the residents and businesses of the City of Santa Cruz, and services for water only to the unincorporated surrounding areas and part of the City of Capitola.

The water portion of the City's utility bill consists of five components: 1) a fixed, monthly "Readiness-to-Serve" charge, 2) a volumetric charge, 3) an infrastructure reinvestment fee, 4) a rate stabilization fee and 5) for customers residing in elevated pressure zones, an elevation charge applies.

The 2020 Readiness-to-serve charge varies by meter size and location (see Table 9-1).

Table 9-1: 2020 Readiness to Serve Changes

Readiness to Serve Charges (2020)		
Meter Size	Inside City (monthly)	Outside City (monthly)
5/8	$10.71	$12.26
3/4"	$10.99	12.59
1"	$11.83	$13.55
1.5"	$12.94	$14.83
2"	$16.02	$18.35
3"	$38.71	$44.34
4"	$47.11	$53.96
6"	$66.71	$76.42
8"	$89.11	$102.09
10"	$114.32	$130.95

For the volumetric charges, the City has an inclining rate structure in place for residential and irrigation customers. Residential tiers are based on CCF used, and irrigation tiers are based on assigned budgets. The Infrastructure Reinvestment Fees (IRFs) for these customer classes follows the same tiered structure. The current residential rates and fees as of July 1, 2019 are listed in Table 9-2, and irrigation rates and fees are listed in Table 9-3. For all other customers, including, business, industrial, municipal, and golf customers, water is billed at a uniform rate of $8.01/CCF inside the city and $9.18/CCF outside the City. These customer classes are billed an Infrastructure Reinvestment Fee of $2.96/CCF inside the city and $3.38 outside the city.

Table 9-2: Fiscal Year 2021 Residential Water Rate Structure

Residential Water Rate Structure (2021)				
Tier	Inside City Volumetric Charge	Outside City Volumetric Charge	Inside City IRF	Outside City IRF
1 (0-5 CCF)	$7.01	$8.04	$2.02	$2.33
2 (6-7 CCF)	$7.83	$8.99	$3.03	$3.49
3 (8-9 CCF)	$9.04	$10.41	$3.74	$4.31
4 (10+ CCF)	$10.72	$12.38	$5.02	$5.80

Table 9-3: Fiscal Year 2021 Landscape/Irrigation Water Rate Structure

Landscape/Irrigation Water Rate Structure (2021)				
Tier	Inside City Volumetric Charge	Outside City Volumetric Charge	Inside City IRF	Outside City IRF
1 (<100% of budget)	$8.36	$9.58	$3.67	$4.21
2 (101%-150%)	$11.16	$12.79	$5.50	$6.30
3 (150% and above)	$12.52	$14.34	$5.57	$6.38

All customers are charged a rate stabilization fee of $1.00/CCF to mitigate the risk associated with the volumetric based rates structure that encourages conservation. Customers in elevated pressure zones also pay an elevation surcharge of $0.51/CCF inside the city and $0.59 outside the city for the cost of being served by an elevated storage reservoir.

In October of 2016, the rate structure moved from one that collects about 65 percent of revenue in volume charges (based on the amount of water used) to one that collects about 90 percent of revenues from volume charges. Other changes at that time included:

- Established the IRF that collects the funding needed to support pay-as-you-go capital and debt service costs. The fee would be collected as a separate charge based on water use.
- Established a $1.00/centium cublic feet[1] (CCF) surcharge on water use beginning in July 2017 to increase the Department's Rate Stabilization Fund. This fund is used to mitigate the potential revenue instability associated with the volumetric based rate structure, and augment revenues in normal years.
- Transitioned multi-family and irrigation accounts to a tiered, rather than fixed, rate structure, and transitioned irrigation accounts to a simple budget-based rate structure.

The Water Department is currently in the processes of updating water rates and the Long Range Financial Plan for Fiscal Year 2022. No changes are being recommended to the water rate structure. The proposed water rate structure includes the following priority water pricing policy objectives for use in evaluating water rate structure options. The selected objectives included:

- Ensures water for essential use is affordable to all customers;
- Maintains transparency and equity for capital and water reliability needs; and
- Provides sufficient revenues to meet operating, capital, and customer service level needs.

On September 21, 2021, the City Council took action to adopt the 2021 Water Department Long Range Financial Plan, to accept the recommended proposed schedule of water rate increases for FY 2023 through FY 2027 and the recommended proposed FY 2022 through FY 2027 Drought Cost Recovery Fee schedule, and to authorize the Water Department to issue a Proposition 218 compliant public notice of the 45-day protest period and November 23, 2021 public hearing. The 2021 Water Department Long Range Financial Plan is included as Appendix R and the Proposition 218 Notice to the public about the proposed rates in included as Appendix S.

The financial plan and recommended rates are needed to ensure the long-term financial health of the utility. These enable the Water Department to support ongoing operations and maintenance of the water system and to make the capital investments required to comply with regulations, ensure adequate water supply, and rehabilitate and replace aging infrastructure. Table 9-4 includes recommended water rates for Fical Year 2023 – Fiscal Year 2027.

[1] A centum cubic foot is one hundred cubic feet of water.

Table 9-34: Recommended Water Rates Fiscal Year 2023 - 2027

Commodity Charges (dollars per CCF) - Consumption Charge, Infrastructure Reinvestment Fee, Rate Support Fund						
Customer Class	Current	As of 7/1/22	As of 7/1/23	As of 7/1/24	As of 7/1/25	As of 7/1/26
Residential*						
Tier 1	$9.60	$9.74	$11.33	$13.17	$14.09	$15.07
Tier 2	$11.58	$14.23	$16.54	$19.23	$20.57	$22.00
Tier 3	$13.64	$18.75	$21.80	$25.34	$27.10	$28.98
Tier 4	$16.83					
Commercial**						
Uniform	$11.70	$11.37	$13.23	$15.38	$16.45	$17.60
UCSC						
Uniform	$12.06	$12.07	$14.04	$16.33	$17.46	$18.67
Landscape Irrigation***						
Tier 1	$12.86	$20.53	$23.87	$27.75	$29.68	$31.74
Tier 2	$17.82	$28.59	$33.24	$38.63	$41.31	$44.17
Tier 3	$19.33	$36.32	$42.22	$49.07	$52.47	$56.10
North Coast Agriculture						
Maintain Reliability	$8.98	$6.45	$7.51	$8.74	$9.35	$10.00
Decrease Reliability	$8.98	$2.88	$3.36	$3.92	$4.20	$4.50
Rate Stabilization Fee	$1.00	$1.00	$1.00	$1.00	$1.00	$1.00
***Includes Single Family and Multi-Family, tier width is per dwelling unit**						
****Includes Business, Industrial, Restaurant, Hotel, Golf, Municipal, Bulk, Fire Service Leaks, and Temporary**						
*****Tiers based on percent of water budget for each customer**						

9.2.4 Public Education and Outreach

The City of Santa Cruz Water Department values and actively promotes public awareness and education about the City's water resources and the importance of water conservation. The City of Santa Cruz disseminates information to the general public in different forms including: 1) media, 2) workshops and community events, and 3) billing and customer service.

The City uses media coverage to broadly share information and updates on events, programs, and news to the public in the following ways:

- "SCMU Review", utility newsletter which includes news and information on water conservation topics;
- City of Santa Cruz Water Conservation website;
- Formal water supply outlook published at least once a year sharing the water conditions/ supply availability;
- Weekly water conditions webpage;
- Paid advertising in local newspapers;

- Opinion page coverage;
- Marketing and advertising of EPA's "Fix a Leak Week"; and
- Television and radio news interviews and community television programs.

In addition, the City uses workshops and community events to engage and interact with the public by the following:

- Tabling at local fairs, farmers markets, and events;
- Participation in regional water forums;
- Participation with other local water agencies in local events and sponsorships of water conservation-related activities;
- Free workshops on irrigation efficiency, new irrigation technologies, and water conservation strategies for the landscape; and
- Financial support to the Green Gardener Program, Water-Smart Gardening Faire, and the Water Education Foundation.

The City of Santa Cruz also uses a personable approach to public education and outreach through billing and customer service, which includes the following:

- Marketing and distribution of free water conservation devices and literature;
- Marketing of rebates and distribution of rebate applications;
- Bill inserts;
- Field representatives showing customers how to read their meter and check for leaks at their properties;
- Messages and information on customer's bills showing daily consumption and a graph charting monthly consumption for the entire year;
- A new web portal for customers to view and track their water use, receive custom conservation recommendations, and ask questions. Customers with AMI can access their hourly and daily data through this portal; and
- Water supply tours.

The City offers school education activities for students ranging from upper elementary age children up to the University level. The program gives students an opportunity to learn about the City's water supply system and water conservation. School educational activities include:

- Field trips and presentations at Loch Lomond Reservoir and San Lorenzo River;
- Loch Lomond Trout in the Classroom fish release field trip;
- Distribution of age and grade level appropriate curriculum and educational materials, including a water education booklet specially developed for Santa Cruz County students;
- High School Watershed Academy program.

9.2.4.1 Water School

In summer 2014, the City of Santa Cruz Water Department started hosting Water School as a result of rationing and curtailment during a declared water shortage. Residential customers were required to stay within their assigned allotment or pay an excessive use penalty for each additional unit of water used over their allotment. Water School served as a one-time opportunity for customers who exceeded their monthly allotment to dismiss their penalty by attending a two-hour class session held at the local community center. The session was followed by a short quiz and a survey for feedback and additional questions. The class curriculum consisted of an overview of the City water system, statewide and local drought conditions, Santa Cruz Municipal Utility (SCMU) services, water use regulations and restrictions, and water conservation strategies to practice at home and outside. The purpose of water school was to educate customers about the water shortage and local impacts, show customers support, empower customers to conserve and think critically about their own usage, and prevent customers from exceeding their allotment in the future. In 2014, the city held 27 classes for 702 customers, which collectively waived $462,050 in penalties. In 2015, there were 14 classes for 461 customers, which dismissed $266,760 in penalties.

The City of Santa Cruz also offered a separate Water School for large landscape accounts that exceeded their water budgets created from the landscape water budget software, Waterfluence. The landscape water school shared some elements with the residential water school curriculum and included tips on how to use Waterfluence effectively and communicate with different staff or stakeholders. In 2014, 28 irrigation customers attended and dismissed $40,375. In 2015, a pre-rationing water efficient workshop was offered to prepare irrigation accounts for rationing where 19 customers attended. The 2015 landscape water school consisted of 20 customers and dismissed $34,850 in excessive use penalties.

Water School has not been implemented since 2014 and 2015. The Water Department is currently updating its Water School curriculum and redesigning the structure of the course to be offered online. The purpose of Water School will remain the same in that it will continue to educate customers about where their water comes from, help customers stay within their allotments, and provide relief for penalties incurred for exceeding their allotment.

9.2.5 Programs to Assess and Manage Distribution System Losses

As mentioned in Chapter 4, Section 4.7, the City has conducted an annual water audit of the City's water distribution system since 1997 to quantify how much water and revenue is lost through physical leaks and apparent losses and to identify steps to minimize system losses and improve the operational efficiency of the water system. The City uses

AWWA water balance software to help quantify and track water losses associated with the water distribution system and identify areas for improved efficiency and cost recovery.

Water audit results indicate average annual system water loss from 2015 to 2019 is 221 million gallons per year (MGY). Of this amount, it is estimated that an average of 161 MGY is lost due to physical leakage in the distribution system, also referred to as "real" losses, including leaking service lines, valves, fittings, and water mains. On average, it is estimated that another 59 MGY is not physically lost but goes unreported on the billing system primarily due to sales meter inaccuracies, billing and accounting errors, and other factors. This second category of losses, labeled "apparent" losses, has a negative impact on both utility revenue and on consumption data accuracy.

In 2015, the City contracted with Water Systems Optimization, Inc. to examine the City's water system and operations practices, validate where losses are occurring, evaluate options, and set forth a formal strategy to improve water accountability and reduce lost water. Water Systems Optimization's proposed scope of work is organized into three tasks, involving the following elements:

- Water audit validation, to assess the accuracy of the system input meters and data transfer systems, and to perform a business process review of meter testing, reading, and billing activities;
- Component analysis of real losses, to quantify the volume of different types of leaks and determine the economic level of leakage – the balance between the value of the water that is lost through leakage and the cost of finding and fixing leakage or reducing leakage through pressure management; and
- Water loss control program design, to outline the most cost-effective strategies for reducing both real and apparent losses over time.

The recommendations produced from this year-long study are used to guide a robust water loss control strategy and serve as a foundation for completing and reporting future annual water audits to the state that began in 2017 under the requirements of SB 555 of 2015.

Currently, the City addresses physical leakage by expediting leak repairs on service connections and mains, and by performing service line and water main replacements on an ongoing basis. The Department budgeted on average a total of about $2.5 million annually between 2016 and 2020 in its capital investment program for water main replacement projects. Projected annual spending on water main replacements through 2030 is estimated to be approximately $1.6 million annually. Although a formal leak detection program is currently not in place, the Water Department uses sonic leak detection equipment to locate and repair leaks in the water system. In addition, the Department monitors for leaks on the customer's side of the meter by reviewing exception reports for

high meter readings. Customers are notified so they can take appropriate action to repair leaks, even before they receive their water bills.

9.2.6 Water Conservation Program Coordination and Staffing Support

The Santa Cruz Water Department Water Conservation section is responsible for promoting efficient water use, administering conservation programs, and implementing drought response measures outlined in the Water Shortage Contingency Plan. This section includes one Environmental Programs Analyst and two Water Conservation Representatives. The section is responsible for coordination of conservation activities with the public and with the Administration, Engineering, Production, Distribution, and Customer Service sections of the Water Department. The Environmental Programs Analyst and Water Conservation Representatives are responsible for operating existing programs and assisting with new program development.

9.2.6.1 Water Conservation Program Activities

The responsibilities and major activities of the Water Conservation Section fall into the following four general categories:

Public Awareness and Education: to promote public awareness and education about the City's water resources and the importance of water conservation; and to provide timely and accurate information to utility customers and the general public about conservation practices and technologies, as well as the City’s conservation programs and policies.

Water Demand Monitoring: to monitor water production, consumption and system water losses; to track weather and population data; to evaluate trends in per capita water use; to track demand associated with new service connections; to compare actual water demand with projected use by customer category; and to develop and support water demand forecasts for the water service area for use in supply planning.

Long-Term Water Conservation Programs: to develop and implement various conservation projects and programs that result in a sustained reduction in customer water demand; to track water savings from ongoing conservation programs; and to evaluate the need for program modifications to improve efficiency, customer service, and water savings in keeping with conservation goals.

Planning and Emergency Management: to periodically update and implement the City’s Water Shortage Contingency Plan and the Urban Water Management Plan, and to assist in Departmental and City-wide emergency planning and management activities.

During periods of drought or water supply shortages, drought management becomes the Conservation section's primary function, accelerating public education and outreach activities as well as addressing increased public interest and participation in long-term conservation programs.

9.2.6.2 Program Funding

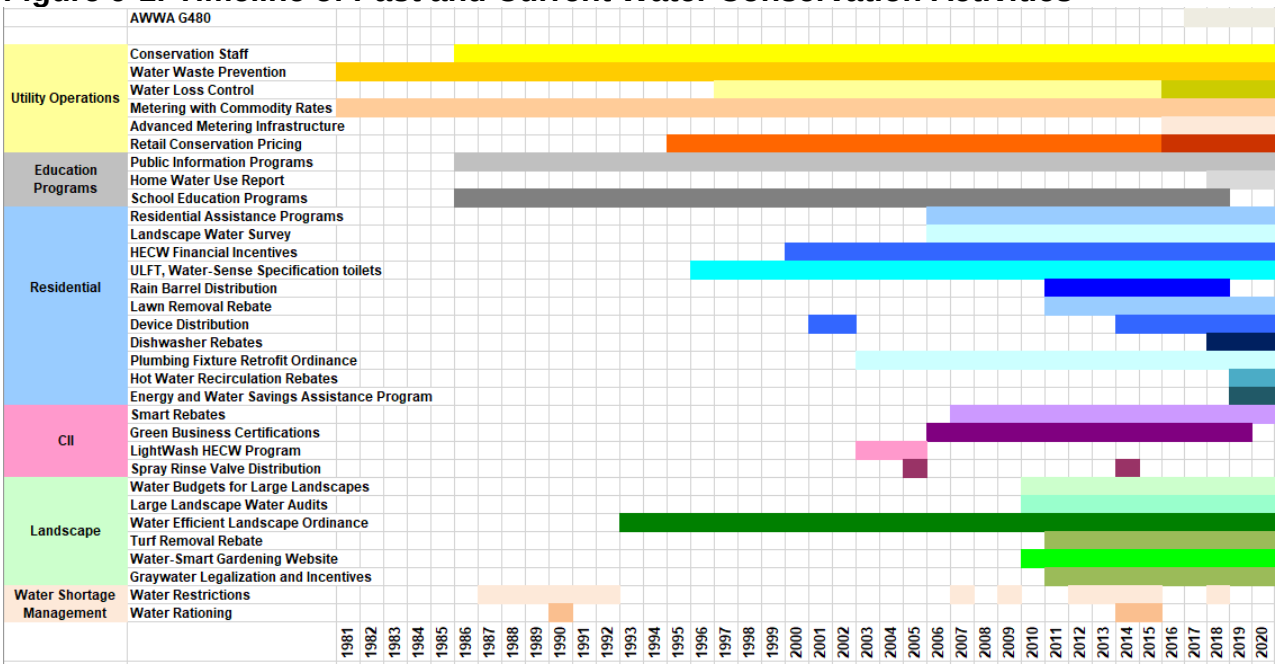
The City's water conservation program is funded by a combination of water rates, system development charges, and miscellaneous service fees. With regard to water conservation, revenues from system development charges are used primarily for various rebate programs, including residential and commercial toilets, urinals, clothes washers, dishwashers, hot water recirculation pump, Smart Rebates, and lawn removal rebates, which account for the majority of long-term water savings generated each year. The total budgeted resources for the Water Conservation Section in FY 2022 is $923 thousand.

9.2.7 Other Demand Management Practices

The City offers a suite of programs to residential, commercial, and irrigation customers to help and encourage them to manage their water consumption. Figure 9-1 below provides a summary and timeline of past and current water conservation activities. The following is a list of programs that were active from 2016 to 2020. The nature and extent of these measures are described in Section 9.3.

- Residential
    - Toilet, dishwasher, clothes washer, hot water recirculation pump, turf removal, and graywater rebate programs
    - Rain Barrel distribution program
    - Free water saving device distribution, including showerheads, aerators, hose timers, and automatic shutoff nozzles for hoses
    - Energy and Savings Assistance program, offering free toilet replacements to low-income qualifying customers
    - Plumbing fixture retrofit ordinance, requiring the replacement of inefficient toilets and showerheads
    - Home water surveys and home water use reports
- Commercial, Industrial, and Institutional
    - Smart business rebates for toilets, clothes washer, and urinals
    - Green business certification
- Irrigation
    - Water budgets for large landscapes
    - Water Efficient Landscape Ordinance (WELO)
    - Turf removal rebates
    - Water-smart gardening website
    - Greywater rebates

Figure 9-1: Timeline of Past and Current Water Conservation Activities



9.3 Reporting Implementation

Demand management program implementation is described in the section below including implementation over the past five years and implementation to achieve water use targets.

9.3.1 Implementation over the Past Five Years

Implementation over the past five years of the City of Santa Cruz residential, commercial and landscape programs are described in the subsequent sections.

9.3.1.1 Residential Programs

Residential water use constitutes almost two thirds of system consumption and therefore is a main focal point of the City's water conservation efforts. Current residential water conservation programs consist of the following: 1) Home Water Survey Program, 2) High Efficiency Clothes Washer Rebate Program, 3) Toilet Rebate Program, 4) Dishwasher rebates 5) Hot Water Recirculation Pump rebates, 6) Laundry to Landscape Rebate Programs, 7) Plumbing Fixture Retrofit Ordinance, and 8) Energy and Water Savings Assistance Program.

The Home Water Survey program is a free service offered to single and multi-family residences and consists of reviewing billing and consumption information, showing how to read a meter and detect leaks, inspecting home plumbing fixtures, and offering free showerheads, faucet aerators, and rebate forms. The survey also assesses outdoor water

use and needs by checking the irrigation system and timer and evaluating the landscape area, design, and plants. Although home water surveys are not in high demand, they play an important role in providing education and customer service. This program was temporarily suspended in 2020 due to the COVID-19 pandemic, and has not yet been reinstated.

The High Efficiency Clothes Washer Rebate program offers $100 for the purchase and installation of an Energy Star clothes washer to single and multi-family (non-communal laundry) residences, and $200 for Energy Star Most Efficient Models. The Energy Star Most Efficient models have the lowest water factor and energy factor of all clothes washers. By increasing the rebate amount for these specific models, the City hopes to encourage customers to use clothes washers that have the lowest water factors. Between 2016 and 2020, the City approved rebates for over 800 water efficient clothes washers, with about half of those being Most Efficient models, saving approximately 6.4 MG of water annually.

The City has operated a rebate program to promote the installation of ultra-high-efficiency or high-efficiency toilets in residential accounts since 1995. The program originally featured a $75 rebate as a financial incentive for customers to remove their higher-volume toilets and replace them with 1.6 gallon ultra-low-flush toilets. This $75 rebate was discontinued in 2010. The City's current toilet rebate program offers $150 rebate for toilets meeting WaterSense[2] criteria of 1.28 gallon per flush maximum. Eligibility requirements depend on the flush volume of the toilet that customer is replacing. Older, higher usage toilets of 3.5+ gallons per flush are eligible with the replacement of a high efficiency toilet of 1.28 gpf or lower. Customers who have toilets less than 3.5 gallons per flush must install ultra-high efficiency toilets of 1.0 gallons per flush or less to be eligible. In the last five years, 1,447 water efficient toilets were installed under the program saving approximately 4.3 million gallons of water annually.

The City also offers a Laundry to Landscape rebate of $150 to customers who install a Laundry to Landscape greywater system and attend a workshop offered by Central Coast Greywater Alliance. The requirement to attend a workshop is intended to ensure systems are installed in accordance with the guidelines listed in the California plumbing code. The program has attracted only very sporadic participation.

Up until 2019, the City offered a Rain Barrel Program for a 50-gallon rain barrel catchment system at a subsidized rate of $50 per barrel. Customers were able to order online during the rainy season from Rainwater Solutions to reserve rain barrels for the upcoming distribution event. Several distribution events were held during the rain barrel

[2] WaterSense is a voluntary partnership program sponsored by the U.S. Environmental Protection Agency, is both label for water-efficient products and a resource to help consumers save water.

sale for customers to pick up their orders at the City's corporation yard. A total of 293 rain barrels have been sold from 2016 to 2019, resulting in an estimated water savings of 193.5 thousand gallons annually. Due to a decrease in participation, the program was discontinued in early 2019. A new rain catchment program is being considered that would offer a rebate to customers still interested in pursuing water savings through rain catchment.

In 2003, the City adopted a plumbing fixture retrofit ordinance, codified as Santa Cruz Municipal Code Chapter 16.03 (Appendix Q). This regulation requires that all residential, commercial, and industrial properties be retrofitted with low consumption showerheads, toilets, and urinals when real estate is sold. As part of the initial program implementation, the City worked closely with the County of Santa Cruz and the City of Capitola to have similar ordinances passed in these other jurisdictions. Under the law, the seller of the property is responsible for retrofitting any older toilets, urinals, and showerheads on the property with low consumption fixtures, and for obtaining a water conservation certificate from the Water Department. There is an option in the ordinance that allows the responsibility for retrofitting to be transferred from the seller to the buyer, if both parties agree. In either case, the City tracks real estate sales and requires every property to be inspected to verify that the plumbing fixtures on the property being sold meet the low consumption standards, with the exception of already existing 1.6 gallon per flush toilets. A custom database program was developed by a consultant to manage property sales data on local properties and retrofitting records, as well as follow-up enforcement of the ordinance. In the last five years, 2,031 properties have been certified under the program, saving about 25.2 million gallons per year.

In 2018 the City began offering a $50 rebate to customers for the purchase and installation of a new Energy Star rated dishwasher. An Energy Star rated dishwasher uses equal to or less than 3.5 gallons per cycle. Between 2018 and 2020, 216 dishwashers have been installed saving approximately 37.5 total gallons per year.

Lastly, in 2019 the City partnered with the Pacific Gas and Electric Energy Savings Assistance Program to offer free water saving assistance to qualifying low-income customers. Through this program, customers received literature, toilet assessments, and toilet replacements for toilets that used 1.6 gallons per flush or greater with Niagara Stealth 0.8 gallon per flush models. The water-saving measures of this program are funded by the Water Department and Pacific Gas and Electric contractors are responsible for the administration of the program. Since the start of this program in 2019, 200 toilets have been replaced, saving approximately 4 million gallons per year.

9.3.1.2 Commercial Programs

The City provides water to about 1,900 commercial and industrial accounts within the service area, which together represents about 20 percent of total system water use. The City offers a Smart Business Rebate programs to encourage commercial customers to become more water efficient by using water-saving technology.

The Smart Business Rebate Program was offered as a result of the conclusion of the statewide Smart Rebate program in 2013. The City's Smart Business Rebate Program mirrors the old statewide program by offering businesses rebates for installing water efficient fixtures including:

- High-Efficiency (1.28 gallons per flush (GPF)) or Ultra-High-Efficiency (1.0 GPF) toilets- $200
- High-Efficiency Urinals (0.125 GPF)- $300
- High-Efficiency Clothes Washer- $400

The eligibility requirements for these rebates are the same for the other programs. Clothes washers must be Energy Star certified and inspected if five or more are installed. Toilet rebate eligibility depends on what is currently being replaced, like the residential program. In the last five years, the City has approved 88 applications, saving an estimated 1.4 million gallons per year.

The City has also distributed water conservation materials to all local hotels, and drinking water upon request table tents to all local restaurants, and continues to make them available upon request.

9.3.1.3 Landscape Programs

The City of Santa Cruz also offers rebates and programs for outdoor water use and landscapes which include: 1) Lawn Removal Rebate Program, 2) Large Landscape Water Budgets, and 3) Water Efficient Landscape Ordinance.

The Lawn Removal Rebate Program currently offers $1.00 per square foot of lawn removed for single family, multi-family, and commercial customers. Single-family residences are eligible to receive up to $1,000 (1,000 square feet) and multi-family or commercial are eligible for up to $5,000 (5,000 square feet). The general requirements are the following:

- Lawn that is maintained or previously maintained prior to drought,
- Lawn must be watered by an in-ground irrigation system,
- Removal or capping of the overhead spray system in the area to be converted,
- Replacement of lawn with very low or low water use plants and mulch (with or without low volume drip irrigation) or install no water use permeable hardscape options,

- Agreement to pre- and post- inspections to take measurements and ensure eligibility requirements have been met,
- Completion of landscape conversion within a year, and
- One rebate per customer per year.

In 2016, the City increased the rebate from $0.50 to $1.00 per square foot removed with the same limitations of rebating up to 1,000 square feet for single-family residences and 5,000 square feet for multi-family and commercial. The hope was to encourage more lawn conversions by offering a higher rebate. Over the last five years, this program has resulted in a total of 298,000 square feet of turf to be removed, saving an estimated 5.7 million gallons of water per year.

In July 2010, the City launched a new program for customers with large landscapes and dedicated irrigation accounts. After converting all dedicated irrigation accounts to monthly meter reading, the City contracted with a consultant, Waterfluence LLC, to map landscape areas using aerial imagery, to develop irrigation budgets for the City's 110 largest irrigation customers, and to distribute the information through monthly Landscape Water Use Reports. Since its launch, participation in the program has expanded to include 305 sites representing 435 acres or 19 million square feet of irrigated area. There are an addition 99 analytics-only accounts, representing 11.3 acres of irrigated area. For each site, Waterfluence provides a site-specific irrigation budget based on landscape size and plantings, type of irrigation, and real-time local weather conditions that is obtained from the CIMIS station located at the DeLaveaga Golf Course (California Irrigation Management Information System (CIMIS) Station 104). Customers receive monthly reports via mail or email comparing their actual consumption to the irrigation budget over a one to three year-long period. Because City irrigation customers have experienced numerous interventions over the last ten years including Waterfluence, drought, advanced metering infrastructure, and water rate increases among other factors, the effects from Waterfluence program along cannot be isolated. The key performance indicator for the irrigation class over time is overwatering. Over the last ten years, overwatering was observed to decrease from 0.86 to 0.39 feet per year over all irrigated landscape. The 0.47 feet per year decrease in overwatering translates into water savings of an estimated 68.5 million gallons per year.

In addition to receiving monthly reports, participants in the program are also eligible for a professional irrigation audit performed by Waterfluence. The audits include an assessment of irrigation efficiency, notation of irrigation issues (scheduling, tilted nozzles, leaks, breaks, pressure, overspray etc.), and a confirmation of the landscape area measurements. Customers receive a detailed report with site photos noting irrigation

problems, a sprinkler condition analysis, cost-effective recommendations, scheduling suggestions, and a list of water management essentials.

The City's Water Efficient Landscape Ordinance was first adopted to establish landscape water conservation regulations for major development projects situated in the City's service area in 1993. Since then it has been rewritten and revised in 2001, 2010, and 2016. It is codified in Santa Cruz Municipal Code Chapter 16.16 (Appendix Q). The overall purpose of the ordinance is to ensure that the City's limited water supply is used efficiently and effectively in new landscapes within the City's water service area and to avoid certain landscape and irrigation design aspects that have the potential to result in water waste.

The City's ordinance applies throughout the entire water service area as a condition of receiving water service. The ordinance covers all new and renovated, commercial, industrial and public projects, and new single-family and multifamily development projects resulting in three or more dwelling units where: 1) the landscape is installed by the developer, and 2) the total landscape area of the project is 500 square feet or more, and new single-family and two-unit residential development projects on properties equal to or larger than 10,000 square feet. Certain provisions also apply to pre-existing landscapes over one acre in size. The ordinance contains provisions for the following:

- Dedicated irrigation meters for new landscapes or expansion of existing landscapes over 5,000 square feet in area;
- Landscape water budgets based on 55 % (residential) and 45% (non-residential) of reference evapotranspiration;
- Turf is limited to 25% on residential projects (turf not permitted for non-residential);
- Requiring very low to moderate water using plant materials, grouping plants with similar water needs;
- Irrigation design to avoid conditions that lead to runoff and overspray;
- Appropriate irrigation equipment, including requiring weather-based irrigation controllers and flow sensors to maximize water efficiency and detect leaks;
- Soil preparation and mulching;
- Storm water management; and
- Alternative water sources.

A complete landscape plan must be submitted and found to satisfy the standards before a building permit can be issued. Water Conservation Section staff reviews the landscape plans for compliance with the ordinance, coordinates plan review with the Santa Cruz Water Department Engineering Section and other City departments and jurisdictions, and once installed, performs final inspections of the completed landscape.

9.3.2 Implementation to Achieve Water Use Targets

In 2013, the City contracted with Maddaus Water Management, Inc. to develop an updated Water Conservation Master Plan. The goal of the updated plan was to define the next generation of water conservation activities through 2035 and serve as a roadmap to help the community achieve maximum, practical water use efficiency. Strengthening water conservation efforts has been identified as a priority by the City Council, the City's Water Commission, and the City's Water Supply Advisory Committee in its effort aimed at delivering a safe, adequate, affordable, and environmentally sustainable water supply.

The plan included a total of 35 measures for implementation between 2015 and 2035. Many were already underway at the time the plan was written, though some were implemented in the last five years. The City Council accepted the plan in concept as a Technical Memorandum in April 2016, and the final report was completed in 2017. Based on the calculated water savings resulting from the implementation of the plan, the City would achieve its water use target in 2020. The demand management measures in Section 9.2 were considered in the Water Conservation Master Plan, and were implemented to help reach and maintain the City's reduction goals.

Current levels of customer demand and the Updated Long-Range Water Demand Forecast (Appendix D) indicate that the Santa Cruz community has achieved levels of water conservation well beyond the levels of anticipated as a product of the programmatic conservation included in the Water Conservation Master Plan, and has done so without the associated spending on program implementation that the Water Conservation Master Plan had envisioned. The water conservation realized over the last five years have been achieved primarily through the effects of a combination of increased water rates and customer water use behavior changes as a result of the 2014-2015 drought. At the time the 2015 Urban Water Management Plan was written the City had already achieved its 20x2020 goal of 110 GPCD. At the time of this 2020 Urban Water Management Plan, the City has maintained level of water use well below this target, with customers using just 74 GPCD in 2020. This very low system-wide water use is highly beneficial from the perspective of meeting demands and preserving water resources, but it also represents a "hardened demand" that presents limited opportunity for further per capita demand reductions moving forward.

9.4 Water Use Objectives

Water use objectives based on specific standards for certain water use sectors will be developed by 2023 as required by California Water Code. While a framework for the new standards has been published by the California Department of Water Resources, parts of the framework remain unfinished. Given the City of Santa Cruz well-demonstrated track record of water conservation and its customers being among the lowest per capita water users in California, the City expects to be able to maintain compliance with upcoming standards.

Chapter 10

PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

This chapter summarizes the process of adoption, submittal, and implementation of the 2020 Urban Water Management Plan and 2021 Water Shortage Contingency Plan, including the steps for amendment if it becomes necessary. The process of preparing the Urban Water Management Plan is described in Chapter 2, and process of preparing the Water Shortage Contingency Plan is described in the Water Shortage Contingency Analysis and Implementation (Appendix O).

10.1 Inclusion of all 2020 Data

As mentioned in Section 2.3, the City is reporting on a calendar year basis. The plan was prepared in 2021 and accordingly includes water use and planning data for the entire calendar year of 2020, except where noted.

10.2 Notice of Public Hearing

Water suppliers must hold a public hearing before adopting an Urban Water Management Plan and a Water Shortage Contingency Plan. The public hearing provides an opportunity for the public to provide input before these plans are adopted by City Council.

Table 10-1 below lists all the cities and counties that receive water service from the City of Santa Cruz and that were sent a notice of the public hearing. As mentioned in Section 2.4, these jurisdictions were previously sent written notice regarding the plan review and update process well in advance of 60 days before the public hearing, in accordance with the Section 10621(b) of the Act. These notices are included in Appendix B.

Table 10-1: Notification to Cities and Counties

Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
City of Capitola	Yes	Yes
City of Santa Cruz	Yes	Yes
County Name	60 Day Notice	Notice of Public Hearing
Santa Cruz County	Yes	Yes

Prior to the public hearing, the draft plans were made available for public inspection, review, and comment on the City's web site, at the Water Department office, and at the City's Central Library beginning on September 30, 2021.

The draft plans were also circulated, along with notice of the time and place of the public hearing, to the County of Santa Cruz and the City of Capitola as required by law. Notification letters included the location where the draft 2020 Urban Water Management Plan and Water Shortage Contingency Plan could be viewed, the hearing schedule, and contact information of the preparer for the City. Copies of these letters are included in Appendix T.

In addition to these jurisdictions, the City provided the notice of the public hearing to the Association of Monterey Bay Area Governments, local elected officials, the Santa Cruz Local Agency Formation Commission, and to all major public water utilities in Santa Cruz County, including the following:

- Soquel Creek Water District
- San Lorenzo Valley Water District
- Scotts Valley Water District
- Central Valley Water District
- City of Watsonville

The public hearing was noticed to the public in the local newspaper as prescribed in Government Code 6066. The notice included the time and place of the hearing, as well as the various locations where the plans were made available for public review. A copy of the notices of the public hearing published in the Santa Cruz Sentinel newspaper are included in Appendix T.

10.3 Public Hearing and Adoption

The City Council is planned to hold a public hearing on the Urban Water Management Plan and Water Shortage Contingency Plan in accordance with California Water Code section 10642. Copies of any written comments received during the public review process, a summary of minor changes after circulation of the draft Urban Water Management Plan, official minutes of the public hearing, and the adoption resolutions for the plans are included in Appendix T.

10.4 Plan Submittal

The final adopted Urban Water Management Plan and Water Shortage Contingency Plan will be submitted electronically to DWR and the California State Library within 30 days of adoption, and transmitted to all jurisdictions receiving water service from the

City of Santa Cruz within 60 days of its submission to California Department of Water Resources, in accordance with California Water Code sections 10644 and 10635. Additionally, all final data tables will be submitted to California Department of Water Resources using the Water Use Efficiency data portal.

10.5 Plan Availability

The final, adopted Urban Water Management Plan and Water Shortage Contingency Plan will be made available to the public in accordance with California Water Code sections 10645 and 10632 by posting on the City's web site within 30 days of submission to the California Department of Water Resources.

Table 10-1 lists the cities and counties that receive water service from the City of Santa Cruz. These entities will be provided copies of the plans within 30 days of plan submittal to California Department of Water Resources.

10.6 Amendment Process

If the City of Santa Cruz chooses or needs to amend the adopted 2020 Urban Water Management Plan or Water Shortage Contingency Plan, proper notification, including copies of the amendments, will be provided in accordance with sections 10621, 10640, and 10644 in a manner set forth for the notification, public hearing, adoption and submittal.

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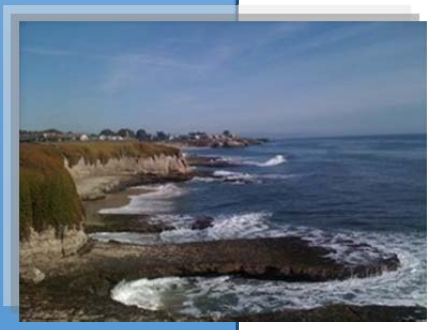
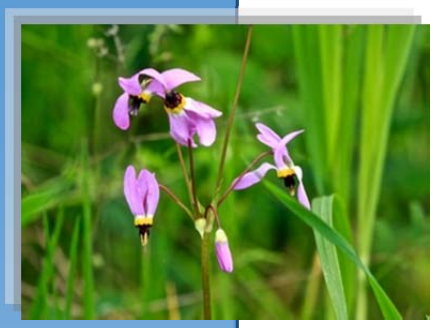
City of Santa Cruz





Water Conservation Master Plan

January 2017

Prepared by:

MADDAUS WATER MANAGEMENT INC.

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LIST OF ACRONYMS

AB	Assembly Bill
AF	acre-feet
AFY	acre-feet per year
AMI	Advanced Metering Infrastructure
AMR	Automatic Meter Reading
AWE	Alliance for Water Efficiency
AWWA	American Water Works Association
BG	billion gallons
BGY	billion gallons per year
BMP	Best Management Practice
CEC	California Energy Commission
CII	Commercial, Industrial and Institutional
CIS	Customer Information System
COM	commercial
CP	Cathodic protection
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
DMM	Demand Management Measures
DOF	California Department of Finance
DSS	Least Cost Planning Decision Support System Model
DWR	California Department of Water Resources
EPA	Environmental Protection Agency (United States)
GHG	Greenhouse Gases
GIS	Geographic Information System
GPCD	gallons per capita per day
gpf	gallons per flush
gpm	gallons per minute
HECW	High-Efficiency Clothes Washer
HET	High-Efficiency Toilet
IND	industrial
IRR	irrigation
IWA	International Water Association
MFR	Multifamily Residential
MG	million gallons
mgd	million gallons per day
MGY	million gallons per year
MOU	Memorandum of Understanding Regarding Water Conservation in California
MUN	municipal
MWELO	Model Water Efficient Landscape Ordinance
MWM	Maddaus Water Management, Inc.
NRW	non-revenue water
PG&E	Pacific Gas & Electric
psi	pounds per square inch
PWSS	Public Water System Statistics
SB	Senate Bill

SB X7-7	Water Conservation Bill of 2009
SCWD	Santa Cruz Water Department
SF	Single Family
UCSC	University of California Santa Cruz
UHET	Ultra-High Efficiency Toilet
ULFT	Ultra-Low Flow Toilet
USBR	U.S. Bureau of Reclamation
UWMP	Urban Water Management Plan
WCMP	Water Conservation Master Plan
WF	water factor
WS	WaterSense (EPA Program)
WSAC	Water Supply Advisory Committee

1. EXECUTIVE SUMMARY

The purpose of the Executive Summary is to briefly describe the City of Santa Cruz Water Department (City) Water Conservation Master Plan (WCMP or Plan). The evaluation process and assumptions used to develop this Plan and recommendations for future implementation are included in the full report.

The City of Santa Cruz has had a long-standing commitment to water conservation since the 1980s and offers a variety of programs, informational materials, and incentives to help City water customers become more water-efficient. In 2000, the City adopted a Water Conservation Plan, the goal of which was to reduce water demand system-wide by 282 million gallons per year in 2010. Through plumbing fixture and appliance rebate programs, technical assistance, regulations, and other strategies, residential and commercial customers have saved over 330 million gallons of water per year so far. The City is also a member of the California Urban Water Conservation Council (CUWCC) and is active in promoting water conservation statewide.

In 2011, the City sponsored a survey of its residential and commercial customers called the Residential and Commercial Baseline Water Use Survey Program (Baseline Survey) to develop a picture of the current state of water-using equipment within the service area. This study revealed that indoor water use efficiency opportunities were mostly saturated. The survey findings provided a basis for estimating additional conservation potential and yielded information to help select, target, and design future water conservation initiatives.

In 2013, the City of Santa Cruz contracted with Maddaus Water Management (MWM) to develop an updated Water Conservation Master Plan. Strengthening water conservation efforts had been identified as top priority by the Santa Cruz City Council (City Council), the City's Water Commission, and more recently by the City's Water Supply Alternatives Committee in its effort aimed at delivering a safe, adequate, affordable, and environmentally sustainable water supply. The overall goal of the updated plan was to define the next generation of water conservation activities and serve as a roadmap to help the community achieve maximum, practical water use efficiency. Additional goals established during the planning process included the following:

- Capitalize on opportunities to assist with meeting the future water needs of the Santa Cruz Water Department customers through cost-effective and sustained water conservation and water use efficiency efforts
- Demonstrate environmental stewardship and foster innovative, responsible, and efficient practices
- Commit to and implement a water conservation program that supports the health of rivers, streams, and groundwater integral to the region's quality of life and economy
- Monitor and measure performance to ensure conservation potential is being met as forecasted
- Maintain and exceed the water savings already achieved by the City of Santa Cruz as well as identify the best path to achieve those savings and to monitor commitments to the CUWCC Memorandum of Understanding (MOU) Regarding Urban Water Conservation
- Maintain a long-term plan for compliance with SB X7-7 to meet the gallons per capita per day (GPCD) target by 2020
- Meet the City's integrated water resource management goals to reduce peak season demands

The process used to develop the plan included analyzing individual conservation measures and different sets of measures or "programs" using the Least Cost Planning Water Demand Management Decision Support System Model (DSS Model). The evaluation includes measures directed at existing accounts as well as new development measures to help ensure new residential and business customers are more water efficient. After a significant screening and evaluation process, a Recommended Program consisting of 35 individual measures was selected to evaluate the net

effect of running selective multiple measures together over time. The elements of the Recommended Program are highlighted in Table 1-1, organized by major customer sector. Note that some measures appear twice since they apply to more than one sector.

1.1 Long-Term Demand and Conservation Program Analysis Results

The development of this Plan consisted of two main parts: 1) create a demand and conservation analysis for 2015 to 2035 and 2) evaluate conservation savings potential for the years 2015 to 2035 with a variety of different measures and conservation programs.

The first step in the analysis was to review and analyze historical water use production and billing data. The analysis built on previous efforts and was updated using M.Cubed's September 2015 City of Santa Cruz Water Demand Forecast, in which M.Cubed conducted an econometric analysis of water demand and forecasts of class-level customer demands and total system production through 2035. The historical water use, selected population projections, most recent plumbing code information, and discussions with the City were used to create a demand forecast for the years 2015 to 2035, as further described in Sections 3 and 5.

Once the demand forecast was completed, the conservation measures listed in Table 1-1 were analyzed for costs and benefits. A total of 33 out of 35 unique measures were analyzed using the DSS model. Two measures (conservation pricing and additional building code requirements for new development) were not sufficiently developed to be modeled individually at the time. The conservation analysis included all the quantifiable measures selected by the City. The following important factors about the conservation measures were included in this analysis:

1. The measures recommended are listed in Table 1-1 and described in Section 7 in Table 7-1.
2. New California state-wide plumbing standards that were adopted in 2015, the Model Water Efficient Landscape Ordinance (MWELO) and the CALGreen building code (as of December 1, 2015). These can be found in Appendix A.

Table 1-1. Elements of Recommended Program

Utility Measures	Residential Measures	CII Measures	Landscape Measures
System Water Loss Reduction	Residential Leak Assistance	CII Incentives	Large Landscape Budget-Based Water Rates
Advanced Metering Infrastructure	Single Family Residential Surveys	Pre-Rinse Spray Nozzle Installation	Water Efficient Landscape Ordinance
SF, MF, COM Conservation Pricing - Water and Sewer[1]	Plumbing Fixture Giveaway/Opt	CII Surveys	Single Family Residential Turf Removal
General Public Information	Residential Ultra High Efficiency Toilet Rebates	High Efficiency Urinal Program	Multifamily Residential/CII Turf Removal
Public Information (Home Water Use Report)	High Efficiency Clothes Washer Rebates	Public Restroom Faucet Retrofit - MUN	Expand Large Landscape Survey/Water Budgets
	Gray Water Retrofit	Public Restroom Faucet Retrofit - COM	Sprinkler Nozzle Rebates
		School Retrofit	Residential Rain Barrels
	Hot Water On Demand - New Development	Hot Water On Demand - New Development	Climate Appropriate Landscaping and Rainwater Infiltration
	Toilet Retrofit at Time of Sale	Toilet Retrofit at Time of Sale	
	CII MF Common Laundry Room High Efficiency Clothes Washer[2]	CII MF Common Laundry Room High Efficiency Clothes Washer[2]	
	Single Family/Multifamily Dishwasher Rebates[2]	Rewarding Businesses for Adopting Best Practices[2]	
	Hot Water Recirculation Systems[2]	Hot Water Recirculation Systems[2]	
	Additional Building Code Requirements for New Development[2]	Additional Building Code Requirements for New Development[2]	
	Innovation Incubator Program[2]	Innovation Incubator Program[2]	

[1] This measure was still under development when the technical memorandum was approved in April 2016. A comprehensive cost of service water rate study conducted by Raftelis Financial Consultants, Inc. was completed in August 2016.
[2] These measures target both CII and residential customers.

The Plan presents the water demands and conservation savings determined by this analysis. The Plumbing Code includes the new California State Law (Assembly Bill 715), which requires installation of High Efficiency Toilets and High Efficiency Urinals as of 2014. The Plumbing Code also includes SB 407, which applies to all new construction and replacements as of 2017 for single family and 2019 for multifamily and commercial properties. The increase of projected growth in population will cause baseline water demand to increase slightly. However, overall water use projections with plumbing code and water savings from the recommended program are expected to decline and then level off by 2035, based on current technologies.

Table 1-2 presents the City's water use projections 1) without plumbing code savings; 2) with only plumbing code savings and no active conservation activity; and 3) with plumbing code savings and the Recommended Program active conservation program implementation savings. It is important to note that demand projections are normalized,

without drought or recession conditions, whereas historical demands have been affected by drought and economic influences.

Table 1-2. Normalized Water Use Projections

	2020	2025	2030	2035
Baseline Demand (MGY)	3,560	3,636	3,743	3,838
Demand with Plumbing Code (MGY)	3,464	3,456	3,474	3,510
Demand with Plumbing Code and Recommended Program (MGY)	3,327	3,225	3,205	3,220

Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

The following table shows the savings in 5-year increments for the plumbing codes, Recommended Program, and the Recommended Program with plumbing code savings from a baseline of 2015 normalized water demands without drought or recession conditions.

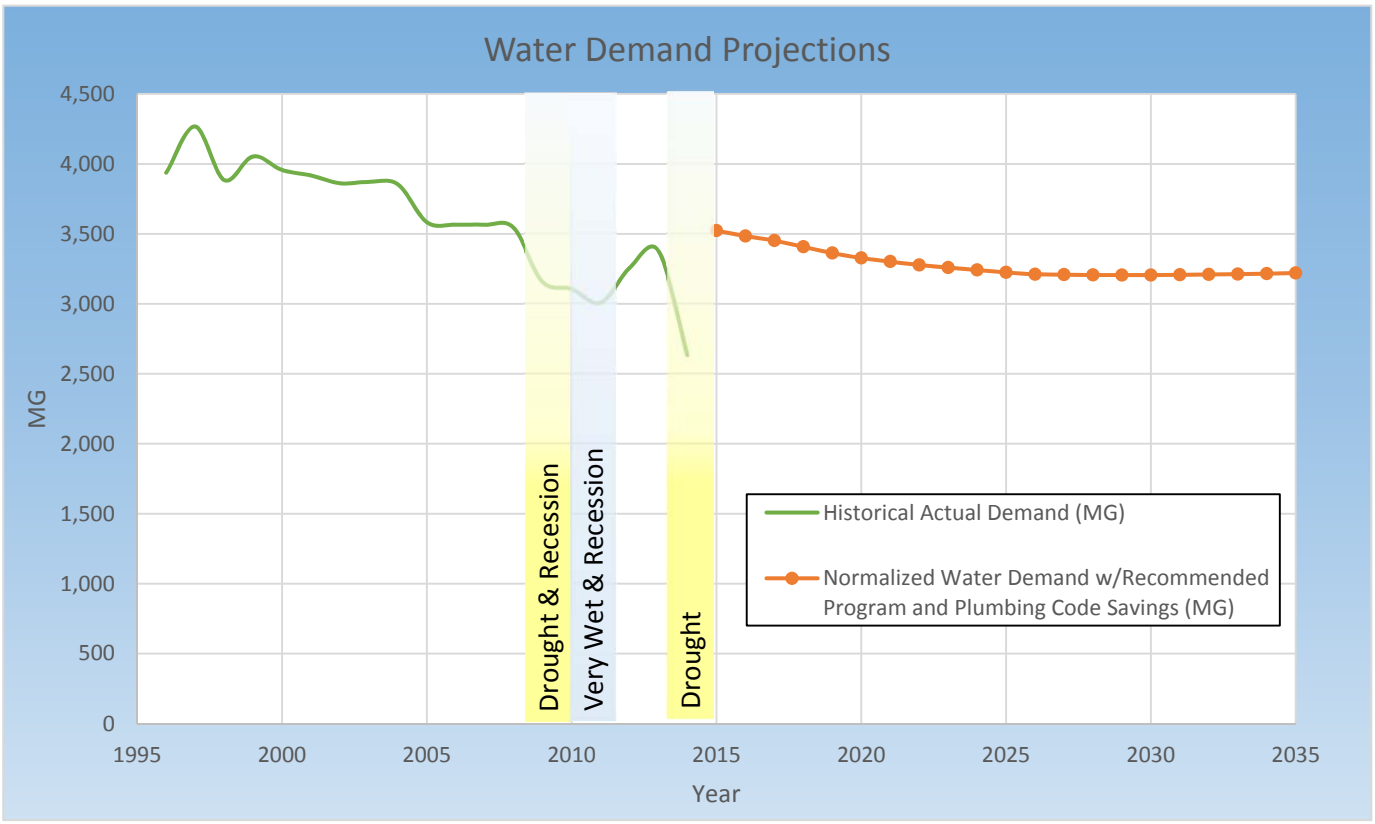
Table 1-3. Long Term Conservation Program Savings over "Baseline" Demand

Conservation Program	2020	2025	2030	2035
Plumbing Code (MGY)	96	179	269	329
Recommended Program (MGY)	137	232	269	291
Recommended Program with Plumbing Code Savings (MGY)	233	411	538	619

Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

Figure 1-1 exhibits the same information as Table 1-2, in graphical form for the Recommended Program only. Demand projections are normalized, beginning in 2015, whereas historical demands are based on actual data, which illustrates how much demands have been affected recently by drought and economic influences. Future water demand is presented without lingering effects of drought, hence the large discontinuity between actual and forecast demand. This rebound to historical demand levels is considered a conservative assumption and repressed demands may persist for several years and beyond 2020. The projections do not reflect this delayed reaction.

Figure 1-1. Recommended Program Projected Normalized Water Demands



Notes:

1. Historical values based on actual data and projections are based on normalized future values.
2. Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

The following table shows the projected per capita water use in gallons per day per person (GPCD) in 5-year increments for the projected demand with no plumbing code savings, projected demand with plumbing code savings, and projected demand with Recommended Program implementation and plumbing code savings.

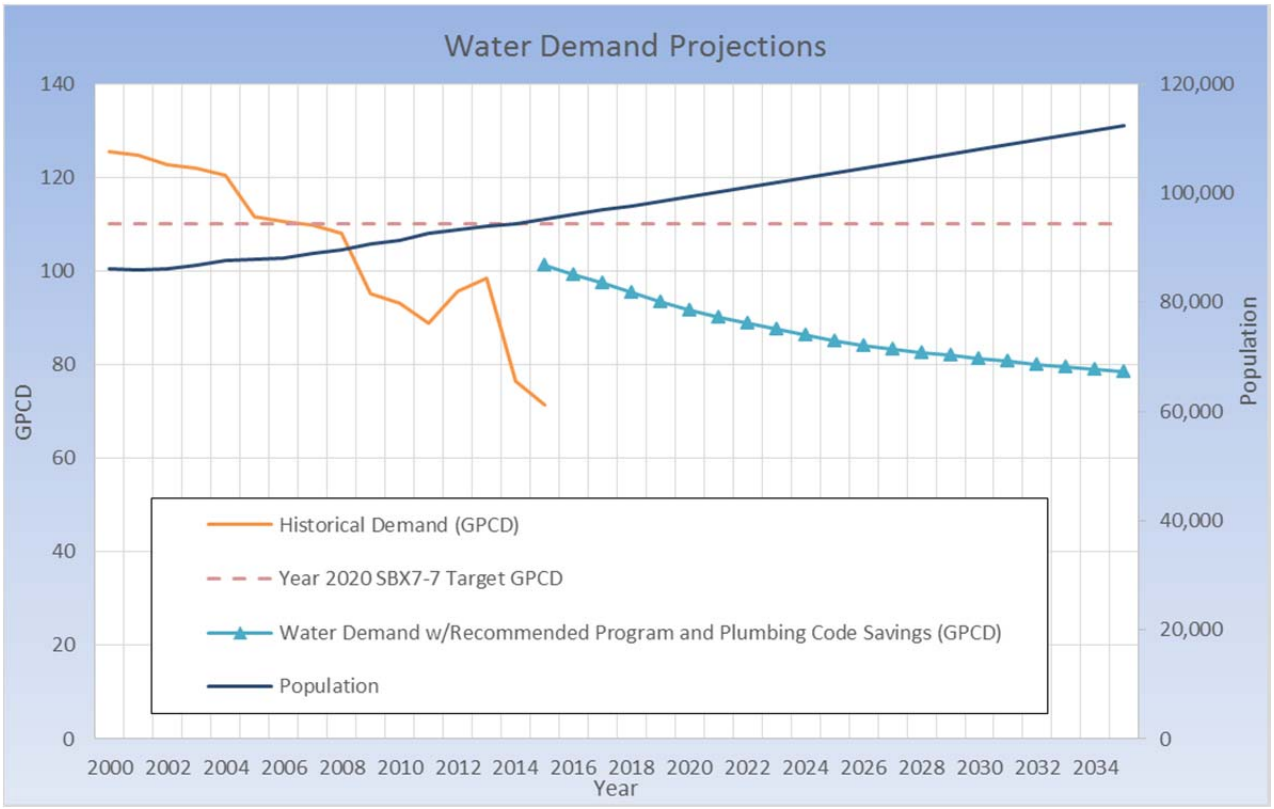
Table 1-4. Projected Population and Per Capita Water Use[1]

	2020	2025	2030	2035
Population [2]	99,403	103,620	107,989	112,390
"Baseline" Demand without Plumbing Code (GPCD)	98	96	95	94
Demand with Plumbing Code (GPCD)	95	91	88	86
Demand with Plumbing Code and Recommended Program (GPCD)	92	85	81	78

[1] City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.
[2] WSAC Final Report, October 2015.

The following figure presents the SB X7-7 year 2020 GPCD target and historical and projected GPCD estimates with plumbing codes and Recommended Program savings. As seen below, the City has already met its state-mandated 2020 target and surpassed its voluntary CUWCC 2018 goal of 101 GPCD. The goal of the City's plan is to press beyond these state targets and instead maximize conservation savings to help meet local resource needs for current and future water demands.

Figure 1-2. Water Conservation Program Savings Normalized Projections – SB X7-7 Target



Notes:

1. Historical values based on actual data and projections are based on normalized future values.
2. Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

The following table presents the benefit-cost analysis summary for the Recommended Program, which includes all the measures listed previously.

Table 1-5. Recommended Program Costs and Savings

Conservation Program	Average Cost of Water Saved ($/MG)	Water Savings over "Baseline" Demand in 2035 (MGY)
Recommended Program with Plumbing Code Savings	4,572	619

Notes:

1. Across the modeling time period of 2015-2035, administrative costs average approximately 22% of total utility costs annually.
2. Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

1.2 Key Findings from the Water Conservation Program Analysis

As a result of this comprehensive analysis, here are some summary observations and conclusions:

1. The additional, incremental water savings from the Recommended Program, compared to the City's recent demand forecast developed by M.Cubed and used by the Water Supply Advisory Committee (WSAC), amount to about 220 million gallons in 2035.
2. The estimated annual demand will decline over time to about 3.2 billion gallons per year (BGY) in 2035, versus about 3.4 BGY estimated in the M.Cubed demand study. That estimate is comparable to the actual

level of water production experienced in the late 1960s, when the service area population was around 50,000. This decrease represents an almost 16% reduction is water use over 20 years.

3. The impact on water savings from 2015 changes in the fixture plumbing codes prompted by the emergency conservation regulations (which would not have been factored in but for the delay associated with the Water Supply Advisory Committee's process) is over 100 million gallons more than previously estimated.
4. The overall cost of water saved by the Recommended Program is about half of what the WSAC set as a recommended threshold.
5. Gross per capita water use is expected to gradually decline to a level of less than 80 GPCD in 2035.

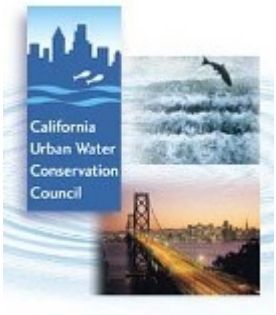
Successful implementation of the Recommended Program will require a significant increase in level of effort on the part of the City. Many new conservation measures will be employed and high participation rates are needed to achieve selected Program goals. Recommendations to assist with implementation include the following next steps:

- Budget an average of $1.1 million per year to cover the estimated cost of implementing this Program.
- Prioritize measures for implementation giving highest priority for implementation to those that contribute the most to meeting peak water saving targets in order to best optimize supply sources.
- Consider working with the largest water using customers in an attempt to reduce water use as described in Section 3.
- Develop a Measure Implementation Plan that describes exactly how each program measure will be implemented.
- Prepare an annual work plan for each plan year as soon as budget is adopted (or in concert with budget planning process).
- Update codes and ordinances, as necessary.
- Form partnerships and apply for grants, where appropriate.
- Contract services, if needed, to gain enough staff support to administer or accelerate implementation of the new program.
- Maintain the City Water Commission and Staff Conservation Working Group to guide the implementation.
- Review and use tools to track water use by customer class and overall water use reductions adjusted for the weather and other external factors.
- Set up a database to store and manage measure participation, cost, and other data to gauge successes and failures and adjust measures as needed.
- Use the tools annually to help decide on priorities for the next plan year.
- Use the DSS Model to annually update the Program, including actual measure participation, projected water savings, and expected per capita water use reductions. This will help to ensure the Program is on track to meet savings goals, including per capita water use targets.

Use the input from the City Water Commission as the forum for ongoing feedback and public input. In addition, utilize the Staff Working Group to update the annual work planning process to amend the plan, budgets, staffing, contracting, schedule, and so forth so as to stay on track.

2. INTRODUCTION

Water is a precious natural resource that is vital to the health and welfare and to the economy of the Central Coast region. The City of Santa Cruz relies entirely on local sources for the community's drinking water supply. Because water supplies are limited, it is important that everyone uses water efficiently. The City of Santa Cruz has had a long-standing commitment to water conservation and offers a variety of programs, informational materials, and incentives to help City water customers become more water-efficient.



In 2000, the City adopted a Water Conservation Plan in order to reduce water demand system-wide by 282 million gallons per year by the year 2010. Residential and commercial customers have saved over 330 million gallons of water per year so far with the help of plumbing fixture and appliance rebate programs, technical assistance, regulations, and other strategies. The City is active in promoting water conservation statewide.

The City of Santa Cruz contracted with MWM in 2013 to develop an updated Water Conservation Master Plan in order to define the next generation of water conservation activities and serve as a roadmap to help the community achieve maximum, practical water use efficiency. The City Council, the City's Water Commission, and the City's Water Supply Alternatives Committee, in its effort aimed at delivering safe, adequate, affordable, and environmentally sustainable water, has identified strengthening water conservation efforts as a top priority.

2.1 Overview of City of Santa Cruz Water System and Need for Conservation

The City faces a projected worst year gap between peak season available supply and demand during an extended drought of about 1.2 billion gallons (WSAC, October 2015). This shortfall is due to the following factors:

- 95% of the City's water supplies are collected from surface water sources.
- The City is physically and geographically isolated from other public water systems.
- The City is currently vulnerable to water shortage in extended dry and critically dry years.
- Expected requirements for fish flow releases to protect threatened and endangered species and anticipated impacts of climate change will further reduce available water supply.
- There is a decline in available groundwater supply.

This WCMP is part of the City's integrated water management approach where the City recognizes water conservation as a responsible management strategy for meeting existing and future water needs. Some of the numerous key potential benefits include:

- Protecting natural resources;
- Stretching existing supply
- Maximizing peak season water savings; and
- Helping downsize or delay costly supply, treatment, and distribution system upgrades.

2.2 Purpose and Scope of Plan

The City of Santa Cruz's Water Conservation Master Plan strives to maximize the community's efficient use of water in the most equitable and cost-effective manner to the extent practical for implementation by City staff.

Key priorities of the WCMP include the following:

- Capitalize on opportunities to meet the future water needs of the Santa Cruz Water Department customers through cost-effective and sustained water conservation and water use efficiency efforts
- Demonstrate environmental stewardship and foster innovative, responsible and efficient practices
- Commit to and implement a water conservation program that supports the health of rivers, streams, and groundwater integral to the region's quality of life and economy
- Monitor and measure performance to ensure conservation potential is being met as forecasted

Achieving these goals will allow the Water Department to:

- Maintain and exceed the water savings already achieved by the City of Santa Cruz as well as identify the best path to achieve those savings and to monitor commitments to the CUWCC Memorandum of Understanding (MOU) Regarding Urban Water Conservation;
- Maintain a long-term plan for compliance with SB X7-7 to meet the gallons per capita per day (GPCD) target by 2020; and
- Meet the City's integrated water resource management goals to reduce peak season demands.

2.3 Plan Development

In preparation for this project, the City completed a Residential and Commercial Baseline Water Use Survey in May 2013 to assess the current status of plumbing fixtures, appliances, and landscape characteristics present in the City's water service area. The results of this baseline study are summarized in Section 3.4. The full baseline study can be found at the following links:

http://www.cityofsantacruz.com/departments/water/conservation/more-information/water-use-baseline-survey

http://www.cityofsantacruz.com/home/showdocument?id=32326

Work on the Water Conservation Master Plan began with a kick-off meeting in January 2013 and was overseen by the City's Water Commission. Since that time, the Water Commission has developed the goals of the planning effort; identified and selected a suite of potential quantifiable conservation measures for technical analysis; and evaluated system-wide conservation potential through selection of a Recommended Program scenario.

There have been two (2) main phases in the City's planning process, separated by an intervening year that included an in-depth review of the work by the Water Supply Advisory Committee (WSAC). The process followed in preparing the Plan is summarized as follows:

Phase 1: January 2013-October 2014

- Analyzed water use and review City's Baseline Survey for remaining conservation potential
- Identified, screened, and prioritized measures, with significant public input via Water Commission Meetings and workshops

- Least Cost Decision Support System Model (DSS Model) was used to analyze the water savings, benefits, costs for each modeled measure that was selected during the screening process
- Formulated programs, leading to a recommended Program "C" to maximize total annual water savings based on conservation potential
- Presented outcomes to Water Commission on October 6, 2014

WSAC Review: October 2014-September 2015

- At City Council direction, staff and MWM worked with WSAC on integrated planning review. This included the WSAC review of prior Phase 1 analytical results from the DSS Model and seeking to answer additional questions with City and MWM technical assistance.
- Shifted conservation program emphasis to peak season (April-October) water savings rather than maximizing overall higher annual volume and/or more cost-effective water efficiency savings to better address the City's supply-demand gap.
- Prepared and adopted a new econometric-based demand forecast
- Produced recommendations for additional conservation measures to be included in the Final Water Conservation Master Plan

Phase 2: October 2015-December 2016

- Recalibrated model to updated econometric demand forecast and reset planning horizon to 2015-2035
- Incorporated new plumbing code changes based on the State's Emergency Drought Regulations, effective December 1, 2015
- Incorporated input (reviewed existing modeled measures for any adjustments and for additions of new measures) from WSAC process, with focus on peak season demand reduction, completed in workshop format on January 14, 2016 with City Staff
- Formulated the "Recommended Program" into the DSS Model and evaluated results.
- Prepared Technical Memorandum for Water Commission review and approval on April 4, 2016.
- City Council approved the TM on April 12, 2016.
- Final report prepared and posted online January 2017.

2.4 Plan Adoption

The Water Conservation Master Plan, in the Technical Memorandum form approved by City Council in April 2016, was formally adopted as a part of the City's 2015 Urban Water Management Plan on August 23, 2016.

3. ANALYSIS OF HISTORICAL WATER DEMAND

The WCMP process was comprised of four distinct steps: 1) input/analysis of system-wide demand projections to establish demand planning baseline with and without plumbing and building codes; 2) evaluation of system-wide conservation potential; 3) identification and study of potential conservation measures; and 4) deliberation and adoption of preferred long-term conservation program. Each of these steps is described in more detail in the following sections. This section presents a summary of the City's historical demand trends as well as the basis for the demand forecast.

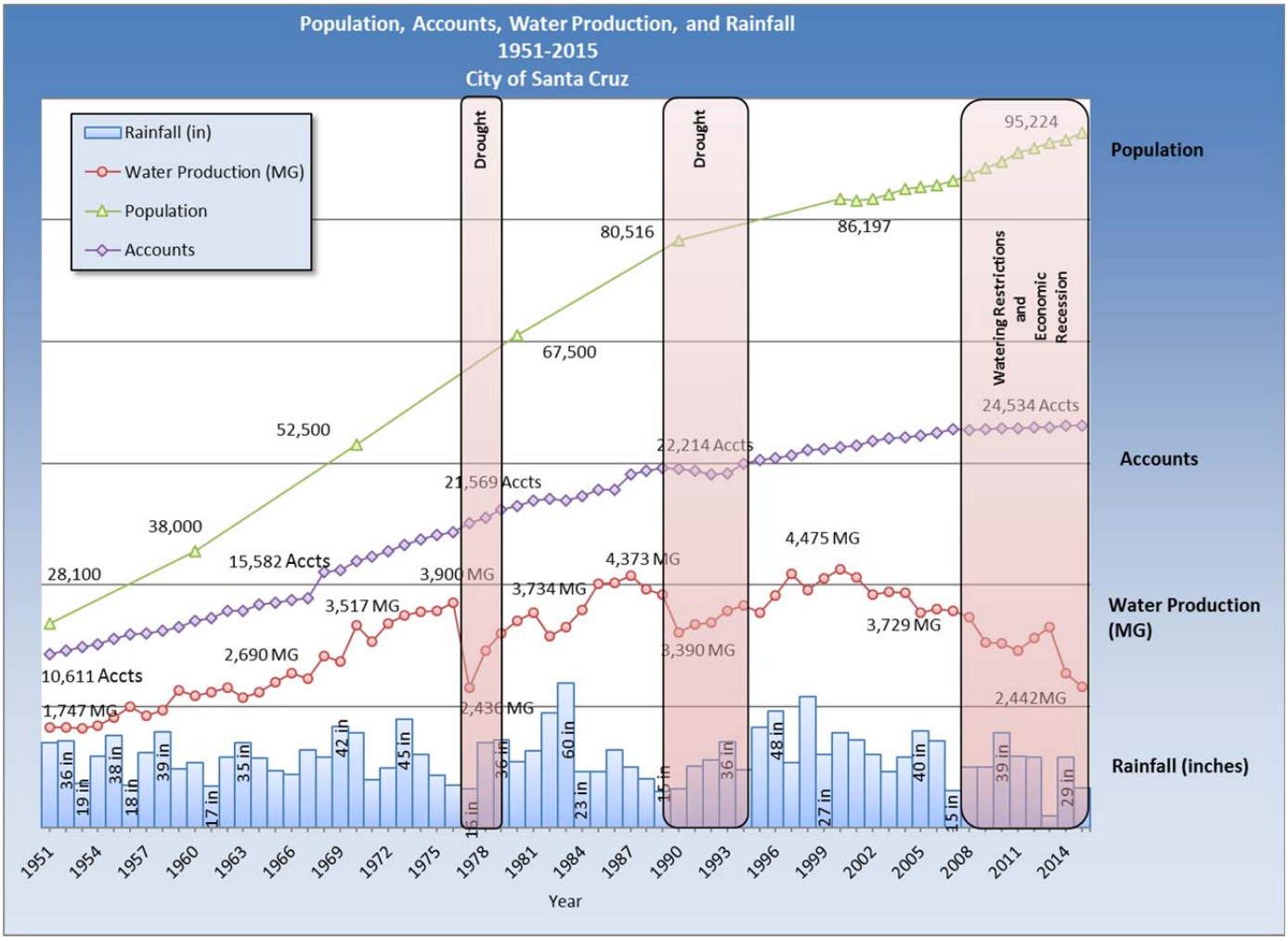
The City's water use patterns were analyzed based on water production and consumption data from City staff; water loss was examined as well. Historical monthly water use data was analyzed. Based on the City's water billing system, residential water use was broken down into single family and multifamily categories. Historical data was segregated into indoor and outdoor water use by customer type using the monthly billing data.

From the billing data, residential per capita water use values were calculated for water use inside the home and outside the home. These values were compared with other sources of municipal water use data applicable to the area. Other nonresidential categories of use were analyzed separately. Average daily commercial/industrial and public water use was expressed on a gallons-per-account or gallons-per-employee basis.

3.1 Historical Trends

As seen in Figure 3-1, the historic trend in system water use from 1950 to 2000 increased over time, consistent with account growth and population growth, except during two major drought periods. Around 2000, the pattern changed and system demand began a long period of decline, accelerated in 2009 by drought, economic downturn, and other influencing factors. The City has not seen a full demand recovery since the recent economic recession due to the ongoing drought. In 2013, system-wide demand was 3,364 million gallons per year, about one billion gallons per year less than the decade before with Stage 1 water shortage regulations and restrictions in effect. In 2014, the City instituted water rationing due to severe drought conditions. In 2015, with the same rationing scheme in place, production declined to 2,442 million gallons, a level not seen since the drought in the 1970s. Water demands are projected to remain depressed after the year 2015 long-term behavioral changes related to water use. While it is prudent to assume that future demands will eventually recover when rainfall patterns/drought conditions and the economy normalize, it might not be to the same level as before due to widespread, long-term conservation measures taken in response to drought and ongoing adjustments in water rates. Nonetheless, system-wide demand has recovered to near pre-drought levels after each of the three droughts of record since 1951. Given the pattern of consistent recovery, it is prudent to assume that future demands will follow suit when rainfall patterns, drought conditions, and the economy normalize.

Figure 3-1. Historical Trends for City of Santa Cruz



Source: City of Santa Cruz, 1951-2015.

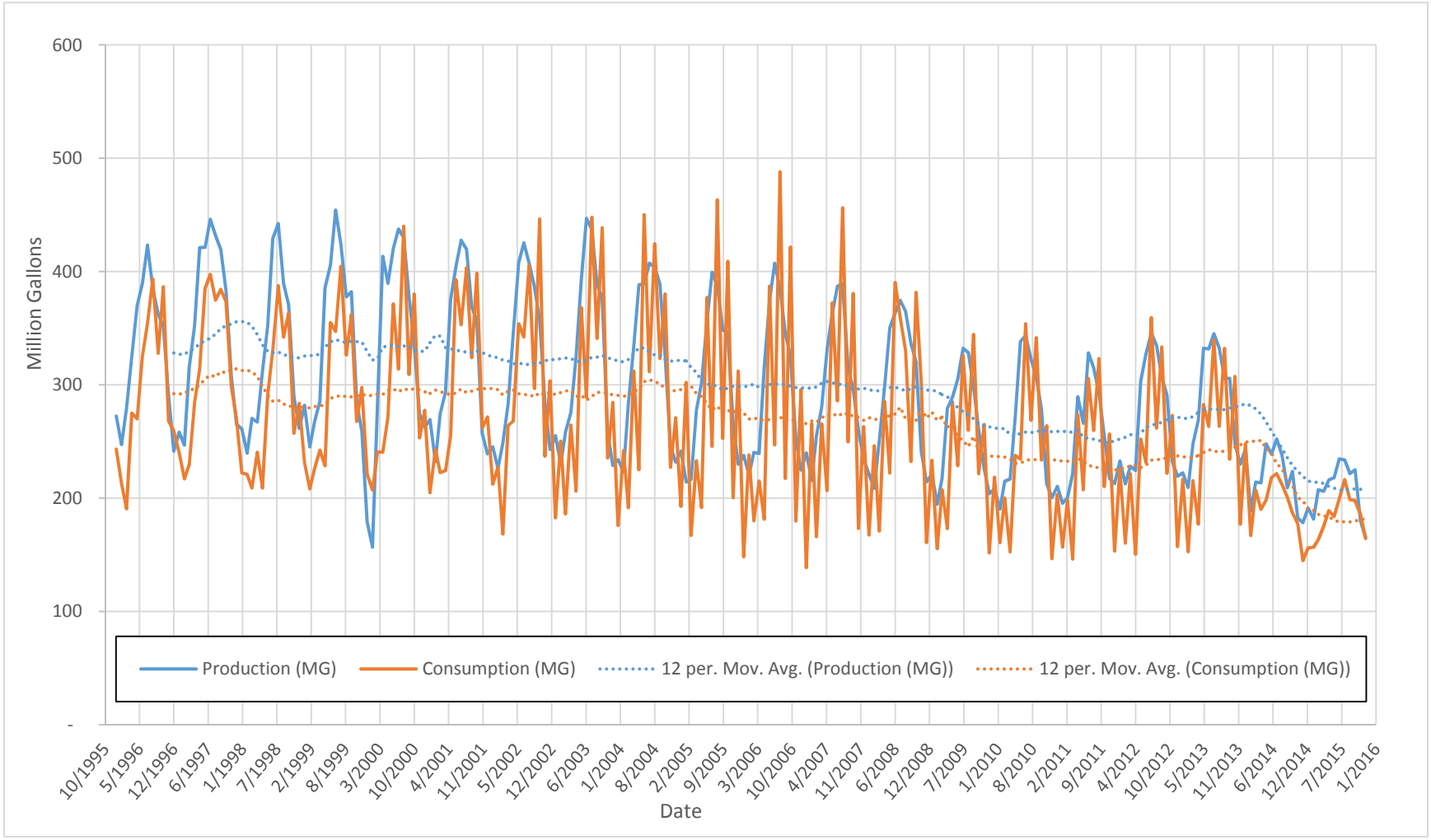
3.2 Production versus Consumption

Historical water production data for the City was analyzed on a monthly basis and shown in Figure 3-2, which illustrates the total production versus total consumption for the City. Water production data was measured at the City's water treatment plants. Water consumption data was measured at the customer meters. As can be seen from the figure, the City does not experience significant losses of water in its system between the sources and the customer.

The difference between the amount of water produced and the amount of water billed is termed the non-revenue water (NRW). The City has elected to use an estimated NRW value of 7.5% in their NRW projection estimates based on past AWWA Water System Audit Reports as presented in Section 4.4.2.

The City is currently preparing a Water Loss Control Program Report completed in 2016. The recommendations produced from this year-long project will be used to guide development of a robust water loss control strategy and will serve as a foundation for completing and reporting future annual water audits to the state beginning in 2017 under the requirements of SB 555 of 2015.

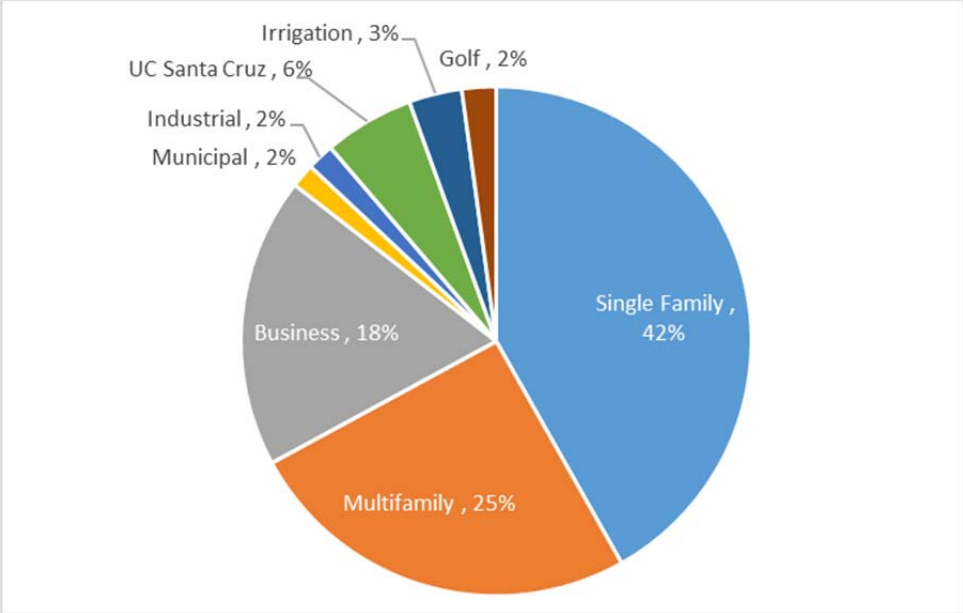
Figure 3-2. Historical Water Production and Consumption



3.3 Consumption by User Category

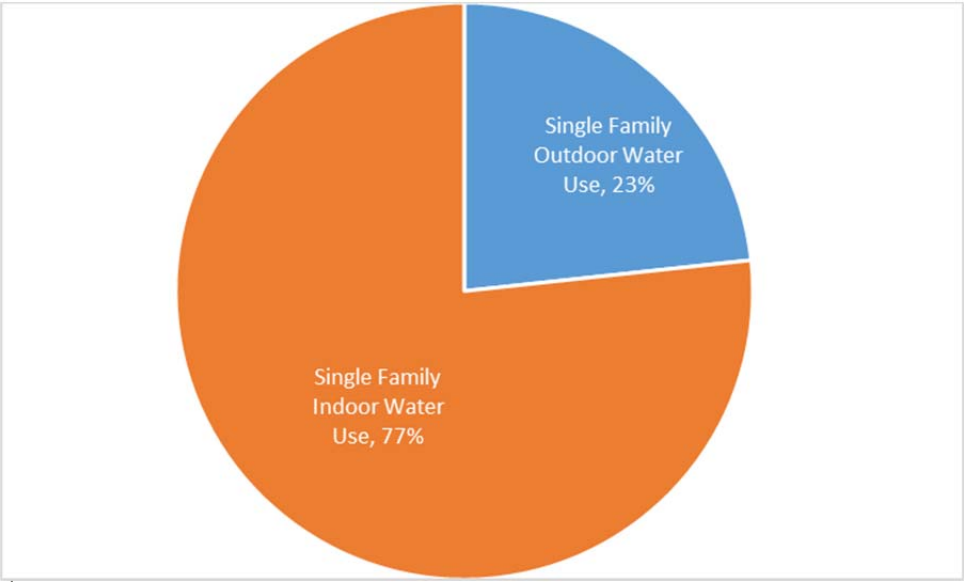
The City has several different types of water users. The current and projected user categories in the City are classified as Single Family, Multifamily, Business, Municipal, Industrial, UC Santa Cruz, Irrigation (including north coast agricultural irrigation), and Golf. The City is a mostly residential community, with some light commercial and industrial. The City is predominately a local services-based economy focused on tourism. The largest category of users of water in the City is the single family residential users who consume about 42% of the water sold. Shown in the following Figure 3-3 is the average annual consumption of the various user categories, based on year 2015 water use and account data for all customer categories.

Figure 3-3. Annual Consumption by User Category



Residential use is approximately 67% of the total annual consumption, typical of a city without significant commercial industrial uses. Since the single family residential use category formed the major portion of the City's water use (42%), it was analyzed further. Figure 3-4 shows the breakdown of single family residential use as indoor and outdoor based on the assumption that indoor use is approximately equal to the minimum use in the winter. Recent rainfall has been below normal, so an average of pre-recession and pre-drought years 2007-2008 as a baseline was selected for this profile as it was evident that there was little, if any, winter watering of landscape in these years. The goal of the analysis by customer sector, shown in the previous Figure 3-3, and the breakdown of indoor and outdoor water use, shown in the following Figure 3-4 were provided to help the water conservation planning staff to design conservation programs and marketing messages to obtain the highest water savings. As seen in Figure 3-4 below, 77% of the average single family water use is indoors.

Figure 3-4. Single Family Residential Water Use: Indoor vs. Outdoor*



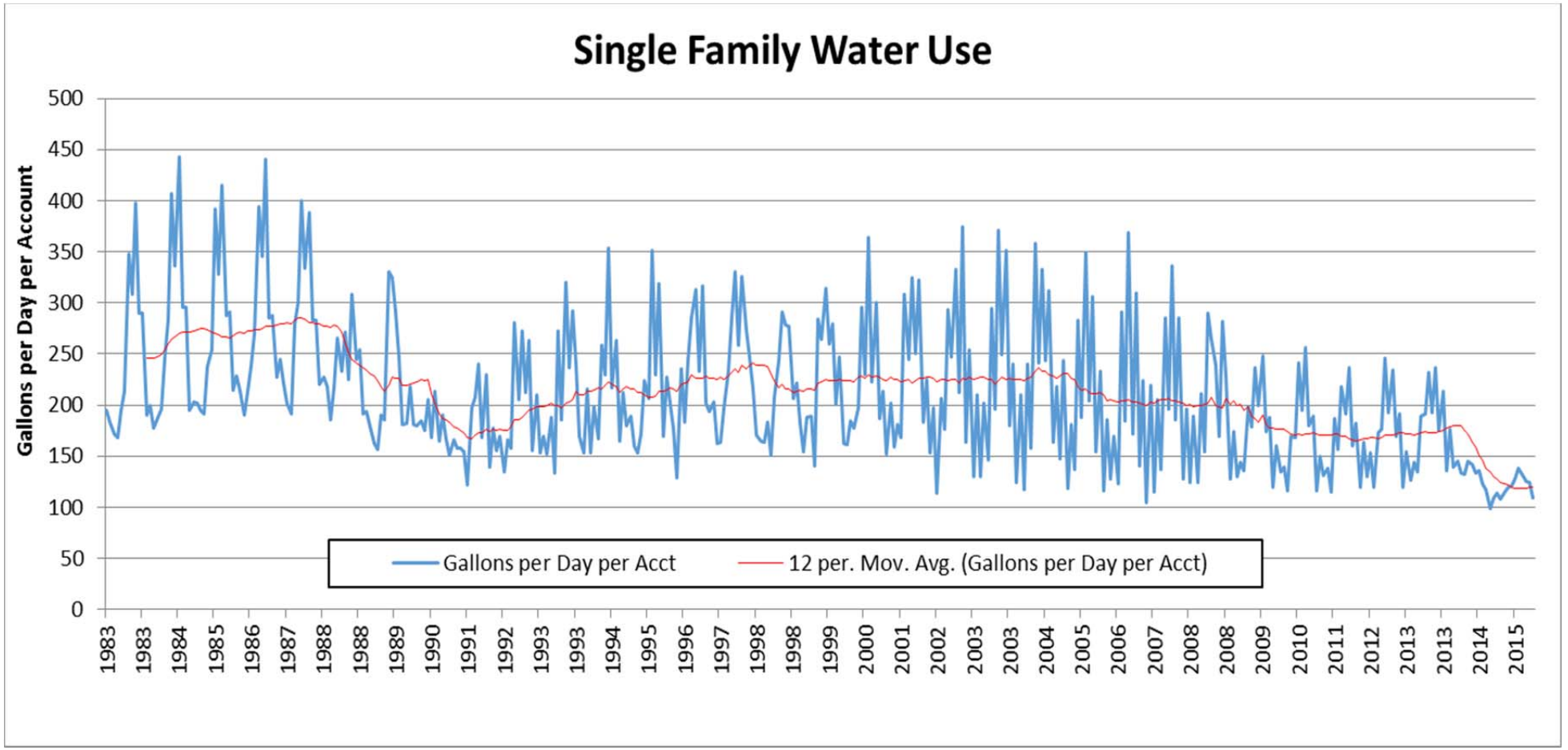
* Average 2007-2008 single family indoor and outdoor water use.

The average monthly usage per account per day for the primary water-user types of customers in the City, including Single Family, Multifamily, Business, and UC Santa Cruz are presented in the following Table 3-1 and Figures 3-5, 3-6, 3-7, and 3-8 along with more information in Appendix B.

Table 3-1. Average Monthly Usage Per Account Per Day

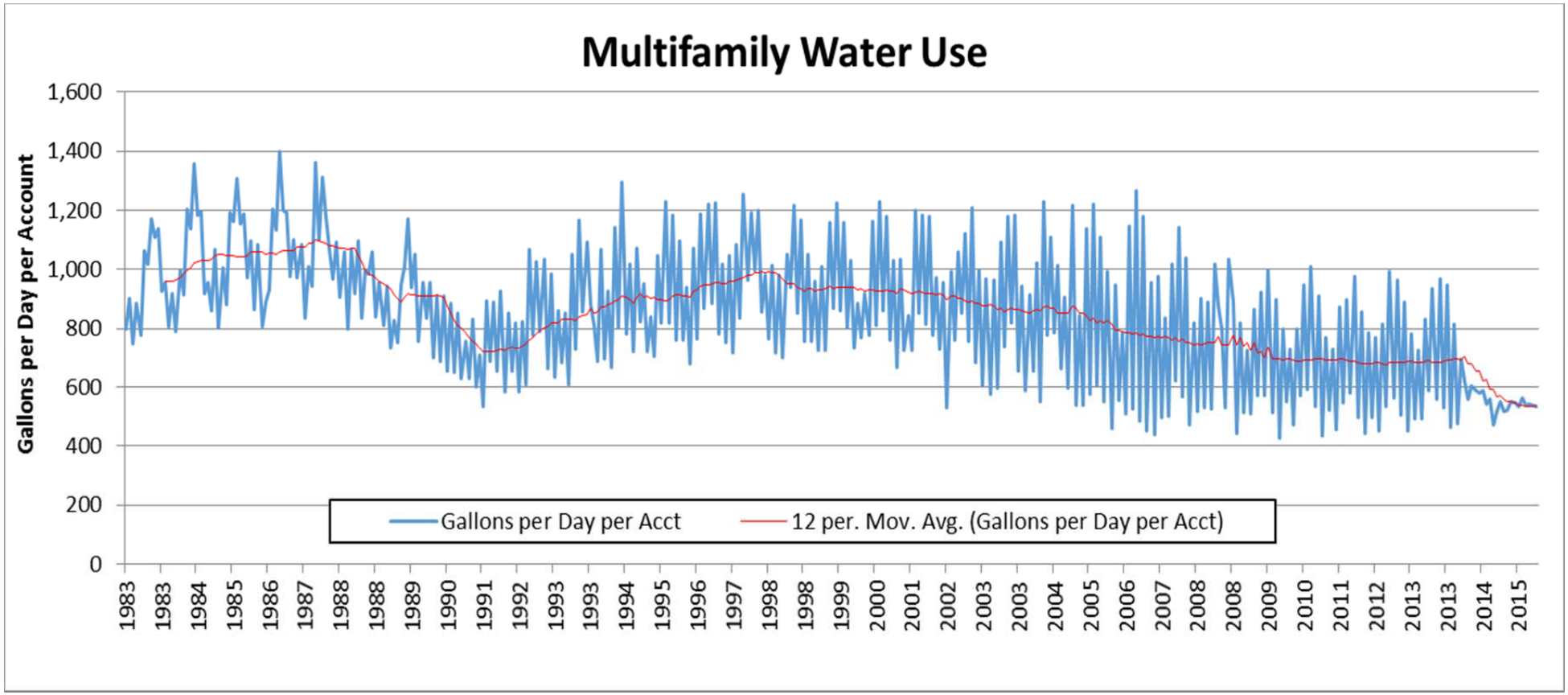
Customer Categories	Indoor Use Percentage	Outdoor Use Percentage
Single Family	77%	23%
Multifamily	88%	22%
Business	83%	17%
Municipal	32%	68%
Industrial	81%	19%
UC Santa Cruz	73%	27%
Irrigation	0%	100%
Golf	0%	100%

Figure 3-5. Single Family Consumption per Account per Day*



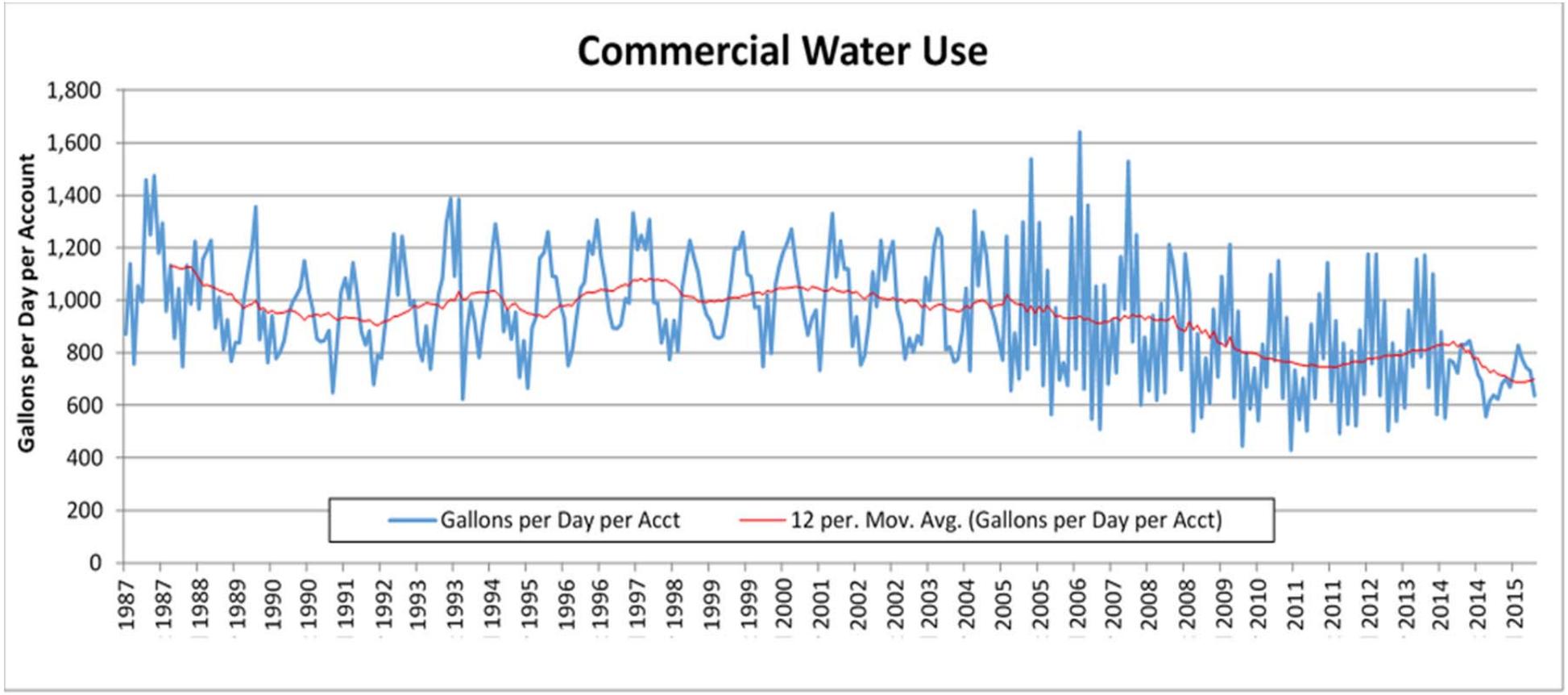
* The City experienced drought years in 1976-77, 1988-1992, and 2009-2015 and economic recession in years 2008-2012.

Figure 3-6. Multifamily Consumption per Account per Day*



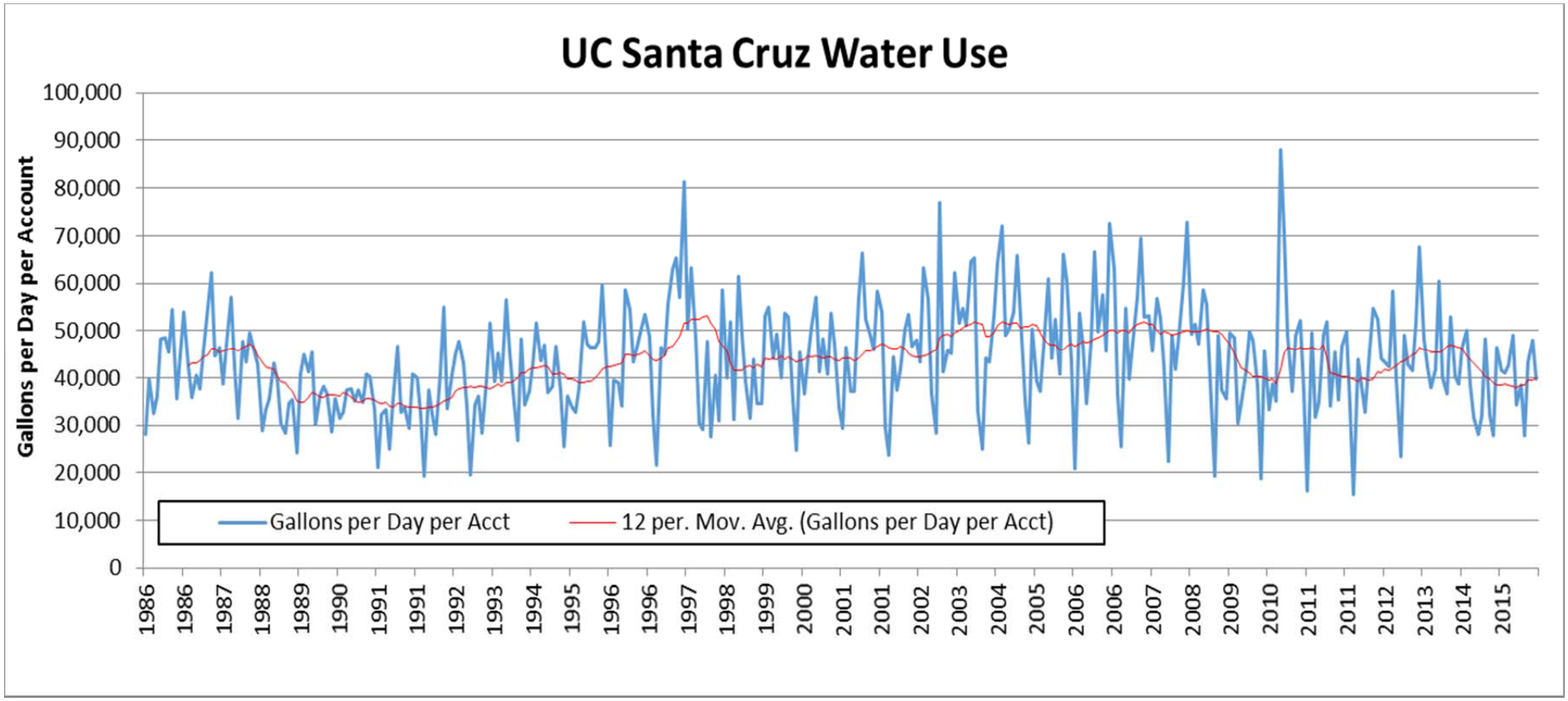
* The City experienced drought years in 1976-77, 1988-1992, and 2009-2015 and economic recession in years 2008-2012.

Figure 3-7. Commercial Consumption per Account per Day*



* The City experienced drought years in 1976-77, 1988-1992, and 2009-2015 and economic recession in years 2008-2012.

Figure 3-8. UC Santa Cruz Consumption per Account per Day*



* The City experienced drought years in 1976-77, 1988-1992, and 2009-2015 and economic recession in years 2008-2012.

Average monthly usage per account per day for the remaining lower water-using four primary types of customers in the City, Industrial, Municipal, Golf, and Irrigation is presented in Appendix B. Several observations can be made when looking at the historical record:

- The City experienced drought years in 1976-77, 1988-1992, and 2009-2015.
- The City experienced a recession in years 2008-2012.
- On January 17, 2014, Governor Edmund G. Brown, Jr. declared a drought state of emergency and directed state officials to take all necessary actions in response. Statewide mandated drought restrictions began in 2014 and are still in effect in the year 2016 at the time this Master Plan update is being written. Therefore, some of the decrease in water use is not actually a true long-term reduction in water use, but only a reflection of the drought restrictions.
- Most of the account growth over time has been in the single family category. Single family accounts have modestly grown 0.2% per year over the last five years. Commercial accounts are also growing slowly at 0.1% per year since 2010. Single family per account water use has decreased over the past five years, most likely due to a combination of the drought, economic recession, and conservation activities. Overall, the community is building out on existing parcels.
- Multifamily water use also has a downward trend, suggesting that newer accounts have been of the smaller size units or have separate irrigation meters and/or conservation programs, which are driving lower per account use.
- Commercial water use also has a gradual downward trend, suggesting shifts in types of commercial uses, smaller new accounts are being added, or commercial accounts are conserving, replacing turf, etc.
- Though the number of irrigation accounts has increased 0.8% per year over the past five years, as shown in Appendix B, irrigation account water use exhibits a significant downward trend due to the current restrictions on outdoor irrigation.

3.4 Baseline Survey Results

In 2011, the City sponsored a survey of its residential and commercial customers called the Residential and Commercial Baseline Water Use Survey Program (Baseline Survey) to develop a picture of the current state of water-using equipment within the service area. The Baseline Survey was designed to cover the City's three largest customer categories and excludes the large University of California Santa Cruz (UCSC) campus located within the service area as well as large landscape customers. Because of its non-comparability to other customers, including the UCSC campus in a random customer survey would have made little sense. Although UCSC is not a part of this study, Santa Cruz Water Department (SCWD) has a close relationship with UCSC and the campus has a water conservation plan in place that was developed specifically for the university, based on the results of a comprehensive campus-wide water audit in 2006/07[1] from which UCSC completed all identified high priority projects in the study. Large landscape customers are also excluded from this study because SCWD already has detailed information and conservation strategies in place for such customers.

[1] University of California Santa Cruz. College Water Efficiency Group, Water Conservation in Student Housing Report, 2012. Online: http://www.allianceforwaterefficiency.org/WorkArea/DownloadAsset.aspx?id=9027

The Baseline Survey was a random survey, statistically valid and designed to meet the following two goals: 1) to estimate the stock of indoor plumbing fixtures and appliances and to determine what percentage of this stock is compliant with the latest efficiency standards; and 2) to determine the prevalence, size, and characteristics of landscapes, irrigation systems, and other outdoor water using features, such as pools and spas. Additional information about the Baseline Survey can be found on the City's website at the following link: http://www.cityofsantacruz.com/home/showdocument?id=32326.

The Baseline Survey was very detailed and rigorous in order to sufficiently benchmark how much fixture replacement had been achieved in various sectors of the community. Some of the Baseline Survey findings are summarized in the following table. The percentage of indoor water using fixtures were used as a starting point (initial proportions) of these fixtures within the City in the determination of the indoor water use profile and the fixture water use plumbing code and standard potential savings. Any retrofit in the drought may shift savings earlier than planned but does not estimate any change in the overall anticipated volume of water savings.

Table 3-2. Baseline Survey Findings

Indoor Water Use Characteristics by Sector - Percentage of Water-Efficient Devices				
	Efficiency Standard	**Single Family**	**Multifamily**	**Commercial**
Toilets	≤1.6 gallons/flush	90%	89%	96%
Showerheads	≤2.5 gallons/min	92%	95%	95%
Bathroom Faucets	≤2.2 gallons/min	90%	89%	Varies
Kitchen Faucets	≤1.8 gallons/min	71%	92%	63%
Clothes Washers	Front loading type	63%	46%	52%

Source: WaterWise Consulting, Inc. (2013), Residential and Commercial Baseline Water Use Survey City of Santa Cruz Water Department.

The landscape surveys provided detailed information about outdoor water uses. Lawn, a high water use plant, was found in only about half of residential properties and just 15% of the business sites (which included schools). For single family homes, less than 1/3 of the total landscape was typically devoted to lawn. Multi-family complexes were found to have about an even mix of lawn and other landscape plants. Other than schools, most commercial properties did not have lawn. Water-efficient drip irrigation was found in 44% of single family homes, 22% of multifamily, and 25% of businesses. These averages provided an overview of typical landscapes. However, survey results showed that landscapes varied a lot between properties in size, planting palette, and irrigation equipment used. This diversity adds an extra challenge when designing outdoor conservation programs and estimating the associated water savings.

3.5 Analysis of Large Users

An analysis was conducted of the City's top-100 water users. These users may be from any customer category. The UCSC campus is the largest user, with various golf courses, businesses, and institutional customers following in terms of annual demand. The businesses include hotels, supermarkets, dialysis centers, and laundromats; the institutional customers include several elementary schools. There are also several large multifamily complexes that are top water users in the City, including many mobile home parks. In addition to their customer account numbers and property addresses, the top users are tracked by customer category and the common name of the property. On average, top-100 users use approximately 20,000 gallons per day per account.

Those users with higher use per day may indicate increased opportunities to save water. One use of this data would be to set a goal of water use reduction through targeted conservation efforts. If the City sets a goal to save 10% of water use, this goal could be achieved by working with these top-100 high water customers and attempting to reduce each account accordingly. Identifying these additional opportunities for conservation may require a more detailed analysis to determine customer-specific opportunities for water savings. The following table presents the percentage of total demand that is used by the top-100 water users.

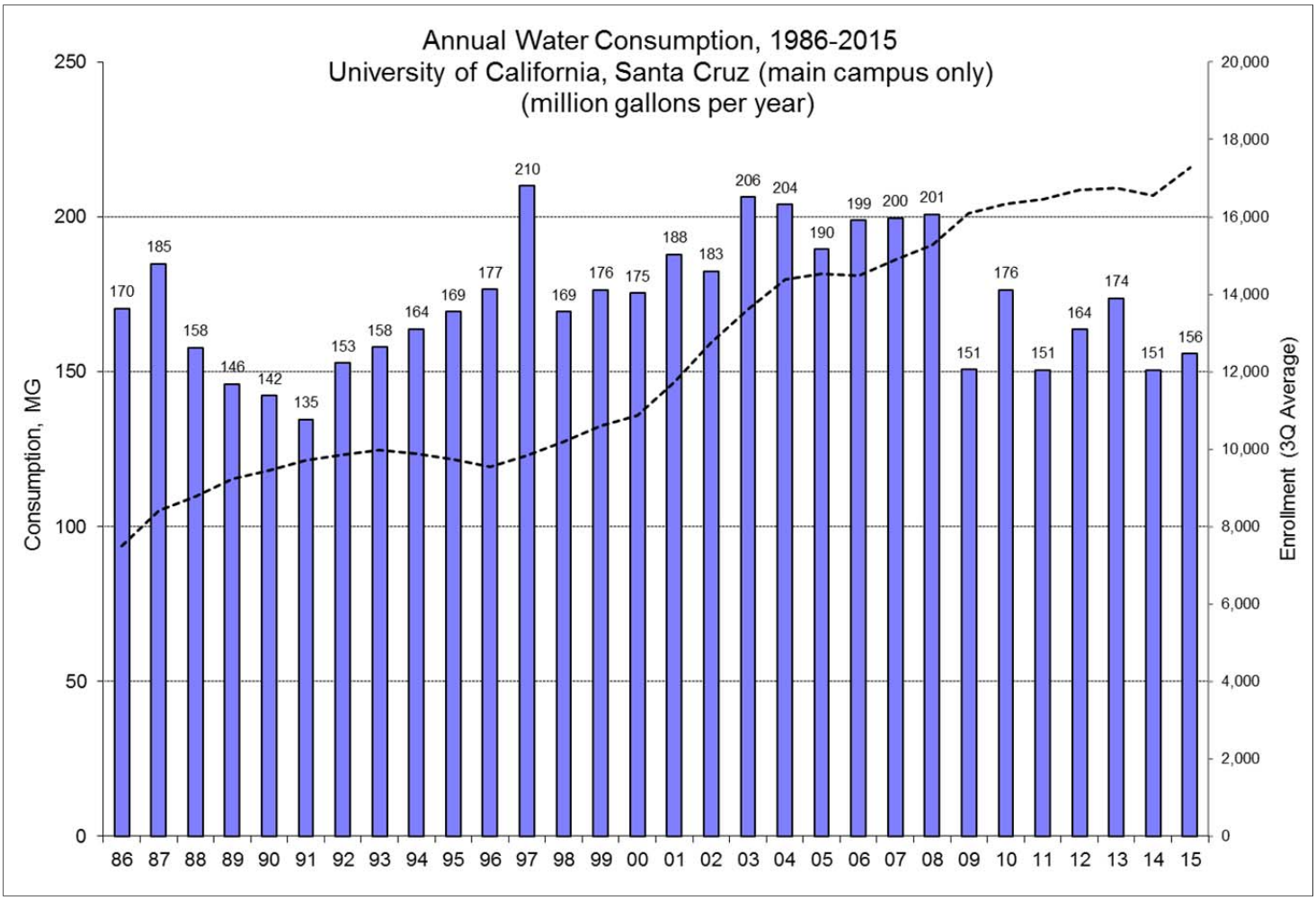
Table 3-3. Top User Demand

Top-100 Large User Demand, MGY[1]	Total CII Demand, MGY[2]	Total Demand, MGY[3]	% Top-100 Large User Use of Total CII Demand	% Top-100 Large User Use of Total Demand
743	853	2,481	87%	30%

[1] Top-100 large user demand for year 2012.
[2] Total CII demand represents year 2015 demand for business, industrial, municipal, UCSC, irrigation, and golf accounts.
[3] Total demand represents year 2015 total City water use (or production) including non-revenue water. The 2015 annual customer category consumption was approximately 2,229 MG.

The following chart presents the UCSC water use and enrollment. Note that despite a doubling in enrollment, annual water use remains relatively steady between 1986 and 2015. In fact, UCSC implemented 19 water saving projects, which reduced water use 15% from 2007 to 2011, based on the above-mentioned Water Conservation in Student Housing Report findings (UCSC, 2012).

Figure 3-9. UCSC Main Campus Annual Water Consumption and Enrollment, 1986-2015



3.5.1 Peak Demand Analysis

The composition of the peak water use was analyzed and methods were further brainstormed to reduce peak water use by all customer types and redesign measures or develop new measures to address this issue.

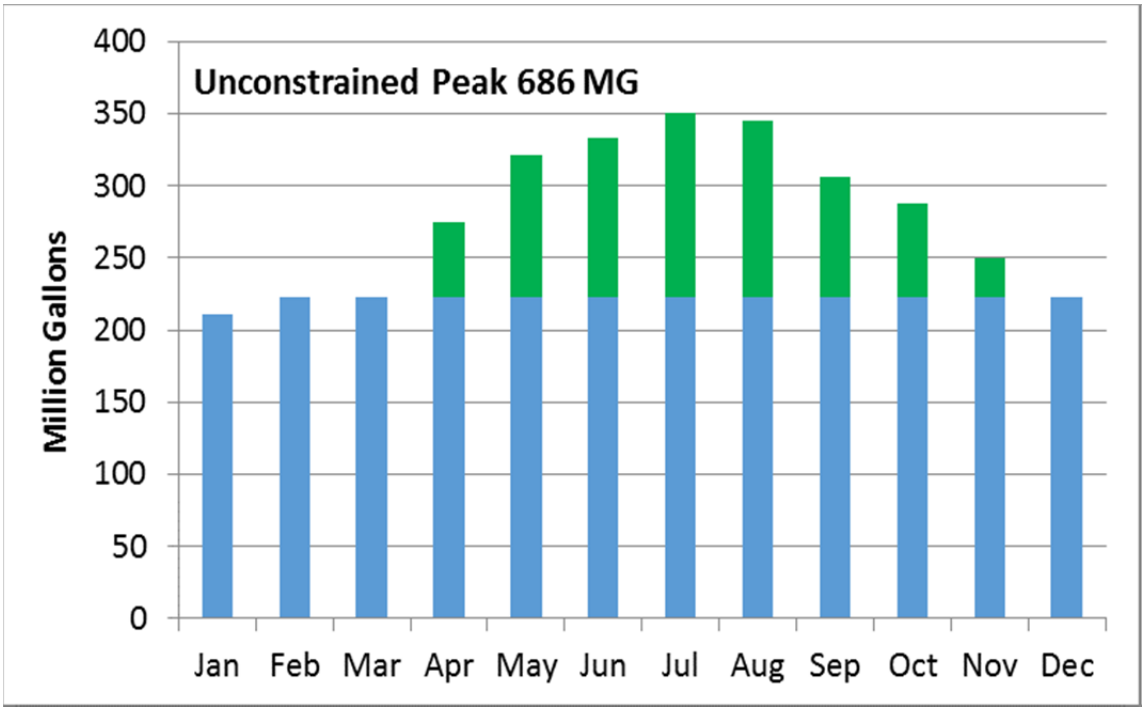
In Santa Cruz, having a pleasant coastal climate, only about 20-25% of the total water use is used for outdoor purposes. Seasonal use is also influenced by tourism, which is primarily in the summer months when visitors enjoy the City's beach lifestyle. In that context, there could be many definitions of what is peak water use, such as:

- Is it the highest water use day of the year? Is it the highest water use month of the year?
- Is it the total water use in the summer?
- Or is it the water use above a baseline of indoor use?

For purposes of this analysis, it was decided to focus on the latter, the total water used for peak use assuming that it is predominately driven by outdoor water demand, principally landscape and turf irrigation. In Santa Cruz, there is measureable outdoor use in the (eight) months of April through November. The highest use month is July, followed closely by August. Most of the nonresidential irrigation water use is separately metered making its quantification easier.

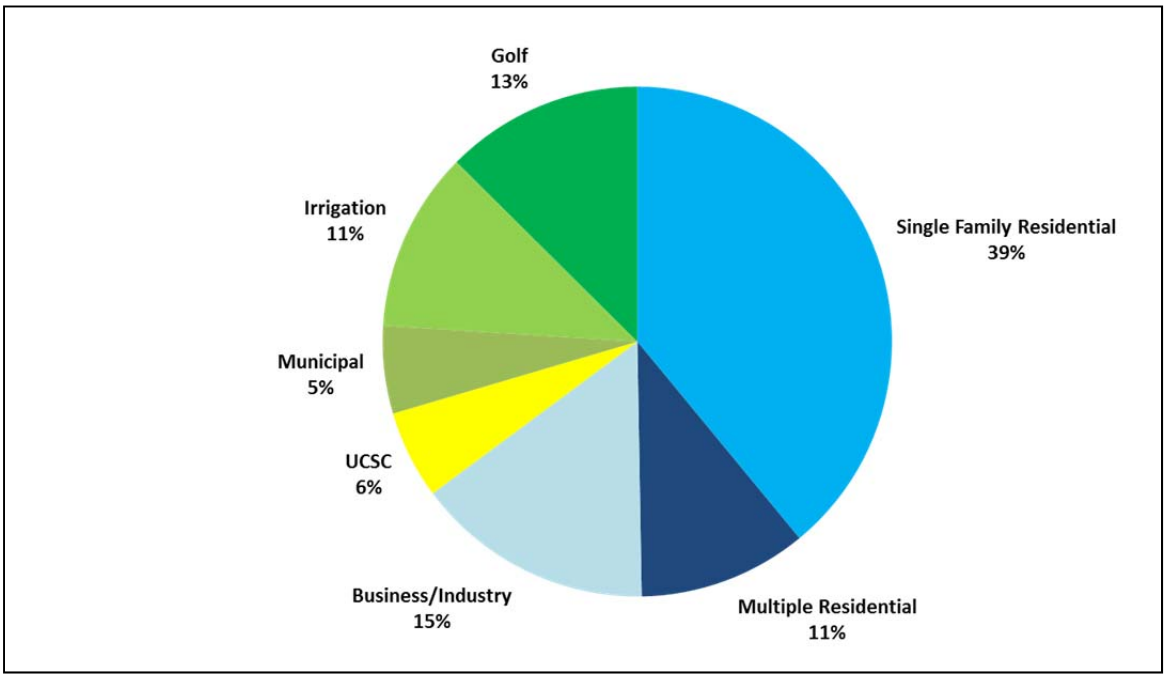
The City's interest is to maximize water savings regardless of whether it is focused on indoor or outdoor use. Due to the nature of how the City uses water, most components of the plan focus on indoor use. Nevertheless, there are some outdoor use reduction components that are useful to the intent of this current assignment of evaluating how best to reduce peak water use. The goal of the peak demand reduction analysis was to define the peak and assess what could be done to reduce it. The following figure presents the City's average monthly consumption for years 2012 and 2013. It is estimated that a total annual non-drought year, post-recession year total annual production would be approximately 3.3 billion gallons (BGY), of which peak water use represents nearly 700 MGY. As this volume is higher than occurred in 2012 or 2013, the monthly volumes shown below were adjusted upwards (about 6%) to reflect the higher annual volume. The green tips on the summer month columns represent the peak.

Figure 3-10. Monthly Consumption



The following figure presents the composition of peak season consumption by customer category for years 2012 and 2013. This is the breakdown of peak water use among the City's customer category who are contributors to peak consumption. Residential use accounts for half of the peak demand.

Figure 3-11. Composition of Peak Season Demand by Customer Category, 2012 & 2013



4. HISTORICAL AND CURRENT WATER CONSERVATION PROGRAMS

The City's past and current conservation efforts can be characterized into the following categories: utility operations programs; public information and education programs; residential; commercial, industrial, and institutional (CII); and landscape. It also includes a category for periodic water shortage management. This section presents a summary of the City's historical and current water conservation efforts.

4.1 Summary of Historical and Current Programs

The City of Santa Cruz has had a long-standing commitment to water conservation and offers a variety of programs, informational materials, and incentives to help City water customers become more water-efficient. Figure 4-1 on the following page presents the Water Conservation Program Timeline as a summary of historical water conservation program activities.

4.2 Overview of Current Program

The City of Santa Cruz has long recognized the importance of conserving water as a responsible water management strategy to help protect the area's natural resources; to stretch existing water supplies; to help downsize and/or delay the need for costly additional water supply, treatment, and distribution upgrades; and to fulfill the City's overall goal of ensuring a safe, reliable, and adequate water supply. In essence, water conservation involves making or inducing changes to many small end uses that individually have minimal effect on overall water use, but that collectively can constitute significant reductions in system demand. The City's Water Conservation section is responsible for promoting efficient water use and implementing management practices that reduce customer demand for water. Its responsibilities and major activities fall into the following four general categories:

Public Awareness and Education: to promote public awareness and education regarding the City's water resources and the importance of water conservation; to provide timely and accurate information to utility customers and the general public about conservation practices and technologies as well as the City's conservation programs and policies.

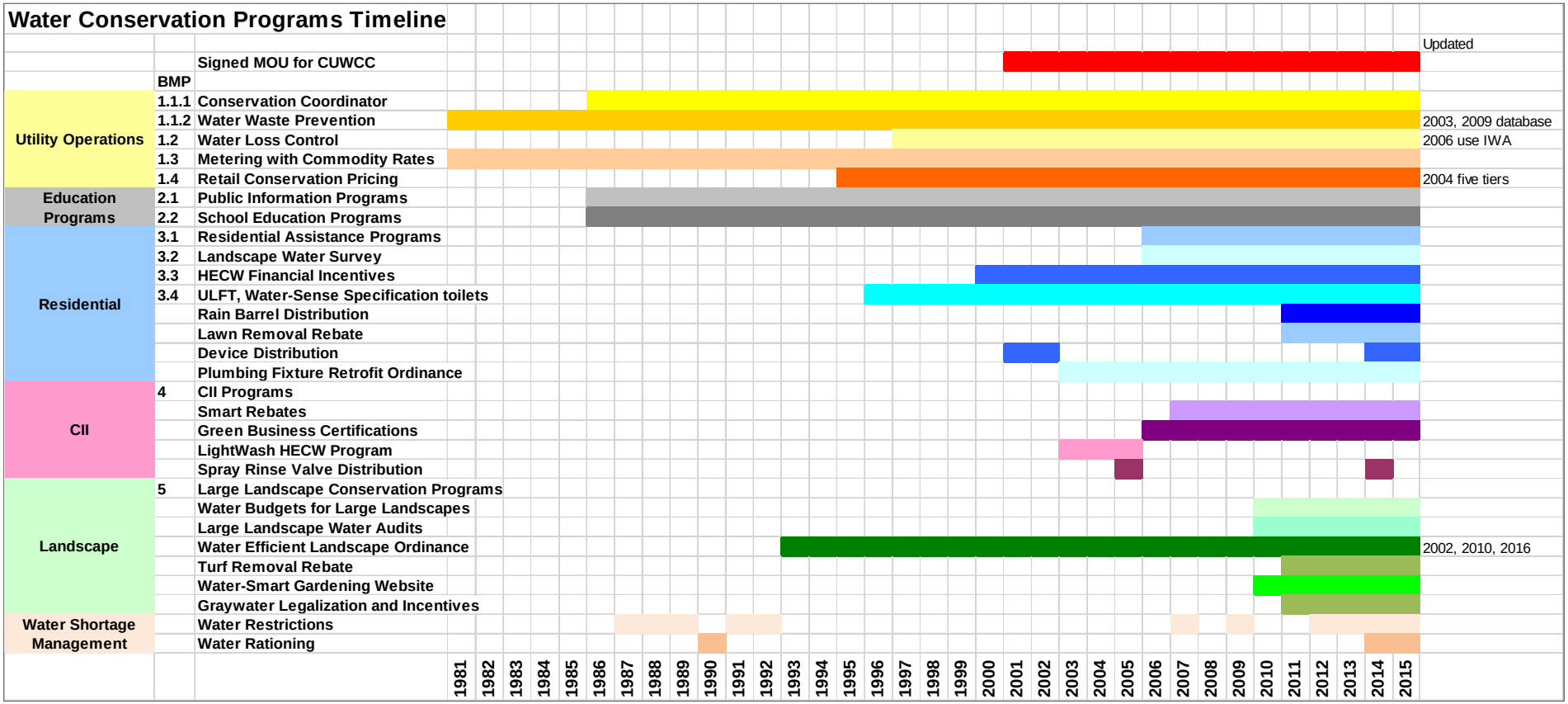
Water Demand Monitoring: to monitor water production, consumption and system water losses; to track weather and population data; to evaluate trends in per capita water use; to track demand associated with new service connections; to compare actual water demand with projected use by customer category; to develop and maintain water demand forecasts for the water service area for use in supply planning.

Long-Term Water Conservation Programs: to develop and implement various conservation projects and programs that result in a sustained reduction in customer water demand; to track water savings from ongoing conservation programs; to evaluate the need for program modifications to improve efficiency, customer service, and water savings in keeping with conservation goals.

Planning and Emergency Management: to periodically update and implement the City's Water Shortage Contingency Plan and the Urban Water Management Plan; to assist in Departmental and City-wide emergency planning and management activities.

Since 2000, the Water Conservation section's priorities and work plan have been guided by two principal documents: 1) MOU Regarding Urban Water Conservation in California; and 2) the Department's previous Long-Term Water Conservation Plan.

Figure 4-1. Water Conservation Program Timeline



In June 2001, the City of Santa Cruz became a signatory to the MOU and joined the CUWCC in promoting water conservation locally and statewide. By becoming a signatory, the City committed to implementing all 14 urban water conservation Best Management Practices (BMPs) contained in the MOU deemed to be locally cost-effective and to periodically report progress made to the CUWCC. Subsequently, the CUWCC MOU was updated in 2008 at which time the 14 BMPs were consolidated down to 5 BMPs.

Effectively, the City's water conservation program addresses every significant end use of water in every major customer sector (residential, commercial, and landscape), with emphasis on measures that: 1) are quantifiable; 2) make a lasting reduction in average daily water use; 3) provide the greatest water savings; 4) are socially acceptable; and 5), have widespread appeal to the City's water customers. The City's water conservation program is funded by a combination of water rates, system development charges, and miscellaneous service fees. Customers also incur expenses in installing various devices and following suggested changes in water use patterns.

The City has created maps to illustrate its efforts for its water use efficiency measures. These maps can be found in Appendix D. The measures are presented in the following sections.

4.3 Recent Accomplishments

Much of the City's recent conservation activity is presented in the 2013 and 2014 CUWCC coverage reports found in Appendix E.

4.4 Utility Operations Programs

This section presents the City's water utility operations programs including the operations practices of a water conservation coordinator and water waste prevention ordinance as well as water loss control, metering, and retail conservation pricing.

4.4.1 Operations Practices

This measure encompasses two elements that the City takes to facilitate conservation program implementation and prevent water waste.

Water Conservation Coordinator

The City of Santa Cruz has employed a full-time water conservation coordinator since 1986. The current Water Conservation Coordinator is responsible for planning, organizing, and directing the operations of the Water Conservation section and for reporting on water conservation implementation.

The Water Conservation Coordinator meets regularly with the Water Director and senior managers to coordinate conservation activities with the administration, engineering, production, distribution, and customer service sections.

The Water Conservation section is staffed with one Environmental Projects Analyst, and two Water Conservation Representatives who operate existing programs and assist with new program development.

Water Waste Prevention

The definition of water waste prevention under the MOU consists of enacting, enforcing, or supporting legislation, regulations, ordinances, or terms of service that prohibit water waste in new development and by existing users, or that facilitate implementation of water shortage response measures.

The City's water conservation ordinance (Santa Cruz Municipal Code 16.02) has been in operation since 1981 and was updated last in 2003. Under the ordinance it is unlawful for any person to use water for any of the following:

- Unauthorized use of water from a fire hydrant,

- Watering of landscaping in a manner, or to an extent, that allows excess water running off the property,
- Once notified, allowing plumbing leaks to go unrepaired,
- Outdoor washing of structures, vehicles, or surfaces without the use of an automatic shut-off nozzle, and
- Operation of a fountain, unless water is recycled.
- Provisions of the ordinance regulating **new development** include prohibitions on the following:
    - The use of water in new ice-making machines and any other new mechanical equipment that utilizes a single pass cooling system to remove and discharge heat to the sanitary sewer
    - Washing of vehicles at a commercial car wash unless the facility utilizes water recycling equipment
    - The use of water for new non-recirculating industrial clothes wash systems
    - The use of potable water for dust control or soil compaction purposes in construction activities where there is a reasonably available source of reclaimed water appropriate for such use

The ordinance is in effect at all times. However, during mandatory water restrictions, violating the water waste ordinance is punishable by a fine levied on the offender's utility bill ranging from $100 up to $500. Under a declared water shortage, field staff actively patrols the water service area to enforce restrictions, including water waste violations, seven days per week.

The Water Conservation Office also encourages the community to report water waste by calling the "leak line", 831-420-LEAK, or sending an email through the City website. Customers may also submit an online form found on the City's website. Staff respond to water waste complaints in a combination of ways including site visits, in-person customer contact, phone, and/or mail correspondence is used to resolve the issue. New software was acquired in 2009 to help document, track, and manage water waste complaints, including the photo evidence of water waste incidents. Since then, the City documented and addressed over 6,000 cases with this software.

In addition, the City has a comprehensive landscape water conservation ordinance (Santa Cruz Municipal Code 16.16) to ensure landscapes and irrigation systems in new and renovated development are designed to avoid runoff, overspray, low-head drainage, and other similar conditions where water flows off site onto adjacent property. Information on the Water Efficient Landscape Ordinance can be found under Landscape Programs.

4.4.2 Water Loss Control

The City's Water Conservation Office has conducted an annual water audit of the City's water distribution system since 1997 using the approach described in the American Water Works Association (AWWA) M36 Manual of Water Supply Practices. The purpose of the audit is to quantify how much water and revenue is lost through physical leaks and apparent losses and to identify steps to minimize system losses and improve the operational efficiency of the water system. As of 2006, the City also uses the water balance approach developed through the International Water Association (IWA), now advocated by AWWA, to better characterize water losses in the distribution system.

Water audit results provide average system water losses as a percent of total water production. Of this amount, included is an estimated amount lost due to physical leakage in the distribution system and another separate portion that is not physically lost but goes uncaptured on the billing system due to sales meter inaccuracies. Results from water audits from 1997 to 2014 showed that on average the City's water loss is approximately 7.5% of total treated water production or 266 mgy. Of this amount, it is estimated that 5-6% (198 mgy) is lost due to physical leakage in the distribution system, also referred to as "real" losses, including leaking service lines, valves, fittings, and water mains. It is estimated that another 1-2% (68 mgy) is not physically lost but goes unreported on the billing system primarily due to sales meter inaccuracies, billing and accounting errors, and other factors. In 2010, the Water Department adopted a new

Meter Testing, Repair, and Replacement Policy that accelerates large meter replacement and should help improve overall meter accuracy.

To address physical leakage, service line repairs, leak repairs, and line replacements occur on an ongoing basis, the City has a multi-year service line replacement program to eliminate all polybutylene service lines, which was a widely used material between the early 1970s and the late 1980s until it was found to be defective. To date, over 6,000 polybutylene service lines on the system have been replaced with copper lines. Although a formal leak detection program is currently not in place, the Water Department uses sonic leak detection equipment to locate and repair leaks in the water system. In addition, the Water Department monitors for leaks on the customer's side of the meter by reviewing exception reports for high meter readings. Customers are notified so they can take appropriate action to repair leaks, even before they receive their water bills. Starting in year 2010, the City's top irrigation customers began receiving Water Use Reports in which customers, property managers, and landscapers can see their irrigation usage, including unexpected spikes due to leaks. Because these reports are sent to vested multiple parties for each property, there is an increased opportunity and incentive to notice and repair outdoor leaks in a timely manner.

In 2015, the City contracted with Water Systems Optimization, Inc. (WSO) to examine the City's water system and operations practices, validate where losses are occurring, evaluate options, and set forth a formal strategy to improve water accountability and reduce lost water. WSO's proposed scope of work is organized into three tasks, involving the following elements:

- Water audit validation, to assess the accuracy of the system input meters and data transfer systems, and to perform a business process review of meter testing, reading, and billing activities;
- Component analysis of real losses, to quantify the volume of different types of leaks and determine the economic level of leakage – the balance between the value of the water that is lost through leakage and the cost of finding and fixing leakage or reducing leakage through pressure management; and
- Water loss control program design, to outline the most cost-effective strategies for reducing both real and apparent losses over time.

The recommendations produced from this year-long study will be used to guide development of a robust water loss control strategy and will serve as a foundation for completing and reporting future annual water audits to the state beginning in 2017 under the requirements of SB 555 of 2015.

4.4.3 Metering with Commodity Rates

All of the City's 24,534 water connections are fully metered with Automated Meter Reading (AMR) technology. Water meters are required for all new service connections. Approximately 15% of all City water meters are now connected with Advanced Metering Infrastructure (AMI) technology, allowing access to hourly meter reads. In addition, a separate, dedicated irrigation meter is required for all new and renovated multifamily and commercial landscape projects with over 5,000 square feet of landscaped area.

All meters are read and billed monthly according to the volume of water consumed. Monthly billing was first instituted inside the City in 2005 mainly to facilitate rising rates for all City utilities, but it also served in aiding in leak detection and allowing for more accurate monitoring of individual account usage and categorical water consumption. Outside City customers were later transitioned to monthly billing in April 2014 to facilitate water rationing.

Water Conservation-Oriented Pricing

The Customer Service section, also referred to as "Santa Cruz Municipal Utilities" provides customer service and handles utility billing for water, sewer, refuse, and recycling services to the residents and businesses of the City of Santa Cruz as well as provides services for water-only to the unincorporated surrounding areas and part of the City of Capitola. The water portion of the City's utility bill consists of three components: 1) a fixed monthly "readiness-to-serve" charge; 2) a

volumetric charge; and 3) for customers residing in elevated pressure zones, an elevation charge. The readiness-to-serve charge varies by meter size and location.

For the volumetric charges, the City has had a multi-block, inclining rate structure in place for single family residential customers since 1995. In 2004, following a comprehensive water rate study, a new, five-tier rate structure was adopted that applies to residential accounts with either one or two dwelling units. This new rate structure was intended to encourage more efficient use by single family residential and two-unit customers during the peak summer season, when the system relies more heavily on reservoir storage to meet daily demands. For all other customers, including multifamily (3 or more dwelling units), business, industrial, municipal, and irrigation customers, water was billed at a uniform rate up until the October 2016 rate changes.

In August 2014, the Santa Cruz City Council adopted an annual 10% water rate increase over the next five years to complete several critical infrastructure projects. These projects included: Phase 3 of the North Coast System pipeline ($10 mil), rehabilitating and replacing six filter basins at the Graham Hill Treatment Plant ($6 mil), converting the Bay Street Reservoir to two modern, 6-million gallon tanks ($25 mil), annually replacing 2-4 miles of aging main, and rehabilitated storage tanks, pumps, and completing the Beltz 12 well project. All utility rates and rate change proposals are established by resolution of the City Council.

The City of Santa Cruz recently developed long-range, 10-year financial plan completed in June 2016 and undertook a 5-year rate study completed in August 2016 to support the Department's ongoing operations and planned capital improvement programs. Capital projects during the first five years will be focused on system rehabilitation and replacement projects. Major investments to implement the Water Supply Augmentation Strategy are anticipated to occur in the second five years of the financial planning horizon. The new rate study was completed in Fall 2016**.** Table 4-1 shows the rate design that was implemented October 2016 in order to meet both conservation pricing and other pricing objectives.

Table 4-1. Recommended Basic Rate Structures for Customer Classes

Customer Category	Basic Rate Structure
Single Family Residential	Keep inclining rates but reduce both tier width and number of tiers
Multi-Family Residential	Change from uniform to tiered rates based on number of dwelling units
Commercial/Municipal/UCSC	Maintain uniform rate structure
Landscape Irrigation	Transition all irrigation accounts to a simple water budget-based rate, as proposed in Section 7 of this plan
North Coast Agriculture	Maintain uniform rate structure

The new, recommended rate structure has changed to a structure that collects about 90% of revenues from volume charges (based on the amount of water used). The prior rate structure in 2015 collected only 65% of revenues from volume charges. Other new changes include:

- Establishing an Infrastructure Reinvestment Fee that will collect the funding needed to support pay-as-you-go capital and debt service costs. The fee would be collected as a separate charge based on water use.
- Establishing a $1.00/CCF surcharge on water use beginning in July 2017 to increase the Department's Rate Stabilization Fund. This fund would be used to mitigate the potential revenue instability associated with the recommended rate structure, and augment revenues in normal years should consumption fall below a level of 2.5 billion gallons per year.

- Retaining the existing Drought Cost Recovery Fees that are triggered by a City Council declared water shortage and would be collected as a fixed charge for the full fiscal year.

The financial plan and new rates are needed to ensure the long-term financial health of the utility, and enable the Water Department to support ongoing operations and maintenance of the water system and make the capital investments required to comply with regulations, rehabilitate and replace aging infrastructure.

4.5 Public Information and School Education Programs

This section presents the City's public information and school education programs.

4.5.1 Public Information

The City of Santa Cruz Water Department actively values and promotes public awareness and education about the City's water resources and the importance of water conservation. The City of Santa Cruz disseminates information to the general public in different forms including: media, workshops and community events, billing and customer service, and school education programs.

The City uses media coverage in order to broadly share information and updates on events, programs, and news to the public in the following ways:

- "SCMU Review", utility newsletter which includes news and information on water conservation topics;
- City of Santa Cruz Water Conservation website/ Water Supply Advisory Committee website;
- Formal water supply outlook published three times a year sharing the water conditions/ supply availability;
- Weekly water conditions webpage;
- Paid advertising in local newspapers;
- Opinion page coverage;
- Marketing and advertising of EPA's "Fix a Leak Week"; and
- Television and radio news interviews and community television programs.

In addition, the City uses workshops and community events to engage and interact with the public by the following:

- Public meetings and speaking events to community organizations, industry and homeowners' associations, and service groups;
- Tabling at local fairs, farmers' markets, and events;
- Participation in regional water forums;
- Participation with other local water agencies in local events and sponsorships of water conservation-related activities;
- Free workshops on irrigation efficiency, new irrigation technologies, and water conservation strategies for the landscape; and
- Financial support to the Green Gardener Program, California Water Awareness Campaign, Water-Smart Gardening Faire, Green Business Program, and the Water Education Foundation.

The City of Santa Cruz also uses a personable approach to public education and outreach through billing and customer service, which includes the following:

- Marketing and distribution of free water conservation devices and literature;
- Marketing of rebates and distribution of rebate applications;
- Bill inserts;
- Field representatives showing customers how to read their meter and check for leaks at their properties;
- Partnership with the Monterey Bay Area Green Business Program;
- Messages and information on customer's bills showing daily consumption and a graph charting monthly consumption for the entire year;
- Water supply tours; and
- Water school (offered to residential and irrigation customers who went over their allotment during rationing).

4.5.2 School Education Programs

The City offers school education activities for students ranging from upper elementary age children up to the University level. Education materials and classes are designed to meet current state education framework requirements and are available to local schools free of charge. The program gives students an opportunity to learn about the City's water supply system, watershed and water conservation. School educational activities include:

- Field trips and ranger presentations at Loch Lomond Reservoir and San Lorenzo River;
- Loch Lomond Trout in the Classroom fish release field trip;
- Distribution of age and grade level appropriate curriculum and educational materials, including a water education booklet specially developed for Santa Cruz County students;
- Classroom presentations; and
- High School Watershed Academy program.

4.6 Residential Programs

Residential water use comprises almost two-thirds of system consumption and therefore is a main focal point of the City's water conservation efforts.

4.6.1 Residential Assistance Programs – Home Indoor and Landscape Water Surveys

The City has been conducting residential home water audits or "surveys" for customers since 2006 with a focus on high water-usage customers. This free service is designed to help residents control their utility costs and reduce water use. A conservation representative sets up the appointment for a specific date and time and spends about an hour and a half at the home. This service is geared toward households with above average water use, whose water use exceeds 14 hundred cubic feet (units) per month or more than 10,000 gallons per month.

The Home Water Survey program is a free service offered to single and multi- family residences and consists of reviewing billing and consumption information, showing how to read a meter and detect leaks, inspecting home plumbing fixtures and offering free showerheads, faucet aerators, and rebate forms. The survey also assesses outdoor water use and needs by checking the irrigation system and timer, and evaluating the landscape area, design, and plants. The City has provided 504 home water surveys since its inception in 2006. The City anticipates that with the new rate increases, participation will increase as customers will need more support in learning how to read their meter, detect leaks, and find ways to conserve at home.

4.6.2 High Efficiency Clothes Washers

Clothes washing is one of the major end uses of water in the residential sector. It is also one with very significant water conservation potential in terms of the opportunity to reduce per capita water use on a long-term basis. Starting in 2000, the City offered a $100 rebate when a resident purchased an Energy Star® labeled high efficiency clothes washer (HECW). In July 2016, the City modified its high efficiency clothes washer rebate as mentioned in the water conservation master plan, by offering a two tiered rebate. The new rebate program offers $100 for any Energy Star® certified clothes washer, and offers an additional $100 for any current Most Efficient Energy Star® clothes washer. Energy Star® clothes washers have water factors of 4.3, whereas the Most Efficient of Energy Star® have an even lower water factor of 3.2 (lower is better). On average, Energy Star® washers use only around 15 gallons per load and about half the total gas and electric energy compared to a standard clothes washer. Since 2000, the City has rebated over 9,000 Energy Star® high efficiency clothes washers.

4.6.3 WaterSense Specification Toilets

Toilets are another area where there is potential for long-term reduction in per capita water use in the residential sector. The City's residential toilet replacement program has two components: 1) a rebate program; and 2) a plumbing fixture retrofit regulation. The City has operated a rebate program to promote the installation of ultra-low-flush or high efficiency toilets in residential accounts since 1995. The program originally featured a $75 rebate as a financial incentive for customers to remove their higher-volume toilets and replace them with 1.6 gallon ultra-low-flush toilets. This $75 rebate was discontinued in 2010. The City's current toilet rebate program offers $150 rebate for toilets meeting Water Sense criteria of 1.28 gallon per flush maximum. Eligibility requirements depend on the flush volume of the toilet that customer is replacing. Older, higher usage toilets of 3.5+ gallons per flush are eligible with the replacement of a high efficiency toilet of 1.28 gpf or lower. Customers who have toilets less than 3.5 gallons per flush must install ultra-high efficiency toilets of 1.0 gallons per flush or less to be eligible. Nearly 14,000 fixtures have been replaced under this program, saving approximately 100 million gallons of water annually.

Additionally, the DWR started a program in 2015 that provides rebates for replacing toilets in single family residences to support California's drought response. The $6 million program budget is expected to support the replacement of 60,000 toilets throughout the state. Up to $100 will be rebated for purchase and installation of one qualified HET (1.28 gallons per flush or less) per household that replaces a less efficient toilet (using more than 1.6 gallons per flush).

4.6.4 Plumbing Retrofit Ordinance – Residential

In 2003, the City adopted a plumbing fixture retrofit ordinance. This regulation requires that all residential, commercial, and industrial properties be retrofitted with low consumption showerheads, toilets, and urinals when real estate is sold. As part of the initial program implementation, the City worked closely with the County of Santa Cruz and the City of Capitola to have similar ordinances passed in these other jurisdictions.

As a result, the retrofit regulation applies uniformly throughout the entire water service area, regardless of jurisdiction. This ordinance implements the City's Long-Term Water Conservation Plan and fulfills the City's obligation under the MOU to carry out a toilet replacement program that is "at least as effective as requiring toilet replacement at time of resale" (CUWCC, 2014).

Under the law, the seller of the property is responsible for retrofitting any older toilets, urinals, and showerheads on the property with low consumption fixtures, and for obtaining a water conservation certificate from the Water Department. There is an option in the ordinance that allows the responsibility for retrofitting to be transferred from the seller to the buyer, if both parties agree. In either case, the City tracks real estate sales and requires every property to be inspected to verify that the plumbing fixtures on the property meet the low consumption standards; toilets flushing no more than 1.28 gallons per flush (1.6 gpf toilets are exempt), showerheads at 2.0 gallons per minute, and urinals flushing at 0.5 gallons per flush. A custom database program was developed by a consultant to manage property sales data on local properties and retrofitting records as well as follow-up enforcement of the ordinance.

Since 2003, the City has processed, inspected, and/or certified 9,523 properties through the plumbing retrofit ordinance. Because the City has had a Plumbing Fixture Retrofit (PFR) Ordinance in place since 2003, it is in compliance with the requirements of SB 407 of 2009.

4.7 Commercial, Industrial, and Institutional (CII) Programs

The City of Santa Cruz Water Department provides water to over 1,900 commercial and industrial accounts within the service area, accounting for 26% of total system water use. Commercial customers are billed for water and sewer service based on the volume of water consumed. Conserving water can lower the cost of doing business by reducing water, sewer, and energy expenses.

4.7.1 Smart Business Rebate Program

The Smart Business Rebate Program was offered as a result of the conclusion of the statewide Smart Rebate program in 2013. The City's Smart Business Rebate Program mirrors the old statewide program by offering businesses rebates for installing water efficient fixtures including:

- High-Efficiency Clothes Washer (Energy Star certified): up to $400
- High-Efficiency Toilet (1.28 gpf or less): up to $200
- High-Efficiency Urinal (.125 gpf or waterless): up to $300

In the Smart Business Rebate Program, 46 businesses have participated and received a total of 97 rebates, saving an estimated 10.2 million gallons per year.

4.7.2 Green Business Certification

The Monterey Bay Area Green Business Program is a partnership of environmental agencies, utilities, and nonprofit organizations, all of which assist, recognize, and promote businesses that volunteer to operate sustainably. To be certified "green," participants must be in compliance with all regulations and meet program standards for conserving water and energy, preventing pollution, and minimizing waste. The City became a participant in the program in 2006. It is coordinated through the City Public Works Department.

Businesses must meet a set of indoor and outdoor water conservation standards as part of achieving their Green Business Certification. All businesses are required to meet basic, mandatory measures (i.e., low consumption fixtures and fittings), as well as a minimum number of elective requirements from several categories (e.g., cleaning, landscape irrigation). Customers are also required to meet additional measures specific to their type of business (i.e., low flow spray rinse valves for restaurants).

The Water Conservation Office has conducted 150 commercial water audits as part of the program, including a diverse list of businesses like auto repair establishments, office buildings, hotels, restaurants, hospitality services, medical facilities, retail outlets, construction companies, churches, landscape contractors, and laundromats.

4.7.3 Plumbing Fixture Retrofit Regulations – Non-Residential

The Plumbing Fixture Retrofit Ordinance's retrofit regulations also apply to commercial and industrial properties, in addition to residential properties. Any older toilets, showerheads, and urinals are required to be replaced with low consumption fixtures and fittings at the time of sale. Although commercial properties do not turn over at the same rate as residential properties, over time this ordinance has triggered the complete retrofit of some of the largest commercial properties in the water service area, including Chaminade Resort & Spa, the Dream Inn, and the University Inn and Conference Center.

4.7.4 Other CII Conservation Programs

The City has operated other commercial water conservation programs in the past which have been completed and are no longer active. Some of these activities include:

- Smart Rinse (2005): kitchen spray valve replacement in restaurants and dining service facilities, coordinated by the City and Ecology Action;
- LightWash (2003-2005): high efficiency clothes washer statewide rebate program for institutional and multifamily customers;
- Distribution of bed linen reuse, towel reuse, drinking water upon request cards to hotels and restaurants;
- CII facility water audits (2006-present); and
- Partnering with UC Santa Cruz to improve the university's water use efficiency.

4.8 Landscape Programs

This section presents the landscape water use efficiency measures available in the City.

4.8.1 Water Efficient Landscape Ordinance

The City of Santa Cruz first adopted an ordinance establishing landscape water conservation regulations for major development projects situated in the City's service area in 1993 (Santa Cruz Municipal Code Chapter 16.16). The ordinance was rewritten in 2001, and revised again in 2010 in response to AB 1881, the Water Conservation in Landscaping Act of 2006. It was adopted to promote efficient water use in landscapes and to help manage water demand when water needs are the highest. Its overall purpose is to ensure that the City's limited water supply is used efficiently and effectively in new landscapes within the City's water service area and to avoid certain landscape and irrigation design aspects that have the potential to result in water waste. The ordinance is currently in the process of a new update in response to April 2015 California Governor's Executive Order B-29-15.

The City's ordinance applies throughout the entire water service area as a condition of receiving water service. Landscape and irrigation plans meeting specific water conservation standards are required as part of the building plan application process for the following projects:

- New commercial, industrial, and public development projects requiring a building permit, land use approval, or new/modified water service
- Existing developments required to re-landscape as part of approval
- Developer-installed residential landscaping equal to or greater than 2,500 square feet
- New single-family and two-unit residential developments (requirements dependent upon parcel size)
- New recreation areas

The ordinance contains provisions for:

- Dedicated irrigation meters for new landscapes or expansion of existing landscapes over 5,000 square feet, except single and two-unit properties;
- Landscape water budget based on 55% (residential) and 45% (non-residential) of reference evapotranspiration;
- Turf, high water use plants and water features are limited to 25% on residential projects (turf not permitted for non-residential);
- Requiring very low to moderate water using plant materials, grouping plants with similar water needs;
- Irrigation design to avoid conditions that lead to runoff and overspray;

- Appropriate irrigation equipment, including requiring weather-based irrigation controllers and flow sensors to maximize water efficiency and detect leaks;
- Soil preparation and mulching;
- Storm water management; and
- Alternative water sources.

Per City Code, a complete landscape plan must be submitted and found to satisfy the standards where applicable before a building permit can be issued. Water Conservation staff reviews the landscape plans for compliance with the ordinance, coordinates plan review with Water Engineering and other City Departments and jurisdictions, and once installed, performs final inspections of the completed landscape. Large projects that underwent the City's landscape plan review process were the Highway 1/17 interchange landscaping, live-work development at 2120 Delaware Avenue, Safeway renovation on Mission Street, and Tannery Arts complex on River Street.

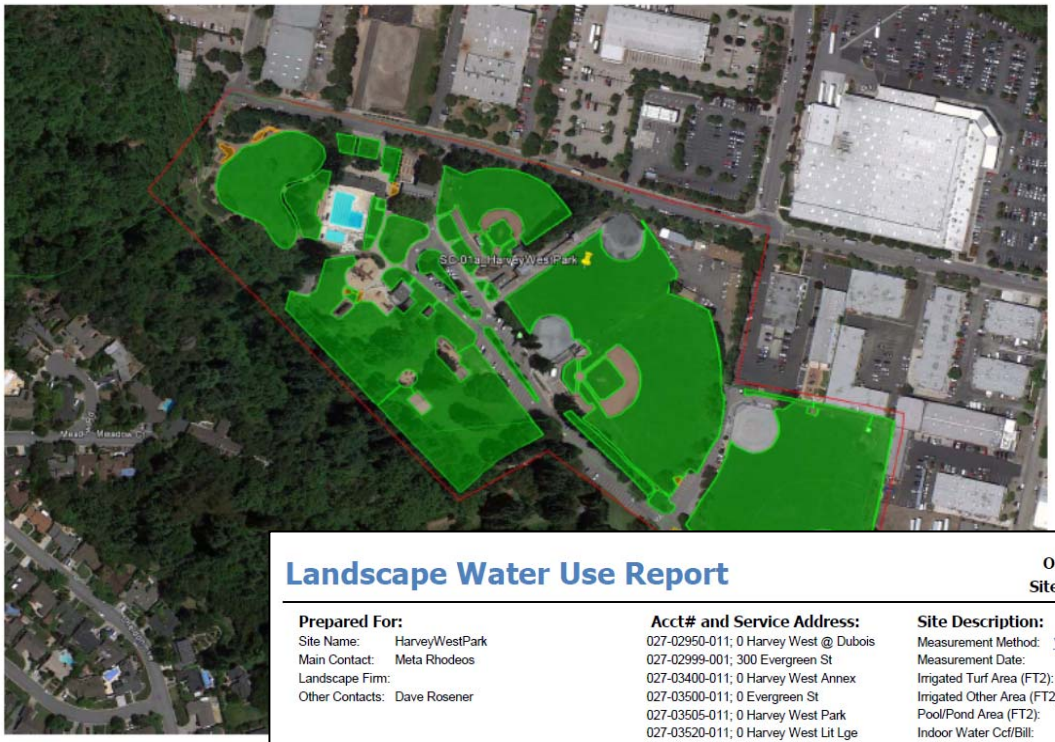
4.8.2 Large Landscape Water Budgets

In July, 2010, the City launched a new program for customers with large landscapes and dedicated irrigation accounts. After converting all dedicated irrigation accounts to monthly meter reading, the City contracted with a consultant, Waterfluence LLC, to map landscape areas using aerial imagery, to develop irrigation budgets for the City's 110 largest irrigation customers, and to distribute the information through monthly Landscape Water Use Reports. Since then the program has expanded its participation to 230 sites representing 426 acres or 18.5 million square feet of irrigated area and over 250 million gallons per year of water. For each site, Waterfluence provides a site-specific irrigation budget based on landscape size and plantings, type of irrigation, and real-time local weather conditions that is obtained from the CIMIS station located at the DeLaveaga golf course. Customers receive monthly reports via mail or email comparing their actual consumption to the irrigation budget over a 1-3-year long period. A 2013 program assessment showed annual savings equal to about 15 million gallons per year. With these accounts being rationed the last two years, however, water use at large landscape sites was temporarily reduced by more than 130 million gallons in 2015. Further evaluation is needed in the future to better quantify long-term program impact.

In addition to receiving monthly reports, participants in the program are also eligible for a professional irrigation audit performed by Waterfluence. The audits include an assessment of irrigation efficiency, notation of irrigation issues (scheduling, tilted nozzles, leaks, breaks, pressure, overspray etc.), and a confirmation of the landscape area measurements. Customers receive a detailed report with site photos noting irrigation problems, a sprinkler condition analysis, cost-effective recommendations, scheduling suggestions, and a list of water management essentials (see Figure 4-2 below for example).

In preparation for the new rate changes in October 2016, Waterfluence mapped all irrigation sites that used above 10 CCF during 2015 and enrolled customers that used over 100 CCF into the Waterfluence program. These included city and county parks, schools, commercial properties, homeowner association golf courses, churches, and cemeteries. For customers using 10 CCF or below for 2015, the City assigned a generic budget for those accounts. Together, outdoor water use at these properties adds up to 265 million gallons per year, almost 10% of the City's total water consumption. In the future, the City anticipates that more of these mapped or noted sites will be enrolled in the Waterfluence program if water usage increases.

Figure 4-2. Landscape Irrigation Surveys and Water Budget Program Success



Landscape Water Use Report

October 2012
SiteID: SC-01a

Prepared For:
Site Name: HarveyWestPark
Main Contact: Meta Rhodeos
Landscape Firm:
Other Contacts: Dave Rosener

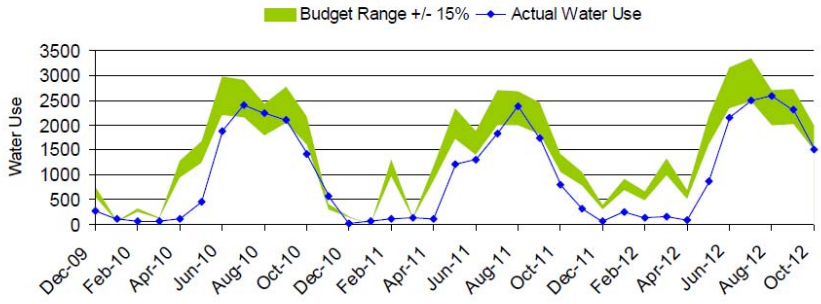
Acct# and Service Address:
027-02950-011; 0 Harvey West @ Dubois
027-02999-001; 300 Evergreen St
027-03400-011; 0 Harvey West Annex
027-03500-011; 0 Evergreen St
027-03505-011; 0 Harvey West Park
027-03520-011; 0 Harvey West Lit Lge

Site Description:
Measurement Method: View Site Map
Measurement Date: 7/10/2012
Irrigated Turf Area (FT2): 576,180
Irrigated Other Area (FT2): 2,889
Pool/Pond Area (FT2): 5,180
Indoor Water Ccf/Bill: 0

CITY OF SANTA CRUZ
HARVEY WEST PARK
809 CENTER ST RM 101
SANTA CRUZ CA 95060-3826

Site Percentile
88
100=top score

Water Use History



Savings Potential	Last Month	Last 12 Months	Last 24 Months	Last 36 Months
Over Water Ccf	0	244	614	805
Over Water %	0%	2%	3%	2%
Dollars Lost $	$0	$975	$2,458	$3,219

Read Date	Actual Water Ccf	Budget Water Ccf	Over Water Ccf	Over Water %	Weather ETo-Rain Inches
10/9/2012	1,502	1,739	0	0%	3.48
9/10/2012	2,317	2,373	0	0%	4.75
8/10/2012	2,592	2,348	244	9%	4.70
7/11/2012	2,486	2,898	0	0%	5.80
6/11/2012	2,158	2,743	0	0%	5.49
5/11/2012	865	1,881	0	0%	3.77
4/11/2012	96	591	0	0%	1.19
3/13/2012	161	1,153	0	0%	2.31
2/10/2012	135	572	0	0%	1.15
1/11/2012	253	799	0	0%	1.60
12/12/2011	74	347	0	0%	0.70
11/10/2011	324	908	0	0%	1.82

Messages

Source: Waterfluence, 2012: http://www.waterfluence.com (last accessed May 31, 2013.

4.8.3 Rain Barrel Program

In winter 2010, the City began offering a subsidized rain barrel distribution program. This program served to educate the community about water conservation for landscapes and stormwater management. In addition, the pilot allowed the City to assess consumer interest and satisfaction with rain water harvesting systems. Initially, the Water Conservation Office purchased two shipments of 65-gallon MOBY rain barrels and made them available at a reduced cost to City water customers. Water Distribution personnel delivered the barrels. Due to popularity, the rain barrel program has been modified. Currently, the Water Conservation Office offers the 50-gallon, 100% recycled plastic Ivy rain barrel at a discounted price of $50.00 that is available for pick up at distribution events located at the City corporation yard. More than 4,000 rain barrels have been sold since then saving about 0.8 mgy.

4.8.4 Turf Removal Rebate

In 2010 the Water Conservation Office began offering a rebate program to promote turf removal to encourage and expand landscape water conservation opportunities for customers and to provide an option for customers seeking to mitigate high utility bills. The rebate offer was originally $0.50 per square foot of lawn removed, up to $500 or 1,000 sq. ft. for single family and $2,500 or 5,000 sq. ft. for multifamily. Prior to the drought, customers must have met the following requirements to qualify:

- Have green lawn that is watered with an in-ground irrigation system
- Remove or cap their overhead spray system in the area to be converted
- Replace lawn with low or very low water use plants and mulch (with or without low volume drip irrigation) or install no-water-use permeable hardscape options
- Agree to pre- and post-inspections to take measurements and ensure eligibility requirements have been met
- Complete the landscape conversion within 120 days of pre-approval

These requirements were later modified due to drought conditions in 2014. In response to rationing, customers allowed their lawns to brown and were more reluctant to planting. Due to these changes, the following eligibility requirements have been modified:

- Lawns do not have to be green to receive the rebate.
- The project does not need to be completed within 180 days or by a deadline. Customers are asked to wait and plant when water conditions return to normal.

In July 2016, the rebate was increased to $1 in order to provide more incentive for customers to convert their lawns. Since 2010, the City has processed 507 lawn rebates for the removal of 496,712 square feet with an estimated water savings of 9.5 mgy.

In 2015, the DWR also implemented turf removal rebate program for single family customers who remove their turf and replace it with low water use landscapes to support California's drought response. Santa Cruz Municipal Utility customers may apply for both the City and State rebate to receive up to $2 per square foot removed. In addition, customers who did not qualify for the City rebate due to lack of pre-site inspection are also encouraged to participate in this program.

4.8.5 Graywater Workshops and Rebate

In 2011, the City amended its Sewer System Ordinance (Santa Cruz Municipal Code Chapter 16.08) to enable graywater systems to be constructed and operated in agreement with the California Plumbing Code. The amended ordinance now

allows residents to legally build a “Laundry-to-Landscape” type graywater system without a permit, and for other types of graywater systems to be developed, consistent with the Plumbing Code, with appropriate permits and oversight. In 2013, the City started offering a Laundry to Landscape rebate of $150 to customers who install a laundry to landscape greywater system and attend a workshop offered by Central Coast Grey Water Alliance. The requirement to attend a workshop is intended to ensure systems are installed in accordance with guidelines listed in the CA plumbing code. Customers also have the option of hiring a licensed greywater laundry to landscape contractor listed by Central Coast Grey Water Alliance. Applicants who reside in the City must also sign and agree to an Installation and Maintenance Agreement through Public Works to qualify for the rebate. Since 2013, the City has rebated 17 Laundry to Landscape graywater systems.

4.9 Other Water Conservation Initiatives

The City has been active in implementing other water conservation measures beyond the BMPs listed in the MOU. These include the previously presented rain barrel and gray water programs. This section presents additional water conservation initiatives conducted by the City.

The Conservation office has been providing free water-saving items to customers in the City of Santa Cruz Water Department service area since 2001. Items that may save water in the home or workplace can be picked up at the Water Conservation Office. Items include the following:

Showerheads. Low-flow, 2.0 gallon per minute showerheads with adjustable flow pattern.

Kitchen Faucet Aerators. Low-flow, 2.2 gallon per minute kitchen aerators with an easy-to-use lever to adjust the flow of water without changing the hot/cold mix. Made of chrome-plated brass.

Bathroom Faucet Aerators. Low-flow, 1.5 gallon per minute aerators made of chrome-plated brass.

Toilet Tank Leak Detection Dye Tablets. Toilets are the most common source of indoor leaks. These non-toxic dye tablets help check toilets for leaks. Drop a tablet into the toilet tank, and wait a few minutes. If blue color appears in toilet bowl, there is a leak.

Garden Hose Shut-Off Nozzles. Multiple spray patterns. Saves water by cutting off hose water that would run if left unattended.

Garden Hose Timer. Manual spring timer has settings from 15 to 120 minutes. Ideal for timing use of hose end sprinklers.

Water-Smart Gardening in Santa Cruz County CD. CD-ROM database featuring information regarding local gardens, plants, and resources to help save water in the garden.

Practical Plumbing Handbook. This booklet gives an overview of preventive maintenance and explains some of the ways residents can conserve water while keeping the home in good condition.

Shower Timer. Five-minute timer, works like an egg-timer. Helps change shower habit, encouraging shorter showers. A suction cup holds plastic timer to shower wall.

Showerhead Control Valve. Control valve used to retrofit existing showerhead to have an adjustable flow pattern.

Water Wise Gardening Literature. Several illustrated booklets on a variety of water saving garden topics.

5. PROJECTED FUTURE WATER DEMANDS WITH AND WITHOUT PLUMBING CODE

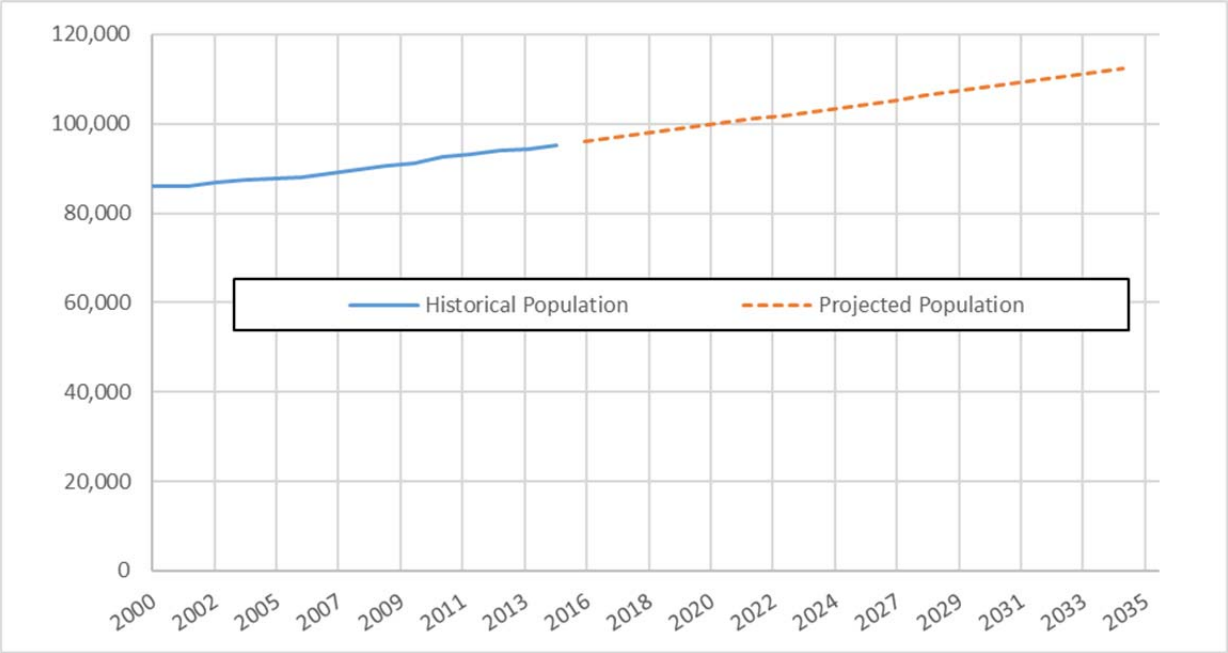
The purpose of this section is to document the demand projections developed for the Program. This section presents:

- Population and account projections;
- Demand methodology overview;
- Basis for Demand Forecast;
- Water use data analysis inputs and key assumptions for the DSS Model; and
- Water demand projections with and without the plumbing code savings through 2035 (this is the demand before incorporating planned water savings from future active conservation efforts).

5.1 Population and Water Account Projections

The main source of population projections used to generate future water demands for the Conservation Master Plan are summarized in the City of Santa Cruz Water Demand Forecast (M.Cubed, 2015). The forecast of service area population is divided into its inside-city and outside-city components. The inside-city component comes directly from the Association of Monterey Bay Area Governments (AMBAG) 2014 Regional Growth Forecast (AMBAG, 2014) and is inclusive of the UCSC population. The outside-city component is derived by Water Department staff using data from the 2014 Regional Growth Forecast. The following figure presents the City's historical and projected population. Historical population values through year 2015 are based on the Department of Finance (DOF) estimates for the City and relevant outside city jurisdictions. Specific year 2000 and 2010 population values are based on the 2010 U.S. Census and Geographic Information System (GIS) analysis. All other things being equal, higher service area population would normally translate to higher water demand over time.

Figure 5-1. Historical and Projected Population



Note: Population projections for the City of Santa Cruz are based on AMBAG projections.

The following table presents the City's projected population.

Table 5-1. Current and Projected Population

Year	Population
2010	91,291
2015	95,251
2020	99,403
2025	103,620
2030	107,989
2035	112,390

Note: Population projections for the City of Santa Cruz are based on AMBAG projections.

The following table presents the City's projected growth in accounts by customer category in five-year increments.

Table 5-2. Current and Projected Accounts by Customer Category

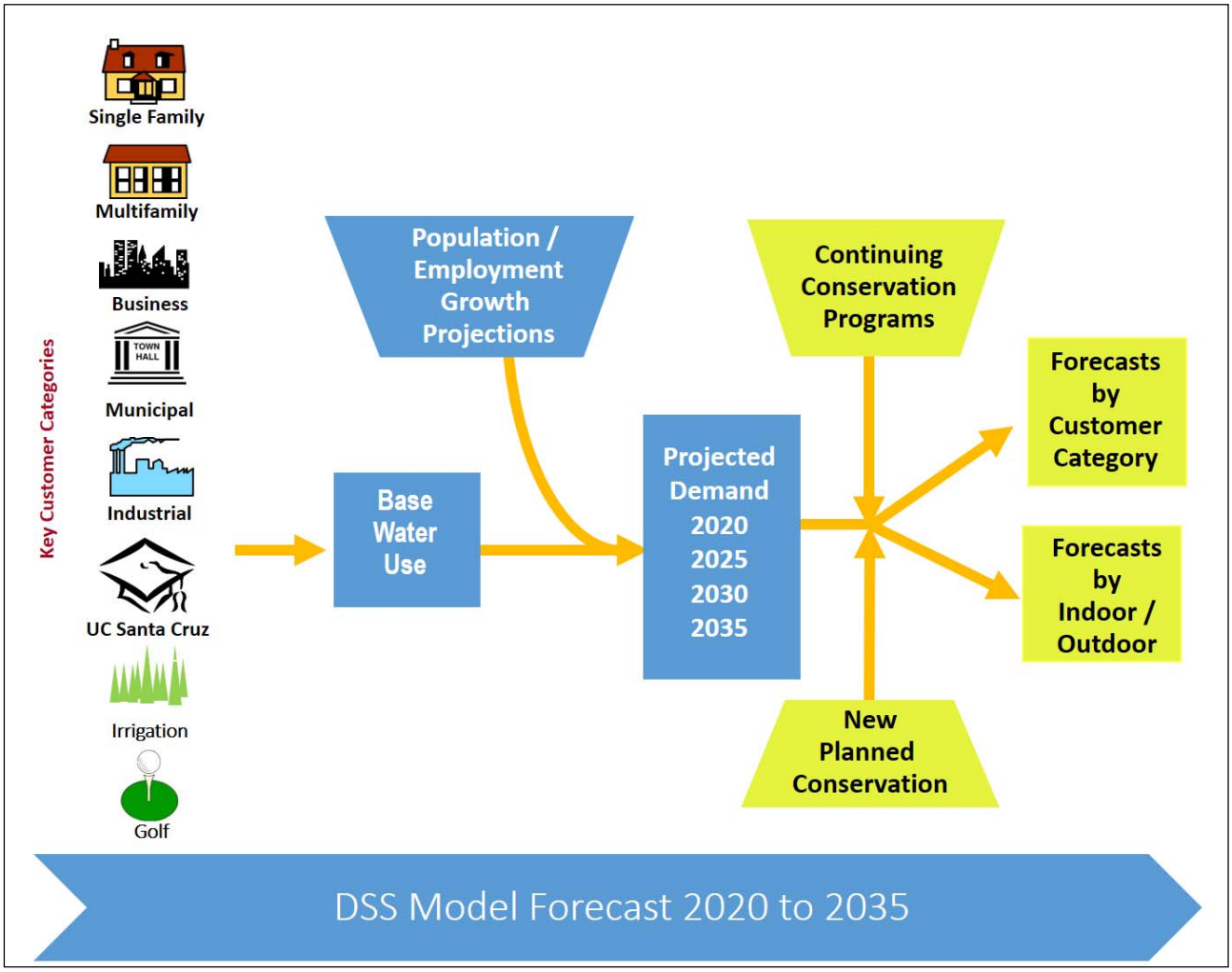
Year	Single Family	Multifamily	Business	Municipal	Industrial	UC Santa Cruz	Irrigation	Golf	Total
2015	19,029	2,745	1,897	312	40	11	460	2	24,496
2020	19,456	2,886	1,948	218	39	12	651	2	25,212
2025	19,854	2,972	1,971	218	41	14	723	2	25,795
2030	20,260	3,122	2,008	218	43	16	845	1	26,514
2035	20,636	3,238	2,055	218	43	18	951	1	27,162

5.2 Demand Methodology Overview

Maddaus Water Management (MWM) employed its Least Cost Planning Decision Support System Model (DSS Model) for the technical analysis. In addition to considering historical demand trends based on billing consumption data, the DSS Model takes into account the following parameters: total population, single family population, multifamily population, UC Santa Cruz population, commercial employment, business-industrial growth, and municipal growth.

As shown in the following figure, the first step for forecasting water demands using the DSS Model was to gather customer category billing data from the City. The next step was to check the model by comparing water use data with available demographic data to characterize water usage for each customer category (single family, multifamily, commercial, municipal, industrial, USCS, irrigation, and golf) in terms of number of users per account and per capita water use. During the model calibration process, data was further analyzed to approximate the indoor/outdoor split by customer category. The indoor/outdoor water usage was also further divided into typical end uses for each customer category. Published data on average per capita indoor water use and average per capita end use was combined with the number of water users to verify that the volume of water allocated to specific end uses in each customer category was consistent with social norms from end-use studies on water use behavior (e.g., for flushes per person per day).

Figure 5-2. DSS Model Flow Diagram



5.2.1 Water Use Data Analysis and Key Inputs to the DSS Model

The demand analysis process includes an investigation of baseline average water use per customer. This analysis includes the following elements:

- *Model Start Year* – This is the starting year for the analysis. For this project, the start year for the model is 2015. The DSS Model includes 20 years of data projecting information until the year 2035.
- *Base Year for Indoor Water Use Factors* – Based on an analysis of historical water billing data, the City selected years that are representative of current water use and used as a base year demand factor for developing future indoor water use projections. An average of 2007 and 2008 was used for all customer categories and was chosen by the City for the following reasons:
  - Note that it is recognized that the years 2009-2011 show a dip in water demand in many areas nationally due to reduction in economic activity.
  - The years selected had relatively "normal" climate conditions (i.e., not a drought or excessively wet year), so no significant weather adjustments were necessary. More recent years (2012-2015) were affected by drought conditions. The water billing or production data shown in Section 3.2 was normalized for this analysis.
  - Section 3.3 presents historical customer category water use graphs. Historical water use was provided by the City, taken from the Department of Water Resources' (DWR's) annual Public Water System Statistics

(PWSS) reports, or taken from previous modeling efforts conducted by MWM. The data was reviewed and confirmed by the City. Units shown are average gallons of water per account per day. These graphs were reviewed to better identify outlier data points and years so that a representative baseline water use value (of average account water use by category) could be determined. The effects of drought, economic recessions, and other influences on water use are typically evident in these figures.

- *Average gal/day/acct* – This is the amount of water in gallons that is used per day, per account.
- *Indoor/outdoor Water Use* – This is the amount of water per account split into the percent that is used indoors and outdoors.
- *Consumption by Customer Class* – This shows the annual amount of water used for an entire calendar year, broken down by customer class (Single Family, Multifamily, Commercial, Irrigation, etc.).
- *Non-Revenue Water (NRW)* – This is the sum of all water input to the system that is not billed (metered and unmetered), including apparent (metering accuracy) and real losses. The values were calculated by taking the difference between the amount of water produced and the amount of water sold.
- *Census Data* – Census data was used as a general reference when determining household sizes for the City.
- *Current Service Area Population* – Year 2015 City population is based on the Department of Finance City of Santa Cruz and relevant jurisdictional estimates. The population forecast of service area population comes directly from the AMBAG 2014 Regional Growth Forecast and the Water Department staff's usage of data from this forecast.

The following table presents the key inputs and assumptions used in the model. The assumptions having the most dramatic effect on future demands were the natural replacement rate of fixtures, how residential or commercial future use is projected, and the percent of estimated non-revenue water. More details on these assumptions, including screenshots of where they are incorporated into the DSS Model, can be found in Appendix C.

Table 5-3. Water Use Data Analysis and DSS Model Key Assumptions

Parameter	Model Input Value, Assumptions, and Key References		
Model Start Year	2015		
Non-Revenue Water in Start Year	7.5%		
	This value can be found in the green Non-Revenue Water section of the DSS Model.		
Population Projection Source	AMBAG 2014 Regional Growth Forecast		
Start Year Water Use Profile			
Customer Categories	**Water Use Distribution**	**Indoor Use %**	**Residential Indoor Water Use (GPCD)**
Single Family	42%	77%	57
Multifamily	25%	88%	54
Business	18%	83%	N/A
Municipal	2%	32%	N/A
Industrial	2%	81%	N/A
UC Santa Cruz	6%	73%	N/A
Irrigation	3%	0%	N/A
Golf	2%	0%	N/A
Total	100%	N/A	N/A
Residential End Uses	City of Santa Cruz Residential and Commercial Baseline Water Use Survey (2013). Key Reference: CA DWR Report "California Single Family Water Use Efficiency Study," (DeOreo, 2011 – Page 28, Figure 3: Comparison of household end-uses) and AWWA Research Foundation (AWWARF) Report "Residential End Uses of Water, Version 2 - 4309" (DeOreo, 2016). Table 2-A. Water Consumption by Water-Using Plumbing Products and Appliances - 1980-2012. PERC Phase 1 Report. Plumbing Efficiency Research Coalition. 2013. http://www.map-testing.com/content/info/menu/perc.html Model Input Values are found in the "End Uses" section of the DSS Model on the "Breakdown" worksheet.		
Non-Residential End Uses, %	City of Santa Cruz Residential and Commercial Baseline Water Use Survey (2013). Key Reference: AWWARF Report "Commercial and Institutional End Uses of Water" (Dziegielewski, 2000 – Appendix D: Details of Commercial and Industrial Assumptions, by End Use). Model Input Values are found in the "End Uses" section of the DSS Model on the "Breakdown" worksheet.		
Efficiency Residential Fixture Current Installation Rates	City of Santa Cruz Residential and Commercial Baseline Water Use Survey (2013). U.S. Census, Housing age by type of dwelling plus natural replacement plus rebate program (if any). Key Reference: California Urban Water Conservation Council Potential Best Management Practice Report "High Efficiency Plumbing Fixtures – Toilets and Urinals" (Koeller, 2005 – Page 42, Table 8 and Table 9: Residential toilet installation rates in California). Key Reference: Consortium for Efficient Energy (www.cee1.org). Model Input Values are found in the "Codes and Standards" green section of the DSS Model by customer category fixtures.		

Parameter	Model Input Value, Assumptions, and Key References
Water Savings for Fixtures, gal/capita/day	Key Reference: AWWARF Report "Residential End Uses of Water, Version 2 - 4309" (DeOreo, 2016). Key Reference: CA DWR Report "California Single Family Water Use Efficiency Study" (DeOreo, 2011 – Page 28, Figure 3: Comparison of household end-uses). WCWCD supplied data on costs and savings; professional judgment was made where no published data was available. Key Reference: California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014. Model Input Values are found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model.
Non-Residential Fixture Efficiency Current Installation Rates	City of Santa Cruz Residential and Commercial Baseline Water Use Survey (2013). Key Reference: 2010 U.S. Census, Housing age by type of dwelling plus natural replacement plus rebate program (if any). Assume commercial establishments built at same rate as housing, plus natural replacement. California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014. Model Input Values are found in the "Codes and Standards" green section of the DSS Model by customer category fixtures.
Residential Frequency of Use Data, Toilets, Showers, Faucets, Washers, Uses/user/day	Key Reference: AWWARF Report "Residential End Uses of Water, Version 2 - 4309" (DeOreo, 2016). Summary values of the report can be found in the following presentation: http://watersmartinnovations.com/documents/pdf/2014/sessions/2014-T-1458.pdf Key Reference: California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014. Key Reference: Alliance for Water Efficiency, The Status of Legislation, Regulation, Codes & Standards on Indoor Plumbing Water Efficiency, January 2016. Model Input Values are found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model and confirmed in each "Service Area Calibration End Use" worksheet by customer category.
Non-Residential Frequency of Use Data, Toilets, Urinals, and Faucets, Uses/user/day	Key References: Estimated based on AWWARF Report "Commercial and Institutional End Uses of Water" (Dziegielewski, 2000 – Appendix D: Details of Commercial and Industrial Assumptions, by End Use). Key Reference: California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014. Based on three studies of office buildings in which the numbers varied from 2.0 to 3.45 toilet flushes per employee per day: Darell Rogers cited in Schultz Communications (1999); Konen Plumbing Engineer (July/August 1986); and Eva Opitz cited in PMCL (1996). Fixture uses over a 5-day work week are prorated to 7 days. Non-residential 0.5 gpm faucet standards per Table 2-A. Water Consumption by Water-Using Plumbing Products and Appliances – 1980-2012. PERC Phase 1 Report. Plumbing Efficiency Research Coalition, 2013. http://www.map-testing.com/content/info/menu/perc.html Model Input Values are found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model and confirmed in each "Service Area Calibration End Use" worksheet by customer category.
Natural Replacement Rate of Fixtures (% per year)	Residential Toilets 2% (1.28 gpf and lower), 3% (1.6 gpf toilets), 4% (3.5 gpf and higher toilets).
	Non-Residential Toilets 2% (1.6 gpf and lower), 3% (3.5 gpf and higher toilets).
	Residential Showers 4% (corresponds to 25-year life of a new fixture).

Parameter	Model Input Value, Assumptions, and Key References
	Residential Clothes Washers 10% (based on 10-year washer life). Key References: "Residential End Uses of Water" (DeOreo, 2016) and "Bern Clothes Washer Study, Final Report" (Oak Ridge National Laboratory, 1998).
	Residential Faucets 10% and Non-Residential Faucets 6.7% (every 15 years). California Energy Commission (CEC) uses an average life of 10 years for faucet accessories (aerators). A similar assumption can be made for public lavatories, though no hard data exists and since CII fixtures are typically replaced less frequently than residential, 15 years is assumed. CEC, Analysis of Standards Proposal for Residential Faucets and Faucet Accessories, a report prepared under CEC's Codes and Standards Enhancement Initiative, Docket #12-AAER-2C, August 6, 2013.
	Model Input Value is found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model.

5.3 Baseline Demand Forecast

In August 2015, M.Cubed conducted an econometric analysis of water demand and developed independent forecasts of class-level customer demands and total system production through 2035. (M.Cubed, 2015) The report was commissioned by the City of Santa Cruz Water Department and the City's Water Supply Advisory Committee. Its purpose was to update the Department's existing demand forecast adopted as part of the 2010 UWMP to reflect current information on water usage and to account for effects of current conservation (using DSS Model Program A), water rates, and other factors expected to impact the future demand for water. With the start of Phase 2, MWM's DSS Model was carefully updated to incorporate this econometric analysis by inputting the regression equations and data sets used by M.Cubed and calibrated to ensure consistency between the two demand forecast models.

The updated DSS model starts with a "baseline" demand forecast, which is not the same forecast as presented by M.Cubed. It differs in that it backs out the earlier estimates for plumbing code savings and the estimated future water saving associated with the City's current water conservation program that were provided by MWM to M.Cubed in 2015 and embedded in that final demand forecast. All other variables, including average water use per account, forecasts of account growth, and economic factors used to forecast water use in the M.Cubed report, were taken directly from that model and used to populate the DSS model.

Table 5-4 below compares the primary water demand forecast presented by M.Cubed without the code savings and program savings that were previously generated from the DSS Model analysis completed in October 2014 compared to the updated DSS "baseline" demand completed in February 2016.

Table 5-4. Comparison of M.Cubed Demand Forecast and DSS "Baseline" Forecast

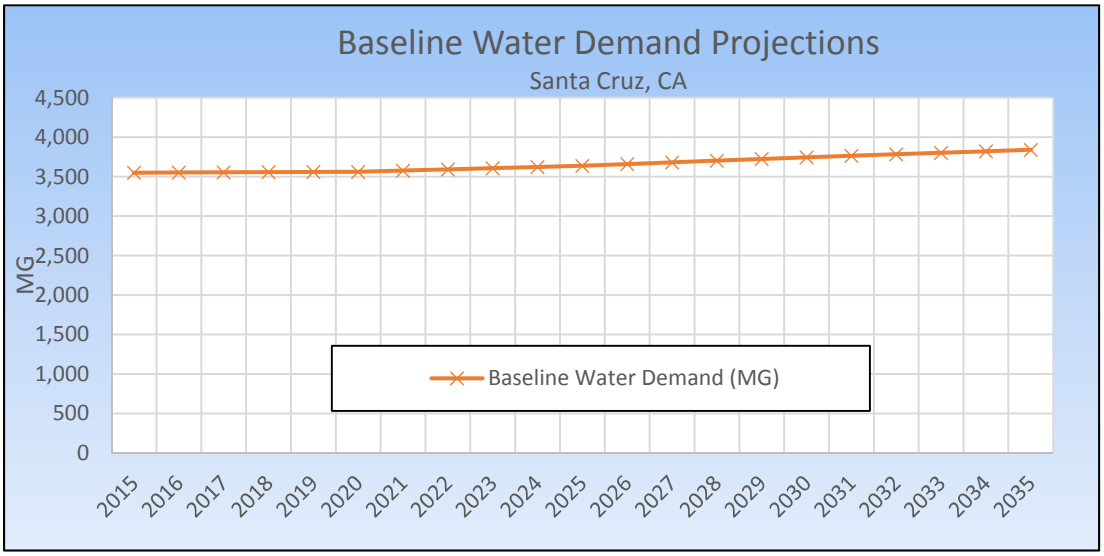
Demand (MG)	2020	2025	2030	2035
M.Cubed Final Demand Forecast, October 2015	3,385	3,351	3,388	3,442
2014 Estimate of Plumbing Code Savings (Prior DSS Model version)	65	132	197	235
M.Cubed Final Demand Forecast without Plumbing Code or Conservation Program Savings	3,560	3,626	3,724	3,811
DSS Model "Baseline" Demand	3,560	3,636	3,743	3,838
Difference, MG	0	10	19	27
Difference, %	0.0%	0.3%	0.5%	0.7%

Note: Plumbing code and program savings: M.Cubed, 2015, Attachment 8, were originally based on results from the DSS Model prior work in 2014 by Maddaus Water Management, which are updated with the most recent DSS Model results from February 2016.

As can be seen in the above table, the two models are in close agreement and in all years differ by less than 1%.

The baseline demand forecast is shown in the following Figure 5-3. As referenced in the M.Cubed report, the baseline forecast is predicated on average weather and normal economic conditions and is not expected to match realized demand, especially in the short term. City staff will continue to monitor production and consumption through and following the drought.

Figure 5-3. Baseline Demand Forecast Without Plumbing Code Savings



Source: City of Santa Cruz. DSS Model, Section: Demand Analysis, Feb 16, 2016.

The next step involves calculating the effect of passive savings against the "baseline" demand described in the following Section 5.4. The results differ from earlier estimates of plumbing code savings presented in 2014-15 for two reasons: 1) lower baseline demand and 2) additional passive savings due to recent changes in California codes resulting from 2015 emergency conservation regulations adopted in California, effective December 1, 2015 (after the publication of the M.Cubed report).

5.4 Water Demand Projections with Plumbing Code Savings

Future community-wide conservation savings will be achieved by implementing both passive and active measures. Passive measures are federal and state codes and standards that increase conservation savings as older appliances and fixtures are replaced naturally over time with more water efficient models. Active measures are those in which the City will invest to promote water conservation, such as incentives and educational programs. As explained previously, the September 2015 M.Cubed baseline forecast was closely matched before the MWM DSS Model applied plumbing code savings.

5.4.1 Basis for Plumbing Code Savings

Since it is beneficial to model the impact of the natural changes in the mix of types of appliances, the DSS Model forecasts service area water demand aggregated at the fixture level. In the codes and standards part of the DSS Model, specific fixture end-use type (point of use fixture or appliance), average water use, and lifetime are compiled. Additionally, state and national plumbing codes and appliance standards for toilets, urinals, showers, and clothes washers are modeled by customer category using the Baseline Survey results as a starting place and projecting future replacements. These fixtures and plumbing codes can be added to, edited, and/or deleted by the user. This yields two demand forecasts – one with and one without plumbing code savings.

Key inputs in the model are fixture water use and life as well as the initial proportions of individual fixtures in each customer class. The following figure presents an example of the initial proportions used in existing single family accounts. Further in this section, Figure 5-4 provides the list of fixtures, average water use, and assumptions for fixture life used in this analysis.

Figure 5-4. Initial Fixture Proportions for Single Family Toilets

Initial Fixture Proportions - Single Family Toilets	
1.28 gpf HET Residential	7.2%
1.6 gpf ULFT Residential	82.7%
High Use Toilet Residential	10.1%
<1.0 gpf Toilet Residential	0.0%
Total	100.0%

Source: Screen shot from the DSS Model.

Data collected from the recently completed City of Santa Cruz Water Use Baseline Survey was used for this purpose. Other input parameters include estimates for annual replacement rate and assumed market share for both replacement and new equipment at various points in the planning horizon.

The scope of analysis involved assessing the rate of change for toilets, shower heads, lavatory and non-lavatory/kitchen faucets, and clothes washers in both existing single family and multifamily accounts; and toilets, urinals, and lavatory and non-lavatory/kitchen faucets in commercial accounts.

Fixture characteristics are also tracked in new accounts, which are subject to the requirements of the 2015 California Green Building Code and 2015 California Code of Regulations Title 20 Appliance Efficiency Regulations adopted by the California Energy Commission on September 1, 2015. This was an update in Phase 2, from the prior work in Phase 1, of preparing the DSS Model.

The controlling law for **toilets** is Assembly Bill (AB) 715. This bill requires high efficiency toilets (1.28 gpf) to be exclusively sold in California as of January 1, 2014. The controlling law for wall-mounted urinals is the 2015 CEC efficiency regulations requiring that ultra-high efficiency pint **urinals** (0.125 gpf) be exclusively sold in California as of January 1, 2016. This is an efficiency progression for urinals from AB 715's requirement of high-efficiency (0.5 gpf) urinals starting in 2014 that was modeled during the WCMP Phase 1.

Standards for **residential clothes washers** fall under the regulations of the U.S. Department of Energy. Even though both front loading and top loading models will still be available for the foreseeable future, national water efficiency standards for both types are becoming more stringent over time. In March 2015, the federal standard reduced the maximum water factor for non-Energy Star® certified top- and front-loading washing machines to 8.4 and 4.7, respectively. In 2018, the maximum water factor for standard top-loading machines will be further reduced to 6.5. Beginning in 2015, the maximum water factor for Energy Star® certified washers has been 4.3 for top-loading machines and 3.7 for front-loading.

Showerhead flow rates are newly regulated under the 2015 California Code of Regulations Title 20 Appliance Efficiency Regulations adopted by the CEC, which requires the exclusive sale in California of 2.0 gpm showerheads at 80 psi as of July 1, 2016 and 1.8 gpm showerheads at 80 psi as of July 1, 2018. The WaterSense specification applies to showerheads that have a maximum flow rate of 2.0 gallons per minute (gpm) or less. This represents a 20% reduction in showerhead flow rate over the current federal standard of 2.5 gpm, as specified by the Energy Policy Act of 1992.

Faucet flow rates have likewise been recently regulated by the 2015 CEC Title 20 regulations. This standard requires that the residential faucets and aerators manufactured on or after July 1, 2016 be exclusively sold in California at 1.2 gpm at 60 psi; and public lavatory and kitchen faucet/aerators sold or offered for sale on or after January 1, 2016 to be 0.5 gpm at 60 psi and 1.8 gpm at 60 psi (with optional temporary flow of 2.2 gpm), respectively. Previously, all faucets had been regulated by the 2010 California Green Building Code at 2.2 gpm at 60 psi.

Plumbing code related water savings are considered reliable, long-term savings and can be counted on over time to help reduce the City's overall system water demand. This assumption of permanent savings is based on when fixtures are replaced at minimum with similarly efficient equipment given fixture efficiency levels are mandated under state law. It does not take into account any reductions efficiency from aging fixtures or hypothetical higher savings from newer technology that will come on the market in the future.

This projection further assumes no active involvement by the City and that the costs of purchasing and installing replacement equipment (as well as new equipment in new construction) are borne solely by the customers, occurring at no direct utility expense. The inverse of the fixture life is the natural replacement rate, expressed as a percent (i.e., 10 years is a rate of 10% per year).

Table 5-5 on the following page presents the list of fixtures, average fixture water use and assumed fixture life use in the DSS model.

Table 5-5. List of Fixtures

Fixture Name	End Use	Average Water Use	Units	Fixture Life (yrs.)
Efficient Front Loader	Clothes Washers	13.0	gal per use	10
Medium Efficient Front Loader	Clothes Washers	19.0	gal per use	10
Top Loader	Clothes Washers	34.0	gal per use	10
0.5 gpm Non-Residential Lavatory Faucet	Lavatory Faucets	0.1	gal per use	15
1.2 gpm Residential Lavatory Faucet	Lavatory Faucets	0.3	gal per use	10
2.2 gpm Residential Lavatory Faucet	Lavatory Faucets	0.6	gal per use	10
2.2 gpm Non-Residential Lavatory Faucet	Lavatory Faucets	0.6	gal per use	15
2.5 gpm Residential Lavatory Faucet	Lavatory Faucets	0.6	gal per use	10
2.5 gpm Non-Residential Lavatory Faucet	Lavatory Faucets	0.6	gal per use	15
>2.5 gpm Residential Lavatory Faucet	Lavatory Faucets	0.9	gal per use	10
>2.5 gpm Non-Residential Lavatory Faucet	Lavatory Faucets	0.9	gal per use	15
1.8 gpm Residential Non-Lavatory/Kitchen Faucet	Non-Lavatory/Kitchen Faucets	1.8	gal per use	10
1.8 gpm Non-Residential Non-Lavatory/Kitchen Faucet	Non-Lavatory/Kitchen Faucets	1.8	gal per use	15
2.2 gpm Residential Non-Lavatory/Kitchen Faucet	Non-Lavatory/Kitchen Faucets	2.2	gal per use	10
2.2 gpm Non-Residential Non-Lavatory/Kitchen Faucet	Non-Lavatory/Kitchen Faucets	2.2	gal per use	15
2.5 gpm Residential Non-Lavatory/Kitchen Faucet	Non-Lavatory/Kitchen Faucets	2.5	gal per use	10
2.5 gpm Non-Residential Non-Lavatory/Kitchen Faucet	Non-Lavatory/Kitchen Faucets	2.5	gal per use	15
>2.5 gpm Residential Non-Lavatory/Kitchen Faucet	Non-Lavatory/Kitchen Faucets	3.5	gal per use	10
>2.5 gpm Non-Residential Non-Lavatory/Kitchen Faucet	Non-Lavatory/Kitchen Faucets	3.5	gal per use	15
High Efficiency 1.5 gpm	Showers	10.4	gal per use	25
High Efficiency 1.8 gpm	Showers	12.5	gal per use	25
High Efficiency 2 gpm	Showers	13.9	gal per use	25
Low Flow 2.5 gpm	Showers	18.3	gal per use	25
High Flow > 3 gpm	Showers	23.5	gal per use	25
<1.0 gpf Toilet Non-Residential	Toilets	1.0	gpf	50
1.28 gpf HET Residential	Toilets	1.3	gpf	50
1.28 gpf HET Non-Residential	Toilets	1.3	gpf	50
1.6 gpf ULFT Residential	Toilets	1.8	gpf	33
1.6 gpf ULFT Non-Residential	Toilets	1.8	gpf	50
High Use Toilet Residential	Toilets	3.5	gpf	25
High Use Toilet Non-Residential	Toilets	3.5	gpf	33
Waterless Urinal	Urinals	0.0	gpf	50
Pint Urinal	Urinals	0.1	gpf	50
Quart Urinals	Urinals	0.3	gpf	50

More information and assumptions about plumbing code and appliance standards can be found in Appendix A.

5.4.2 State Building Code for New Development – 2015 CALGreen

The 2015 CALGreen requirements effect all new development in the State of California after July 1, 2015.[2] The DSS Model includes the CALGreen requirements that effect all new development in the State of California after July 1, 2015. The DSS Model modeled water savings from the CALGreen building code by adding Multi-family and Commercial customer categories as appropriate to applicable conservation measures.

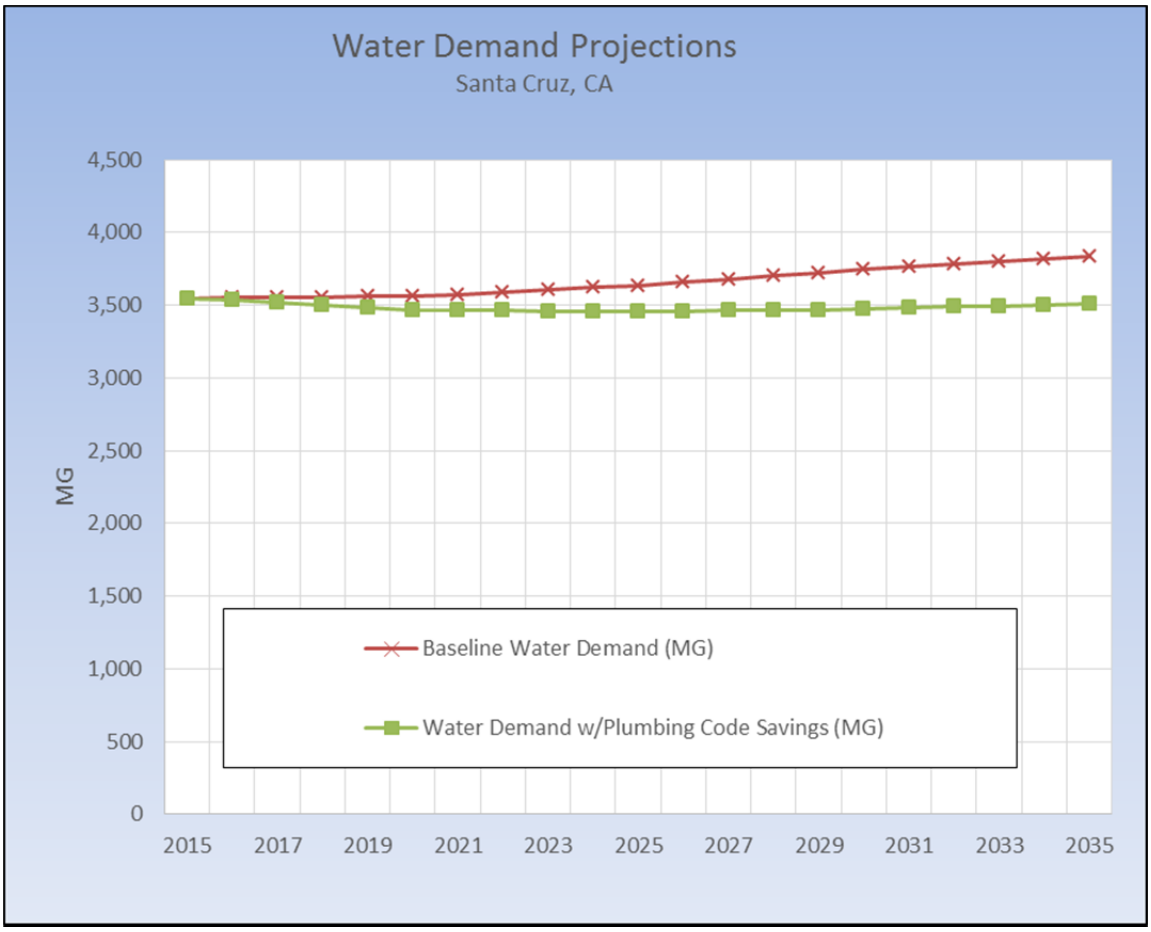
5.4.3 Baseline Demands with Passive Savings 2015-2035

The DSS Model estimates total cumulative plumbing code savings of 329 million gallons per year in 2035. As seen in Figure 5-5, water savings from fixture and appliance codes alone is expected to reduce total water demand (without plumbing code) from approximately 3.8 billion gallons per year to about 3.5 billion gallons by 2035, a reduction of about 8.6% due to plumbing code savings. As shown in Figure 5-5, overall water demand adjusted for plumbing code savings is expected to be essentially level over the 20-year planning horizon, with savings from plumbing codes effectively offsetting added demand from expected population growth and economic development within the City's service area.

Note that demand projections are normalized, without drought or recession conditions, whereas historical demands have been affected by drought and economic influences.

[2] More information on the California Building Standards Commission reference documents are available online: http://www.bsc.ca.gov/pubs/bullet.aspx

Figure 5-5. Demand Forecast With and Without Plumbing Code Savings



Source: City of Santa Cruz. DSS Model, Section: Demand Analysis, Feb 16, 2016.

Water demand projections were developed to the year 2035 using the DSS Model. Table 5-6 shows the savings in 5-year increments for the plumbing codes and the projected demands in 5-year increments with plumbing codes and appliance standards.

Table 5-6. Water Demand Forecast With and Without Plumbing Code Savings

Water Demand Forecast With and Without Plumbing Code Savings	2020	2025	2030	2035
Baseline Demand without Codes or Conservation (MGY)	3,560	3,636	3,743	3,839
Plumbing Code Savings (MGY)	96	179	269	329
Demand with Plumbing Code Savings (MGY)	3,464	3,456	3,474	3,510

Note: Values include Non-Revenue Water (NRW).

6. GOAL SETTING AND POTENTIAL NEW WATER CONSERVATION MEASURES

This section presents the City's conservation planning goals and the conservation measure screening process the City undertook to accomplish these goals.

6.1 Conservation Planning Goals and Approach

The goal of the Water Conservation Master Plan is to further enhance the existing water conservation program. To accomplish this goal, additional measures could be added to the existing program. Most of these measures are targeting new technologies to support customers to be more efficient with their water use.

Experience from many utilities has shown that there is a reasonable limit to how many measures can be feasibility implemented at one time. Programs that consist of a large number of measures are historically difficult to implement successfully; therefore, prioritization of measures is important both as an outcome of this planning effort and as the program is implemented. The approach to program implementation is viewed as a "living" process where new opportunities may be adopted as new technologies become available over time.

6.2 Potential New Conservation Measures and Measure Screening Process

As discussed at a public kickoff meeting March 4, 2013, development of the City's Water Conservation Master Plan involved a systematic process to evaluate a range of possible conservation measures and determine which measures were best suited to the City's service area. The overall goal was to create a roadmap to achieve maximum practical water use efficiency through 2035.

As part of this effort, the City cast a wide net to request that the community review existing implementation methods, including pros/cons of current efforts, and consider implementing additional conservation measures presented in this Plan.

It was envisioned that roughly 20-25 measures would be selected for further evaluation, including the existing measures that are currently being implemented and are planned to continue and new conservation measures not yet implemented. Sometimes not all programs need to be modeled to be incorporated into the plan (but can be qualitatively included in the plan instead), such as water waste prohibition or other non-quantifiable best practices like public education.

An important step in updating the water conservation program was the review and screening of new water conservation measures. This task included a review of the current water conservation measures, identification of measures that may be appropriate for the City's service area, and the screening of these measures to a short-list for detailed evaluation (benefit-cost analysis). To complete this process, a list of potential demand management measures (DMMs) for qualitative evaluation (screening) was compiled. This list, in Appendix F, includes 54 potential types of conservation measures in a variety of program implementation approaches that, when combined, total 99 individual measures ranging from those aimed at reducing real water losses to programs designed to improve customer awareness. The list also reflects the focus of specific programs based on the following categories:

- All Customers
- Residential
- Commercial, Industrial, and Institutional
- Landscape Irrigation
- System (focused on measures for the public water system rather than customers)

Additionally, the list reflects whether customer participation in a program is solely voluntary, encouraged with incentives, or mandatory through adopted rules or ordinances. This can significantly impact anticipated levels of adoption, with those that are purely voluntary likely to have the least participation, those with incentives leading to greater market penetration, and mandatory measures potentially having the highest levels of adoption. These classifications also have cost implications, with incentive programs being popular but adding expense to the utility, whereas required programs typically involve minimal cost to the utility, but may result in some costs for customers.

Appendix F lists the conservation measures considered potentially appropriate for the Santa Cruz community. The table includes devices or programs (e.g., a new high efficiency toilet that would save water if installed by the City, contractor, or customer) that can be used to achieve water conservation, the means through which the device or program will be implemented, and what distribution method, or mechanism, can be used to activate the device or program.

The list of potential measures in Appendix F was drawn from MWM's general experience and review of what the City and other water agencies with conservation programs are currently implementing. Current Program Measures implemented in the project service area as of March 2013 are indicated in the column "Current City Program" in Appendix F, mostly reflecting the City's conservation activities.

The Water Commission and community members were welcomed to add additional measures to the list presented in Appendix F. City staff and MWM reviewed these ideas as part of developing recommendations for the selection of conservation measures to be evaluated in detail. The City set up the ability to suggest ideas through its website for the project.

The screening was conducted by City staff with advice and facilitation support from MWM. Input was welcomed following the Water Commission Meeting on April 1, 2013. The public comment period, provided to stakeholders and policy makers to add new ideas to the list of potential measures, was closed after two weeks on April 15, 2013 in order to allow for the screening process to take place from April 17-24, 2013. The results of the screening process and the measures recommended for selection for the benefit-cost analysis were provided to the Water Commission at the May 6, 2013 meeting for final review and acceptance.

The screening was conducted by Water Department staff in consultation with MWM. MWM described each measure prior to the rating and answered questions about its applicability as well as potential savings and costs. MWM did not specifically recommend any one measure.

Ratings with respect to each criterion were made on a scale of 0 to 5, where 5 was the highest score. Ancillary benefits were rated on a scale of 0 to 2, where 2 was the highest score. It should be emphasized that a measure that passed the screening was not necessarily included in the recommended conservation plan, but it was analyzed.

The measures were screened using the following six criteria:

- *Water Savings Potential (Service Area Match) – emphasis on the measure's ability to reduce average daily water use within the Santa Cruz community (e.g., largely based on individual end use savings and current level of saturation)*
    - Higher savings = 5 (e.g., high end use water savings, low saturation), lower savings (e.g., low end use savings, or very saturated) = 0
- *Sustainable Water Savings – emphasis on savings lifetime/reliability*
    - Permanent = 5 (e.g., codes and technological changes ensure future reliable savings), short, temporary savings or draconian behavioral change = 0
- *Quantifiable Water Savings – emphasis on measures where water savings can be accurately predicted*

  - Highly quantifiable = 5 (substantial evidence exists to demonstrate reliable, accurate conservation savings), measure savings not quantifiable = 0

- *Widespread Community & Social Acceptance (Technology/Market Maturity) – emphasis on willingness to participate, out of pocket expenses, equity/perceived fairness, aesthetics*
  - High expected participation = 5, low expected acceptance/reject mandatory participation =0
- *Feasibility of Implementation/Secondary Impacts – emphasis on ability to achieve objectives*
  - Fully within City capacity/legally possible = 5, fatally flawed = 0 (insurmountable obstacle to implementation)
- *Ancillary Benefits – emphasis on achieving additional goals, including reduction in energy/greenhouse gases (GHG) and/or reduction in peak season use, providing valuable customer service, or other non-quantifiable benefits (behavioral change, public awareness)*
  - Multiple benefits = 2 and singular or very limited benefits = 0

Ratings were summed for all six criteria. A passing score was selected so that the number of measures with the highest scores passing the screening was 20-25 measures total.

The initial screening of all the conservation measures was a very iterative process, as was the screening and selection of the conservation measures to be included in the Recommended Program. From this iterative screening process, the Water Commission added to and approved the recommended list of measures from the technical analysis phase of the project.

More information about the City's measure screening process can be found in Appendix F.

6.3 Additional Measures to Address Peak Season Water Use

During the WSAC Report development, several additional measures were considered and added to the program. The result of the WSAC work on demand management was to shift the focus more toward reducing peak season use to increase supply reliability. It did so not only by considering measures to reduce outdoor use in residences and large landscapes, but also by enhancing base or indoor measures that lessen overall demand or that target specific uses, including visitor-serving uses, thereby helping to reduce the City's peak season water use. More information about the City's peak water use can be found in section 3.5.1.

7. CONSERVATION MEASURE EVALUATION

This section presents the conservation measures evaluated in the DSS Model. The total list of measures evaluated includes the recommended measures list published in the October 2015 Water Supply Advisory Committee Final Report on Agreements and Recommendations, Table 14.

7.1 Conservation Measures Evaluated

A total of 33 individual measures were evaluated in the Santa Cruz DSS Model. For each measure selected to be modeled, a measure description, as well as details on each measure's utility and customer costs, time period, and targets, can be found in the DSS Model's measure inputs.

Some of the key assumptions used in evaluating the water savings, benefits, and costs include the following:

- Applicable customer class
- Applicable end use
- Estimated annual account participation rates
- Estimated number of fixtures per account
- Evaluation start and end year
- Measure length, years
- Measure life, years
- Utility unit cost, $
- Customer unit cost, $
- Estimated annual administration and marketing overhead, %

The measures listed in Table 7-1 presents a basic description of each active measure and the types of customers each measure targets. Measures 29-35 listed in the table were requested additions by the WSAC in October 2015. More detailed information and assumptions for each modeled measure were developed in collaboration with City staff and are presented in Appendix C.

Water use efficiency savings due to plumbing codes, such as CALGreen (California Statewide New Development Building Code), SB 407 (Plumbing Fixture Retrofit on Resale or Remodel), and any new development ordinances, are included in the DSS Model and presented in Section 4.6.4 and Appendix A. Plumbing code measures account for 53% of the future conservation potential achieved and are independent of any program.

Table 7-1. Conservation Measure Descriptions[1]

No.	Measure Name	Type of Customer	Description
1	System Water Loss Reduction	System	This measure's purpose is to identify and reduce water losses in the City's water system. The City is currently doing a water loss control study to review its annual water audit, look at water losses, and design a cost-effective water loss control program. The City currently loses an average of 7.5% of all treated water due to leaks, meter inaccuracies, and other problems. The goal of this measure is to reduce the City's system water losses on a long-term basis by an average of 1%. A new state law passed in 2015 that will require water suppliers to conduct water system audits, verify, and report water losses every year to the state beginning in 2017.
2	Advanced Metering Infrastructure (AMI)	Single Family (SF), Multifamily (MF), Commercial (COM)	This measure involves a major investment to upgrade meter reading technology and data management abilities. The City currently uses an Automatic Meter Reading (AMR) system in which water meters are read monthly by radio equipment that then transmits the information back to the City. This system may increase the frequency of meter reading from once a month to once an hour. The main water conservation (savings) benefits are for customer in-home or outdoor leak detection and increased customer awareness of water use. Other benefits include more action in enforcing the drought restrictions and more efficient customer service. Utility billing would continue to be on a monthly basis.
3	Large Landscape Budget-Based Water Rates	Irrigation (IRR)	This measure includes the development of individual monthly water budgets for irrigation customers. Water budgets are connected to a water rate schedule where water rates increase when a customer goes above their landscape water budget, or decreases if they are below budget. Budgets are typically based on factors like the size of the irrigated area, plant material, and changes in weather conditions.
4	General Public Information	SF	This measure addresses opportunities to use public information programs as an effective tool to inform customers of the need for water conservation and conservation-related benefits. The current campaign is called "*Surf City Saves"* program. This measure includes paid and public service advertising, newsletters, bill inserts, information on the utility bill, a website, flyers and brochures, media campaigns, community meetings, direct mailings, community engagement at local activities, and other techniques. Public information is often carried out and coordinated with other agencies, groups, and schools.
5	Public Information (Home Water Use Report)	SF	This measure involves contracting with a firm to produce a detailed water billing report for high-use customers that is in addition to their normal utility bill. This billing report compares water use in the neighborhood and offers suggestions to customers on ways to reduce water use.

No.	Measure Name	Type of Customer	Description
6	Residential Leak Assistance	SF, MF	Customer leaks can go uncorrected at homes where owners are not able to pay the costs of repair. This measure would involve the City either paying part of the repair or paying the entire cost of the repair with funds that are paid back from customer water bills over time. This measure may also include an option to replace inefficient plumbing fixtures at low-income residences.
7	Single Family Residential Surveys	SF	This measure provides an outdoor water survey for existing single family residential customers. High water users will be targeted. This measure may include giving away water-efficient showerheads, faucet aerators, and toilet devices. This measure would provide a basic outdoor survey (look for leaks, irrigation problems and scheduling, plant information, etc.) and promote landscape and irrigation programs and improvements to reduce peak season water use.
8	Plumbing Fixture Giveaway/ Opt	SF, MF	The City would buy large amounts of efficient showerheads, kitchen and lavatory faucet aerators, shower timers, and hose timers. Hose nozzles and leak detection tablets would be available for distribution at the Utility office and at community events.
9	Residential Ultra High Efficiency Toilet Rebates	SF, MF	This measure provides a rebate or voucher for the installation of an ultra-high efficiency toilet (UHET) that uses 1.0 gallons of water or less per flush (gpf).
10	High Efficiency Clothes Washer Rebates	SF, MF	The City would provide a rebate for high efficiency clothes washing machines (HECW) to single family homes and in-unit condo/apartment complexes that do NOT have common laundry rooms. This program would be similar to the City's current program, except that higher rebate amounts would be increased for qualifying machines that are listed as Energy Star® “Most Efficient” Clothes Washers.
11	High Efficiency Clothes Washer - New Development	SF, MF, COM	This measure would involve amending the City’s building regulations to require building developers to install an efficient clothes washer (meeting certain water efficiency standards, such as gallons per load). Inspections would be coordinated with City and County building departments to make sure that an efficient washer is installed before the new home or building is occupied.
12	Hot Water On Demand - New Development	SF, MF, COM	The City would work to pass an ordinance requiring developers and permitted building remodels to equip new homes or buildings with efficient hot-water-on-demand systems. These systems use a pump placed under the sink to recycle water sitting in the hot water pipes to the water heater or to move the water heater into the center of the house and/or reduce hot water waiting times by having an on-demand pump on a recirculation line looping back to the hot water heater.
13	Toilet Retrofit at Time of Sale	SF, MF, COM	This measure involves tracking real estate sales within the City’s water service area and working with buyers, sellers, and the real estate industry to retrofit older, inefficient toilets, showerheads, and urinals with the most efficient, upgraded fixtures when real estate is sold. A property inspection by either City staff or a licensed plumbing/general building contractor would be required to verify compliance with the regulation.

No.	Measure Name	Type of Customer	Description
14	COM, MF Common Laundry Room High Efficiency Clothes Washer[4]	MF, COM	This measure provides a rebate for the installation of a high efficiency commercial washer (HEW) in COM laundromats and MF common area laundry rooms.
15	COM Incentives	MF, COM	After getting a free water use survey (Measure 17), the City will analyze the survey recommendations and determine if the MF or COM site qualifies for a financial incentive (reward). Financial incentives will be provided after analyzing the benefit-cost ratio of each proposed project. Incentives are designed to fit each individual site as each site has varying water savings potentials. Incentives will be given based on the decisions of the City specifically and while the money lasts.
16	Pre-Rinse Spray Nozzle Installation	COM	The City will provide free 1.3 gpm (or lower) pre-rinse spray nozzles, and possibly free installation of nozzles, in restaurants and other commercial kitchens.
17	COM Surveys	MF, COM	This measure will offer top MF and COM water customers a professional water survey that would evaluate ways for the site to save water and money. The surveys would be for large accounts (accounts that use more than 5,000 gallons of water per day, or the top 3%), such as hotels, restaurants, stores, and schools.
18	High Efficiency Urinal Program	COM, Municipal (MUN), Industrial (IND)	The City will provide a rebate or voucher for the replacement of older, high use urinals with high efficiency urinals (HEU) and flush valves using 0.125 gpf (1 pint) or less.
19	Public Restroom Faucet Retrofit - MUN	MUN	This measure includes the direct installation of high efficiency (0.5 gpm) sensor faucet fixtures in institutional (public) buildings, such as schools, hospitals, etc. High-use municipal building will be focused on first.
20	Public Restroom Faucet Retrofit - COM	COM	This measure includes the direct installation of high efficiency (0.5 gpm) sensor faucet fixtures in commercial buildings, such as businesses. High-use commercial buildings will be focused on first.
21	School Retrofit	MUN	This school retrofit program involves schools receiving funding to replace non-efficient fixtures, retrofit mixed use meters to dedicated irrigation meters, and upgrade irrigation systems.
22	Water Efficient Landscape Ordinance	SF, MF, COM, MUN, IND	This measure accounts for the lower irrigation water use that new accounts have due to their more efficient landscape designs, which are a result of the City's Landscape Code (implementation of Statewide Model Landscape Ordinance). The City is in the process of updating this code to keep up with new state regulations and technology for irrigation controllers and irrigation equipment.

No.	Measure Name	Type of Customer	Description
23	Single Family Residential Turf Removal	SF	This measure provides a per-square-foot incentive to SF customers to remove and replace turf (grass) with low-water-use plants or permeable hardscape (pavers, concrete, etc. that allows water to soak through and into the ground). This is modeled after the City's current program. The rebate is currently $0.50 per square foot and capped at $500 for a single family residence. To increase participation, this measure would increase the rebate to $1 per square foot and a $1,000 maximum, or more in both cases.
24	Multifamily Residential/CII Turf Removal	MF, COM, MUN, IRR	This measure provides a per-square-foot incentive to MF, COM, MUN, and IRR customers to remove and replace turf with low-water-use plants or permeable pavers (or other permeable hardscape). The rebate is currently $0.50 per square foot of turf removed and capped at $2,500 for multifamily or commercial residences. This measure would increase the rebate to $1 per square foot and a $5,000 maximum or more to increase participation.
25	Expand Large Landscape Survey/Water Budgets	IRR	This measure expands on the City's existing landscape water budget program to include more dedicated irrigation accounts. Outdoor water audits will be offered for existing customers with problems of overwatering or water waste. Normally, those with high water use are focused on and provided a customized report telling them how to save water. All multifamily residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. This measure is connected to Measure 3 above, Large Landscape Budget-Based Water Rates.
26	Sprinkler Nozzle Rebates	SF, MF, COM	The City will provide rebates to replace standard spray sprinkler nozzles with more efficient rotating nozzles. Nozzles cost about $6 each.
27	Gray Water Retrofit	SF	The City will hold a workshop to support a Gray Water Challenge or similar program. A rebate will be offered that will help to cover a portion of the cost to single family homeowners per year who install gray water systems. A gray water kit/package, available from local hardware stores, would be supported by this City rebate.
28	Residential Rain Barrels	SF	The City will provide an incentive for the installation of rain barrels. This could involve rebates, purchasing rain barrels in high quantities, and giveaways of barrels as well as workshops on proper installation and use of captured rain water for landscape irrigation.
29[2]	Climate Appropriate Landscaping and Rainwater Infiltration	SF, MF, COM, MUN	This measure will provide incentives for the installation of climate-appropriate and rainwater infiltration landscape (soaks up water on-property as opposed to running off-property). This measure will provide rebates to Home Owners Associations (HOAs), businesses, and institutions that increase their outdoor water use efficiency by replacing qualifying high water use landscape and/or upgrading to qualifying high efficiency irrigation equipment or climate appropriate landscape. To qualify, sites must participate in a pre-inspection before beginning their project or purchasing materials. Single family homes, multifamily homes, and business properties with qualifying irrigated landscape (i.e., irrigated turf or a functional swimming pool) can receive rebates for replacing high water use landscape (e.g., irrigated turf grass) with a minimum

No.	Measure Name	Type of Customer	Description
			of 50% plant coverage consisting of low water use plants from the Approved Plant List. Recommendations from the Water Supply Alternatives Committee (WSAC) Report include: • Increase turf conversion rebate • Require conversion of spray to drip for shrub irrigation • Discourage runoff through rainwater infiltration features (i.e., permeable pavers) • Support local actions for climate-appropriate landscaping • Focus on landscape narrower than 10 feet – no spray irrigation and/or next to hardscapes
30 SF[2]	SF Conservation Pricing - Water and Sewer[3]	SF	This measure is awaiting the results of an ongoing rate study conducted by Raftelis Financial Consultants, Inc. in 2016.
30 MF[2]	MF Conservation Pricing - Water and Sewer[3]	MF	This measure is awaiting the results of an ongoing rate study conducted by Raftelis Financial Consultants, Inc. in 2016.
30 COM[2, 4]	COM Conservation Pricing - Water and Sewer	COM	This measure is awaiting the results of an ongoing rate study conducted by Raftelis Financial Consultants, Inc. in 2016.
31[2, 4]	Single Family, Multifamily Dishwasher Rebates	SF, MF	This measure provides incentives for the purchase of water efficient dishwashers (Residential WF of 6.25 or less).
32[2, 4]	Hot Water Recirculation Systems	SF, MF, COM	This measure provides incentives for the installation of a hot water recirculation system. Having hot water discharge promptly is important for energy and water use efficiency. A hot water recirculating system enables the cold water in the hot water pipes to be continually returned to the water heater and reheated before the hot water faucet is turned on. Rebates would be available to the following water customer groups: - single family dwellings, including townhomes and mobile homes - apartment complexes - commercial institutions - commercially zoned businesses or institutions Maximum rebates allowable: 1) $300 per single family account per year; and 2) $3,000 per commercial, industrial, or institutional account (e.g., laundromats and apartments) per year.

No.	Measure Name	Type of Customer	Description
33[2, 4]	Rewarding Businesses for Adopting Best Practices	COM	This measure offers commercial customers who employ best practices an increased water supply reliability and a lower price. For a business, the difficulty of rationing water during severe drought years can have a negative effect on its profits. This measure proposes that the City's Water Shortage Contingency Plan be changed so that businesses who adopt best practices, such as efficient plumbing fixtures, hotel laundry recycling, and climate-appropriate landscaping, would get a lower level of water usage reduction during a severe drought. For example, in a Stage 4 drought, with a system-wide goal of 35% reduction, the current plan is to have the water allotment of businesses be 87% of their normal year water use. Under this measure, businesses adopting best practices would be expected to cut back to only 95% of normal use, rather than 87%. These businesses could also be rewarded with a lower rate for their water use.
34[2, 4]	Additional Building Code Requirements for New Development	SF, MF, COM, MUN, IND	New CALGreen Building Codes already included in the DSS Model (see Section 5.4) takes many of the items recommended by WSAC into account. This measure currently cannot be measured with regard to future additional CALGreen updates and water savings. This measure involves the coming together of a working group of planners, builders, conservation groups, and Water Department personnel to evaluate possible additions to current codes and fee structures that would encourage water conservation. Some examples include: 1) requiring high efficiency washers in new development; and 2) requiring hot water on demand/structured plumbing in new development. It is also intended that the work group track and incorporate new technologies in future City codes.
35[2, 4]	Innovation Incubator Program	SF, MF, COM, MUN	This measure would establish an Innovation Incubator Program allowing Santa Cruz to continue its leadership in water management by creating a program that supports new developments in: • New technologies, customer financing programs, and customer outreach programs; and • Pilot projects to promote popular adoption of rainwater for toilets and washers, new technology toilets in institutional buildings, onsite recycling of graywater, rainwater irrigated lawns, and promotion of native plant landscapes. Small grants would be offered to local businesses and/or working with state and national organizations like California Urban Water Conservation Council, California Water Foundation, California Urban Water Agencies, University of California (Santa Cruz or Davis), Alliance for Water Efficiency, Water Research Foundation, US Bureau of Reclamation, or other coalitions of utilities or research-focused organizations.

Notes:

AMI – Advance Metering Infrastructure
AMR – Automatic Meter Reading System
COM – commercial
gpf – gallons per flush
gpm – gallons per minute
HECW – high efficiency clothes washing machine
HEU – high efficiency urinal
HEW – high efficiency commercial washer
HOA – Home Owners Association
IND – industrial
IRR – irrigation
MF – multifamily
MUN – municipal
SF – single family
UHET – ultra-high efficiency toilet
WF – water factor, gallons per cubic foot
WSAC – Water Supply Alternatives Committee

[1] Source: Santa Cruz Final Technical Memorandum (City of Santa Cruz, 2016).
[2] Measures 29-35 were requested additions by the WSAC in October 2015.
[3] A comprehensive cost of service water rate study was being conducted by Raftelis Financial Consultants, Inc. when the modeling effort for this conservation plan was finalized. It was later completed in August 2016. The DSS model is set up to analyze the impacts of the new rates and rate structure on water consumption in the future if needed.
[4] These measures target both CII and residential customers.

7.2 Assumptions about Avoided Costs

The four main sources of water for the City are 1) the North Coast sources; 2) the San Lorenzo River; 3) Loch Lomond Reservoir; and 4) the Live Oak Wells. The avoided cost of water to the City is estimated to be $2,550/MG as a place holder value set to be five times the variable cost of current annual supplies. Until the City has a recommended water supply project approved with known costs, a better avoided cost is not available. For this evaluation, the avoided cost of treated water is assumed to be $2,500/MG (water production operational costs) and the avoided cost of wastewater is assumed to be $50/MG (wastewater operational costs). These values can be found in the "Avoided Costs" red section of the City's DSS Model. It is recommended in the future that this cost be updated when new cost information becomes available. It is important to note that $10,000/MG is the average total program cost threshold established by the WSAC; this value is lower than the expected unit cost of various supply augmentation projects recommended to be pursued as a result of the WSAC's work.

7.3 Comparison of Individual Measures

Table 7-2 presents each measure's water savings in million gallons (MG) per year for year 2035 as a result of each measure's design and implementation schedule. Year 2035 savings include ongoing savings still valid since the measure's start. Savings per measure presented in the table assume measures are implemented on a stand-alone basis (i.e., without interaction or overlap from other measures that might address the same end use or uses).

It is important to understand that the savings from measures presented in the table which address the same end use(s) are not simply additive. The DSS Model uses impact factors to avoid double counting in estimating the water savings from programs of measures. For example, if two measures are planned to address the same end use and both save 10% of the prior water use, then the net effect is not the simple sum (20%). Rather it is the cumulative impact of the first measure reducing the use to 90% of what it was without the first measure in place, then reducing the use another 10% to result in the use being 81% of what it was originally. In this example the net savings is 19%, not 20%. Using impact factors, the model computes the reduction as follows: 0.9 x 0.9 = 0.81 or 19% water savings.

Since interaction between measures has not been accounted for in Table 7-2, it is not appropriate to include a total in the bottom row. However, the table is useful to give a close approximation of the savings of each individual measure.

The four measures that save the most water (more than 20 million gallons per year in 2035) include:

2. Advanced Metering Infrastructure: 45.94 MGY
10. High Efficiency Clothes Washers: 36.20
1. System Water Loss Reduction: 34.87 MGY
6. Residential Leak Assistance: 22.03 MGY

Of the remaining 31 measures, five measures are each estimated to save between 10 and 20 MGY in 2035, and the remaining 26 measures all save less than 10 MGY each.

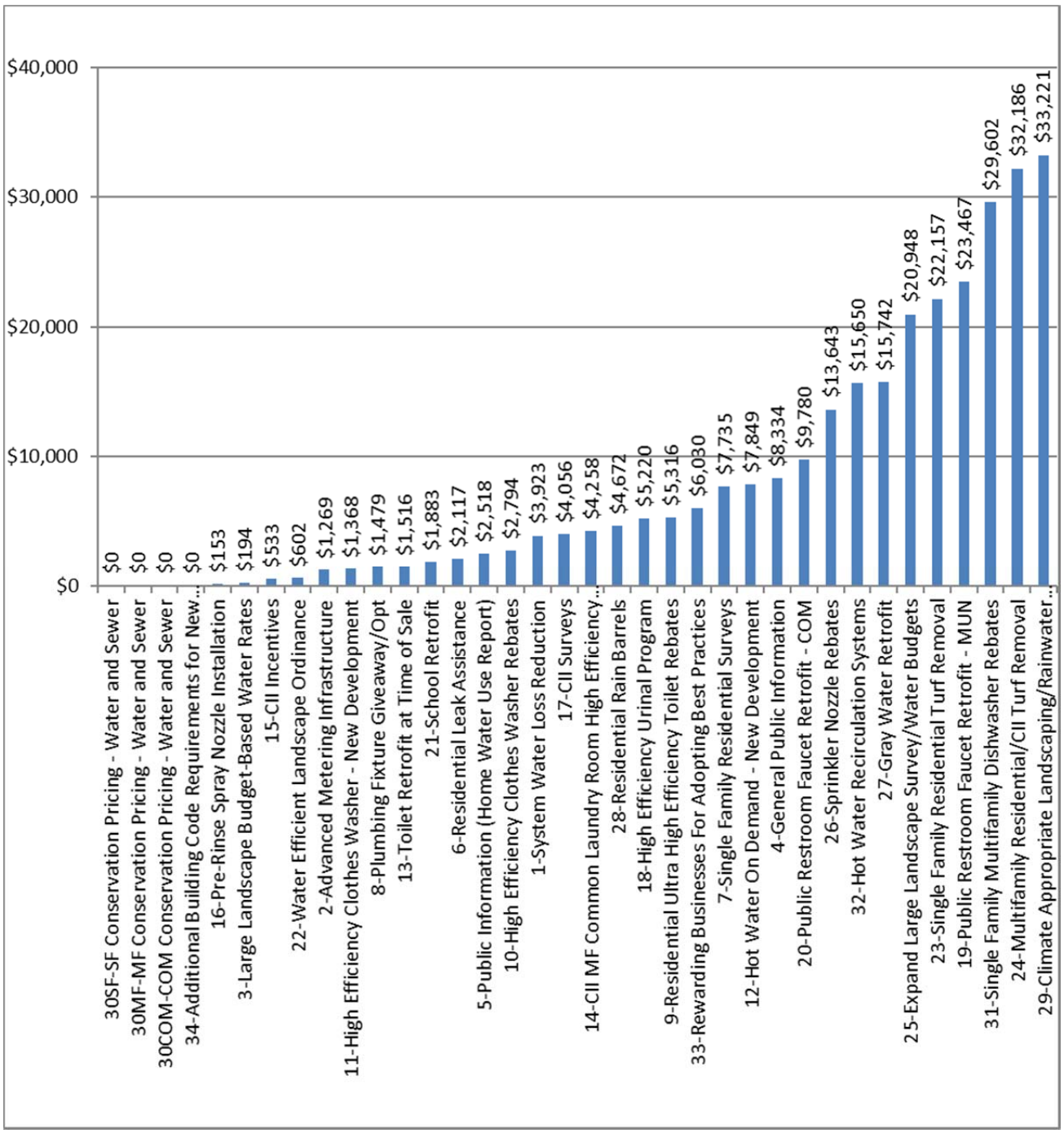
Table 7-2. Individual Measure Estimated Cost of Water Saved and 2035 Water Savings[1]

No.	Measure Name	Estimated Cost of Water Saved ($/MG)	Estimated 2035 Water Savings (MGY)
1	System Water Loss Reduction	$3,923	34.87
2	Advanced Metering Infrastructure	$1,269	45.94
3	Large Landscape Budget-Based Water Rates	$194	12.83
4	General Public Information	$8,334	5.73
5	Public Information (Home Water Use Report)	$2,518	11.39
6	Residential Leak Assistance	$2,117	22.03
7	Single Family Residential Surveys	$7,735	2.78
8	Plumbing Fixture Giveaway/Opt	$1,479	2.03
9	Residential Ultra High Efficiency Toilet Rebates	$5,316	2.91
10	High Efficiency Clothes Washer Rebates	$2,794	36.20
11	High Efficiency Clothes Washer - New Development	$1,368	12.53
12	Hot Water On Demand - New Development	$7,849	4.46
13	Toilet Retrofit at Time of Sale	$1,516	8.70
14	CII MF Common Laundry Room High Efficiency Clothes Washer	$4,258	3.07
15	CII Incentives	$533	18.39
16	Pre-Rinse Spray Nozzle Installation	$153	9.16
17	CII Surveys	$4,056	19.24
18	High Efficiency Urinal Program	$5,220	3.22
19	Public Restroom Faucet Retrofit – MUN	$23,467	0.29
20	Public Restroom Faucet Retrofit – COM	$9,780	8.47
21	School Retrofit	$1,883	2.88
22	Water Efficient Landscape Ordinance	$602	6.66
23	Single Family Residential Turf Removal	$22,157	4.18
24	Multifamily Residential/CII Turf Removal	$32,186	2.39
25	Expand Large Landscape Survey/Water Budgets	$20,948	1.97
26	Sprinkler Nozzle Rebates	$13,643	3.35
27	Gray Water Retrofit	$15,742	0.24
28	Residential Rain Barrels	$4,672	3.42
29[2]	Climate Appropriate Landscaping and Rainwater Infiltration	$33,221	8.26
30SF[2]	SF Conservation Pricing - Water and Sewer[3]	N/A	N/A
30MF[2]	MF Conservation Pricing - Water and Sewer[3]	N/A	N/A
30COM[2]	COM Conservation Pricing - Water and Sewer[3]	N/A	N/A
31[2]	Single Family Multifamily Dishwasher Rebates	$29,602	0.20
32[2]	Hot Water Recirculation Systems	$15,650	1.38
33[2]	Rewarding Businesses for Adopting Best Practices	$6,030	3.64
34[2]	Additional Building Code Requirements for New Development[4]	N/A	N/A
35[2]	Innovation Incubator Program	$121,679	1.08

[1] Source: City of Santa Cruz. DSS Model, Section: Conservation Analysis, Feb 16, 2016. This table does not contain a total in bottom row since interaction between measures has not been accounted for in table but is accounted for at the program level.
[2] Measures 29-35 were requested additions by the WSAC in October 2015.
[3] Pricing measure costs and savings not yet available. Awaiting results of ongoing rate study scheduled to be completed in 2016.
[4] New CALGreen Building codes, effective January 2016, are already modeled. This measure is awaiting support from a Working Group yet to be formed.

Figure 7-1 shows the costs of water saved for individual measures ranked from lowest to highest (excluding Measure 35 Innovation Incubator Program). The measures to be implemented in the next several years are a mix of some lower cost and some higher cost measures. It was assumed by the City's Water Supply Advisory Committee that the recommended program, even with higher cost measures included, would incur an average total program cost of no more than $10,000 per million gallons of water saved.

Figure 7-1. Conservation Measures Unit Cost of Water Saved



Notes:

1. Units are $/MG.
2. Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

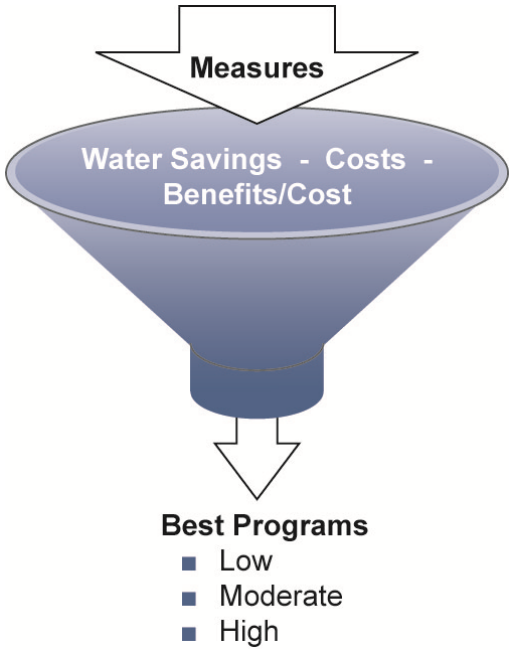
8. RECOMMENDED PROGRAM

This section of the Plan addresses the public and technical process involved to evaluate all measures available and how the final selection of measures for the Recommended Program was made. It also addresses estimated per capita water use reductions, projected total water savings, and the overall cost of water saved.

8.1 Selection of Measures for Recommended Program

During the evaluation process, as presented in Section 7 and below, the water savings and costs were estimated for the quantifiable measures using assumptions for each measure that were collaboratively developed by MWM and City staff. Benefits and costs were compared in a formal present value analysis. Conclusions were drawn about which measures produce cost-effective water savings and these were then further discussed and evaluated. This process can be considered an economic screening process (Figure 8-1). Packaging the best measures into alternative program scenarios allowed the City to consider what level of conservation was appropriate.

Figure 8-1. Overview of the Conservation Measure Evaluation Process



As part of this Program development, several measure combinations were developed and program scenarios explored in order to develop the Recommended Program that is presented below. These included several iterations with the City Staff, Water Commission and then the WSAC. The reviews included discussions on mix of measures as well as various measure design levels (e.g., more or less accounts targeted and earlier or later, longer or shorter measure lengths) such that these recommended measures were well vetted with stakeholder input.

Appendix C presents the assumptions and inputs used in the City's DSS Model to evaluate each water conservation measure, including water reduction methodology, perspectives on benefits and costs, present value parameters, and assumptions about unit costs, water savings, measure costs, and market penetration.

Benefit-cost analysis has been used by many water agencies to evaluate and select water supply alternatives, including water conservation measures best suited to local conditions. For the City's Water Department, this analysis requires a Santa Cruz-specific set of data, such as historical water consumption patterns by customer class, population projections, results of the pilot projects and Baseline Water Use Study, and prior conservation efforts. The end result is the recommended measures previously described above in Table 7-1.

The City's Recommended Program consists of both passive and active elements. Plumbing code measures account for 53% of the future conservation potential achieved and are independent of any program – the savings are based on customers following applicable current local, state, and federal laws, building codes and ordinances. Recommended Program active measures fall within one of four categories (see Table 8-1): 1) general measures; 2) residential measures (indoor); 3) commercial measures (indoor); and 4) irrigation measures (outdoor).

The following table lists the Recommended Program active measures and how each falls within one of four categories.

Table 8-1. Elements of Recommended Program

Utility Measures	Residential Measures	CII Measures	Landscape Measures
System Water Loss Reduction	Residential Leak Assistance	CII Incentives	Large Landscape Budget-Based Water Rates
Advanced Metering Infrastructure	Single Family Residential Surveys	Pre-Rinse Spray Nozzle Installation	Water Efficient Landscape Ordinance
SF, MF, COM Conservation Pricing - Water and Sewer	Plumbing Fixture Giveaway/Opt	CII Surveys	Single Family Residential Turf Removal
General Public Information	Residential Ultra High Efficiency Toilet Rebates	High Efficiency Urinal Program	Multifamily Residential/CII Turf Removal
Public Information (Home Water Use Report)	High Efficiency Clothes Washer Rebates	Public Restroom Faucet Retrofit - MUN	Expand Large Landscape Survey/Water Budgets
	Gray Water Retrofit	Public Restroom Faucet Retrofit - COM	Sprinkler Nozzle Rebates
		School Retrofit	Residential Rain Barrels
	Hot Water On Demand - New Development	Hot Water On Demand - New Development	Climate Appropriate Landscaping and Rainwater Infiltration
	Toilet Retrofit at Time of Sale	Toilet Retrofit at Time of Sale	
	CII MF Common Laundry Room High Efficiency Clothes Washer*	CII MF Common Laundry Room High Efficiency Clothes Washer*	
	Single Family/Multifamily Dishwasher Rebates*	Rewarding Businesses for Adopting Best Practices*	
	Hot Water Recirculation Systems*	Hot Water Recirculation Systems*	
	Additional Building Code Requirements for New Development*	Additional Building Code Requirements for New Development*	
	Innovation Incubator Program*	Innovation Incubator Program*	

* These measures target both CII and residential customers.

8.2 Projected Total Water Savings of Program

The following Table 8-2 presents the benefit cost analysis summary for the Recommended Program, which includes all the measures evaluated as discussed in Section 7.

Cost categories are defined as follows:

- Utility Costs – those costs that the City as a water utility will incur to operate the measure, including administrative costs
- Utility Benefits – the avoided cost of producing water

The column headings in Table 8-2 are defined as follows:

- Average Cost of Water Saved ($/MG) = average cost to implement the program divided by the water savings over the life of the conservation measure
- Water Savings in 2035 (MGY) = water saved in million gallons. The year 2035 is presented as this represents the end of the planning horizon for both the 2015 UWMP and this analysis effort.

Table 8-2. Recommended Program Costs and Savings

Conservation Program	Average Cost of Water Saved ($/MG)	Water Savings over "Baseline" Demand in 2035 (MGY)
Recommended Program with Plumbing Code Savings	$4,572/MG	619

Notes:
1. Across the modeling time period of 2015-2035, administrative costs average approximately 22% of total utility costs annually.
2. Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

Table 8-3 shows the savings in 5-year increments for the plumbing codes, Recommended Program, and the Recommended Program with plumbing code savings.

Table 8-3. Long Term Conservation Program Savings over "Baseline" Demand

Conservation Program	2020	2025	2030	2035
Baseline Demand without Codes or Conservation (MGY)	3,560	3,636	3,743	3,839
Plumbing Code (MGY)	96	179	269	329
Recommended Program (MGY)	137	232	269	291
Recommended Program with Plumbing Code Savings (MGY)	233	411	538	619

Source: City of Santa Cruz. DSS Model, Feb 16, 2016.

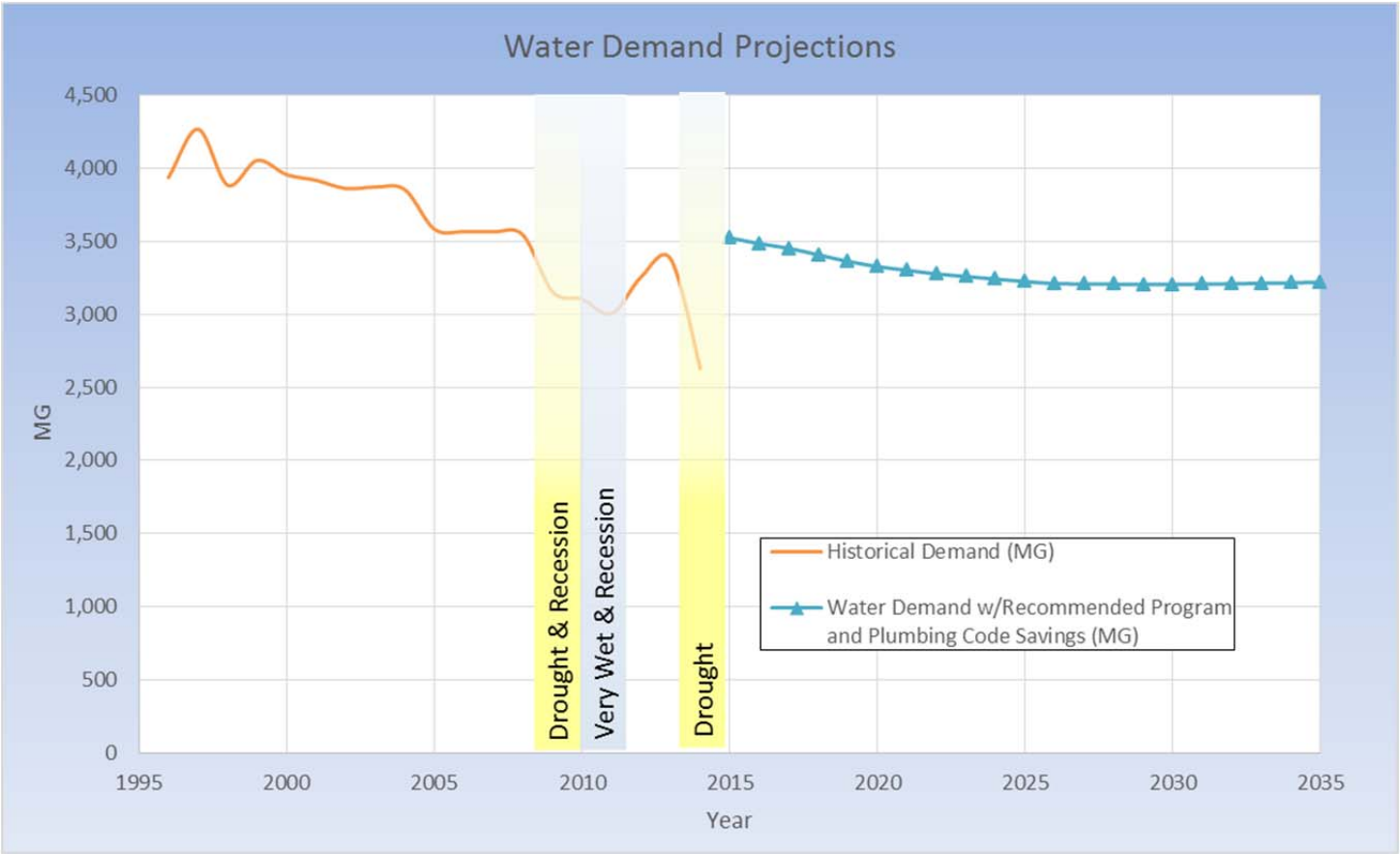
The Recommended Program is envisioned to include strong customer participation to support additional planned growth while keeping total water use relatively constant for the next 20 years. New development will be built to water efficient standards following the 2015 CALGreen Plumbing Code, 2015 CEC Code, and other local ordinances (e.g., City's landscape ordinance). Water use in new homes should be more efficient than existing homes on comparable lot sizes. Table 8-4 and Figure 8-2 below present the Recommended Program projected water demands. Note that the Recommended Program with Plumbing Code is lower than the Demand Forecast by M.Cubed shown in Table A-1 in Appendix A of this Plan. The Recommended Program forecast is 222 MGY lower (6%) than the M.Cubed forecast in 2035. This is due to increased savings by the new plumbing codes and new conservation programs that would be added over time. As seen in Table 8-4, total water savings from both plumbing code and the recommended program is expected to reduce total water demand from approximately 3.8 billion gallons per year to about 3.2 billion gallons per year, a reduction of over 600 million gallons or more than 16% by 2035.

Table 8-4. Normalized Water Use Projections

	2020	2025	2030	2035
"Baseline" Demand	3,560	3,636	3,743	3,839
Demand with Plumbing Code (MGY)	3,464	3,456	3,474	3,510
Demand with Plumbing Code and Recommended Program (MGY)	3,327	3,225	3,205	3,220

Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

Figure 8-2. Projected Water Demands with Recommended Program



Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

The current and projected number of connections and deliveries to the City's water distribution system by sector are identified in the following table. Note that total deliveries include plumbing code savings, Recommended Program savings, and Non-Revenue Water.

Table 8-5. Accounts and Recommended Program Demands by Customer Category*

		Single Family	Multi-family	Business	Municipal	Industrial	UC Santa Cruz	Irrigation	Golf	Non-Revenue Water	Total
2020	# of accounts	19,456	2,886	1,948	218	39	12	651	2	N/A	25,212
	Deliveries MGY	1,277	772	574	46	56	196	81	58	267	3,327
2025	# of accounts	19,854	2,972	1,971	218	41	14	723	2	N/A	25,795
	Deliveries MGY	1,223	714	541	43	59	234	87	52	273	3,225
2030	# of accounts	20,260	3,122	2,008	218	43	16	845	1	N/A	26,514
	Deliveries MGY	1,191	690	525	41	60	271	100	47	281	3,205
2035	# of accounts	20,636	3,238	2,055	218	43	18	951	1	N/A	27,162
	Deliveries MGY	1,170	678	519	40	61	308	110	46	288	3,220

*Demands include plumbing code savings and Recommended Program savings.

8.3 Estimated Per Capita Water Use Reductions

The City currently and in the future is projected to exceed the two possible conservation targets that are being tracked by the City, both in terms of the State's SB X7-7 mandate and the voluntary California Urban Water Conservation Council MOU commitments. As published in the 2010 and 2015 UWMPs, the City has selected to aim to achieve SB X7-7 Method 3: 95% of State Hydrological Region Target by 2020. The City's baseline and target GPCD are as follows:

- Baseline GPCD = 113 GPCD
- 2015 Interim Target = 111 GPCD
- 2020 target = 110 GPCD
- CUWCC 2018 target = 101 GPCD

Table 8-6 below shows the projected per capita water use in gallons per day per person (GPCD) in 5-year increments for the projected demand with no plumbing code savings, projected demand with plumbing code savings, and projected demand with Recommended Program implementation and plumbing code savings. Note that demand projections are normalized, without drought or recession conditions, whereas historical demands have been affected by drought and economic influences.

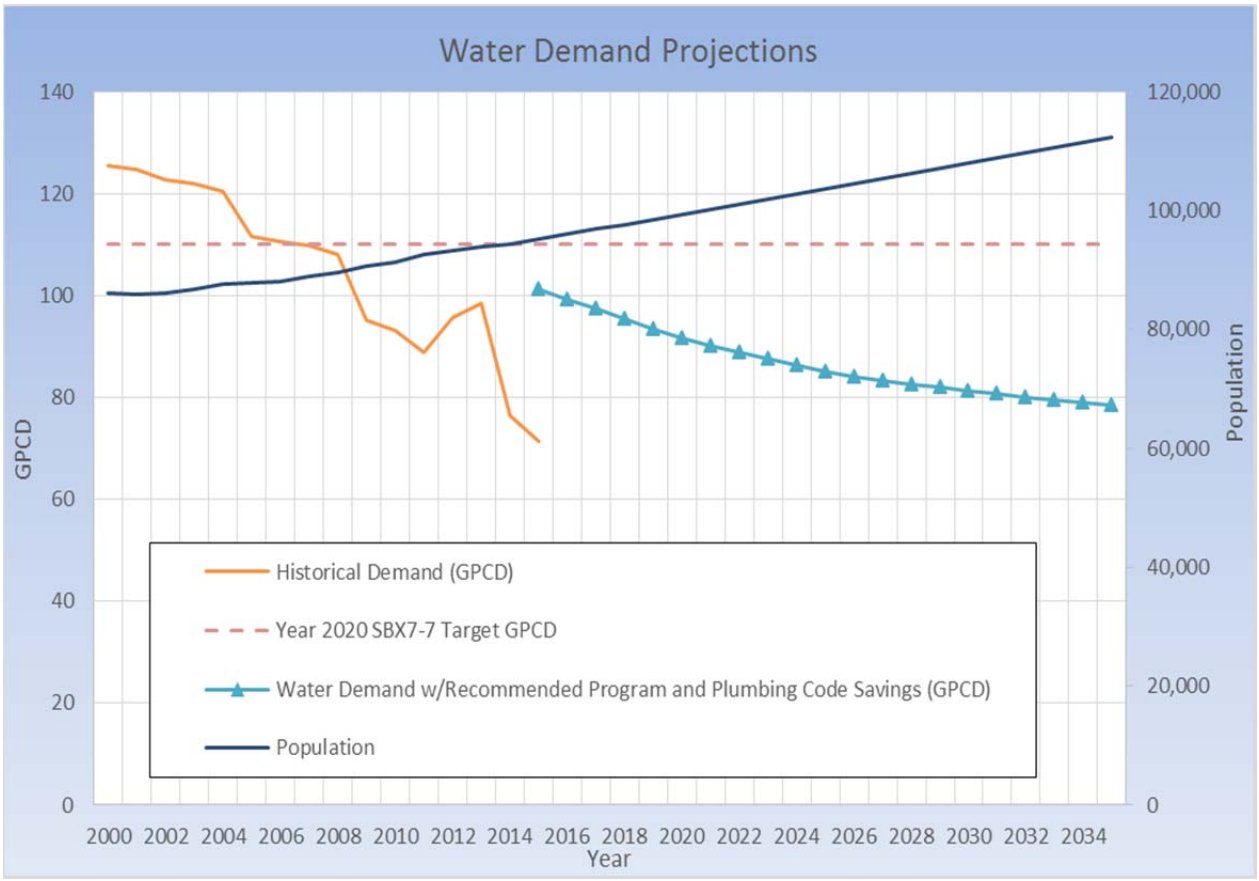
Table 8-6. Projected Population and Per Capita Water Use[1]

	2020	2025	2030	2035
Population [2]	99,403	103,620	107,989	112,390
"Baseline" Demand without Plumbing Code (GPCD)	98	96	95	94
Demand with Plumbing Code (GPCD)	95	91	88	86
Demand with Plumbing Code and Recommended Program (GPCD)	92	85	81	78

[1] Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.
[2] Source: WSAC Final Report, October 2015.

Figure 8-3 below presents the SB X7-7 year 2020 GPCD target and historical and projected GPCD estimates with plumbing codes and Recommended Program savings. As seen below in Figure 8-3, the City has already met its state-mandated 2020 target and surpassed its voluntary CUWCC 2018 goal. The goal of the City's plan is to press beyond these state targets and instead maximize conservation savings to help meet local resource needs for current and future customer water demands.

Figure 8-3. Water Conservation Program Savings Projections – SB X7-7 Target



Notes:

1. Historical values based on actual data and projections are based on normalized future values.
2. Source: City of Santa Cruz. DSS Model, Section: Results, Feb 16, 2016.

8.4 Overall Cost of Water Saved

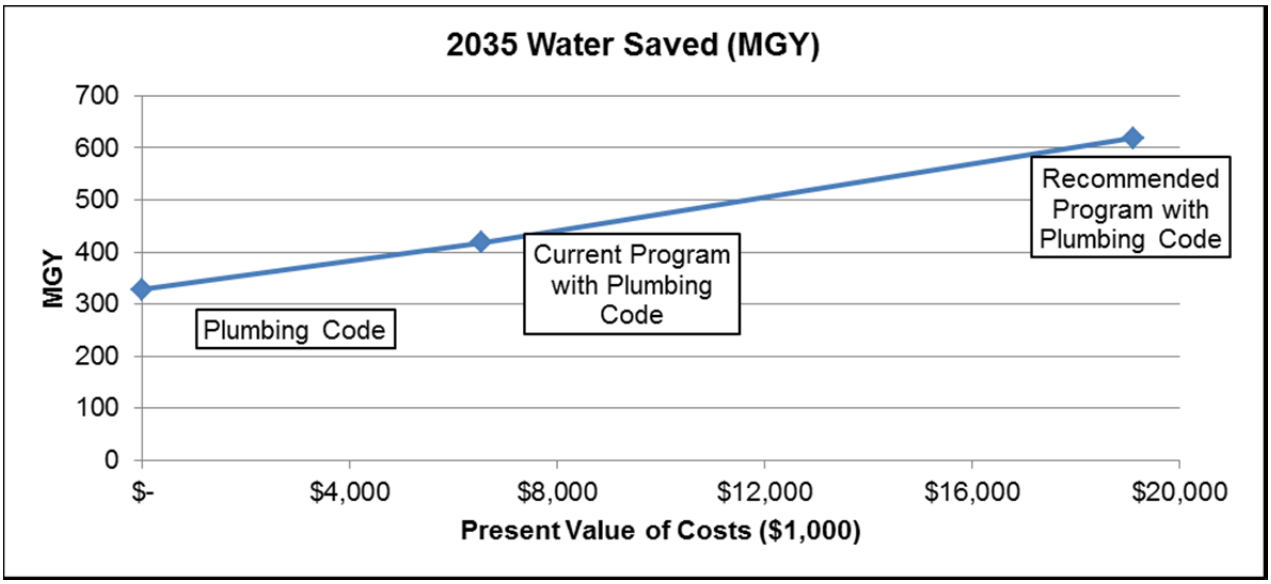
The cost of water saved per unit volume ($/MG) for the Recommended Program is $4,572/MG. This is below the Water Supply Alternatives Committee's recommended threshold for overall cost of water saved, which is $10,000/MG.

Several of the measures addressing peak season water use have the highest unit costs, but, together as a package, the Recommended Program is $4,572/MG, well below $10,000/MG (City of Santa Cruz, 2016), the maximum level established by the WSAC, which is lower than the expected unit cost of supply augmentation projects recommended to be pursued as a result of the WSAC's work.

It should be noted that the cost of water saved value somewhat undervalues the cost of savings because program costs are discounted to present value and the water benefit is not.

The following figure shows how the costs and savings of the City's current water conservation program compare to the Recommended Program as more utility dollars are spent to achieve greater water savings.

Figure 8-4. Present Value of Utility Costs vs. Cumulative Water Saved



8.5 GHG Savings Analysis

The City has a Climate Action Plan an expressed goal to reduce greenhouse gases. For the conserved water supply, there is an estimated embedded energy intensity of 1,948 kWh/MG saved, estimated in 2015 from the Pacific Gas and Electric (PG&E) GHG Inventory and City staff. The total annual GHG savings can be estimated simply by multiplying the water savings times the energy intensity times the PG&E GHG emission factor.

The following assumptions were made in estimating the GHG emissions savings:

- Estimated water savings in 2020 are 233 MGY and in 2035 are 619 MGY (Table 8-3).
- Same energy intensity as 2015 of 1,984 kWh/gallon saved (which is considered to be a preliminary estimate of future savings provided that the City is not required to add more energy intensive treatment facilities).
- PG&E emission factor of 290 lb. CO_2/MWh estimated for 2020 as provided in their November 2015 Guidance for PG&E Customers. Note that the recent average emission factor from 2009-2013 was 457 lb. CO_2/MWh. Emission factors are estimated based on the California Public Utilities Commission calculator who regulates private energy utilities and requires tracking and reporting of GHG emissions. The CPUC calculator was developed prior to the drought with reduction in hydropower and also does not extend to 2035, such that the 2020 value was used.
- Additional GHG savings from hot water savings at the end user level and from reduced wastewater collection, treatment, and disposal energy use is not quantified in this analysis.

Based on the parameters above, the total projected annual savings due to conserved water from the 2015 water supply sources is estimated to be a total of 61 metric tons of CO_2 per year equivalent savings in 2020 and 162 metric tons of CO_2 per year equivalent savings in 2035. Cumulative greenhouse gas reduction over the 20-year planning horizon is expected to be approximately 307 metric tons of CO_2.

9. IMPLEMENTATION STRATEGY

Each year a progress update will be used to analyze the progress being made regarding meeting the Recommended Program's targeted water savings. It will be imperative to track activities and water demand to understand the level of progress being made in meeting overall goals for the program.

The Program is intended to be dynamic and changes and adjustments are expected. Monitoring progress on implementing recommended measures should be a priority. Costs, participation rates, and water use should be tracked to ensure that the Program is on target to meet goals. As new promising technologies emerge, they should be tested and possibly replace programs that are underachieving. Summary reports should be issued citing progress and recommending changes in program content.

The following sections outline the recommended schedule as well as estimated budget and staffing needs to implement the Recommended Program. It also describes recommendations for potential future activities in support of the Santa Cruz Water Conservation Master Plan, including:

- Concepts for data collection and management systems
- Considerations of emerging new technologies
- Implications for responding to water shortages
- Future DSS Model updates

9.1 Proposed Implementation Schedule

The following Figure 9-1 presents the planned Recommended Program implementation schedule. A description of each measure can be found in Table 7-1. Some measures involve modifying existing programs and are relatively simple to implement. Other measures could involve extensive planning and or additional authority to implement. At least three measures involve the City passing new ordinances or amending building codes. One measure, No. 16 (Pre-Rinse Spray Nozzle Installation), has already been completed in conjunction with drought response during 2014.

Figure 9-1. Recommended Program Planned Implementation Schedule

No.	Measure	Time Period	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
1	System Water Loss Reduction	2015 - 2035	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2	Advanced Metering Infrastructure	2021 - 2035							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3	Large Landscape Budget-Based Water Rates	2018 - 2020				■	■	■															
4	General Public Information	2015 - 2035	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5	Public Information (Home Water Use Report)	2018 - 2035				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
6	Residential Leak Assistance	2018 - 2035				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
7	Single Family Residential Surveys	2015 - 2035	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
8	Plumbing Fixture Giveaway/Opt	2015 - 2017	■	■	■																		
9	Residential Ultra High Efficiency Toilet Rebates	2015 - 2020	■	■	■	■	■	■															
10	High Efficiency Clothes Washer Rebates	2015 - 2026	■	■	■	■	■	■	■	■	■	■	■	■									
11	High Efficiency Clothes Washer - New Development	2021 - 2035							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
12	Hot Water On Demand - New Development	2021 - 2035							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
13	Toilet Retrofit at Time of Sale	2015 - 2019	■	■	■	■	■																
14	CII MF Common Laundry Room High Efficiency Clothes Washer	2015 - 2024	■	■	■	■	■	■	■	■	■	■											
15	CII Incentives	2021 - 2026							■	■	■	■	■	■									
16	Pre-Rinse Spray Nozzle Installation	2015 - 2016	■	■																			
17	CII Surveys	2021 - 2026							■	■	■	■	■	■									
18	High Efficiency Urinal Program	2015 - 2018	■	■	■	■																	
19	Public Restroom Faucet Retrofit - MUN	2021 - 2023							■	■	■												
20	Public Restroom Faucet Retrofit - COM	2021 - 2030							■	■	■	■	■	■	■	■	■	■					
21	School Retrofit	2021 - 2030							■	■	■	■	■	■	■	■	■	■					
22	Water Efficient Landscape Ordinance	2015 - 2035	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
23	Single Family Residential Turf Removal	2015 - 2035	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
24	Multifamily Residential/CII Turf Removal	2015 - 2035	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
25	Expand Large Landscape Survey/Water Budgets	2018 - 2035				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
26	Sprinkler Nozzle Rebates	2018 - 2035				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
27	Gray Water Retrofit	2015 - 2035	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
28	Residential Rain Barrels	2015 - 2035	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
29	Climate Appropriate Landscaping and Rainwater Infiltration	2015 - 2035	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
30SF	SF Conservation Pricing - Water and Sewer	2018 - 2035				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
30MF	MF Conservation Pricing - Water and Sewer	2018 - 2035				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
30COM	COM Conservation Pricing - Water and Sewer	2018 - 2035				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
31	Single Family Multifamily Dishwasher Rebates	2018 - 2022				■	■	■	■	■													
32	Hot Water Recirculation Systems	2018 - 2022				■	■	■	■	■													
33	Rewarding Businesses For Adopting Best Practices	2020 - 2035						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
34	Additional Building Code Requirements for New Development	2018 - 2035				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
35	Innovation Incubator Program	2021 - 2035							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Source: City of Santa Cruz. DSS Model.

9.2 Estimated Implementation Budget

Over the next five years (2015-2020), the average annual cost to the City to implement the Recommended Program is approximately $1,064,000 per year of additional budget and includes additional staff time, materials, rebates, giveaways, etc. The annual utility cost and administrative cost breakdown for each conservation measure can be found in the DSS Model measure screen shots in Appendix C.

This budget was developed as part of the DSS Model evaluations for level of activity by year. The opportunities for State grants or cost sharing partnership with other County utilities or other means for lowering the cost of a conservation measure would lower the budgetary needs for implementation. The City should develop a detailed annual work plan;

use the DSS Model to monitor progress on demand reductions; and update the implementation cost estimates and associated budgets on an annual basis.

Table 9-1. Five-year Implementation Budget

Measure	2015	2016	2017	2018	2019	2020
Total Utility Costs	$991,343	$995,453	$984,192	$1,228,850	$1,147,135	$1,032,241
Total Admin Costs	$199,333	$200,346	$196,967	$257,707	$236,558	$222,420
Admin % of Total Costs	20%	20%	20%	21%	21%	22%

Source: City of Santa Cruz. DSS Model, Section: Conservation Analysis, Program Scenarios, Program Details, Feb 16, 2016.

Table 9-2. Long Range Budget Forecast

	Costs		
	Utility	Customer	Total
2015	$991,343	$958,295	$1,949,637
2016	$995,453	$963,305	$1,958,757
2017	$984,192	$968,314	$1,952,506
2018	$1,228,850	$1,329,686	$2,558,536
2019	$1,147,135	$1,295,705	$2,442,840
2020	$1,032,241	$1,307,901	$2,340,142
2021	$1,512,745	$2,864,331	$4,377,076
2022	$1,518,574	$2,871,599	$4,390,173
2023	$1,418,219	$2,593,586	$4,011,805
2024	$1,384,731	$2,580,369	$3,965,100
2025	$1,363,955	$2,562,136	$3,926,090
2026	$1,383,788	$3,247,801	$4,631,588
2027	$993,319	$2,955,101	$3,948,420
2028	$998,287	$2,961,365	$3,959,652
2029	$1,003,255	$2,967,629	$3,970,884
2030	$1,008,223	$2,973,893	$3,982,116
2031	$888,237	$2,770,177	$3,658,414
2032	$892,379	$2,776,042	$3,668,422
2033	$896,522	$2,781,907	$3,678,430
2034	$900,665	$2,787,772	$3,688,438
2035	$904,808	$2,793,638	$3,698,445

Source: City of Santa Cruz. DSS Model, Section: Conservation Analysis, Program Scenarios, Recommended Programs, Feb 16, 2016.

9.2.1 Overall Program Staffing Needs

The overall vision for conservation spans across the City's Water Department with multiple sections supporting planning and implementation tasks. A summary of each section's roles and responsibilities are as follows:

- Water Department: responsible for leading the efforts for both the internal and external conservation programs with a Conservation Section supported by four staff positions currently. It is estimated that the Water

Department may need to add up to two more full-time equivalent personnel to implement the additional workload represented by the recommended plan.

- Operations (Production and Distribution sections): responsible for implementation of the water loss control program as part of the water loss control program initiative.
- Customer Service section: responsible for responding to direct customer questions related to water conservation or for referring the questions to the appropriate staff, as well as meter shop operations.
- Communications staff: responsible for outreach and awareness campaigns to educate the public related to the need to use water wisely and the quality of the City's water in order to help sustain Santa Cruz's quality of life.
- In addition, implementation of the plan will require coordination and assistance of other City Departments, including IT, Finance, Planning and Community Development (building inspectors), Public Works, and Parks and Recreation.

The governing body for the Water Department is the Santa Cruz City Council. A seven-member Water Commission advises the City Council on policy matters involving the operations and management of the water system, including water conservation initiatives and activities.

Water conservation activities are also coordinated with neighboring water districts and other jurisdictions served by the City of Santa Cruz. These include the County of Santa Cruz, City of Capitola, Soquel Creek Water District, Scotts Valley Water District, San Lorenzo Valley Water District, and the City of Watsonville. The Regional Water Management Foundation and Resource Conservation District of Santa Cruz County also assist with coordination, outreach, integrated regional planning, and grant administration.

9.3 Conservation Data Collection and Management System

Tracking conservation data can and should be well organized. As conservation is a vital part of the water supply portfolio for City to meet projected future demands, estimating and analyzing water savings due to water demand reductions is necessarily based on reviewing customer usage data and conservation program activities. The City is embarking on a significant expansion of its existing efforts. As a result, taking an ad-hoc approach to data management where different employees maintain various program data inevitably leads to information having compatibility or quality issues over time as attempts at creating program activity summaries and water savings estimates are compiled. Different conservation measures have different options for tracking data. A summary of primary data tracking and management needs by program area are presented in Table 9-3.

Conservation database systems can be designed to integrate within a customer information system (e.g., billing system) and/or a work order system or be created as a stand-alone database (or utilize all three systems) to implement the conservation program (e.g., issue requests for surveys or water waste call follow-up sent to staff) and track data (e.g., post survey reports or water waste enforcement actions). Most systems track by address and not customer account number, given that these can open and close and legacy data can be lost. These information systems used to manage conservation program actions and data are custom to each utility, given the individual conservation measures and implementation strategies are unique to each agency and their existing data management system. Most important is a plan for data collection and due diligence on implementation of data tracking according to the Program. Without adequate data collection, analysis of past water savings and future planning adjustments for the conservation program become very challenging and end up being based mainly on assumptions or inferences of savings achieved or possible.

Table 9-3. Overview of Data Tracking and Management Needs

Program Area	Primary Data Tracking and Management Needs
Program Database Tracking	• Budget tracking (especially rebate and incentive programs for funds remaining). • Overall program water savings (e.g., calculator of quantifiable savings by activity or create a monitoring version of DSS Model using "actual" versus "planned activities"). • Workload planning (e.g., survey requests and technician assigned, through the customized work order system). • Contracts and agreements. • Overall programs and measures status. • Demand Use Study data - flow meter logging or connection to an existing database. • Saturation estimates of hardware or the measure (toilets, faucets, etc.) similar to the stats from the Baseline Water Use Survey and with updates every 3-5 years on a formal survey. • Retail audit information from periodic checks with local hardware stores.
Water Loss Control Program	• Use both Geographic Information System (GIS) and Customer Information System (CIS). • Manage data for annual AWWA system water audit software. • Analyze data for capital planning purposes (e.g., repeat main breaks earmarked for replacement versus repair). • Data from various leak detection products, data, etc. • Main break and leak information - dates, time, location, size of main, etc. This can be linked to existing database. Annually create a summary of program statistics. • Pipeline failure analysis - also can be linked to the existing database. Annually create a summary of program statistics. • Cathodic protection (CP) information - CP testing data. • Photo library of the main breaks - can be tied to mapping but it may be more organized through a data search and or location/demographic search.
Public Awareness and Education	• Customer Information System to manage customer contacts (e.g., attending classes, etc.). • Inventory of current outreach materials. • Educational classes for schools and to target groups such as school teachers, landscapers, etc.
Water Waste Violations	• CIS linked to GIS to manage customer water waste violations and repeat violation history and past fines.
All Rebate and Incentive Programs	• CIS linked to GIS to manage customer participating in any rebate or incentive program (e.g., allows for quick checking on exceeding number of eligible rebates, fraud protection, financial tracking on budget expended, etc.).

Program Area	Primary Data Tracking and Management Needs
Residential Surveys	• CIS linked to GIS to manage customer data (e.g., usage history queries, survey reports, notes customer needs [like medical for when drought comes to allow for variances], etc.).
Commercial Surveys	• CIS linked to GIS to manage customer data (e.g., usage history queries, survey reports, notes customer unique uses and needs [any issues for when drought comes to allow for variances], etc.).
Landscape Surveys and Water Budgets	• CIS linked to GIS to manage customer data (e.g., usage history queries, landscape survey reports, water budget tracking related to actual usage compared to budget, site photos, etc.).

Data tracking will be customized to each measure. At a minimum, the City staff will need the data for the DSS Model updates if it is desired to use the model to estimate achieved water savings. Ideally, City staff would also include enough data to support an annual report and/or publish summary accomplishments on the City's website.

Related to supporting future DSS Model updates, as described in Section 9.3, the City will need to collect data regarding measure implementation in separate worksheets (i.e., one worksheet per measure). Important parameters to track on the individual measure worksheets include the following for measures that involve rebates:

- All parameters requested in the rebate application
- City cost
- Pre-retrofit consumption
- Post-retrofit consumption
- Estimated savings

Related to incentive program information, it is recommended that the City develop rebate application forms that require the customer to complete the following fields in order to receive their rebate:

- Measure name
- Customer name
- Customer address
- Customer phone number
- Customer City water account number
- Customer PG&E account number (only applicable if cost-sharing measure with PG&E)
- Assessor parcel number (if needed to cross reference with other utility program for cost sharing)
- Water use of fixture being replaced, including the year that the fixture was manufactured (particularly for the HET retrofit)
- Original type of plumbing or appliance data – means to determine water usage (e.g., date purchased [plumbing fixtures] or manufacturer and model number)
- Behavior use information, as appropriate (e.g., number of loads of clothes per washer per week)

- New equipment date purchased
- New equipment date installed
- Purchase price
- Brand
- Model number
- Store name
- Any customer satisfaction related questions (e.g., toilet double flushing experienced before with old fixture and then with new fixture)
- Year property built
- Square footage
- Property type (include check-boxes with all customer types eligible to receive a rebate for particular measure)

Additionally, it should be required that the City require that the following are submitted with rebate applications:

- Proof of purchase
- Signed application for rebate (to be developed and provided by City)

The City should take the same approach to collecting data on other measures (e.g., surveys) to track progress. The following parameters should be tracked on individual measure worksheets for surveys:

- Measure name
- Customer name
- Customer address
- Customer phone number
- Customer City account number
- Customer PG&E account number (only applicable if cost-sharing measure with PG&E)
- Water use of fixture being replaced, including the year that the fixture was manufactured (particularly for the HET retrofit)
- Survey date
- Total acres of turf surveyed (if landscape survey)
- Inventory of water using appliances (and appropriate usage information if seeking to estimate before water savings)
- Documentation of any upgraded equipment on site (already occurred, planned or potential future) – especially important if a rebate or other incentive for upgrade is to be offered
- Information related to cooling tower or other larger water using equipment on site (dependent on building type and occupant usage)

9.4 Track and Update for New Codes and Emerging Technologies

More challenging is tracking the changes in the consumer marketplace for the vast array of water-using appliances and plumbing fixtures in both the residential and commercial sectors. Some means for tracking the latest in national standards and building codes as well as technologies and emerging trends in customer preferences include the following resources:

- Having staff member(s) assigned to voluntarily participate on the AWWA Water Conservation Division's committees with attendance at the Annual Conference Committee Meetings and conference calls, in particular the Water Efficiency Programs and Technology Committee.
- Monitor the Alliance for Water Efficiency (AWE) for updates on changes in National Standards and Codes and opportunities to comment on future changes to codes and regulations at the national level.
- As a WaterSense Partner, the City should continue to track the U.S. EPA WaterSense new technologies and post updated equipment lists of newly labeled products and services. Frequently, AWE or CUWCC have performance testing results posted on their websites that provide very useful information to consumers. Performance information may also be available through Consumer Reports or Consortium for Energy Efficiency (http://www.cee1.org).
- Attend the WaterSmart Innovations Conference for exposure to the vendors participating in the exhibition and also to attend technical sessions on emerging trends in water conservation programs.
- Leverage the State and County process for adopting new building codes and regulations, especially building codes to help implement proactive changes in future development in Santa Cruz. Many new codes first appear in appendices that can be easily excluded.
- Maintain and use a network of ten to twenty key contacts at progressive utilities to inquire about new technologies (e.g., through known contacts or new contacts made at WaterSmart Innovations or AWWA conferences).
- Host events with other partner utilities and applicable stakeholders on related water loss control programs or conservation measures.
- Conduct surveys every three years with other utilities nationally to gain insight on programs and testing of products.

Staying on or ahead of the curve with tracking new technologies would lead to water savings without City investment for later upgrades through incentive programs. One caution is adopting new technologies that have yet to have adequate research or product testing. These emerging products may be worthy of pilot programs and potentially attractive for grant funding projects through agencies like the U.S. EPA or U.S. Bureau of Reclamation (USBR).

9.5 Implications for Responding to Water Shortages

Given the investment and response by the Community both with the most recent 2013-2015 drought and through implementation of this conservation program in the coming years, the City will need to revise its Water Shortage Contingency Plan. This is needed in order to modify its expectations in meeting future reductions during low water supply conditions as it's assumed that the City has been and will continue to be subject to "demand hardening." This term refers to the concept that certain upgrades or changes can only have realized savings once (e.g., replacing an older toilet with a new high efficiency 1.28 gpf toilet).

In an attempt to achieve equity, it is recommended that the City's policies and Water Shortage Contingency Plan be expanded to include additional definition for other customer user classes. It is also recommended that priority for fire, health, and sanitation protection be placed above other discretionary uses. In other states, such as California, the Water Code Section 350 sets priority for order of demand to be served in times of drought, including fire protection, health and sanitation, with more discretionary uses following later. The California Water Code in Section 10632(a) specifies requirements for any water supplier serving more than 3,000 acre feet or 3,000 connections to plan for up to a 50% reduction in demand in times of drought. Section 10632(b) sets the criteria for planning for minimum water supply conditions based on the driest three-year sequence on record. These sections of the Water Code are required to be addressed every five years in a Water Shortage Contingency Plan, which is to be filed with the California Department of Water Resources.

Given the goal to reduce peak water savings and preserve surface water storage supplies, more concentrated efforts aimed at lowering irrigation and non-potable demands in times of drought should be explored for potential inclusion in the City's Water Shortage Contingency Plan.

9.6 Suggestions for Future DSS Model Updates

With the level of investment in both capital projects that may be deferred due to this program and also investments in the program itself, City staff should be ready with an answer to the question: "How much water has been saved and at what cost?" In addition, due to the need for ongoing water conservation efforts to attain and maintain more water savings, the City will need to track program water savings, programs costs, and benefits (i.e., cost savings).

The DSS Model is only for the quantifiable measures that have estimates for water savings. There are two types of updates envisioned for the DSS Model: 1) regular monitoring of costs and water savings; and 2) model recalibration with updated base year data and model inputs and assumptions. The following describes each type of update in more detail:

- Annual or more frequent model monitoring updates: The conservation measure worksheets can each be used to track actual activities and compared to the planned activities defined as part of the model development for this program plan. This update is recommended to happen as part of developing an annual work plan and budget. At minimum, it should happen on the order of every 3-5 years.
- Recalibration of the model: The DSS Model has a base year set in 2015. Depending on water demand and account growth rates, it is advisable to update the base year on a 5-year basis, which can be a few percent change in the number of total accounts served by the City. This update requires reviewing historical demand trends, future population and demand forecasts, fixture models calibration, new or updated conservation measures, and cost and water savings assumptions. The next model recalibration update is likely due around 2020 after the next U.S. Census is completed and when development of the next Urban Water Management Plan is underway.

Specific triggers for updates may include:

- Significant cost in the water pumped (more than 10-20% energy or chemical cost increase or decrease would modify the "savings worksheet" and change the benefit cost ratios)
- Significant change in population or accounts by one of the billing categories (more than 5% shift)
- Revision to the end use (e.g., study of end uses that modify the breakdown of the water system balance on the Demand Scenarios Worksheet)
- Significant changes to water system balance (e.g., more than 10% change in water losses or other parameter on the Demands Section of the Model)

- New codes or regulations that affect natural replacement rates of fixtures (need to modify to fixture models)
- Alternatives for staffing versus outsource contracting or other change to cost of implementation of a conservation measure (change to conservation measure worksheet only)
- New technologies for conservation measure being considered (change or addition of new conservation measure worksheet)
- Any other change in conservation measures (e.g., updates to the measure worksheets can be changed or modified at any time without altering the water system balance worksheets or affecting fixture model calibration)

A separate deliverable of the DSS Model and accompanying model source data documentation are also being provided to the City under a license from Maddaus Water Management, Inc.

10. CONCLUSIONS

The City staff and community teamed with MWM and developed this comprehensive water conservation program over the course of 2 phases and 3 years. The Program is in full alignment with and supports the City's recommended plan outlined in the WSAC Report. Overall, this Conservation Plan strives to balance the three interdependent goals of cost effective demand reduction, affordability, and organizational stability or capability. This section provides a summary of the planning effort, overall benefits and key findings from this Plan's development.

10.1 Summary of Planning Efforts

Throughout this planning effort, MWM teamed with City staff to achieve the goals of providing conservation program planning services that included the following components:

- Development and implementation support of pilot projects, Baseline Water Use Study, economic analysis tools, and metrics to define the planning assumptions appropriate to the Santa Cruz community
- A measure screening and evaluation process to select the specific water conservation measures for City's water conservation program
- An outline for the schedule and budget to implement the selected conservation measures
- A blueprint for an organizational staffing structure to support the wide variety water demand-side management projects and programs to implement the measures

Santa Cruz and MWM with this Plan have now documented the Water Conservation Program that clearly defines the following:

- City needs and objectives with a recommended, phased implementation strategy for meeting the objectives including scope, budget, and schedule for each of conservation measures selected
- An organizational structure for the City's water conservation program
- A process for ongoing use of the DSS Model as a decision-making tool using benefit-cost analysis, or business case evaluations, for the current planned and potential future new conservation measures

10.2 Key Benefits from the Water Conservation Program

This Program, when successfully implemented, will deliver a host of benefits. These benefits are listed in this section.

10.2.1 Resource Sustainability

Maximize available freshwater sources: The Santa Cruz community has finite limits on fresh surface and groundwater supplies to meet supply reliability needs and a growing population. The more efficient the existing demands become with the Program being implemented, the more resilient the existing water supplies will become.

Enhance stream ecosystems: Local streams and waterways are unique ecosystems and are home to sensitive listed species such as steelhead and Coho salmon. Decreasing the amount of water diverted for municipal purpose through water conservation allows for increased habitat value and healthier ecosystems.

10.2.2 Economic Sustainability

Allow for accelerated investment in rehabilitation and replacement programs under the Capital Improvement Plan: The costs for all utility services are projected to increase; however, the costs will be lower than otherwise with conservation due to lower demands and less wear and tear on infrastructure. The City would also be better able to afford increasing fiscal demands to rehabilitate and replace aging infrastructure by avoiding adding costlier supplies to meet future demands or savings from debt service to the extent projects can be delayed. Any reductions in lower demand are offset by lower fiscal requirements from the cost-effective conservation program that has been selected for implementation.

Utilize the least costly sources of supply: Conservation is often the cheapest source of water when offsetting the cost of future supplies that may be more than $10,000/MG. The unit cost of the recommend conservation program is about half the estimated cost of new supply in terms of $/MG produced.

Supply Augmentation Strategy: The water conservation program is estimated to assist in meeting future demands of more than 700 MG per year through 2035.

10.2.3 Social Sustainability

Support the City Council's sustainability initiatives: The national trend to minimize reliance on imported oil and use all resources more efficiently has been evolving and accelerating in recent years. City has unique resources and natural biodiversity that leads the community to flourish economically through tourism and other industry and is wholly dependent on local residents and visitors respecting the need to live sustainably.

Strengthen the socioeconomic conditions of Santa Cruz's residents: By maintaining more reasonable costs for water, energy, and sewer utility bills, local residents and businesses can better afford to reinvest in their community and have more dispensable income to support the local economy.

10.3 Key Findings from the Water Conservation Program

As a result of this comprehensive analysis here are some summary observations and conclusions:

1. The additional, incremental water savings from the Recommended Program, compared to the City's recent demand forecast, amount to about 220 million gallons in 2035.
2. The estimated annual demand will decline over time to about 3.2 billion gallons per year (BGY) in 2035, versus about 3.4 BGY estimated in the demand study. That estimate is comparable to the actual level of water production experienced in the late 1960s, when the service area population was around 50,000. This decrease represents an almost 16% reduction is water use over 20 years.
3. The impact on water savings from 2015 changes in the fixture plumbing codes prompted by the emergency conservation regulations (which would not have been factored in but for the delay associated with the Water Supply Advisory Committee's process) is over 100 million gallons more than previously estimated.
4. The overall cost of water saved by the Recommended Program is about half of what the WSAC set as a recommended threshold.
5. Gross per capita water use is expected to gradually decline to a level of less than 80 GPCD in 2035.

10.4 Recommended Next Steps

Successful implementation of the Program will require a significant increase in efforts on the part of the City. Many new conservation measures will be employed and high participation rates are needed to achieve Program goals. At current staffing and budget levels, the City would have difficultly implementing such an aggressive conservation program. Additional resources are needed. Recommendations to assist with implementation include the following next steps:

- Budget an additional $1.1 million per year to cover the added cost of implementing this plan
- Prioritize measures for implementation with those that contribute the most to meeting water saving targets being given highest priority for implementation
- Consider working with the largest water using customers to try to reduce water use as described in Section 3.5
- Develop a Measure Implementation Plan that describes exactly how the plan measures will be designed and implemented

- Develop an annual work plan for each plan year as soon as budget is adopted (or in concert with budget planning process)
- Update codes and ordinances, as necessary
- Form partnerships and apply for grants, where appropriate
- Contract to gain enough staff support to help administer or accelerate the new program measures, if needed
- Develop analytical tools to track water use by customer class and overall water use reductions adjusted for the weather and external factors
- Set up a database to store and manage measure participation, cost, and other data to gauge successes and failures
- Use the tools annually to help decide on priorities for the next plan year
- Use the DSS Model to annually update the Program, including actual measure participation, projected water savings, and expected per capita water use reductions, to ensure Program is on track to meet 2020 targets

To stay focused and on schedule, use input from the City's Water Commission and annual work planning process as the forum to amend the plan, budgets, staffing, contracting, schedule, and so forth to stay on track.

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APPENDIX A – DEMAND & PASSIVE SAVINGS METHODOLOGY

Plumbing codes and appliance standards for toilets, urinals, faucets, clothes washers, and showerheads will continue to reduce indoor residential and non-residential water demands in the future. This reduction in demand is accounted for in Maddaus Water Management (MWM) Decision Support System (DSS) Model. Background on the DSS Model, as well as details on the method of determining plumbing code savings is presented in the following sections.

A.1 DSS Model Overview

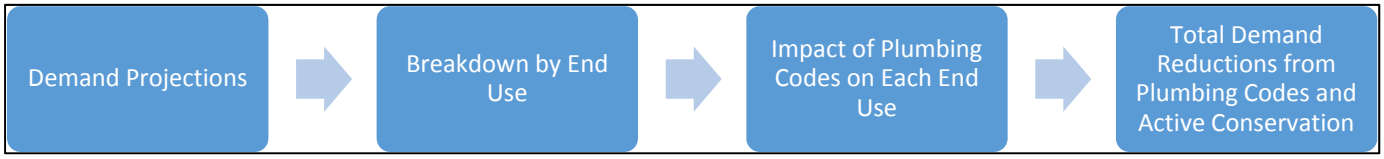
The DSS Model prepares long-range, detailed demand projections. The purpose of the extra detail is to enable a more accurate assessment of the impact of water efficiency programs on demand. A rigorous modeling approach is especially important if the project will be subject to regulatory or environmental review.

The DSS Model is an end-use model that breaks down total water production (water demand in the service area) to specific water end-uses. The model uses a bottom-up approach that allows for multiple criteria to be considered when estimating future demands, such as the effects of natural fixture replacement, plumbing codes, and conservation efforts. The DSS Model may also use a top-down approach with a utility prepared water demand forecast.

To forecast urban water demands using the DSS Model, customer demand data are obtained from the water agency being modeled. The demand data are reconciled with available demographic data to characterize the water usage for each customer category in terms of number of users per account and per capita water use. The data are further analyzed to approximate the split of indoor and outdoor water usage in each customer category. The indoor/outdoor water usage is further divided into typical end uses for each customer category. Published data on average per-capita indoor water use and average per-capita end use are combined with the number of water users to calibrate the volume of water allocated to specific end uses in each customer category. In other words, the DSS Model checks that social norms from end studies on water use behavior (e.g., for flushes per person per day) are not exceeded.

The DSS Model evaluates conservation measures using benefit cost analysis with the present value of the cost of water saved ($/Acre-Foot). Benefits are based on savings in water and wastewater facility operations and maintenance (O&M). The figure below illustrates the process for forecasting conservation water savings, including the impacts of fixture replacement due to plumbing codes and standards already in place.

The DSS Model has been used for practical applications of conservation planning in over 250 service areas representing 20 million people including extensive efforts nationally in California, Colorado, Hawaii, Idaho, Utah, Georgia, Florida, North Carolina, Tennessee, Oregon, Texas, Ohio, and internationally in Australia, New Zealand and Canada. The California Urban Water Conservation Council (CUWCC) did a peer review and has endorsed the model since 2006. The model is offered to all of their members for use to estimate water demand, plumbing code and conservaiton program savings. For more information please see the CUWCC Website: https://www.cuwcc.org/Resources/Planning-Tools-and-Models?folderId=776&view=gridview&pageSize=10



The DSS Model forecasts service area water fixture use. In the codes and standards part of the DSS Model, specific fixture end use type (point of use fixture or appliance), average water use, and lifetime are compiled. Additionally, state and national plumbing codes and appliance standards for toilets, urinals, showers, and clothes washers are modeled by customer category. These fixtures and plumbing codes can be added to, edited, or deleted by the user. This yields two demand forecasts: 1) with plumbing codes, and 2) without plumbing codes.

Plumbing code measures are independent of any conservation program; they are based on customers following applicable current local, state and federal laws, building codes, and ordinances.

A.2 Plumbing Codes and Legislation

The DSS Model incorporates the following items as a "code" meaning that the savings are assumed to occur and are therefore "passive" savings.

- National Plumbing Code
- CALGreen
- AB 715
- AB 407
- CA Code of Regulations Title 20 Sections 1601-1608 2015 Appliance Efficiency Rulemaking New Standards

National Plumbing Code

The Federal Energy Policy Act of 1992, as amended in 2005, mandates that only fixtures meeting the following standards can be installed in new buildings:

- Toilet – 1.6 gal/flush maximum
- Urinals – 1.0 gal/flush maximum
- Showerhead – 2.5 gal/min at 80 psi
- Residential faucets – 2.2 gal/min at 60 psi
- Public restroom faucets – 0.5 gal/min at 60 psi
- Dishwashing pre-rinse spray valves – 1.6 gal/min at 60 psi

Replacement of fixtures in existing buildings is also governed by the Federal Energy Policy Act, which mandates that only devices with the specified level of efficiency (as shown above) can be sold as of 2006. The net result of the plumbing code is that new buildings will have more efficient fixtures and old inefficient fixtures will slowly be replaced with new, more efficient models. The national plumbing code is an important piece of legislation and must be carefully taken into consideration when analyzing the overall water efficiency of a service area.

In addition to the plumbing code, the U.S. Department of Energy regulates appliances, such as residential clothes washers, further reducing indoor water demands. Regulations to make these appliances more energy efficient have driven manufactures to dramatically reduce the amount of water these machines use. Generally, front loading washing machines use 30-50% less water than conventional models (which are still available). In a typical analysis, the DSS Model forecasts a gradual transition to high efficiency clothes washers (using 12 gallons or less) so that by the year 2025 that will be the only type of machines available for purchase. In addition to the industry becoming more efficient, rebate programs for washers have been successful in encouraging customers to buy more water efficient models. Given that machines last about 10 years, eventually all machines on the market will be the more water efficient models. Energy Star® washing machines have a water factor (WF) of 6.0 or less - the equivalent of using 3.1 cubic feet (or 23.2 gallons) of water per load. The maximum water factor for residential clothes washers under current federal standards is 9.5. The water factor equals the number of gallons used per cycle per cubic foot of capacity. Prior to year 2000, the water factor for a typical new residential clothes washer was about 12. In March 2015, the federal standard reduced the maximum water factor for top- and front-loading machines to 8.4 and 4.7, respectively. In 2018, the maximum water factor for top-loading machines will be further reduced to 6.5. For commercial washers, the maximum water factors were reduced

in 2010 to 8.5 and 5.5 for top- and front-loading machines, respectively. Beginning in 2015, the maximum water factor for Energy Star® certified washers was 3.7 for front-loading and 4.3 for top-loading machines. In 2011, the Environmental Protection Agency (EPA) estimated that Energy Star® washers comprised more that 60% of the residential market and 30% of the commercial market (Energy Star®, 2011). A new Energy Star® compliant washer uses about two-thirds less water per cycle than washers manufactured in the 1990s.

State Building Code – 2015 CALGreen

The 2015 CALGreen requirements effect all new development in the State of California after July 1, 2015.[3] The DSS Model includes the CALGreen requirements that effect all new development in the State of California after July 1, 2015. The DSS Model modeled water savings from the CALGreen building code by adding Multi-family and Commercial customer categories as appropriate to applicable conservation measures.

State Plumbing Code – AB 715

Plumbing codes for toilets, urinals, showerheads, and faucets were initially adopted by California in 1991, mandating the sale and use of ultra-low flush 1.6 gallon per flush (gpf) toilets (ULFTs), 1 gpf urinals, and low-flow showerheads and faucets. California Code of Regulations Title 20 California State Law (AB 715) required High Efficiency Toilets and High Efficiency Urinals be exclusively sold in the state by 2014. Effective January 1, 2014, Assembly Bill (AB) 715 (enacted in 2007) required that toilets and urinals sold and installed in California cannot have flush ratings exceeding 1.28 and 0.5 gallons per flush, respectively.

California State Law – SB 407

SB 407 addresses plumbing fixture retrofits on resale or remodel. The DSS Model carefully takes into account the overlap with SB 407, the plumbing code (natural replacement), CALGreen, AB 715 and rebate programs (such as toilet rebates). SB 407 (enacted in 2009) requires that properties built prior to 1994 be fully retrofitted with water conserving fixtures by the year 2017 for single-family residential houses and 2019 for multifamily and commercial properties. SB 407 program length is variable and continues until all the older high flush toilets have been replaced the service area. The number of accounts with high flow fixtures is tracked to make sure that the situation of replacing more high flow fixtures than actually exist does not occur. SB 837 (enacted in 2011) requires that sellers of real property disclose on their Real Estate Transfer Disclosure Statement whether their property complies with these requirements. Additionally, SB 407 conditions issuance of building permits for major improvements and renovations upon retrofit of non-compliant plumbing fixtures. Each of these laws is intended to accelerate the replacement of older, low efficiency plumbing fixtures, and ensure that only high-efficiency fixtures are installed in new residential and commercial buildings.

2015 CALGreen and 2015 CA Code of Regulations Title 20 Appliance Efficiency Regulations

Fixture characteristics in the DSS Model are tracked in new accounts, which are subject to the requirements of the 2015 California Green Building Code and 2015 California Code of Regulations Title 20 Appliance Efficiency Regulations adopted by the California Energy Commission (CEC) on September 1, 2015. The CEC 2015 appliance efficiency standards applies to the following new appliances, if they are sold in California: showerheads, lavatory faucets, kitchen faucets, metering faucets, replacement aerators, wash fountains, tub spout diverters, public lavatory faucets, commercial pre-rinse spray valves, urinals, and toilets. The DSS Model accounts for plumbing code savings due to these standards effects on showerheads, faucets and aerators, urinals, and toilets.

[3] More information on the California Building Standards Commission reference documents are available online: http://www.bsc.ca.gov/pubs/bullet.aspx

- Showerheads: July 2016: 2.0 gpm; July 2018: 1.8 gpm
- Wall Mounted Urinals: 2016: 0.125 (pint) gpf
- Lavatory Faucets and Aerator: July 2016: 1.2 gpm at 60 psi
- Kitchen Faucets and Aerator: July 2016: 1.8 gpm with optional temporary flow of 2.2 gpm at 60 psi
- Public Lavatory Faucets: July 2016: 0.5 gpm at 60 psi

In summary, the controlling law for **toilets** is Assembly Bill (AB) 715. This bill requires high efficiency toilets (1.28 gpf) to be exclusively sold in California beginning January 1, 2014. The controlling law for wall-mounted urinals is the 2015 CEC efficiency regulations requiring that ultra-high efficiency pint **urinals** (0.125 gpf) be exclusively sold in California beginning January 1, 2016. This is an efficiency progression for urinals from AB 715's requirement of high-efficiency (0.5 gpf) urinals starting in 2014.

Standards for **residential clothes washers** fall under the regulations of the U.S. Department of Energy. In March 2015, the federal standard reduced the maximum water factor for non-Energy Star® certified top- and front-loading washing machines to 8.4 and 4.7, respectively. In 2018, the maximum water factor for standard top-loading machines will be further reduced to 6.5.

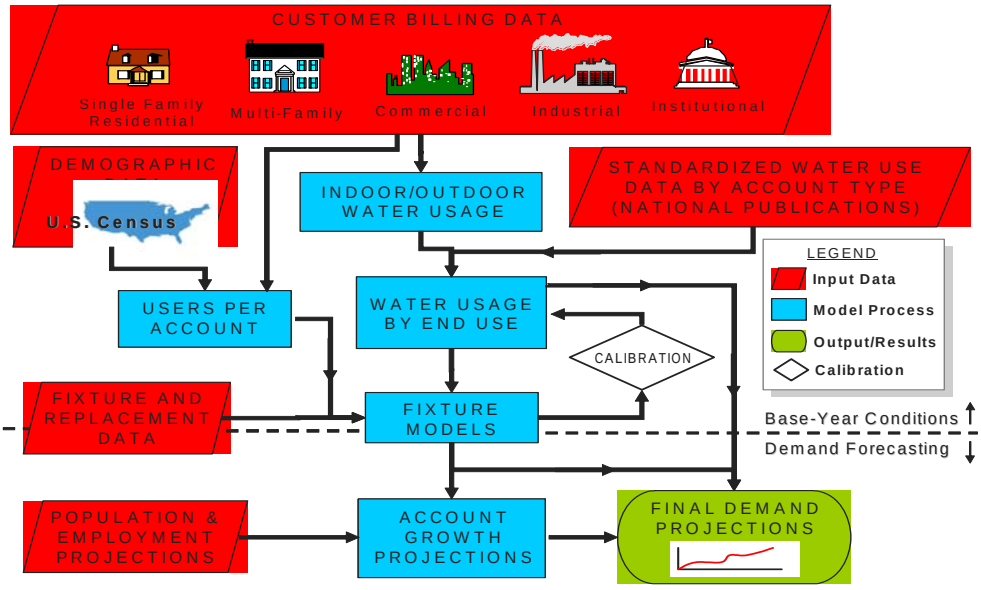
Showerhead flow rates are newly regulated under the 2015 California Code of Regulations Title 20 Appliance Efficiency Regulations adopted by the CEC, which requires the exclusive sale in California of 2.0 gpm showerheads at 80 psi as of July 1, 2016 and 1.8 gpm showerheads at 80 psi as of July 1, 2018. The WaterSense specification applies to showerheads that have a maximum flow rate of 2.0 gallons per minute (gpm) or less. This represents a 20% reduction in showerhead flow rate over the current federal standard of 2.5 gpm, as specified by the Energy Policy Act of 1992.

Faucet flow rates have likewise been recently regulated by the 2015 CEC Title 20 regulations. This standard requires that the residential faucets and aerators manufactured on or after July 1, 2016 be exclusively sold in California at 1.2 gpm at 60 psi; and public lavatory and kitchen faucet/aerators sold or offered for sale on or after July 1, 2016 be 0.5 gpm at 60 psi, and 1.8 gpm at 60 psi (with optional temporary flow of 2.2 gpm), respectively. Previously, all faucets had been regulated by the 2010 California Green Building Code at 2.2 gpm at 60 psi.

Plumbing code related water savings are considered reliable, long-term savings, and can be counted on over time to help reduce the City's overall system water demand. The demand projections including plumbing code savings further assumes no active involvement by the water utility, and that the costs of purchasing and installing replacement equipment (and new equipment in new construction) are borne solely by the customers, occurring at no direct utility expense. The inverse of the Fixture Life is the natural replacement rate, expressed as a percent (i.e., 10 years is a rate of 10% per year).

The following figure conceptually describes how plumbing codes are incorporated into the flow of information in the DSS Model.

Figure A-1. DSS Model Overview Used to Make Potable Water Demand Projections



DSS Model Fixture Replacement

The DSS Model is capable of modeling multiple types of fixtures, including fixtures with slightly different design standards. For example, currently toilets can be purchased that flush at a rate of 0.8 gallons per flush (gpf), 1.0 gallon per flush or 1.28 gallons per flush. The 1.6 gpf and higher gallons per flush toilets still exist but can no longer be purchased in California. Therefore, they cannot be used for replacement or new installation of a toilet. So, the DSS Model utilizes a fixture replacement table to decide what type of fixture should be installed when a fixture is replaced or a new fixture is installed. The replacement of the fixtures is listed as a percentage, as shown in the following figure. A value of 100% would indicate that all the toilets sold would be of one particular flush volume. A value of 75% means that three out of every four toilets installed would be of that particular flush volume type. The DSS Model contains a pair of replacement tables for each fixture type and customer category combination (i.e., Residential Single Family toilets, Residential Multifamily toilets, Commercial toilets, Residential clothes washing machines, Commercial washing machines, etc.).

In the following example, the DSS Model includes the effects of the Federal Policy Act and AB 715 on each toilet fixture type. This DSS Model feature determines the “saturation” of 1.6 gpf toilets as the Federal Policy Act was in effect from 1992-2014 for 1.6 gpf toilet replacements.

Figure A-2. Toilet Replacement Percentages by Type of Toilet

Replacement Fixture Market Shares					
Year	1.28 gpf HET Residential	1.6 gpf ULFT Residential	High Use Toilet Residential	<1.0 gpf Toilet Residential	Total
2012	75%	25%	0%	0%	100%
2015	100%	0%	0%	0%	100%
2020	90%	0%	0%	10%	100%
2030	65%	0%	0%	35%	100%
2040	50%	0%	0%	50%	100%
New Fixture Market Shares					
Year	1.28 gpf HET Residential	1.6 gpf ULFT Residential	High Use Toilet Residential	<1.0 gpf Toilet Residential	Total
2012	100%	0%	0%	0%	100%
2015	100%	0%	0%	0%	100%
2020	90%	0%	0%	10%	100%
2030	65%	0%	0%	35%	100%
2040	50%	0%	0%	50%	100%

A.3 Basis for the Demand Forecast

In the City of Santa Cruz Water Demand Forecast, M.Cubed conducted an econometric analysis of water demand and forecasts of class-level customer demands and total system production through 2035. (M.Cubed, 2015) The report was commissioned by the City of Santa Cruz Water Department and the City's Water Supply Advisory Committee. Its purpose was to update the Department's existing demand forecast adopted as part of the 2010 UWMP to reflect current information on water usage and to account for effects of current conservation, water rates, and other factors expected to impact the future demand for water. MWM's DSS Model incorporates this econometric analysis by inputting the regression equations and data sets used by M.Cubed and calibrated to ensure consistency between the two demand forecast models.

The City's DSS Model starts with a "baseline" demand forecast, which is not the same forecast as presented by M.Cubed. It differs in that it backs out the earlier estimates for plumbing code savings and the estimated future water saving associated with the City's current water conservation program that were provided by MWM to M.Cubed in 2015 and embedded in that final demand forecast. All other variables, including average water use per account, forecasts of account growth, and economic factors used to forecast water use in the M.Cubed report, were taken directly from that model and used to populate the DSS Model.

The following table compares the primary water demand forecast presented by M.Cubed without the code savings and program savings that were previously generated from the DSS Model analysis completed in October 2014 compared to the updated DSS "baseline" demand completed in February 2016.

Table A-1. Comparison of M.Cubed Demand Forecast and DSS "Baseline" Forecast

Demand (MG)	2020	2025	2030	2035
M.Cubed Final Demand Forecast, September 2015	3,385	3,351	3,388	3,442
2014 Estimate of Plumbing Code Savings (prior DSS Model version)	65	132	197	235
2014 Estimate of Conservation Program Savings – Program "A" (prior DSS Model version)	110	143	139	134
M.Cubed Final Demand Forecast without Plumbing Code or Conservation Program Savings	3,560	3,626	3,724	3,811
DSS Model "Baseline" Demand	3,560	3,636	3,743	3,838
Difference, MG	0	10	19	27
Difference, %	0.0%	0.3%	0.5%	0.7%

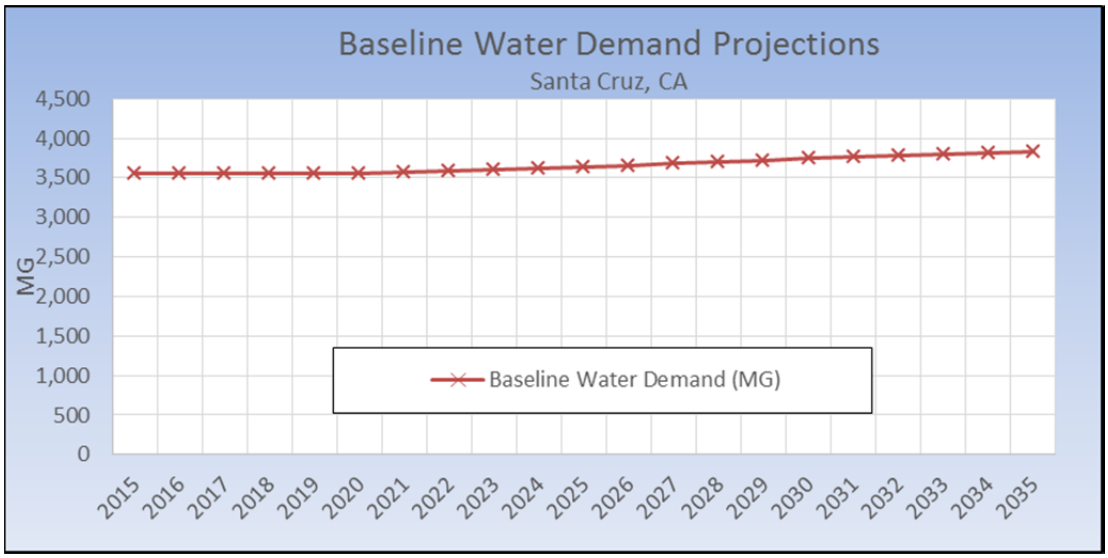
Note: Plumbing code and program savings (M.Cubed, 2015, Attachment 8) were originally based on results from the 2014 DSS Model work by Maddaus Water Management; they were updated with the most recent DSS Model results from February 2016.

As can be seen in the previous table, the two models are in close agreement and in all years differ by less than 1%.

The baseline demand forecast is shown in the following figure. As referenced in the 2015 M.Cubed report, the baseline forecast is predicated on average weather and normal economic conditions and is not expected to match realized demand, especially in the short term. City staff will continue to monitor production and consumption through and following the drought.

The next step involves calculating the effect of passive savings against the "baseline" demand. The results differ from previous estimates of plumbing code savings presented in 2014-15 for two reasons: 1) lower baseline demand and 2) additional passive savings due to recent changes in California codes resulting from 2015 emergency conservation regulations adopted in California, effective December 1, 2015 (after the publication of the M.Cubed report).

Figure A-3. Baseline Demand Forecast Without Plumbing Code Savings



Source: City of Santa Cruz. DSS Model, Section: Demand Analysis, Feb 16, 2016.

A.4 Water Reduction Methodology

Each conservation measure targets a particular water use such as indoor single family water use. Targeted water uses are categorized by water user group and by end use. Targeted water user groups include single family residential, multifamily residential, commercial, industrial, and institutional (CII), etc. Measures may apply to more than one water user group. Targeted end uses include indoor and outdoor use. The targeted water use is important to identify because the water savings are generated from reductions in water use for the targeted end use. For example, a residential retrofit conservation measure targets single family and multifamily residential indoor use, and in some cases specifically shower use. When considering the water savings potential generated by a residential retrofit one considers the water saved by installing low-flow showerheads in single family and multifamily homes.

The market penetration goal for a measure is the extent to which the product or service related to the conservation measure occupies the potential market. In essence, the market penetration goal identifies how many fixtures, rebates, surveys, etc. the wholesale customer would have to offer or conduct over a period of time to reach its water savings goal for that conservation measure. This is often expressed in terms of the number of fixtures, rebates, surveys, etc. offered or conducted per year.

The potential for errors in market penetration goal estimates for each measure can be significant because they are based on previous experience, chosen implementation methods, projected utility effort, and funds allocated to implement the measure. The potential error can be corrected through re-evaluation of the measure as the implementation of the measure progresses. For example, if the market penetration required to achieve specific water savings turns out to be more or less than predicted, adjustments to the implementation efforts can be made. Larger rebates or additional promotions are often used to increase the market penetration. The process is iterative to reflect actual conditions and helps to ensure that market penetration and needed savings are achieved regardless of future variances between estimates and actual conditions.

In contrast, market penetration for mandatory ordinances can be more predictable with the greatest potential for error occurring in implementing the ordinance change. For example, requiring dedicated irrigation meters for new accounts through an ordinance can assure an almost 100% market penetration for affected properties.

Water utilities are constantly looking at when a measure reaches saturation. Baseline surveys are the best approach to having the most accurate information on market saturation. This was taken into account when analyzing individual conservation measures where best estimates were made. MWM was not provided with any baseline surveys for this analysis, but discussions were held with the City staff regarding what their best estimates were for saturation for their service area.

A.5 Perspectives on Benefits and Costs

The determination of the economic feasibility of water conservation programs involves comparing the costs of the programs to the benefits provided. This analysis was performed using the DSS Model developed by MWM. The DSS Model has received the endorsement of the California Urban Water Conservation Council, and calculates cost effectiveness of conservation measure savings at the end-use level; for example, the model determines the amount of water a toilet rebate program saves in daily toilet use for each single family account.

A.6 Present Value Parameters

Present value analysis using constant FY 2015 dollars and a real discount rate of 2.25% is used to discount costs and benefits to the base year; this is based on a nominal interest rate of 4.5% and an assumed inflation rate of 2.2%. From this analysis, benefit-cost ratios of each measure are computed. When measures are put together in programs, the model is set up to avoid double counting savings from multiple measures that act on the same end use of water. For example, multiple measures in a program may target toilet replacements. The model includes assumptions to apportion water savings between the multiple measures.

Economic analysis can be performed from several different perspectives, based on which party is affected. For planning water use efficiency programs for utilities, the perspectives most commonly used for benefit-cost analyses are the "utility" perspective and the "community" perspective. The Utility Benefit-Cost Analysis is based on the benefits and costs to the water provider. The Community Benefit-Cost Analysis includes the utility benefit and costs together with account owner/customer benefits and costs. These include customer energy and other capital or operating cost benefits plus costs of implementing the measure, beyond what the utility pays.

The utility perspective offers two advantages. First, it considers only the program costs that will be directly borne by the utility. This enables the utility to fairly compare potential investments for saving versus supplying increased quantities of water. Second, revenue shifts are treated as transfer payments, which means program participants will have lower water bills and non-participants will have slightly higher water bills so that the utility's revenue needs continue to be met. Therefore, the analysis is not complicated with uncertainties associated with long-term rate projections and retail rate design assumptions. It should be noted that there is a significant difference between the utility's savings from the avoided cost of procurement and delivery of water and the reduction in retail revenue that results from reduced water sales due to water use efficiency. This budget impact occurs slowly, and can be accounted for in water rate planning. Because it is the water provider's role in developing a water use efficiency plan that is vital in this study, the utility perspective was primarily used to evaluate elements of this report.

The community perspective is defined to include the utility and the customer costs and benefits. Costs incurred by customers striving to save water while participating in water use efficiency programs are considered, as well as the benefits received in terms of reduced energy bills (from water heating costs) and wastewater savings, among others. Water bill savings are not a customer benefit in the aggregate for reasons described above. Other factors external to the utility, such as environmental effects, are often difficult to quantify or are not necessarily under the control of the utility. They are therefore frequently excluded from economic analyses, including this one.

The time value of money is explicitly considered. Typically, the costs to save water occur early in the planning period whereas the benefits usually extend to the end of the planning period. A long planning period of 20-30 years is typically used because costs and benefits that occur beyond 2050 years have very little influence on the total present value of the costs and benefits. The value of all future costs and benefits is discounted to the first year in the DSS Model (the base year, which in this case is 2015), at the real interest rate of 2.25%. The DSS Model calculates this real interest rate, adjusting the current nominal interest rate (assumed to be approximately 4.5%) by the assumed rate of inflation (2.2%). The formula to calculate the real interest rate is: (nominal interest rate – assumed rate of inflation)/ (1 + assumed rate of inflation). Cash flows discounted in this manner are herein referred to as "Present Value" sums.

A.7 Measure Assumptions Including Unit Costs, Water Savings, and Market Penetrations

Measure assumptions including unit costs, water savings and market penetrations were made for each measure.

- Targeted Water User Group End Use – Water user group (e.g., single family residential) and end use (e.g., indoor or outdoor water use).
- Utility Unit Cost – Cost of rebates, incentives, and contractors hired to implement measures. The assumed dollar values for the measure unit costs were closely reviewed by staff and are found to be adequate for each individual measure. The values in the majority of cases are in the range of what is currently offered by other water utilities in the region.
- Retail Customer Unit Cost – Cost for implementing measures that is paid by retail customers (i.e., the remainder of a measure's cost that is not covered by a utility rebate or incentive).
- Utility Administration and Marketing Cost – The cost to the utility for administering the measure, including consultant contract administration, marketing, and participant tracking. The mark-up is sufficient (in total) to cover conservation staff time and general expenses and overhead.

The unit costs vary according to the type of customer account and implementation method being addressed. For example, a measure might cost a different amount for a residential single family account than a residential multifamily

account, and for a rebate versus an ordinance requirement or a direct installation implementation method. Typically water utilities have found there are increased costs associated with achieving higher market saturation, such as more surveys per year. The DSS Model calculates the annual costs based on the number of participants each year. The general formula for calculating annual utility costs is:

- Annual Utility Cost = Annual market penetration rate x total accounts in category x unit cost per account x (1+administration and marketing markup percentage)
- Annual Customer Cost = Annual number of participants x unit customer cost
- Annual Community Cost = Annual utility cost + annual customer cost

A.8 Assumptions about Measure Costs

Costs were determined for each of the measures based on industry knowledge, past experience and data provided by the City. Costs may include incentive costs, usually determined on a per-participant basis; fixed costs, such as marketing; variable costs, such as the costs to staff the measures and to obtain and maintain equipment; and a one-time set-up cost. The set-up cost is for measure design by staff or consultants, any required pilot testing, and preparation of materials that will be used in marketing the measure. The model was run for 25 years, (each year between 2015 and 2035) to encompass the 10-year conservation planning period of 2015 to 2025. The model provides long range forecasted savings, with a focus on conservation measure implementation period of 10 years. Costs were spread over the time period depending on the length of the implementation period for the measure and estimated voluntary customer participation levels.

Lost revenue due to reduced water sales is not included as a cost because the conservation measures evaluated herein generally take effect over a span of time that is sufficient to enable timely rate adjustments, if necessary, to meet fixed cost obligations.

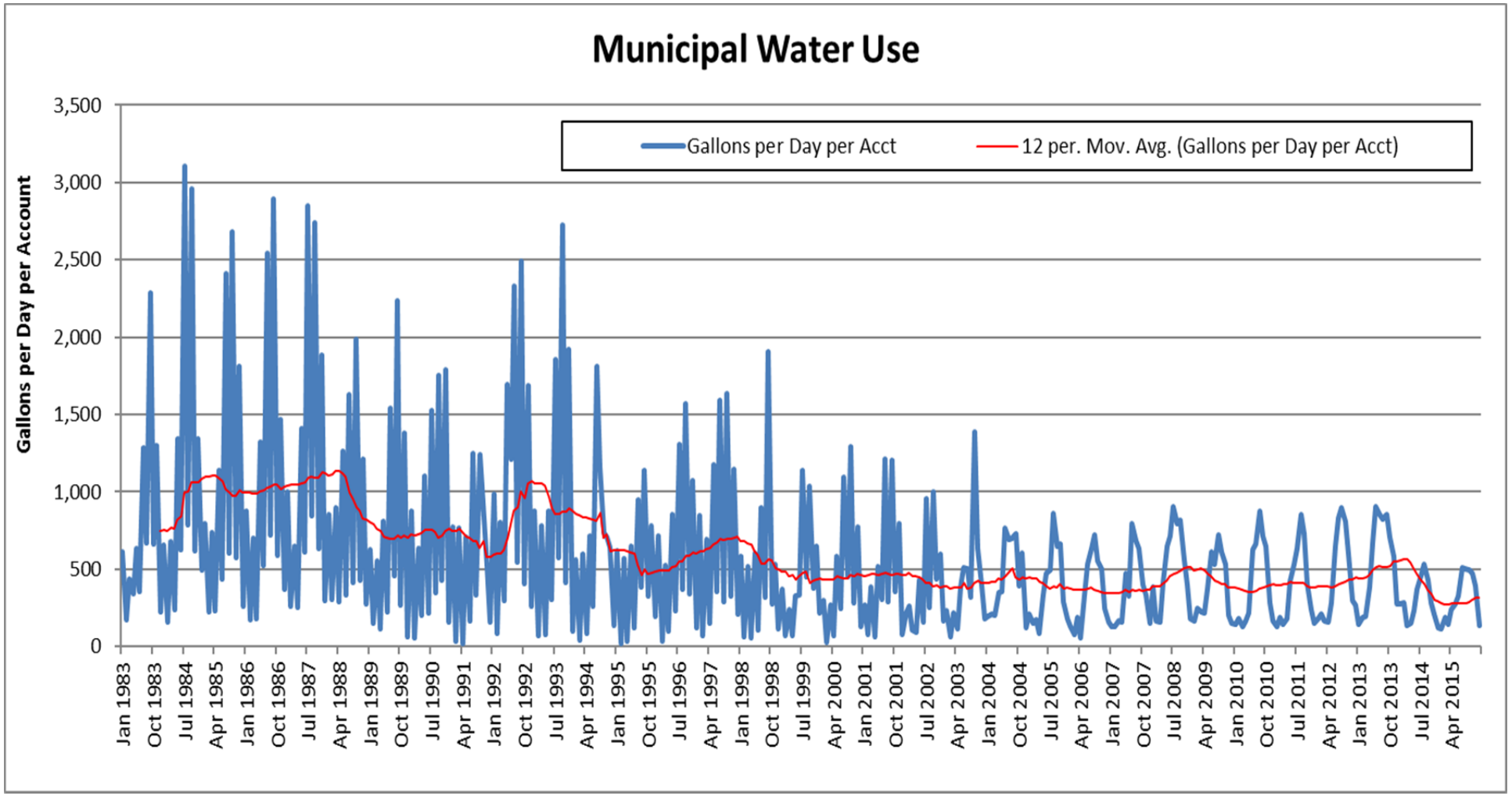
A.9 Assumptions about Measure Savings

Data necessary to forecast water savings of measures include specific data on water use, demographics, market penetration, and unit water savings. Savings normally develop at a measured and predetermined pace, reaching full maturity after full market penetration is achieved. This may occur three to seven years after the start of implementation, depending upon the implementation schedule. For every conservation activity or replacement with more efficient devices, there is a useful life. The useful life is called the “Measure Life” and is defined to be how long conservation measure stays in place and continues to save water. It is assumed that measures implemented because of codes, standards or ordinances, like toilets for example, would be “permanent” and not revert to an old inefficient level of water use if the device needed to be replaced. However, some measures that are more behavioral based like residential surveys are assumed to need to be repeated on an ongoing basis to retain the water savings (e.g., homeowners move away and new homeowners may have less efficient water using practices around the home). Surveys typically have a measure life on the order of five years.

APPENDIX B – HISTORICAL MONTHLY WATER USE PER ACCOUNT TYPE

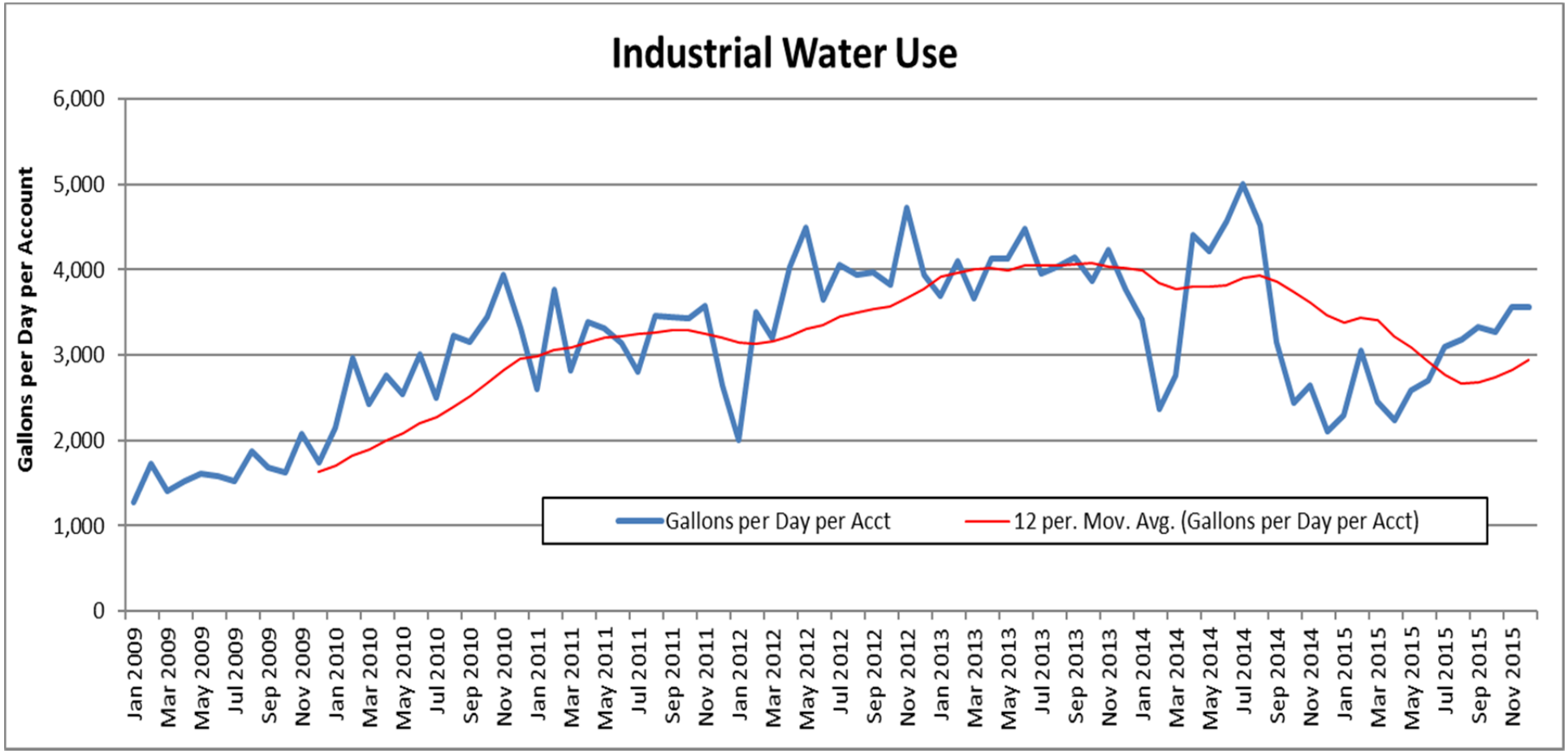
The average monthly usage per account per day for the four primary types of customers in the City are presented in the following figures.

Figure B-1. Municipal Consumption per Account per Day*



* The City experienced drought years in 1976-77, 1988-1992, and 2009-2015 and economic recession in years 2008-2012.

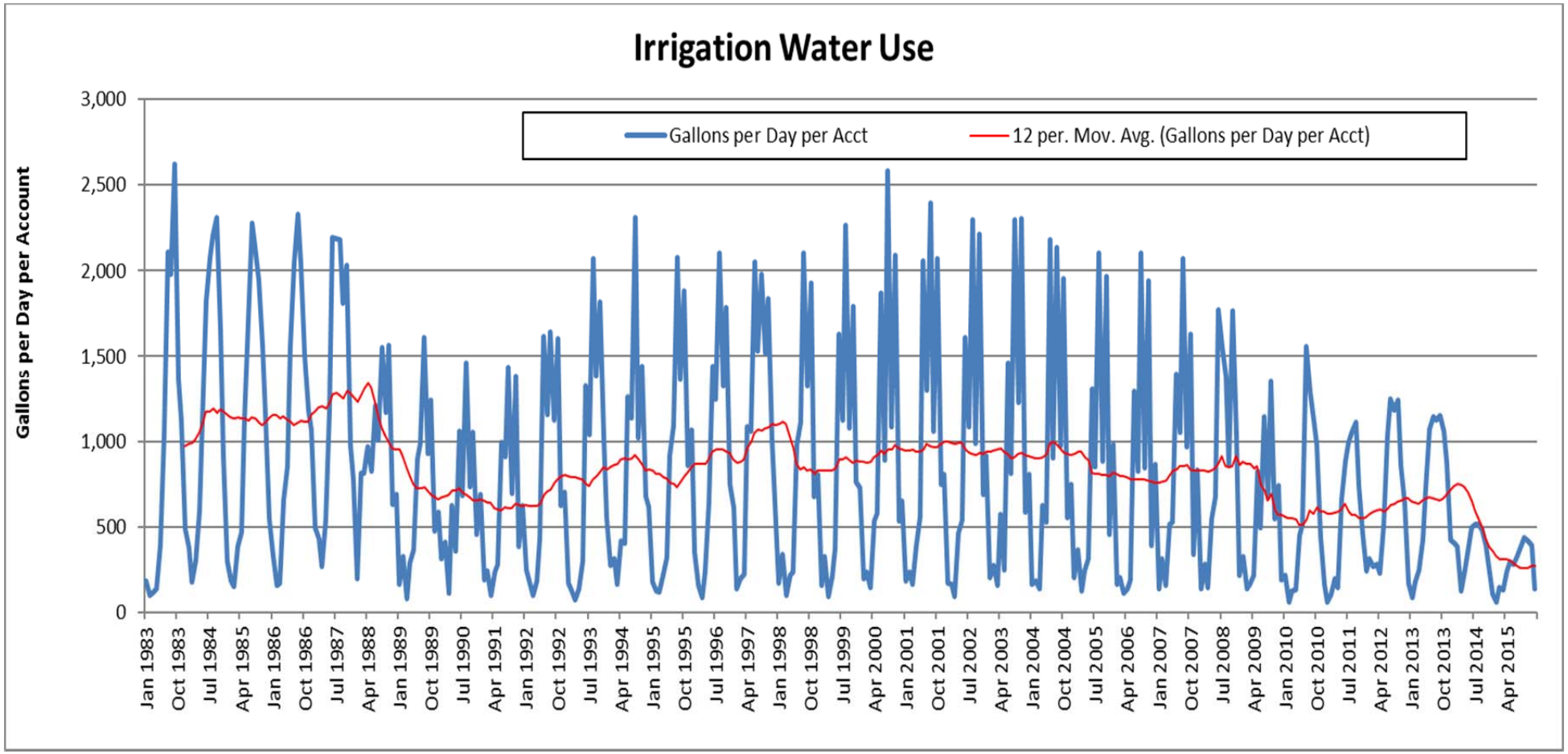
Figure B-2. Industrial Consumption per Account per Day



Notes:

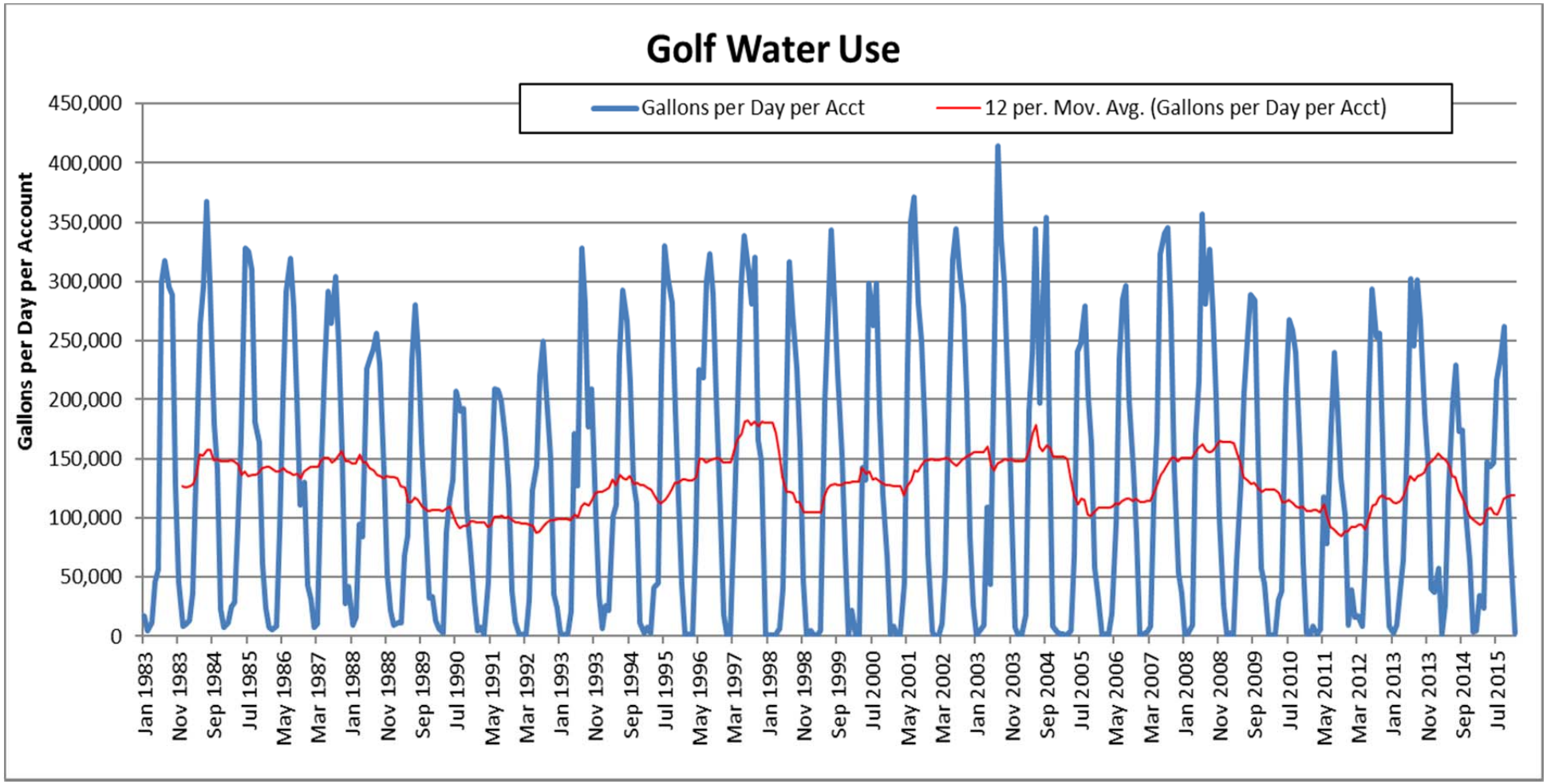
1. Industrial water use was not tracked as a separate customer category until 2009.
2. The City experienced drought years in 1976-77, 1988-1992, and 2009-2015 and economic recession in years 2008-2012.

Figure B-3. Irrigation Consumption per Account per Day*



* The City experienced drought years in 1976-77, 1988-1992, and 2009-2015 and economic recession in years 2008-2012.

Figure B-4. Golf Consumption per Account per Day*



* The City experienced drought years in 1976-77, 1988-1992, and 2009-2015 and economic recession in years 2008-2012.

APPENDIX C – DSS MODELING ASSUMPTIONS FOR CONSERVATION MEASURES

System Water Loss Reduction

Overview	
Name	System Water Loss Reduction
Abbr	1
Category	Default
Measure Type	Water Loss Measure

Time Period	
First Year	2015

Backlog Costs	
Total Backlog Work Costs	$1,000,000
Years to Complete Backlog	5

Maintenance Costs	
Annual Maintenance Costs	$120,000

Target	
Total GPCD Reduction	0.9

Description

City of Santa Cruz's water losses are relatively low. This measure would seek to maintain low non-revenue water rates through controlling both apparent and real water losses. This would be annually tracked through the American Water Works Association (AWWA) Water Balance Water System Audit. The City's Distribution Department implements this measure.

Results	
Average Water Savings (mgd)	
	0.080377
Lifetime Savings - Present Value ($)	
Utility	$1,210,408
Community	$1,210,408
Lifetime Costs - Present Value ($)	
Utility	$2,418,332
Community	$2,418,332
Benefit to Cost Ratio	
Utility	0.50
Community	0.50
Cost of Savings per Unit Volume ($/mg)	
Utility	$3,923

Comments

The savings is over the life of the program which is tied to the agency current Non Revenue Water (NRW) percentage which can be found in the GREEN "Non Revenue Water" portion of the DSS Model. "Annual Maintenance Costs" inputs allow for budget estimates for complete program. Additional water savings of "Non-Revenue Water" real water losses may be available when technically feasible. Rule of thumb is minimum system water losses below approximately 6% (as defined as the difference between production and consumption or alternatively as a percent of System Input Volume using AWWA Water System Audit definitions). For NRW below 6% (which can be found in the GREEN "Non Revenue Water" portion of the DSS Model), input "0%" for new real water savings and "$0" in the Backlog Cost section. For NRW above 6%, a GPCD savings input volume can be computed (an estimate of annual savings volume divided by total population). For example a 4.0 GPCD is equivalent to a 2% reduction for the system with a 150 GPCD water use. Additional Water Loss Control Program budget to achieve these water savings is inputted into the "Backlog Cost" section along with the duration of the years to accomplish the estimated reduction. In other words, $250,000 over 5 years would add $50,000 per year to assist with meeting NRW reduction goals.

Costs	
	Utility
2015	$200,000
2016	$200,000
2017	$200,000
2018	$200,000
2019	$200,000
2020	$120,000
2021	$120,000
2022	$120,000
2023	$120,000
2024	$120,000
2025	$120,000
2026	$120,000
2027	$120,000
2028	$120,000
2029	$120,000
2030	$120,000
2031	$120,000
2032	$120,000
2033	$120,000
2034	$120,000
2035	$120,000

Targets	
	Projected NRW Percent
2015	7.3%
2016	7.2%
2017	7.0%
2018	6.8%
2019	6.6%
2020	6.6%
2021	6.6%
2022	6.6%
2023	6.6%
2024	6.6%
2025	6.6%
2026	6.6%
2027	6.6%
2028	6.5%
2029	6.5%
2030	6.5%
2031	6.5%
2032	6.5%
2033	6.5%
2034	6.5%
2035	6.5%

Water Savings	
	Total Savings
2015	0.016188
2016	0.032660
2017	0.049417
2018	0.066457
2019	0.083782
2020	0.084493
2021	0.085209
2022	0.085926
2023	0.086643
2024	0.087360
2025	0.088077
2026	0.088820
2027	0.089562
2028	0.090305
2029	0.091048
2030	0.091791
2031	0.092539
2032	0.093287
2033	0.094035
2034	0.094783
2035	0.095532

Advanced Metering Infrastructure

Overview	
Name	Advanced Metering Infrastructure
Abbr	2
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2021
Last Year	2035
Measure Length	15

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$40.00	$500.00	1
MF	$40.00	$500.00	1
COM	$40.00	$1,500.00	1

Administration Costs	
Markup Percentage	40%

Description

Install or retrofit system with AMI meters and associated network capable of providing continuous consumption data to Utility offices. Improved identification of system and customer leaks is major conservation benefit. Some of costs of these systems are offset by operational efficiencies and reduced staffing, as regular meter reading and those for opening and closing accounts are accomplished without need for physical or drive-by meter reading. Also enables enhanced billing options and ability to monitor unauthorized usage (such as use/tampering with closed accounts or irrigation if time of day or days per week are regulated). Customer service is improved as staff can quickly access continuous usage records to address customer inquiries. Optional features include online customer access to their usage, which has been shown to improve accountability and reduce water use. Assume seven year change-out would be a reasonable objective based on City's past experience with AMR installation program.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐	☐					
Urinals			☐					
Lavatory Faucets	☐	☐	☐					
Showers	☐	☐	☐					
Dishwashers	☐	☐	☐					
Clothes Washers	☐	☐	☐					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage	☑	☑	☑					
Baths	☐	☐						
Other	☐	☐	☐					
Irrigation	☐	☐	☐					
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐	☐					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets	☐	☐	☐					

Comments

Basis for the starting value cost estimate is $540 per AMI unit where assumes (a) partial % cost share for the "utility" of estimated AMI (automatic meter infrastructure) retrofit cost of $40 with other water utility departments such as operations; and (b) model input for customer unit cost of $500 to cover the reminder of the total unit cost (assumed paid by rate revenue). Cost estimate includes leak repair for those customer-side leaks found and fixed. Cost estimate does not include service leak repair (assume included in Water Loss Control program).

Results	
Average Water Savings (mgd)	
0.048889	
Lifetime Savings - Present Value ($)	
Utility	$683,028
Community	$683,028
Lifetime Costs - Present Value ($)	
Utility	$475,949
Community	$5,400,600
Benefit to Cost Ratio	
Utility	1.44
Community	0.13
Cost of Savings per Unit Volume ($/mg)	
Utility	$1,269

End Use Savings Per Replacement	% Savings per Account
SF Internal Leakage	50.0%
MF Internal Leakage	50.0%
COM Internal Leakage	50.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	3.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$40,977	$424,451	$465,428
2022	$41,148	$426,113	$467,260
2023	$41,318	$427,774	$469,092
2024	$41,489	$429,436	$470,924
2025	$41,659	$431,098	$472,757
2026	$41,859	$433,101	$474,960
2027	$42,058	$435,104	$477,163
2028	$42,258	$437,108	$479,366
2029	$42,457	$439,111	$481,568
2030	$42,657	$441,115	$483,771
2031	$42,838	$443,013	$485,851
2032	$43,019	$444,911	$487,930
2033	$43,200	$446,809	$490,009
2034	$43,381	$448,708	$492,088
2035	$43,562	$450,606	$494,167

Targets — View: Accounts

	SF	MF	COM	Total
2015	0	0	0	0
2016	0	0	0	0
2017	0	0	0	0
2018	0	0	0	0
2019	0	0	0	0
2020	0	0	0	0
2021	586	87	59	732
2022	588	88	59	735
2023	591	88	59	738
2024	593	89	59	741
2025	596	89	59	744
2026	598	90	59	747
2027	600	91	60	751
2028	603	92	60	755
2029	605	93	60	758
2030	608	94	60	762
2031	610	94	61	765
2032	612	95	61	768
2033	615	96	61	771
2034	617	96	61	775
2035	619	97	62	778

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.009004
2022	0.017903
2023	0.026695
2024	0.035380
2025	0.043958
2026	0.052397
2027	0.060755
2028	0.069042
2029	0.077267
2030	0.085434
2031	0.093598
2032	0.101719
2033	0.109803
2034	0.117853
2035	0.125872

Large Landscape Budget-Based

Overview	
Name	Large Landscape Budget-Based W
Abbr	3
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2018
Last Year	2020
Measure Length	3

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
IRR	$50.00	$200.00	1

Administration Costs	
Markup Percentage	50%

Description

Develop individualized monthly water budgets for all or a selected category of customers. Water budgets are linked to a rate schedule where rates per unit of water increase when a customer goes above their budget, or decreases if they are below their budget. Budgets typically are based on such factors as the size of the irrigated area and often vary seasonally to reflect weather during the billing period. These rates have been shown to be effective in reducing landscape irrigation demand (AWWARF Reports). This measure would require rate study and capable billing software. Over time lower budgets to climate appropriate irrigation levels.

Customer Classes

SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
☐	☐	☐	☐	☐	☐	☑	☐

End Uses

	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets								
Urinals								
Lavatory Faucets								
Showers								
Dishwashers								
Clothes Washers								
Process								
Kitchen Spray Rinse								
Internal Leakage								
Baths								
Other								
Irrigation							☑	
Pools								
Wash Down								
Car Washing								
External Leakage							☑	
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets								

Comments

Basis of water savings: Overwatering is about 30 MGY for all participants or about 12%. Education has dropped the use about 15 MGY and price and other measures should do the rest of 15 MGY or about 6% of this end use category.

Results

Average Water Savings (mgd)	
0.030986	
Lifetime Savings - Present Value ($)	
Utility	$460,424
Community	$460,424
Lifetime Costs - Present Value ($)	
Utility	$46,122
Community	$169,115
Benefit to Cost Ratio	
Utility	9.98
Community	2.72
Cost of Savings per Unit Volume ($/mg)	
Utility	$194

End Use Savings Per Replacement	% Savings per Account
IRR Irrigation	12.0%
IRR External Leakage	0.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	36.000%
Only Effects New Accts	☐

Costs

View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$16,046	$42,790	$58,837
2019	$16,814	$44,838	$61,652
2020	$17,582	$46,885	$64,467
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets

View: Accounts

	IRR	Total
2015	0	0
2016	0	0
2017	0	0
2018	214	214
2019	224	224
2020	234	234
2021	0	0
2022	0	0
2023	0	0
2024	0	0
2025	0	0
2026	0	0
2027	0	0
2028	0	0
2029	0	0
2030	0	0
2031	0	0
2032	0	0
2033	0	0
2034	0	0
2035	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.013868
2019	0.027587
2020	0.041137
2021	0.040711
2022	0.040289
2023	0.039872
2024	0.039459
2025	0.039051
2026	0.038642
2027	0.038238
2028	0.037838
2029	0.037442
2030	0.037050
2031	0.036663
2032	0.036279
2033	0.035900
2034	0.035524
2035	0.035153

General Public Information

Overview	
Name	General Public Information
Abbr	4
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2035
Measure Length	21

Measure Life	
Permanent	☐
Years	2
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$4.00	$2.00	1

Administration Costs	
Markup Percentage	50%

Description

Comprehensive education and public awareness campaign that would evolve over the years and seek to drive participation in other conservation programs. This measure includes support for the Landscape Water Budget & Water Use Reports and additional overall customer service and administrative support not specific to any particular conservation measure across the Water Department.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☐	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☑							
Urinals								
Lavatory Faucets	☑							
Showers	☑							
Dishwashers	☑							
Clothes Washers	☑							
Process								
Kitchen Spray Rinse								
Internal Leakage	☑							
Baths	☑							
Other	☑							
Irrigation	☑							
Pools	☑							
Wash Down	☑							
Car Washing	☑							
External Leakage	☑							
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐							

Comments

Cost assumes SF category but impacts all customer classes. Basis of water savings: Assume baseline of 0.5% per year average single family home use. Utility costs are based on staffing support and education materials cost. Have website now.

Results	
Average Water Savings (mgd)	
	0.015759
Lifetime Savings - Present Value ($)	
Utility	$247,012
Community	$247,012
Lifetime Costs - Present Value ($)	
Utility	$1,007,398
Community	$1,343,197
Benefit to Cost Ratio	
Utility	0.25
Community	0.18
Cost of Savings per Unit Volume ($/mg)	
Utility	$8,334

End Use Savings Per Replacement	% Savings per Account
SF Toilets	0.5%
SF Lavatory Faucets	0.5%
SF Showers	0.5%
SF Dishwashers	0.5%
SF Clothes Washers	0.5%
SF Internal Leakage	0.5%
SF Baths	0.5%
SF Other	0.5%
SF Irrigation	0.5%
SF Pools	0.5%
SF Wash Down	0.5%
SF Car Washing	0.5%
SF External Leakage	0.5%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	50.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$57,290	$19,097	$76,387
2016	$57,506	$19,169	$76,674
2017	$57,721	$19,240	$76,962
2018	$57,937	$19,312	$77,249
2019	$58,153	$19,384	$77,537
2020	$58,368	$19,456	$77,824
2021	$58,607	$19,536	$78,143
2022	$58,846	$19,615	$78,461
2023	$59,085	$19,695	$78,779
2024	$59,323	$19,774	$79,098
2025	$59,562	$19,854	$79,416
2026	$59,806	$19,935	$79,741
2027	$60,050	$20,017	$80,066
2028	$60,293	$20,098	$80,391
2029	$60,537	$20,179	$80,716
2030	$60,781	$20,260	$81,041
2031	$61,006	$20,335	$81,341
2032	$61,231	$20,410	$81,642
2033	$61,457	$20,486	$81,942
2034	$61,682	$20,561	$82,243
2035	$61,907	$20,636	$82,543

Targets — View: Accounts

	SF	Total
2015	9,548	9,548
2016	9,584	9,584
2017	9,620	9,620
2018	9,656	9,656
2019	9,692	9,692
2020	9,728	9,728
2021	9,768	9,768
2022	9,808	9,808
2023	9,847	9,847
2024	9,887	9,887
2025	9,927	9,927
2026	9,968	9,968
2027	10,008	10,008
2028	10,049	10,049
2029	10,089	10,089
2030	10,130	10,130
2031	10,168	10,168
2032	10,205	10,205
2033	10,243	10,243
2034	10,280	10,280
2035	10,318	10,318

Water Savings (mgd)

	Total Savings (mgd)
2015	0.008488
2016	0.016847
2017	0.016736
2018	0.016623
2019	0.016507
2020	0.016389
2021	0.016329
2022	0.016271
2023	0.016211
2024	0.016148
2025	0.016084
2026	0.016020
2027	0.015964
2028	0.015914
2029	0.015869
2030	0.015830
2031	0.015797
2032	0.015766
2033	0.015738
2034	0.015714
2035	0.015694

Public Information (Home Water

Overview	
Name	Public Information (Home Water
Abbr	5
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2018
Last Year	2035
Measure Length	18

Measure Life	
Permanent	☐
Years	5
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$31.01	$0.00	1

Administration Costs	
Markup Percentage	35%

Description

Detailed Water Billing Reports for Customers with neighborhood use comparisons and suggestions on customer specific conservation actions. Use or pattern after WaterSmart software's program. Special emphasis and contact for high water users. Design to obtain 5% water savings overall.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☐	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☑							
Urinals								
Lavatory Faucets	☑							
Showers	☑							
Dishwashers	☑							
Clothes Washers	☑							
Process								
Kitchen Spray Rinse								
Internal Leakage	☑							
Baths	☑							
Other	☑							
Irrigation	☑							
Pools	☑							
Wash Down	☑							
Car Washing	☑							
External Leakage	☑							
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐							

Comments

Water savings basis: WaterSmart states about 5% savings, City has lower per capita use which will result in less savings, however resulted to account 5% savings. Assume that targeting to the higher 20% of customer users would be sent a report and 4% will act on the billing report (20% over the 5 years respond). Utility costs are based on WaterSmart Software Program cost. Unit cost is assuming $6.20 per account responding and need to multiply by 5 to get to the 20% of accounts that receive a billing report.

Results	
Average Water Savings (mgd)	
0.024235	
Lifetime Savings - Present Value ($)	
Utility	$360,158
Community	$902,012
Lifetime Costs - Present Value ($)	
Utility	$468,123
Community	$468,123
Benefit to Cost Ratio	
Utility	0.77
Community	1.93
Cost of Savings per Unit Volume ($/mg)	
Utility	$2,518

End Use Savings Per Replacement	% Savings per Account
SF Toilets	5.0%
SF Lavatory Faucets	5.0%
SF Showers	5.0%
SF Dishwashers	5.0%
SF Clothes Washers	5.0%
SF Internal Leakage	5.0%
SF Baths	5.0%
SF Other	5.0%
SF Irrigation	5.0%
SF Pools	5.0%
SF Wash Down	5.0%
SF Car Washing	5.0%
SF External Leakage	5.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	4.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$32,339	$0	$32,339
2019	$32,460	$0	$32,460
2020	$32,580	$0	$32,580
2021	$32,713	$0	$32,713
2022	$32,847	$0	$32,847
2023	$32,980	$0	$32,980
2024	$33,113	$0	$33,113
2025	$33,246	$0	$33,246
2026	$33,382	$0	$33,382
2027	$33,518	$0	$33,518
2028	$33,654	$0	$33,654
2029	$33,791	$0	$33,791
2030	$33,927	$0	$33,927
2031	$34,052	$0	$34,052
2032	$34,178	$0	$34,178
2033	$34,304	$0	$34,304
2034	$34,430	$0	$34,430
2035	$34,555	$0	$34,555

Targets — View: Accounts

	SF	Total
2015	0	0
2016	0	0
2017	0	0
2018	772	772
2019	775	775
2020	778	778
2021	781	781
2022	785	785
2023	788	788
2024	791	791
2025	794	794
2026	797	797
2027	801	801
2028	804	804
2029	807	807
2030	810	810
2031	813	813
2032	816	816
2033	819	819
2034	822	822
2035	825	825

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.006662
2019	0.013206
2020	0.019630
2021	0.026028
2022	0.032351
2023	0.032227
2024	0.032101
2025	0.031975
2026	0.031847
2027	0.031734
2028	0.031634
2029	0.031547
2030	0.031470
2031	0.031407
2032	0.031351
2033	0.031301
2034	0.031256
2035	0.031216

Residential Leak Assistance

Overview	
Name	Residential Leak Assistance
Abbr	6
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2018
Last Year	2035
Measure Length	18

Measure Life	
Permanent	☐
Years	5
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$300.00	$0.00	1
MF	$500.00	$0.00	1

Administration Costs	
Markup Percentage	45%

Description

Customer leaks can go uncorrected at properties where owners are least able to pay costs of repair. These programs may require that customer leaks be repaired, but either subsidize part of the repair and/or pay the cost with revolving funds that are paid back with water bills over time. May also include an option to replace inefficient plumbing fixtures at low-income residences.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐						
Urinals								
Lavatory Faucets	☐	☐						
Showers	☐	☐						
Dishwashers	☐	☐						
Clothes Washers	☐	☐						
Process								
Kitchen Spray Rinse								
Internal Leakage	☑	☑						
Baths	☐	☐						
Other	☐	☐						
Irrigation	☐	☐						
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐						
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐	☐						

Results	
Average Water Savings (mgd)	
	0.046894
Lifetime Savings - Present Value ($)	
Utility	$700,539
Community	$700,539
Lifetime Costs - Present Value ($)	
Utility	$761,305
Community	$761,305
Benefit to Cost Ratio	
Utility	0.92
Community	0.92
Cost of Savings per Unit Volume ($/mg)	
Utility	$2,117

End Use Savings Per Replacement	% Savings per Account
SF Internal Leakage	595.0%
MF Internal Leakage	549.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Comments

Savings is difference between unrepaired and repaired leaks. Assumes SF accounts that have more than 100 gpd/acct leakage (MF>300 gpd/acct leakage) or more are eligible to participate (the savings percentage is estimate of 595% for SF and 549% for MF) is accounting for the fact that the "average internal leakage" of less than 10% (5.7 gpd) in the "average" home). Assuming that City pays 100% of costs for low income, utility costs are based on city checking with local plumbing contractors. Assuming that low income customers pay 0% and some cost share (like City bill credit on high bills) in the future may be considered for customers not in the PG&E Customer Care Program. For SF accts, up to $300 for leak repair or fixture replacement ($500 for MF accts.). Small faucet or toilet repair, irrigation expert to help with leak repair, or customer side service line leak. GreenPlumbers on retainer from a menu to do an upgrade. Assume $100-200 will be multi-family type repairs per dwelling unit, not per account. Cost will be multiplied by 5 for per account cost (average number of units per account), so $500 per MF acct.

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$52,233	$0	$52,233
2019	$52,505	$0	$52,505
2020	$52,777	$0	$52,777
2021	$53,013	$0	$53,013
2022	$53,248	$0	$53,248
2023	$53,484	$0	$53,484
2024	$53,719	$0	$53,719
2025	$53,955	$0	$53,955
2026	$54,241	$0	$54,241
2027	$54,527	$0	$54,527
2028	$54,813	$0	$54,813
2029	$55,099	$0	$55,099
2030	$55,385	$0	$55,385
2031	$55,632	$0	$55,632
2032	$55,879	$0	$55,879
2033	$56,127	$0	$56,127
2034	$56,374	$0	$56,374
2035	$56,621	$0	$56,621

Targets — View: Accounts

	SF	MF	Total
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	97	14	111
2019	97	14	111
2020	97	14	112
2021	98	15	112
2022	98	15	113
2023	98	15	113
2024	99	15	114
2025	99	15	114
2026	100	15	115
2027	100	15	115
2028	100	15	116
2029	101	15	116
2030	101	16	117
2031	102	16	117
2032	102	16	118
2033	102	16	118
2034	103	16	119
2035	103	16	119

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.012965
2019	0.025658
2020	0.038078
2021	0.050471
2022	0.062699
2023	0.062475
2024	0.062224
2025	0.061947
2026	0.061614
2027	0.061333
2028	0.061101
2029	0.060913
2030	0.060767
2031	0.060674
2032	0.060587
2033	0.060505
2034	0.060425
2035	0.060348

Single Family Residential Surveys

Overview	
Name	Single Family Residential Surveys
Abbr	7
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2035
Measure Length	21

Measure Life	
Permanent	☐
Years	5
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$100.00	$50.00	1

Administration Costs	
Markup Percentage	25%

Description

Outdoor water surveys for existing single family residential customers. Assume survey is triggered for leak forgiveness application (average in 2015 was 700 account applications). Target those with high water use and provide a customized report to owner. May include give-away of efficient shower heads, aerators, toilet devices. Would include a basic outdoor survey (look for leaks, irrigation problems & schedule, plant information, etc.). Personalized outreach to high water users with periodic follow up to maintain savings as long as possible.

Customer Classes

SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
☑	☐	☐	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐							
Urinals								
Lavatory Faucets	☐							
Showers	☐							
Dishwashers	☐							
Clothes Washers	☐							
Process								
Kitchen Spray Rinse								
Internal Leakage	☑							
Baths	☐							
Other	☐							
Irrigation	☑							
Pools	☑							
Wash Down	☑							
Car Washing	☑							
External Leakage	☑							
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐							

Comments

Target % considers pushing for more than 100 accounts per year. Utility cost based mainly on internal labor cost (2 hours of labor per survey) and some additional labor for short report. Customer costs based on customer cost to implement recommendations. Water savings based on results from Baseline Study to support conservation potential and CUWCC Cost and Savings Study, 2006.

Results	
Average Water Savings (mgd)	
0.007075	
Lifetime Savings - Present Value ($)	
Utility	$108,353
Community	$108,353
Lifetime Costs - Present Value ($)	
Utility	$419,749
Community	$587,649
Benefit to Cost Ratio	
Utility	0.26
Community	0.18
Cost of Savings per Unit Volume ($/mg)	
Utility	$7,735

End Use Savings Per Replacement	% Savings per Account
SF Internal Leakage	25.0%
SF Irrigation	10.0%
SF Pools	10.0%
SF Wash Down	10.0%
SF Car Washing	10.0%
SF External Leakage	25.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$23,871	$9,548	$33,419
2016	$23,961	$9,584	$33,545
2017	$24,051	$9,620	$33,671
2018	$24,140	$9,656	$33,797
2019	$24,230	$9,692	$33,922
2020	$24,320	$9,728	$34,048
2021	$24,420	$9,768	$34,187
2022	$24,519	$9,808	$34,327
2023	$24,619	$9,847	$34,466
2024	$24,718	$9,887	$34,605
2025	$24,818	$9,927	$34,745
2026	$24,919	$9,968	$34,887
2027	$25,021	$10,008	$35,029
2028	$25,122	$10,049	$35,171
2029	$25,224	$10,089	$35,313
2030	$25,325	$10,130	$35,455
2031	$25,419	$10,168	$35,587
2032	$25,513	$10,205	$35,718
2033	$25,607	$10,243	$35,850
2034	$25,701	$10,280	$35,981
2035	$25,795	$10,318	$36,113

Targets — View: Accounts

	SF	Total
2015	191	191
2016	192	192
2017	192	192
2018	193	193
2019	194	194
2020	195	195
2021	195	195
2022	196	196
2023	197	197
2024	198	198
2025	199	199
2026	199	199
2027	200	200
2028	201	201
2029	202	202
2030	203	203
2031	203	203
2032	204	204
2033	205	205
2034	206	206
2035	206	206

Water Savings (mgd)

	Total Savings (mgd)
2015	0.001659
2016	0.003293
2017	0.004897
2018	0.006473
2019	0.008020
2020	0.007963
2021	0.007933
2022	0.007903
2023	0.007873
2024	0.007842
2025	0.007811
2026	0.007780
2027	0.007753
2028	0.007728
2029	0.007707
2030	0.007688
2031	0.007673
2032	0.007659
2033	0.007647
2034	0.007636
2035	0.007626

Plumbing Fixture Giveaway/Opt

Overview	
Name	Plumbing Fixture Giveaway/Opt
Abbr	8
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2017
Measure Length	3

Measure Life	
Permanent	☐
Years	25
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$12.00	$0.00	2
MF	$12.00	$0.00	6

Administration Costs	
Markup Percentage	35%

Description

City would buy showerheads and faucet aerators in bulk and give them away at Utility office or community events. Need to coordinate this program with the School Education measure on retrofit kit giveaways to the same customer categories.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐						
Urinals								
Lavatory Faucets	☑	☑						
Showers	☑	☑						
Dishwashers	☐	☐						
Clothes Washers	☐	☐						
Process								
Kitchen Spray Rinse								
Internal Leakage	☐	☐						
Baths	☐	☐						
Other	☐	☐						
Irrigation	☐	☐						
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐						
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐	☐						

Comments

Assumes 2 kits per SF account and 6 kits per MF account. Utility Costs provided by BAWSCA for 1.8 gpm showerhead / 1.5 gpm aerator kit. Customer cost is to repair leaks or other minor costs. Current customer participation based on WCDB Residential retrofit kits measure record (2004-2013). Assume kits save 27.6% (reduced to be conservative).

Results	
Average Water Savings (mgd)	
	0.005751
Lifetime Savings - Present Value ($)	
Utility	$90,465
Community	$310,044
Lifetime Costs - Present Value ($)	
Utility	$65,222
Community	$65,222
Benefit to Cost Ratio	
Utility	1.39
Community	4.75
Cost of Savings per Unit Volume ($/mg)	
Utility	$1,479

End Use Savings Per Replacement	% Savings per Account
SF Lavatory Faucets	6.9%
SF Showers	6.9%
MF Lavatory Faucets	6.9%
MF Showers	6.9%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	2.500%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$22,093	$0	$22,093
2016	$22,228	$0	$22,228
2017	$22,364	$0	$22,364
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	SF	MF	Total
2015	477	68	546
2016	479	69	548
2017	481	70	551
2018	0	0	0
2019	0	0	0
2020	0	0	0
2021	0	0	0
2022	0	0	0
2023	0	0	0
2024	0	0	0
2025	0	0	0
2026	0	0	0
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0
2031	0	0	0
2032	0	0	0
2033	0	0	0
2034	0	0	0
2035	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.002245
2016	0.004446
2017	0.006600
2018	0.006507
2019	0.006414
2020	0.006322
2021	0.006266
2022	0.006210
2023	0.006154
2024	0.006097
2025	0.006040
2026	0.005976
2027	0.005915
2028	0.005858
2029	0.005804
2030	0.005753
2031	0.005710
2032	0.005668
2033	0.005629
2034	0.005592
2035	0.005556

Residential Ultra High Efficiency

Overview	
Name	Residential Ultra High Efficiency T
Abbr	9
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2020
Measure Length	6

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$150.00	$150.00	2
MF	$150.00	$150.00	4

Administration Costs	
Markup Percentage	35%

Description

Provide a rebate or voucher for the installation of an ultra high efficiency toilet (UHET). Toilets flushing less than 1.0 gpf and phase out inclusion of 1.28 gpf (dual flush) technology. Rebate amounts would reflect the incremental purchase cost and have been at least $150 for UHET. Phase out HETs over time to sunset by 2020.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☑	☑						
Urinals								
Lavatory Faucets	☐	☐						
Showers	☐	☐						
Dishwashers	☐	☐						
Clothes Washers	☐	☐						
Process								
Kitchen Spray Rinse								
Internal Leakage	☐	☐						
Baths	☐	☐						
Other	☐	☐						
Irrigation	☐	☐						
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐						
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐	☐						

Comments

Water savings calculated from fixture models based on flush volume HET vs. 1.6 gpf. Baseline study reports that 90% of toilets are 1.6 gpf. There are not many UHET models right now, but more are entering the market annually.
Consider: implementing a Retrofit on Resale.
Consider: Graduated rebate levels. Use averages in the model. Phase out $50 on HET and focus on $150 on UHET. Tie the HET Time of Sale connected to the 2019 sunset of that ordinance with the sunset of the HET rebate.

Results	
Average Water Savings (mgd)	
	0.007561
Lifetime Savings - Present Value ($)	
Utility	$116,911
Community	$116,911
Lifetime Costs - Present Value ($)	
Utility	$308,293
Community	$536,658
Benefit to Cost Ratio	
Utility	0.38
Community	0.22
Cost of Savings per Unit Volume ($/mg)	
Utility	$5,316

End Use Savings Per Replacement	% Savings per Account
SF Toilets	37.5%
MF Toilets	37.5%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Costs

View: Utility Details

	Fixture Costs	Admin Costs	Util Total
2015	$39,688	$13,891	$53,578
2016	$39,902	$13,966	$53,868
2017	$40,116	$14,041	$54,157
2018	$40,331	$14,116	$54,446
2019	$40,545	$14,191	$54,735
2020	$40,759	$14,266	$55,025
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets

View: Fixtures

	SF	MF	Total
2015	210	55	265
2016	211	55	266
2017	212	56	267
2018	212	56	269
2019	213	57	270
2020	214	58	272
2021	0	0	0
2022	0	0	0
2023	0	0	0
2024	0	0	0
2025	0	0	0
2026	0	0	0
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0
2031	0	0	0
2032	0	0	0
2033	0	0	0
2034	0	0	0
2035	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.001592
2016	0.003154
2017	0.004682
2018	0.006176
2019	0.007637
2020	0.009065
2021	0.008984
2022	0.008904
2023	0.008823
2024	0.008741
2025	0.008660
2026	0.008567
2027	0.008479
2028	0.008397
2029	0.008320
2030	0.008247
2031	0.008184
2032	0.008125
2033	0.008069
2034	0.008015
2035	0.007964

High Efficiency Clothes Washer

Overview	
Name	High Efficiency Clothes Washer Re
Abbr	10
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2026
Measure Length	12

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$200.00	$400.00	1
MF	$200.00	$400.00	1

Administration Costs	
Markup Percentage	40%

Description

Provide a rebate for efficient washing machines to single family homes and in-unit condo/apartment complexes that do NOT have common laundry rooms. It is assumed that the rebates would remain consistent with relevant state and federal regulations (Department of Energy, Energy Star) and only offer the best available technology. This program would be similar to the City's current program. Rebate would be modified to increase incentive for the most efficient washers. Consider alternative delivery/financing mechanisms.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐						
Urinals								
Lavatory Faucets	☐	☐						
Showers	☐	☐						
Dishwashers	☐	☐						
Clothes Washers	☑	☑						
Process								
Kitchen Spray Rinse								
Internal Leakage	☐	☐						
Baths	☐	☐						
Other	☐	☐						
Irrigation	☐	☐						
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐						
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐	☐						

Comments

Water savings is based on difference between a 34 gallon per load machine compared to a 12 gallon per load CEE Tier 3 machine. Assumes PG&E program is ongoing. Water savings is calculated from fixture models based on washer volume. Allows participants to replace medium efficiency machines with high-efficiency ones. Customer pays incremental purchase and installation costs after rebate amount. Utility cost is based on the City's current rebate value doubled to increase participation.

Results	
Average Water Savings (mgd)	
0.077760	
Lifetime Savings - Present Value ($)	
Utility	$1,168,045
Community	$4,058,236
Lifetime Costs - Present Value ($)	
Utility	$1,666,452
Community	$4,047,097
Benefit to Cost Ratio	
Utility	0.70
Community	1.00
Cost of Savings per Unit Volume ($/mg)	
Utility	$2,794

End Use Savings Per Replacement	% Savings per Account
SF Clothes Washers	53.3%
MF Clothes Washers	53.3%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	2.500%
Only Effects New Accts	☐

Costs

View: Utility Details

	Fixture Costs	Admin Costs	Util Total
2015	$109,114	$43,645	$152,759
2016	$109,633	$43,853	$153,486
2017	$110,151	$44,061	$154,212
2018	$110,670	$44,268	$154,938
2019	$111,189	$44,476	$155,665
2020	$111,708	$44,683	$156,391
2021	$112,192	$44,877	$157,069
2022	$112,676	$45,070	$157,747
2023	$113,160	$45,264	$158,424
2024	$113,644	$45,458	$159,102
2025	$114,128	$45,651	$159,780
2026	$114,685	$45,874	$160,559
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets

View: Fixtures

	SF	MF	Total
2015	477	68	546
2016	479	69	548
2017	481	70	551
2018	483	71	553
2019	485	71	556
2020	486	72	559
2021	488	73	561
2022	490	73	563
2023	492	73	566
2024	494	74	568
2025	496	74	571
2026	498	75	573
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0
2031	0	0	0
2032	0	0	0
2033	0	0	0
2034	0	0	0
2035	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.009766
2016	0.019343
2017	0.028708
2018	0.037867
2019	0.046817
2020	0.055560
2021	0.064449
2022	0.073211
2023	0.081845
2024	0.090347
2025	0.098717
2026	0.106819
2027	0.105710
2028	0.104668
2029	0.103686
2030	0.102758
2031	0.101967
2032	0.101217
2033	0.100504
2034	0.099825
2035	0.099177

High Efficiency Clothes Washer - New

Overview	
Name	High Efficiency Clothes Washer - N
Abbr	11
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2021
Last Year	2035
Measure Length	15

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$50.00	$600.00	1
MF	$50.00	$600.00	1
COM	$50.00	$1,200.00	10

Administration Costs	
Markup Percentage	40%

Description

Require developers to install an efficient clothes washer (meeting certain water efficiency standards, such as gallons/load). Building Department would be requested to ensure that an efficient washer was installed before new home or building occupancy. Verify that the Utility can enforce conditions of water service that may include efficiency standards for washing machines. Pattern after the North Marin Water District Program.

Customer Classes

SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
☑	☑	☑	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐	☐					
Urinals			☐					
Lavatory Faucets	☐	☐	☐					
Showers	☐	☐	☐					
Dishwashers	☐	☐	☐					
Clothes Washers	☑	☑	☑					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage	☐	☐	☐					
Baths	☐	☐						
Other	☐	☐	☐					
Irrigation	☐	☐	☐					
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐	☐					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets	☐	☐	☐					

Comments

Water savings is based on difference between a 34 gallon per load machine compared to a 12 gallon per load CEE Tier 3 machine. Water savings based on new machines selected and paid for by developer (bearing the customer costs). Utility costs based on cost of inspection - City estimates the administrative costs of having a HECW code requirement as part of construction projects would be about $10,000 per year. This is based on 75-100 projects that would need plan review, customer contacts to explain requirements, inspections at the end of all projects, and all necessary interactions with Planning Department through the computer or by other means.

Results

Average Water Savings (mgd)	
0.012936	
Lifetime Savings - Present Value ($)	
Utility	$179,990
Community	$657,587
Lifetime Costs - Present Value ($)	
Utility	$135,761
Community	$1,771,938
Benefit to Cost Ratio	
Utility	1.33
Community	0.37
Cost of Savings per Unit Volume ($/mg)	
Utility	$1,368

End Use Savings Per Replacement

	% Savings per Account
SF Clothes Washers	53.3%
MF Clothes Washers	53.3%
COM Clothes Washers	53.3%

Targets

Target Method	Percentage
% of Accts Targeted / yr	100.000%
Only Effects New Accts	☑

Costs

View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$10,035	$113,944	$123,979
2022	$10,035	$113,944	$123,979
2023	$10,035	$113,944	$123,979
2024	$10,035	$113,944	$123,979
2025	$10,035	$113,944	$123,979
2026	$12,972	$155,540	$168,511
2027	$12,972	$155,540	$168,511
2028	$12,972	$155,540	$168,511
2029	$12,972	$155,540	$168,511
2030	$12,972	$155,540	$168,511
2031	$13,475	$172,034	$185,509
2032	$13,475	$172,034	$185,509
2033	$13,475	$172,034	$185,509
2034	$13,475	$172,034	$185,509
2035	$13,475	$172,034	$185,509

Targets

View: Accounts

	SF	MF	COM	Total
2015	0	0	0	0
2016	0	0	0	0
2017	0	0	0	0
2018	0	0	0	0
2019	0	0	0	0
2020	0	0	0	0
2021	80	17	5	101
2022	80	17	5	101
2023	80	17	5	101
2024	80	17	5	101
2025	80	17	5	101
2026	81	30	7	119
2027	81	30	7	119
2028	81	30	7	119
2029	81	30	7	119
2030	81	30	7	119
2031	75	23	9	108
2032	75	23	9	108
2033	75	23	9	108
2034	75	23	9	108
2035	75	23	9	108

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.002097
2022	0.004156
2023	0.006178
2024	0.008162
2025	0.010109
2026	0.012870
2027	0.015576
2028	0.018230
2029	0.020838
2030	0.023402
2031	0.025638
2032	0.027848
2033	0.030033
2034	0.032195
2035	0.034334

Hot Water On Demand - New Development

Overview	
Name	Hot Water On Demand - New Dev
Abbr	12
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2021
Last Year	2035
Measure Length	15

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$25.00	$600.00	3
MF	$25.00	$2,767.72	14
COM	$25.00	$2,940.19	15

Administration Costs	
Markup Percentage	50%

Description

Work with developers and permitted remodels (of certain size or type) to equip new homes or buildings with efficient hot water on-demand systems such as structured plumbing systems. These systems use a pump placed under the sink to recycle water sitting in the hot water pipes to the water heater or to move the water heater into the center of the house and/or reduce hot water waiting times by having an on-demand pump on a recirculation line.

Customer Classes

SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
☑	☑	☑	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐	☐					
Urinals			☐					
Lavatory Faucets	☑	☑	☑					
Showers	☑	☑	☑					
Dishwashers	☐	☐	☐					
Clothes Washers	☐	☐	☐					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage	☐	☐	☐					
Baths	☐	☐						
Other	☐	☐	☐					
Irrigation	☐	☐	☐					
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐	☐					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets	☐	☐	☐					

Results

Average Water Savings (mgd)	
0.004647	
Lifetime Savings - Present Value ($)	
Utility	$64,691
Community	$223,009
Lifetime Costs - Present Value ($)	
Utility	$279,776
Community	$15,345,798
Benefit to Cost Ratio	
Utility	0.23
Community	0.01
Cost of Savings per Unit Volume ($/mg)	
Utility	$7,849

End Use Savings Per Replacement

	% Savings per Account
SF Lavatory Faucets	11.6%
MF Lavatory Faucets	11.6%
COM Lavatory Faucets	11.6%
SF Showers	11.6%
MF Showers	11.6%
COM Showers	11.6%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	100.000%
Only Effects New Accts	☑

Comments

Customer costs funded by developer and based on installation costs. Utility cost based on inspection cost. Target about 60 new SF homes per year for a total of 840 new homes inside the city by year 2030. Also an additional 2510 multi-family dwelling units by 2030. The number of fixtures per account is based on the number of bath and kitchen units. For MF accounts it's based on the ratio of dwelling units to accounts and assumes one bath unit and kitchen.

Water savings based on Jim Lutz paper and information from Gary Klein and David Grieshop. See spreadsheet titled "Hot Water On Demand Water Savings Estimate_2013", includes 1750 sq. ft. house, saves 1571 gallons per year or 4.3 gpd/acct and a total of 99.5 gpd per SF home, equates to ~4.3% savings per home. Based on a review of Single Family Home use for City of Santa Cruz customers at 30.6 gpd for faucet and 37.5 gpd for showers per household results in an equivalent savings of 12% on shower and faucet end use. Overall an estimated 7.45 gpd savings or 12% by MWM.

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$20,454	$1,003,809	$1,024,263
2022	$20,454	$1,003,809	$1,024,263
2023	$20,454	$1,003,809	$1,024,263
2024	$20,454	$1,003,809	$1,024,263
2025	$20,454	$1,003,809	$1,024,263
2026	$28,861	$1,620,580	$1,649,441
2027	$28,861	$1,620,580	$1,649,441
2028	$28,861	$1,620,580	$1,649,441
2029	$28,861	$1,620,580	$1,649,441
2030	$28,861	$1,620,580	$1,649,441
2031	$25,673	$1,430,279	$1,455,952
2032	$25,673	$1,430,279	$1,455,952
2033	$25,673	$1,430,279	$1,455,952
2034	$25,673	$1,430,279	$1,455,952
2035	$25,673	$1,430,279	$1,455,952

Targets — View: Accounts

	SF	MF	COM	Total
2015	0	0	0	0
2016	0	0	0	0
2017	0	0	0	0
2018	0	0	0	0
2019	0	0	0	0
2020	0	0	0	0
2021	80	17	5	101
2022	80	17	5	101
2023	80	17	5	101
2024	80	17	5	101
2025	80	17	5	101
2026	81	30	7	119
2027	81	30	7	119
2028	81	30	7	119
2029	81	30	7	119
2030	81	30	7	119
2031	75	23	9	108
2032	75	23	9	108
2033	75	23	9	108
2034	75	23	9	108
2035	75	23	9	108

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000764
2022	0.001513
2023	0.002249
2024	0.002972
2025	0.003680
2026	0.004665
2027	0.005630
2028	0.006577
2029	0.007506
2030	0.008420
2031	0.009199
2032	0.009969
2033	0.010730
2034	0.011482
2035	0.012227

Toilet Retrofit at Time of Sale

Overview	
Name	Toilet Retrofit at Time of Sale
Abbr	13
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2019
Measure Length	5

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$37.50	$80.25	2
MF	$37.50	$75.00	4
COM	$125.00	$500.00	10

Administration Costs	
Markup Percentage	50%

Description

Work with the real estate industry to require a certificate of compliance be submitted to the Utility that verifies that a plumber has inspected the property and efficient fixtures were either already there or were installed at time of sale (TOS).

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☑	☑	☑					
Urinals			☐					
Lavatory Faucets	☐	☐	☐					
Showers	☐	☐	☐					
Dishwashers	☐	☐	☐					
Clothes Washers	☐	☐	☐					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage	☐	☐	☐					
Baths	☐	☐						
Other	☐	☐	☐					
Irrigation	☐	☐	☐					
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐	☐					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets	☐	☐	☐					

Comments

Water savings assumes City's ordinance will sunset when Statewide Retrofit on Resale SB 407 goes active 2017 for residential and 2019 for commercial properties. Savings based on replacing a 3.5 gpf with a 1.28 gpf HET. Utility cost based on inspection costs. Customer costs based on purchase and installation costs. Long term housing turnover is about 2.7% per year. Commercial property turns over less frequently than residential. Fewer than 1 fixture per property is now being replaced under this ordinance. Will upgrade standard to become HET.

Results	
Average Water Savings (mgd)	
0.023134	
Lifetime Savings - Present Value ($)	
Utility	$359,499
Community	$359,499
Lifetime Costs - Present Value ($)	
Utility	$268,930
Community	$832,001
Benefit to Cost Ratio	
Utility	1.34
Community	0.43
Cost of Savings per Unit Volume ($/mg)	
Utility	$1,516

End Use Savings Per Replacement	% Savings per Account
SF Toilets	63.0%
MF Toilets	63.0%
COM Toilets	63.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.850%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$55,676	$116,610	$172,286
2016	$55,947	$117,158	$173,105
2017	$56,218	$117,706	$173,924
2018	$56,490	$118,254	$174,744
2019	$56,761	$118,802	$175,563
2020	$0	$0	$0
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	SF	MF	COM	Total
2015	162	23	16	202
2016	163	23	16	203
2017	164	24	16	204
2018	164	24	16	205
2019	165	24	16	206
2020	0	0	0	0
2021	0	0	0	0
2022	0	0	0	0
2023	0	0	0	0
2024	0	0	0	0
2025	0	0	0	0
2026	0	0	0	0
2027	0	0	0	0
2028	0	0	0	0
2029	0	0	0	0
2030	0	0	0	0
2031	0	0	0	0
2032	0	0	0	0
2033	0	0	0	0
2034	0	0	0	0
2035	0	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.005652
2016	0.011199
2017	0.016633
2018	0.021955
2019	0.027166
2020	0.026803
2021	0.026583
2022	0.026363
2023	0.026143
2024	0.025924
2025	0.025704
2026	0.025458
2027	0.025226
2028	0.025007
2029	0.024799
2030	0.024603
2031	0.024432
2032	0.024269
2033	0.024114
2034	0.023965
2035	0.023823

CII MF Common Laundry Room

Overview	
Name	CII MF Common Laundry Room Hi
Abbr	14
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2024
Measure Length	10

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
MF	$400.00	$500.00	2
COM	$400.00	$500.00	4

Administration Costs	
Markup Percentage	35%

Description

Provide a $400 rebate for the installation of a high efficiency commercial washer (HEW) in CII and MF common area laundry. Rebate amounts would reflect the incremental purchase cost. Program will be shorter lived as it is intended to be a market transformation measure and eventually would be stopped as efficient units reach saturation. Currently, eligible for City's program, this is planned as an expanded measure.

Customer Classes

SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
☐	☑	☑	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets		☐	☐					
Urinals			☐					
Lavatory Faucets		☐	☐					
Showers		☐	☐					
Dishwashers		☐	☐					
Clothes Washers		☑	☑					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage		☐	☐					
Baths		☐						
Other		☐	☐					
Irrigation		☐	☐					
Pools		☐						
Wash Down		☐						
Car Washing		☐						
External Leakage		☐	☐					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets		☐	☐					

Comments

Water savings is based on difference between a 34 gallon per load machine compared to a 12 gallon per load CEE Tier 3 machine. Utility costs assume high-efficiency machine that's more expensive than a SF residential one. Customer costs based on installation costs. Engineering estimate of average savings, assume water factor is 25% less for replacement. Want on-site laundries for CII (hotels), spas, UCSC laundry, see page 49 of baseline survey. Start by considering a combination of a mandate and City funded clothes washer program for common laundry rooms that would accelerate retirement of old inefficient equipment for the next 5-10 years when codes will transform market.

Results

Average Water Savings (mgd)	
	0.007058
Lifetime Savings - Present Value ($)	
Utility	$106,946
Community	$427,131
Lifetime Costs - Present Value ($)	
Utility	$230,548
Community	$444,018
Benefit to Cost Ratio	
Utility	0.46
Community	0.96
Cost of Savings per Unit Volume ($/mg)	
Utility	$4,258

End Use Savings Per Replacement

	% Savings per Account
MF Clothes Washers	53.3%
COM Clothes Washers	53.3%

Targets

Target Method	Percentage
% of Accts Targeted / yr	0.350%
Only Effects New Accts	☐

Costs

View: Utility Details

	Fixture Costs	Admin Costs	Util Total
2015	$18,306	$6,407	$24,713
2016	$18,442	$6,455	$24,897
2017	$18,579	$6,503	$25,082
2018	$18,716	$6,550	$25,266
2019	$18,852	$6,598	$25,451
2020	$18,989	$6,646	$25,635
2021	$19,063	$6,672	$25,735
2022	$19,138	$6,698	$25,836
2023	$19,212	$6,724	$25,936
2024	$19,286	$6,750	$26,036
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets

View: Fixtures

	MF	COM	Total
2015	19	27	46
2016	19	27	46
2017	20	27	46
2018	20	27	47
2019	20	27	47
2020	20	27	47
2021	20	27	48
2022	20	27	48
2023	21	27	48
2024	21	28	48
2025	0	0	0
2026	0	0	0
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0
2031	0	0	0
2032	0	0	0
2033	0	0	0
2034	0	0	0
2035	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000999
2016	0.001978
2017	0.002933
2018	0.003868
2019	0.004781
2020	0.005674
2021	0.006586
2022	0.007487
2023	0.008375
2024	0.009251
2025	0.009170
2026	0.009070
2027	0.008977
2028	0.008888
2029	0.008804
2030	0.008724
2031	0.008656
2032	0.008592
2033	0.008530
2034	0.008470
2035	0.008413

CII Incentives

Overview	
Name	CII Incentives
Abbr	15
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2021
Last Year	2026
Measure Length	6

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
MF	$500.00	$1,500.00	1
COM	$500.00	$1,500.00	2

Administration Costs	
Markup Percentage	50%

Description

After the free water use survey has been completed at site, the Utility will analyze the recommendations on the findings report that is provided and determine if site qualifies for a financial incentive. Financial incentives will be provided after analyzing the cost-benefit ratio of each proposed project. Incentives are tailored to each individual site as each site has varying water savings potentials. Incentives will be granted at the sole discretion of the Utility while funding lasts.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☐	☑	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets		☑	☑					
Urinals			☐					
Lavatory Faucets		☑	☑					
Showers		☑	☑					
Dishwashers		☑	☑					
Clothes Washers		☑	☑					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage		☑	☑					
Baths		☐						
Other		☐	☐					
Irrigation		☑	☑					
Pools		☐						
Wash Down		☐						
Car Washing		☐						
External Leakage		☑	☑					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets		☑	☑					

Comments

Water savings based on engineering estimate of average savings for MF CII Facilities receiving an incentive. Assume targeting larger accounts with use above 5,000 gpd or the top 3% (about 200 accounts). Utility costs set-up similar to SNWA and EBMUD. Large accounts have moved down in use - efficiency has happened. Utility costs based on paying for $200 to help replace CII toilet. Currently, running about $22 per 1000 gals per year. Basis for cost sharing. Assume utility cost may triple as more expensive rebates are requested. Customer costs based on labor installation costs. This is a designer rebate or grant program that depends on viable projects documented in survey.

Results	
Average Water Savings (mgd)	
	0.031363
Lifetime Savings - Present Value ($)	
Utility	$449,234
Community	$1,482,337
Lifetime Costs - Present Value ($)	
Utility	$128,134
Community	$384,401
Benefit to Cost Ratio	
Utility	3.51
Community	3.86
Cost of Savings per Unit Volume ($/mg)	
Utility	$533

End Use Savings Per Replacement	% Savings per Account
MF Toilets	55.6%
COM Toilets	71.4%
MF Lavatory Faucets	55.6%
COM Lavatory Faucets	71.4%
MF Showers	55.6%
COM Showers	71.4%
MF Dishwashers	55.6%
COM Dishwashers	71.4%
MF Clothes Washers	55.6%
COM Clothes Washers	71.4%
MF Internal Leakage	55.6%
COM Internal Leakage	71.4%
MF Irrigation	55.6%
COM Irrigation	71.4%
MF External Leakage	55.6%
COM External Leakage	71.4%
Non-Lavatory/Kitchen Fa	55.6%
Non-Lavatory/Kitchen Fa	71.4%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$25,531	$51,062	$76,593
2022	$25,631	$51,261	$76,892
2023	$25,730	$51,460	$77,190
2024	$25,830	$51,659	$77,489
2025	$25,929	$51,858	$77,787
2026	$26,098	$52,195	$78,293
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	MF	COM	Total
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	0	0	0
2021	15	10	24
2022	15	10	24
2023	15	10	24
2024	15	10	25
2025	15	10	25
2026	15	10	25
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0
2031	0	0	0
2032	0	0	0
2033	0	0	0
2034	0	0	0
2035	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.009326
2022	0.018534
2023	0.027627
2024	0.036605
2025	0.045468
2026	0.054144
2027	0.053614
2028	0.053111
2029	0.052634
2030	0.052179
2031	0.051791
2032	0.051420
2033	0.051064
2034	0.050722
2035	0.050393

Pre-Rinse Spray Nozzle Installation

Overview	
Name	Pre-Rinse Spray Nozzle Installatio
Abbr	16
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2016
Measure Length	2

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
COM	$100.00	$0.00	1

Administration Costs	
Markup Percentage	40%

Description

Provide free 1.3 gpm (or lower) spray nozzles and possibly free installation for the rinse and clean operation in restaurants and other commercial kitchens. Thousands have been replaced in California going door to door, very cost-effective because saves hot water. Project completed in 2014.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☐	☐	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets			☐					
Urinals			☐					
Lavatory Faucets			☐					
Showers			☐					
Dishwashers			☐					
Clothes Washers			☐					
Process			☐					
Kitchen Spray Rinse			☑					
Internal Leakage			☐					
Baths								
Other			☐					
Irrigation			☐					
Pools								
Wash Down								
Car Washing								
External Leakage			☐					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets			☐					

Comments

Water savings based on back calculation from the City's baseline survey; use 1.3 gpm Fisher. Scaled up end-use savings to allow for more savings on the average account. Only 2 year program. Using 7.2 scaling factor for the "average" CII customer does not have high enough demand for this end use, which therefore is estimated at 360% for this end use for restaurant customers only. Utility costs are based on $50 for valve, $50 for installation including door to distribution. Plan on about 200 sites with up to 300 valves in the service area. Renew every ten years.

Results	
Average Water Savings (mgd)	
0.025722	
Lifetime Savings - Present Value ($)	
Utility	$405,820
Community	$3,820,600
Lifetime Costs - Present Value ($)	
Utility	$30,202
Community	$30,202
Benefit to Cost Ratio	
Utility	13.44
Community	126.50
Cost of Savings per Unit Volume ($/mg)	
Utility	$153

End Use Savings Per Replacement	% Savings per Account
COM Kitchen Spray Rins	360.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	5.710%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$15,236	$0	$15,236
2016	$15,303	$0	$15,303
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	COM	Total
2015	109	109
2016	109	109
2017	0	0
2018	0	0
2019	0	0
2020	0	0
2021	0	0
2022	0	0
2023	0	0
2024	0	0
2025	0	0
2026	0	0
2027	0	0
2028	0	0
2029	0	0
2030	0	0
2031	0	0
2032	0	0
2033	0	0
2034	0	0
2035	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.014123
2016	0.028031
2017	0.027754
2018	0.027485
2019	0.027224
2020	0.026969
2021	0.026818
2022	0.026673
2023	0.026531
2024	0.026395
2025	0.026262
2026	0.026130
2027	0.026002
2028	0.025877
2029	0.025756
2030	0.025638
2031	0.025522
2032	0.025408
2033	0.025298
2034	0.025190
2035	0.025084

CII Surveys

Overview	
Name	CII Surveys
Abbr	17
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2021
Last Year	2026
Measure Length	6

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
MF	$4,000.00	$500.00	1
COM	$4,000.00	$500.00	2

Administration Costs	
Markup Percentage	50%

Description

Offer top water customers from each category a professional water survey that would evaluate ways for the business to save water and money. The surveys would be for large accounts (accounts that use more than 5,000 gallons of water per day or the top 3%) such as hotels, restaurants, stores and schools. Emphasis will be on supporting the top 25 users for each customer category.

Customer Classes

	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☐	☑	☑	☐	☐	☐	☐	☐

End Uses

	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets		☑	☑					
Urinals			☐					
Lavatory Faucets		☑	☑					
Showers		☑	☑					
Dishwashers		☑	☑					
Clothes Washers		☑	☑					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage		☑	☑					
Baths		☐						
Other		☐	☐					
Irrigation		☑	☑					
Pools		☐						
Wash Down		☐						
Car Washing		☐						
External Leakage		☑	☑					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets		☑	☑					

Comments

Water savings based on CUWCC Cost and Savings Study (2005) report of potential savings ranging from 11 to 29%, assuming all projects are implemented. Assume 30% potential and 35% compliance, CUWCC Cost and Savings Study, 2005, page 2-66-68. Assume 10% due to survey only, rest of savings comes from participation in an incentive program. Assume shared savings between survey and incentives for overall 20% per facility. Targeting large accounts. Utility costs based on CUWCC Cost and Savings Study (2005) report of cost range from $600 to $8,000. Customer costs based on installation costs. Large CII users are already receiving landscape water use reports and surveys.

Results

Average Water Savings (mgd)	
	0.032952
Lifetime Savings - Present Value ($)	
Utility	$472,192
Community	$1,475,766
Lifetime Costs - Present Value ($)	
Utility	$1,025,069
Community	$1,110,492
Benefit to Cost Ratio	
Utility	0.46
Community	1.33
Cost of Savings per Unit Volume ($/mg)	
Utility	$4,056

End Use Savings Per Replacement

	% Savings per Account
MF Toilets	71.4%
COM Toilets	55.6%
MF Lavatory Faucets	71.4%
COM Lavatory Faucets	55.6%
MF Showers	71.4%
COM Showers	55.6%
MF Dishwashers	71.4%
COM Dishwashers	55.6%
MF Clothes Washers	71.4%
COM Clothes Washers	55.6%
MF Internal Leakage	71.4%
COM Internal Leakage	55.6%
MF Irrigation	71.4%
COM Irrigation	55.6%
MF External Leakage	71.4%
COM External Leakage	55.6%
Non-Lavatory/Kitchen Fa	71.4%
Non-Lavatory/Kitchen Fa	55.6%

Targets

Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Costs

View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$204,249	$17,021	$221,270
2022	$205,045	$17,087	$222,132
2023	$205,841	$17,153	$222,994
2024	$206,636	$17,220	$223,856
2025	$207,432	$17,286	$224,718
2026	$208,780	$17,398	$226,179
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets

View: Accounts

	MF	COM	Total
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	0	0	0
2021	15	10	24
2022	15	10	24
2023	15	10	24
2024	15	10	25
2025	15	10	25
2026	15	10	25
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0
2031	0	0	0
2032	0	0	0
2033	0	0	0
2034	0	0	0
2035	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.009853
2022	0.019574
2023	0.029163
2024	0.038619
2025	0.047944
2026	0.057043
2027	0.056422
2028	0.055836
2029	0.055280
2030	0.054753
2031	0.054310
2032	0.053887
2033	0.053483
2034	0.053095
2035	0.052723

High Efficiency Urinal Program

Overview	
Name	High Efficiency Urinal Program
Abbr	18
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2018
Measure Length	4

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
COM	$300.00	$200.00	2
MUN	$300.00	$200.00	2
IND	$300.00	$200.00	2

Administration Costs	
Markup Percentage	35%

Description

Provide a rebate or voucher for the installation of high efficiency urinals (HEU). Recent CEC requirements denote flushing as low as 0.125 gpf (1 pint).

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☐	☐	☑	☑	☑	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets			☐	☐	☐			
Urinals			☑	☑	☑			
Lavatory Faucets			☐	☐	☐			
Showers			☐	☐	☐			
Dishwashers			☐	☐	☐			
Clothes Washers			☐	☐	☐			
Process			☐		☐			
Kitchen Spray Rinse			☐	☐				
Internal Leakage			☐	☐	☐			
Baths								
Other			☐	☐	☐			
Irrigation			☐	☐	☐			
Pools								
Wash Down								
Car Washing								
External Leakage			☐	☐	☐			
Indoor								
Outdoor								
Cooling			☐	☐	☐			
tory/Kitchen Faucets			☐	☐	☐			

Comments

Water savings assumes 50% of urinal replacements use 1 gpf and up, and 50% are 0.5 and .25 gpf urinals being replaced with 0.125 gpf pint urinals. Baseline Survey found lower saturation in restaurants and office buildings. Schools were 100% high efficiency. Utility costs based on fixture cost. Customer costs based on installation costs. Comprehensive City, school, and other government buildings urinal replacement with 0.125 gpf or less. City could potentially fund 100% of costs.

Results	
Average Water Savings (mgd)	
0.008515	
Lifetime Savings - Present Value ($)	
Utility	$132,704
Community	$132,704
Lifetime Costs - Present Value ($)	
Utility	$340,958
Community	$509,333
Benefit to Cost Ratio	
Utility	0.39
Community	0.26
Cost of Savings per Unit Volume ($/mg)	
Utility	$5,220

End Use Savings Per Replacement	% Savings per Account
COM Urinals	80.0%
MUN Urinals	80.0%
IND Urinals	80.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	5.000%
Only Effects New Accts	☐

Costs

View: Utility Details

	Fixture Costs	Admin Costs	Util Total
2015	$64,887	$22,710	$87,597
2016	$65,143	$22,800	$87,943
2017	$65,399	$22,890	$88,288
2018	$65,655	$22,979	$88,634
2019	$0	$0	$0
2020	$0	$0	$0
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets

View: Fixtures

	COM	MUN	IND	Total
2015	191	22	4	216
2016	191	22	4	217
2017	192	22	4	218
2018	193	22	4	219
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0
2022	0	0	0	0
2023	0	0	0	0
2024	0	0	0	0
2025	0	0	0	0
2026	0	0	0	0
2027	0	0	0	0
2028	0	0	0	0
2029	0	0	0	0
2030	0	0	0	0
2031	0	0	0	0
2032	0	0	0	0
2033	0	0	0	0
2034	0	0	0	0
2035	0	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.002435
2016	0.004837
2017	0.007206
2018	0.009544
2019	0.009463
2020	0.009385
2021	0.009339
2022	0.009295
2023	0.009253
2024	0.009212
2025	0.009171
2026	0.009132
2027	0.009093
2028	0.009055
2029	0.009018
2030	0.008983
2031	0.008947
2032	0.008913
2033	0.008879
2034	0.008846
2035	0.008814

Public Restroom Faucet Retrofit

Overview	
Name	Public Restroom Faucet Retrofit -
Abbr	19
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2021
Last Year	2023
Measure Length	3

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
MUN	$300.00	$200.00	4

Administration Costs	
Markup Percentage	35%

Description

Direct install of high efficiency (0.5 gpm) sensor faucet fixtures in all or selected high-use institutional buildings.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☐	☐	☐	☑	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets				☐				
Urinals				☐				
Lavatory Faucets				☑				
Showers				☐				
Dishwashers				☐				
Clothes Washers				☐				
Process								
Kitchen Spray Rinse				☐				
Internal Leakage				☐				
Baths								
Other				☐				
Irrigation				☐				
Pools								
Wash Down								
Car Washing								
External Leakage				☐				
Indoor								
Outdoor								
Cooling				☐				
tory/Kitchen Faucets				☐				

Comments

Water savings based on reduction in flow rate from existing 2 gpm to 0.5 gpm or 75% reduction. Page 51 of Baseline Study. 2.2-1.5 gpm is basis. Measured by WaterWise. Customer costs based on installation costs. Utility costs based on a rebate for full fixture costs. No official limit on total number per site, but assume up to 6 per site. Schools and public beach restrooms.

Results	
Average Water Savings (mgd)	
0.000554	
Lifetime Savings - Present Value ($)	
Utility	$8,077
Community	$16,588
Lifetime Costs - Present Value ($)	
Utility	$99,747
Community	$149,005
Benefit to Cost Ratio	
Utility	0.08
Community	0.11
Cost of Savings per Unit Volume ($/mg)	
Utility	$23,467

End Use Savings Per Replacement	% Savings per Account
MUN Lavatory Faucets	75.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	11.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$38,848	$19,184	$58,032
2022	$38,848	$19,184	$58,032
2023	$38,848	$19,184	$58,032
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	MUN	Total
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	0	0
2021	24	24
2022	24	24
2023	24	24
2024	0	0
2025	0	0
2026	0	0
2027	0	0
2028	0	0
2029	0	0
2030	0	0
2031	0	0
2032	0	0
2033	0	0
2034	0	0
2035	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000287
2022	0.000571
2023	0.000852
2024	0.000848
2025	0.000844
2026	0.000841
2027	0.000837
2028	0.000833
2029	0.000829
2030	0.000825
2031	0.000822
2032	0.000818
2033	0.000814
2034	0.000810
2035	0.000807

Public Restroom Faucet Retrofit

Overview	
Name	Public Restroom Faucet Retrofit -
Abbr	20
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2021
Last Year	2030
Measure Length	10

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
COM	$300.00	$100.00	4

Administration Costs	
Markup Percentage	35%

Description

Rebate Program for installation of high efficiency (0.5 gpm) sensor faucet fixtures in all or selected high-use commercial buildings.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☐	☐	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets			☐					
Urinals			☐					
Lavatory Faucets			☑					
Showers			☐					
Dishwashers			☐					
Clothes Washers			☐					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage			☐					
Baths								
Other			☐					
Irrigation			☐					
Pools								
Wash Down								
Car Washing								
External Leakage			☐					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets			☐					

Comments

Water savings based on reduction in flow rate from existing 2 gpm to 0.5 gpm or 75% reduction. Page 51 of Baseline Study. 2.2-1.5 gpm is basis. Measured by WaterWise. Customer costs based on installation costs. Utility costs based on a rebate for full fixture costs. No official limit on total number per site, but assume up to 6 per site. Large restaurants, spas, etc.

Results	
Average Water Savings (mgd)	
0.011851	
Lifetime Savings - Present Value ($)	
Utility	$167,271
Community	$386,622
Lifetime Costs - Present Value ($)	
Utility	$889,040
Community	$1,108,555
Benefit to Cost Ratio	
Utility	0.19
Community	0.35
Cost of Savings per Unit Volume ($/mg)	
Utility	$9,780

End Use Savings Per Replacement	% Savings per Account
COM Lavatory Faucets	75.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	3.500%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$110,722	$27,339	$138,061
2022	$110,986	$27,404	$138,390
2023	$111,250	$27,469	$138,719
2024	$111,514	$27,534	$139,048
2025	$111,778	$27,599	$139,377
2026	$112,197	$27,703	$139,900
2027	$112,616	$27,806	$140,423
2028	$113,035	$27,910	$140,945
2029	$113,455	$28,013	$141,468
2030	$113,874	$28,117	$141,991
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	COM	Total
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	0	0
2021	68	68
2022	69	69
2023	69	69
2024	69	69
2025	69	69
2026	69	69
2027	70	70
2028	70	70
2029	70	70
2030	70	70
2031	0	0
2032	0	0
2033	0	0
2034	0	0
2035	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.002451
2022	0.004881
2023	0.007291
2024	0.009683
2025	0.012057
2026	0.014416
2027	0.016762
2028	0.019096
2029	0.021419
2030	0.023731
2031	0.023623
2032	0.023518
2033	0.023415
2034	0.023315
2035	0.023218

School Retrofit

Overview	
Name	School Retrofit
Abbr	21
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2021
Last Year	2030
Measure Length	10

Measure Life	
Permanent	☐
Years	27
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
MUN	$2,500.00	$2,500.00	1

Administration Costs	
Markup Percentage	35%

Description

School retrofit program wherein school receives a grant to replace fixtures and upgrade irrigation systems. Expand current City Program, pattern after EBMUD and MWD programs. Promote to schools for cash flow upfront. Review Generation Water program.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☐	☐	☐	☑	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets				☑				
Urinals				☑				
Lavatory Faucets				☑				
Showers				☑				
Dishwashers				☐				
Clothes Washers				☐				
Process								
Kitchen Spray Rinse				☐				
Internal Leakage				☑				
Baths								
Other				☐				
Irrigation				☑				
Pools								
Wash Down								
Car Washing								
External Leakage				☑				
Indoor								
Outdoor								
Cooling				☐				
tory/Kitchen Faucets				☐				

Comments

Water savings based on doing two schools per year and assuming a reduction in use of 25% below a current use of 3,000 gpd. Costs assume $5,000 split 50:50 between customer and City. Might have to couple with survey of school sites first, and a landscape survey.

Results	
Average Water Savings (mgd)	
0.004042	
Lifetime Savings - Present Value ($)	
Utility	$56,200
Community	$56,200
Lifetime Costs - Present Value ($)	
Utility	$58,362
Community	$101,593
Benefit to Cost Ratio	
Utility	0.96
Community	0.55
Cost of Savings per Unit Volume ($/mg)	
Utility	$1,883

End Use Savings Per Replacement	% Savings per Account
MUN Toilets	88.2%
MUN Urinals	88.2%
MUN Lavatory Faucets	88.2%
MUN Showers	88.2%
MUN Internal Leakage	88.2%
MUN Irrigation	88.2%
MUN External Leakage	88.2%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$7,358	$5,450	$12,808
2022	$7,358	$5,450	$12,808
2023	$7,358	$5,450	$12,808
2024	$7,358	$5,450	$12,808
2025	$7,358	$5,450	$12,808
2026	$7,358	$5,450	$12,808
2027	$7,358	$5,450	$12,808
2028	$7,358	$5,450	$12,808
2029	$7,358	$5,450	$12,808
2030	$7,358	$5,450	$12,808
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	MUN	Total
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	0	0
2021	2	2
2022	2	2
2023	2	2
2024	2	2
2025	2	2
2026	2	2
2027	2	2
2028	2	2
2029	2	2
2030	2	2
2031	0	0
2032	0	0
2033	0	0
2034	0	0
2035	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000841
2022	0.001675
2023	0.002502
2024	0.003321
2025	0.004132
2026	0.004936
2027	0.005732
2028	0.006521
2029	0.007303
2030	0.008077
2031	0.008041
2032	0.008004
2033	0.007967
2034	0.007931
2035	0.007895

Water Efficient Landscape Ordinance

Overview

Name	Water Efficient Landscape Ordinance
Abbr	22
Category	Default
Measure Type	Standard Measure

Time Period

First Year	2015
Last Year	2035
Measure Length	21

Measure Life

Permanent	☐
Years	27
Repeat	☐

Fixture Costs

	Utility	Customer	Fix/Acct
SF	$0.00	$0.00	0
MF	$50.00	$1,000.00	1
COM	$100.00	$2,500.00	1
MUN	$100.00	$2,500.00	1
IND	$100.00	$2,500.00	1

Administration Costs

Markup Percentage	35%

Description

Include less irrigation demand for new accounts due to more efficient landscape designs because of City Code (implementation of Statewide Model Landscape Ordinance). Update City Code to keep pace with new state regulations and technology for irrigation controllers and irrigation equipment. Updated MWELO based on changes Dec 1, 2015. City changes are pending as of January 31, 2016.

Customer Classes

SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
☑	☑	☑	☑	☑	☐	☐	☐

End Uses

	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐	☐	☐	☐			
Urinals			☐	☐	☐			
Lavatory Faucets	☐	☐	☐	☐	☐			
Showers	☐	☐	☐	☐	☐			
Dishwashers	☐	☐	☐	☐	☐			
Clothes Washers	☐	☐	☐	☐	☐			
Process			☐		☐			
Kitchen Spray Rinse			☐	☐				
Internal Leakage	☐	☐	☐	☐	☐			
Baths	☐	☐						
Other	☐	☐	☐	☐	☐			
Irrigation	☑	☑	☑	☑	☑			
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐	☐	☐	☐			
Indoor								
Outdoor								
Cooling			☐	☐	☐			
tory/Kitchen Faucets	☐	☐	☐	☐	☐			

Comments

Water savings based on native landscaping (Xeriscape) over efficiently irrigated turf grass per City Code Chapter 16.16.
http://www.cityofsantacruz.com
Utility costs based on application and inspection. Customer costs based on Xeriscape replacing turf. Based on ordinance limit of 2,500 square feet. Assumed increased by 10% savings and added in single family homes to new Ordiance.

Results

Average Water Savings (mgd)	
0.010291	
Lifetime Savings - Present Value ($)	
Utility	$149,120
Community	$149,120
Lifetime Costs - Present Value ($)	
Utility	$47,531
Community	$816,763
Benefit to Cost Ratio	
Utility	3.14
Community	0.18
Cost of Savings per Unit Volume ($/mg)	
Utility	$602

End Use Savings Per Replacement

	% Savings per Account
MF Irrigation	35.0%
COM Irrigation	35.0%
MUN Irrigation	35.0%
IND Irrigation	35.0%
SF Irrigation	0.0%

Targets

Target Method	Percentage
% of Accts Targeted / yr	100.000%
Only Effects New Accts	☑

Costs

View: Summary

	Utility	Customer	Total
2015	$3,306	$53,245	$56,551
2016	$3,306	$53,245	$56,551
2017	$3,306	$53,245	$56,551
2018	$3,306	$53,245	$56,551
2019	$3,306	$53,245	$56,551
2020	$3,306	$53,245	$56,551
2021	$1,841	$29,782	$31,623
2022	$1,841	$29,782	$31,623
2023	$1,841	$29,782	$31,623
2024	$1,841	$29,782	$31,623
2025	$1,841	$29,782	$31,623
2026	$3,067	$49,253	$52,320
2027	$3,067	$49,253	$52,320
2028	$3,067	$49,253	$52,320
2029	$3,067	$49,253	$52,320
2030	$3,067	$49,253	$52,320
2031	$2,853	$47,046	$49,899
2032	$2,853	$47,046	$49,899
2033	$2,853	$47,046	$49,899
2034	$2,853	$47,046	$49,899
2035	$2,853	$47,046	$49,899

Targets

View: Accounts

	SF	MF	COM	MUN	IND	Total
2015	72	32	8	0	0	112
2016	72	32	8	0	0	112
2017	72	32	8	0	0	112
2018	72	32	8	0	0	112
2019	72	32	8	0	0	112
2020	72	32	8	0	0	112
2021	80	17	5	0	0	102
2022	80	17	5	0	0	102
2023	80	17	5	0	0	102
2024	80	17	5	0	0	102
2025	80	17	5	0	0	102
2026	81	30	7	0	0	119
2027	81	30	7	0	0	119
2028	81	30	7	0	0	119
2029	81	30	7	0	0	119
2030	81	30	7	0	0	119
2031	75	23	9	0	0	108
2032	75	23	9	0	0	108
2033	75	23	9	0	0	108
2034	75	23	9	0	0	108
2035	75	23	9	0	0	108

Water Savings (mgd)

	Total Savings (mgd)
2015	0.001258
2016	0.002477
2017	0.003655
2018	0.004795
2019	0.005897
2020	0.006962
2021	0.007582
2022	0.008191
2023	0.008789
2024	0.009376
2025	0.009952
2026	0.010882
2027	0.011797
2028	0.012696
2029	0.013582
2030	0.014454
2031	0.015230
2032	0.015998
2033	0.016759
2034	0.017513
2035	0.018260

Single Family Residential Turf Removal

Overview	
Name	Single Family Residential Turf Rem
Abbr	23
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2035
Measure Length	21

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$1,000.00	$2,000.00	1

Administration Costs	
Markup Percentage	25%

Description

Provide a per-square-foot incentive to remove turf and replace with low-water-use plants or permeable hardscape. Pattern after the City's current program. Rebate is currently $0.50 per square foot removed and capped at $500 for single family residence. Increase rebate to $1 per square foot or more and raise maximum to $1,000 or more to increase participation.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☐	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐							
Urinals								
Lavatory Faucets	☐							
Showers	☐							
Dishwashers	☐							
Clothes Washers	☐							
Process								
Kitchen Spray Rinse								
Internal Leakage	☐							
Baths	☐							
Other	☐							
Irrigation	☑							
Pools	☐							
Wash Down	☐							
Car Washing	☐							
External Leakage	☐							
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐							

Comments

Estimated water savings are 19 gallons per square foot. CUWCC Cost and Savings Study (2005) reports up to 39% savings in summer. Assume 50% of landscaping removed and replaced with low water use that uses 50% less water so overall irrigation savings may be on the order of 35% (documented up to maximum of 38%). Note some system efficiency/residual overwatering may still occur. Costs assume $3/per square foot. Net cost to customer is $2/square foot for 1,000 square feet.

Results	
Average Water Savings (mgd)	
0.006175	
Lifetime Savings - Present Value ($)	
Utility	$88,847
Community	$88,847
Lifetime Costs - Present Value ($)	
Utility	$1,049,373
Community	$2,728,369
Benefit to Cost Ratio	
Utility	0.08
Community	0.03
Cost of Savings per Unit Volume ($/mg)	
Utility	$22,157

End Use Savings Per Replacement	% Savings per Account
SF Irrigation	35.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.250%
Only Effects New Accts	☐

Costs

View: Utility Details

	Fixture Costs	Admin Costs	Util Total
2015	$47,742	$11,935	$59,677
2016	$47,921	$11,980	$59,902
2017	$48,101	$12,025	$60,126
2018	$48,281	$12,070	$60,351
2019	$48,460	$12,115	$60,576
2020	$48,640	$12,160	$60,800
2021	$48,839	$12,210	$61,049
2022	$49,038	$12,260	$61,298
2023	$49,237	$12,309	$61,546
2024	$49,436	$12,359	$61,795
2025	$49,635	$12,409	$62,044
2026	$49,838	$12,460	$62,298
2027	$50,041	$12,510	$62,552
2028	$50,244	$12,561	$62,805
2029	$50,447	$12,612	$63,059
2030	$50,651	$12,663	$63,313
2031	$50,838	$12,710	$63,548
2032	$51,026	$12,757	$63,783
2033	$51,214	$12,803	$64,017
2034	$51,402	$12,850	$64,252
2035	$51,589	$12,897	$64,487

Targets

View: Accounts

	SF	Total
2015	48	48
2016	48	48
2017	48	48
2018	48	48
2019	48	48
2020	49	49
2021	49	49
2022	49	49
2023	49	49
2024	49	49
2025	50	50
2026	50	50
2027	50	50
2028	50	50
2029	50	50
2030	51	51
2031	51	51
2032	51	51
2033	51	51
2034	51	51
2035	52	52

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000612
2016	0.001214
2017	0.001806
2018	0.002387
2019	0.002957
2020	0.003517
2021	0.004080
2022	0.004636
2023	0.005185
2024	0.005728
2025	0.006263
2026	0.006791
2027	0.007316
2028	0.007838
2029	0.008357
2030	0.008875
2031	0.009392
2032	0.009908
2033	0.010423
2034	0.010936
2035	0.011449

Multifamily Residential/CII Turf Removal

Overview	
Name	Multifamily Residential/CII Turf Removal
Abbr	24
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2035
Measure Length	21

Measure Life	
Permanent	☑

Fixture Costs

	Utility	Customer	Fix/Acct
MF	$2,000.00	$8,000.00	1
COM	$5,000.00	$10,000.00	1
MUN	$5,000.00	$10,000.00	1
IRR	$5,000.00	$10,000.00	1

Administration Costs	
Markup Percentage	25%

Description

Provide a per-square-foot incentive to remove turf and replace with low-water-use plants or hardscape. Pattern after the City's current program. Rebate is currently $0.50 per square foot removed and capped at $2,500 for multi-family or commercial residences. Increase rebate to $1 per square foot or more and raise maximum amount to $5,000 or more to increase participation.

Customer Classes

SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
☐	☑	☑	☑	☐	☐	☑	☐

End Uses

	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets		☐	☐	☐				
Urinals			☐	☐				
Lavatory Faucets		☐	☐	☐				
Showers		☐	☐	☐				
Dishwashers		☐	☐	☐				
Clothes Washers		☐	☐	☐				
Process			☐					
Kitchen Spray Rinse			☐	☐				
Internal Leakage		☐	☐	☐				
Baths		☐						
Other		☐	☐	☐				
Irrigation		☑	☑	☑			☑	
Pools		☐						
Wash Down		☐						
Car Washing		☐						
External Leakage		☐	☐	☐			☐	
Indoor								
Outdoor								
Cooling			☐	☐				
tory/Kitchen Faucets		☐	☐	☐				

Comments

Estimated water savings are 19 gallons per square foot from high water use plants (turf grass) at Plant Factor (PF) 0.8 compared to low water use plants at PF of 0.4. Evapotranspiration (ETo) for Santa Cruz is relatively low at 36 inches per year. Assume 50% square footage is replaced. Costs assume $3/per square foot. Net cost to customer is $2/square foot for 1,000 square feet.

Results

Average Water Savings (mgd)	
0.003519	
Lifetime Savings - Present Value ($)	
Utility	$50,616
Community	$50,616
Lifetime Costs - Present Value ($)	
Utility	$868,786
Community	$2,661,845
Benefit to Cost Ratio	
Utility	0.06
Community	0.02
Cost of Savings per Unit Volume ($/mg)	
Utility	$32,186

End Use Savings Per Replacement

	% Savings per Account
MF Irrigation	35.0%
COM Irrigation	35.0%
MUN Irrigation	5.0%
IRR Irrigation	5.0%

Targets

Target Method	Percentage
% of Accts Targeted / yr	0.200%
Only Effects New Accts	☐

Costs

View: Utility Details

	Fixture Costs	Admin Costs	Util Total
2015	$37,233	$9,308	$46,541
2016	$37,729	$9,432	$47,162
2017	$38,226	$9,556	$47,782
2018	$38,722	$9,681	$48,403
2019	$39,219	$9,805	$49,023
2020	$39,715	$9,929	$49,644
2021	$39,975	$9,994	$49,968
2022	$40,234	$10,059	$50,293
2023	$40,494	$10,123	$50,617
2024	$40,753	$10,188	$50,941
2025	$41,012	$10,253	$51,266
2026	$41,451	$10,363	$51,814
2027	$41,890	$10,472	$52,362
2028	$42,328	$10,582	$52,910
2029	$42,767	$10,692	$53,459
2030	$43,205	$10,801	$54,007
2031	$43,604	$10,901	$54,506
2032	$44,003	$11,001	$55,004
2033	$44,402	$11,101	$55,503
2034	$44,801	$11,200	$56,002
2035	$45,200	$11,300	$56,501

Targets

View: Accounts

	MF	COM	MUN	IRR	Total
2015	5	4	0	1	11
2016	6	4	0	1	11
2017	6	4	0	1	11
2018	6	4	0	1	11
2019	6	4	0	1	11
2020	6	4	0	1	11
2021	6	4	0	1	11
2022	6	4	0	1	12
2023	6	4	0	1	12
2024	6	4	0	1	12
2025	6	4	0	1	12
2026	6	4	0	1	12
2027	6	4	0	2	12
2028	6	4	0	2	12
2029	6	4	0	2	12
2030	6	4	0	2	12
2031	6	4	0	2	12
2032	6	4	0	2	13
2033	6	4	0	2	13
2034	6	4	0	2	13
2035	6	4	0	2	13

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000347
2016	0.000689
2017	0.001023
2018	0.001350
2019	0.001672
2020	0.001986
2021	0.002309
2022	0.002629
2023	0.002945
2024	0.003258
2025	0.003568
2026	0.003869
2027	0.004170
2028	0.004469
2029	0.004766
2030	0.005063
2031	0.005362
2032	0.005661
2033	0.005958
2034	0.006255
2035	0.006551

Expand Large Landscape Survey/Water

Overview	
Name	Expand Large Landscape Survey/V
Abbr	25
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2018
Last Year	2035
Measure Length	18

Measure Life	
Permanent	☐
Years	10
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
IRR	$1,500.00	$1,500.00	1

Administration Costs	
Markup Percentage	45%

Description

Outdoor water audits offered for existing large landscape customers. Normally those with high water use are targeted and provided a customized report on how to save water. All large multifamily residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. Tied to the Water Budget Program.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☐	☐	☐	☐	☐	☐	☑	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets								
Urinals								
Lavatory Faucets								
Showers								
Dishwashers								
Clothes Washers								
Process								
Kitchen Spray Rinse								
Internal Leakage								
Baths								
Other								
Irrigation							☑	
Pools								
Wash Down								
Car Washing								
External Leakage							☐	
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets								

Comments

1 acre and above get offered survey and water budget due to ordinance. Option to do it on their own. Water savings based on relatively cool climate and not much turf irrigation. See notes on water budget based billing. Utility costs based on $1400 per audit per contract. Customer costs assume customer makes some changes to system to try and meet budget. 10-15 audits per year on 250 participating accounts.

Results	
Average Water Savings (mgd)	0.003167
Lifetime Savings - Present Value ($)	
Utility	$45,029
Community	$45,029
Lifetime Costs - Present Value ($)	
Utility	$508,859
Community	$859,797
Benefit to Cost Ratio	
Utility	0.09
Community	0.05
Cost of Savings per Unit Volume ($/mg)	
Utility	$20,948

End Use Savings Per Replacement	% Savings per Account
IRR Irrigation	6.6%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	2.200%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$28,438	$19,612	$48,050
2019	$29,798	$20,551	$50,349
2020	$31,159	$21,489	$52,648
2021	$31,848	$21,964	$53,813
2022	$32,538	$22,440	$54,977
2023	$33,227	$22,915	$56,142
2024	$33,916	$23,390	$57,306
2025	$34,605	$23,866	$58,471
2026	$35,773	$24,671	$60,444
2027	$36,941	$25,477	$62,418
2028	$38,109	$26,282	$64,391
2029	$39,277	$27,087	$66,364
2030	$40,445	$27,893	$68,337
2031	$41,459	$28,593	$70,052
2032	$42,474	$29,292	$71,766
2033	$43,489	$29,992	$73,481
2034	$44,503	$30,692	$75,195
2035	$45,518	$31,392	$76,910

Targets — View: Accounts

	IRR	Total
2015	0	0
2016	0	0
2017	0	0
2018	13	13
2019	14	14
2020	14	14
2021	15	15
2022	15	15
2023	15	15
2024	16	16
2025	16	16
2026	16	16
2027	17	17
2028	18	18
2029	18	18
2030	19	19
2031	19	19
2032	20	20
2033	20	20
2034	20	20
2035	21	21

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000466
2019	0.000927
2020	0.001383
2021	0.001856
2022	0.002329
2023	0.002803
2024	0.003278
2025	0.003752
2026	0.004232
2027	0.004719
2028	0.004807
2029	0.004890
2030	0.004969
2031	0.005049
2032	0.005132
2033	0.005217
2034	0.005304
2035	0.005392

Sprinkler Nozzle Rebates

Overview	
Name	Sprinkler Nozzle Rebates
Abbr	26
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2018
Last Year	2035
Measure Length	18

Measure Life	
Permanent	☐
Years	20
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$6.00	$4.00	25
MF	$6.00	$4.00	50
COM	$6.00	$4.00	100

Administration Costs	
Markup Percentage	25%

Description

Provide rebates to replace standard spray sprinkler nozzles with rotating nozzles that have lower application rates. Nozzles cost about $6 each. Consider online application processing through options like www.freesprinklernozzles.com.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐	☐					
Urinals			☐					
Lavatory Faucets	☐	☐	☐					
Showers	☐	☐	☐					
Dishwashers	☐	☐	☐					
Clothes Washers	☐	☐	☐					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage	☐	☐	☐					
Baths	☐	☐						
Other	☐	☐	☐					
Irrigation	☑	☑	☑					
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐	☐					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets	☐	☐	☐					

Comments

Water savings assume improvement in distribution uniformity saves 10% of irrigation. Reference CUWCC Potential Best Management Practice Report on Rotating Nozzles. Utility costs assume cost is $6/nozzle with rebate amount of $2 per nozzle with the following nozzles distributed: SF = 25; MF = 50; COM = 100. Customer pays the remainder of the device cost plus installation. No nozzle minimum.

Results	
Average Water Savings (mgd)	0.004259
Lifetime Savings - Present Value ($)	
Utility	$59,780
Community	$59,780
Lifetime Costs - Present Value ($)	
Utility	$445,715
Community	$683,430
Benefit to Cost Ratio	
Utility	0.13
Community	0.09
Cost of Savings per Unit Volume ($/mg)	
Utility	$13,643

End Use Savings Per Replacement	% Savings per Account
SF Irrigation	10.0%
MF Irrigation	10.0%
COM Irrigation	10.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$30,638	$16,340	$46,978
2019	$30,797	$16,425	$47,222
2020	$30,956	$16,510	$47,466
2021	$31,080	$16,576	$47,656
2022	$31,205	$16,642	$47,847
2023	$31,329	$16,709	$48,038
2024	$31,453	$16,775	$48,228
2025	$31,578	$16,841	$48,419
2026	$31,738	$16,927	$48,665
2027	$31,898	$17,013	$48,911
2028	$32,059	$17,098	$49,157
2029	$32,219	$17,184	$49,403
2030	$32,380	$17,269	$49,649
2031	$32,529	$17,349	$49,878
2032	$32,678	$17,428	$50,106
2033	$32,827	$17,508	$50,335
2034	$32,977	$17,587	$50,564
2035	$33,126	$17,667	$50,793

Targets — View: Accounts

	SF	MF	COM	Total
2015	0	0	0	0
2016	0	0	0	0
2017	0	0	0	0
2018	97	14	10	120
2019	97	14	10	121
2020	97	14	10	121
2021	98	15	10	122
2022	98	15	10	122
2023	98	15	10	123
2024	99	15	10	123
2025	99	15	10	124
2026	100	15	10	125
2027	100	15	10	125
2028	100	15	10	126
2029	101	15	10	126
2030	101	16	10	127
2031	102	16	10	127
2032	102	16	10	128
2033	102	16	10	129
2034	103	16	10	129
2035	103	16	10	130

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000560
2019	0.001110
2020	0.001649
2021	0.002187
2022	0.002719
2023	0.003244
2024	0.003762
2025	0.004274
2026	0.004777
2027	0.005277
2028	0.005772
2029	0.006265
2030	0.006755
2031	0.007245
2032	0.007733
2033	0.008220
2034	0.008705
2035	0.009188

Gray Water Retrofit

Overview	
Name	Gray Water Retrofit
Abbr	27
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2035
Measure Length	21

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$175.00	$300.00	1

Administration Costs	
Markup Percentage	45%

Description

Provide a workshop to support a Gray Water Challenge similar to 2013 event that was modeled after Sonoma County program. Offer rebate to assist covering certain percentage of the cost to single family homeowners per year to install gray water systems. Package from local hardware stores containing the primary components would be supported by City rebate.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☐	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐							
Urinals								
Lavatory Faucets	☐							
Showers	☐							
Dishwashers	☐							
Clothes Washers	☐							
Process								
Kitchen Spray Rinse								
Internal Leakage	☐							
Baths	☐							
Other	☐							
Irrigation	☑							
Pools	☐							
Wash Down	☐							
Car Washing	☐							
External Leakage	☐							
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐							

Comments

Water savings assume single fixture type system used to replace a portion of garden watering on new or existing homes. System costs ~$450 and City pays ~ 1/3. Customer pays for installation. In the summer washing machine use of ~25 gpd would cover about 25% or summer use (2x annual average). Based on continuation of our 2013 Gray Water Challenge.

Results	
Average Water Savings (mgd)	
	0.000353
Lifetime Savings - Present Value ($)	
Utility	$5,077
Community	$5,077
Lifetime Costs - Present Value ($)	
Utility	$42,605
Community	$92,974
Benefit to Cost Ratio	
Utility	0.12
Community	0.05
Cost of Savings per Unit Volume ($/mg)	
Utility	$15,742

End Use Savings Per Replacement	% Savings per Account
SF Irrigation	10.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.050%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$2,423	$2,865	$5,287
2016	$2,432	$2,875	$5,307
2017	$2,441	$2,886	$5,327
2018	$2,450	$2,897	$5,347
2019	$2,459	$2,908	$5,367
2020	$2,468	$2,918	$5,387
2021	$2,479	$2,930	$5,409
2022	$2,489	$2,942	$5,431
2023	$2,499	$2,954	$5,453
2024	$2,509	$2,966	$5,475
2025	$2,519	$2,978	$5,497
2026	$2,529	$2,990	$5,520
2027	$2,540	$3,002	$5,542
2028	$2,550	$3,015	$5,565
2029	$2,560	$3,027	$5,587
2030	$2,571	$3,039	$5,610
2031	$2,580	$3,050	$5,630
2032	$2,590	$3,062	$5,651
2033	$2,599	$3,073	$5,672
2034	$2,609	$3,084	$5,693
2035	$2,618	$3,095	$5,714

Targets — View: Accounts

	SF	Total
2015	10	10
2016	10	10
2017	10	10
2018	10	10
2019	10	10
2020	10	10
2021	10	10
2022	10	10
2023	10	10
2024	10	10
2025	10	10
2026	10	10
2027	10	10
2028	10	10
2029	10	10
2030	10	10
2031	10	10
2032	10	10
2033	10	10
2034	10	10
2035	10	10

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000035
2016	0.000069
2017	0.000103
2018	0.000136
2019	0.000169
2020	0.000201
2021	0.000233
2022	0.000265
2023	0.000296
2024	0.000327
2025	0.000358
2026	0.000388
2027	0.000418
2028	0.000448
2029	0.000478
2030	0.000507
2031	0.000537
2032	0.000566
2033	0.000596
2034	0.000625
2035	0.000654

Residential Rain Barrels

Overview	
Name	Residential Rain Barrels
Abbr	28
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2035
Measure Length	21

Measure Life	
Permanent	☐
Years	20
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$30.00	$50.00	1

Administration Costs	
Markup Percentage	25%

Description

Provide incentive for installation of rain barrels. This could involve rebates or bulk purchase and giveaways of barrels, plus workshops on proper installation and use of captured rain water for landscape irrigation. Pattern after Honolulu Board of Water Supply program.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☐	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐							
Urinals								
Lavatory Faucets	☐							
Showers	☐							
Dishwashers	☐							
Clothes Washers	☐							
Process								
Kitchen Spray Rinse								
Internal Leakage	☐							
Baths	☐							
Other	☐							
Irrigation	☑							
Pools	☐							
Wash Down	☐							
Car Washing	☐							
External Leakage	☐							
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐							

Results	
Average Water Savings (mgd)	0.005271
Lifetime Savings - Present Value ($)	
Utility	$75,892
Community	$75,892
Lifetime Costs - Present Value ($)	
Utility	$188,887
Community	$440,737
Benefit to Cost Ratio	
Utility	0.40
Community	0.17
Cost of Savings per Unit Volume ($/mg)	
Utility	$4,672

End Use Savings Per Replacement	% Savings per Account
SF Irrigation	5.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.500%
Only Effects New Accts	☐

Comments

Water savings assumes 4 effective fills per year for 20 years. 20 year useful life. 1.5% actual water savings from barrel and 3.5% from behavioral change. City pays for the difference plus shipping. Customer has to install.
If the rain barrel model were available for purchase locally, the City would probably stop selling them and offer a rebate instead due to storage and delivery challenges. We could also add a rebate anyway so people have more choice in models and sizes. Assume a 50 percent subsidy. Currently sell subsidized rain barrels to customers. May want to expand types. Probill Hardware now carries the bushman line. Education and promotion program. 3-4 effective fills. Discount starts at $100 per barrel.

Costs — View: Summary

	Utility	Customer	Total
2015	$10,742	$14,323	$25,064
2016	$10,782	$14,376	$25,159
2017	$10,823	$14,430	$25,253
2018	$10,863	$14,484	$25,347
2019	$10,904	$14,538	$25,442
2020	$10,944	$14,592	$25,536
2021	$10,989	$14,652	$25,641
2022	$11,034	$14,711	$25,745
2023	$11,078	$14,771	$25,849
2024	$11,123	$14,831	$25,954
2025	$11,168	$14,891	$26,058
2026	$11,214	$14,951	$26,165
2027	$11,259	$15,012	$26,272
2028	$11,305	$15,073	$26,378
2029	$11,351	$15,134	$26,485
2030	$11,396	$15,195	$26,592
2031	$11,439	$15,251	$26,690
2032	$11,481	$15,308	$26,789
2033	$11,523	$15,364	$26,887
2034	$11,565	$15,420	$26,986
2035	$11,608	$15,477	$27,084

Targets — View: Accounts

	SF	Total
2015	286	286
2016	288	288
2017	289	289
2018	290	290
2019	291	291
2020	292	292
2021	293	293
2022	294	294
2023	295	295
2024	297	297
2025	298	298
2026	299	299
2027	300	300
2028	301	301
2029	303	303
2030	304	304
2031	305	305
2032	306	306
2033	307	307
2034	308	308
2035	310	310

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000524
2016	0.001041
2017	0.001548
2018	0.002046
2019	0.002535
2020	0.003014
2021	0.003497
2022	0.003974
2023	0.004445
2024	0.004909
2025	0.005368
2026	0.005821
2027	0.006271
2028	0.006718
2029	0.007164
2030	0.007607
2031	0.008051
2032	0.008493
2033	0.008934
2034	0.009374
2035	0.009364

Climate Appropriate Landscaping

Overview	
Name	Climate Appropriate Landscaping and Rainw
Abbr	29
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2035
Measure Length	21

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$1,000.00	$1,500.00	1
MF	$2,000.00	$2,500.00	1
COM	$5,000.00	$10,000.00	1
MUN	$5,000.00	$10,000.00	1

Administration Costs	
Markup Percentage	25%

Description

Provide incentives for installation of climate appropriate landscaping and rainwater infiltration. This measure will provide rebates for HOAs, businesses, and institutions that increase their outdoor water use efficiency by replacing qualifying high water use landscape and/or upgrading to qualifying high efficiency irrigation equipment or climate appropriate landscape. To qualify, sites must participate in a pre-inspection prior to beginning their project or purchasing materials for which they would like to receive rebates. Single family homes, multifamily and business properties with qualifying irrigated landscape (i.e., irrigated turf or functional swimming pool) can receive rebates for replacing high water use landscape, such as irrigated turf grass, with a minimum of 50% plant coverage consisting of low water using plants from the Approved Plant List.

Recommendations from July 17, 2015 WSAC Agenda Item 6A "Summary of WSAC Work on Demand Management Options and Options for Integrating Demand Management into potential Water Supply Advisory Committee Recommendations and Agreement":

- Increase turf conversion rebate
- Require conversion of spray to drip for shrub irrigation
- Discourage runoff through rainwater infiltration features
- Support local initiatives for climate-appropriate landscaping
- Target landscaping narrower than 10 ft - no spray irrigation and/or next to hardscapes

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☑	☑	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐	☐	☐				
Urinals			☐	☐				
Lavatory Faucets	☐	☐	☐	☐				
Showers	☐	☐	☐	☐				
Dishwashers	☐	☐	☐	☐				
Clothes Washers	☐	☐	☐	☐				
Process			☐					
Kitchen Spray Rinse			☐	☐				
Internal Leakage	☐	☐	☐	☐				
Baths	☐	☐						
Other	☐	☐	☐	☐				
Irrigation	☑	☑	☑	☑				
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐	☐	☐				
Indoor								
Outdoor								
Cooling			☐	☐				
tory/Kitchen Faucets	☐	☐	☐	☐				

Results	
Average Water Savings (mgd)	
0.012210	
Lifetime Savings - Present Value ($)	
Utility	$175,704
Community	$175,704
Lifetime Costs - Present Value ($)	
Utility	$3,111,311
Community	$7,115,560
Benefit to Cost Ratio	
Utility	0.06
Community	0.02
Cost of Savings per Unit Volume ($/mg)	
Utility	$33,221

End Use Savings Per Replacement	% Savings per Account
SF Irrigation	25.0%
MF Irrigation	25.0%
COM Irrigation	25.0%
MUN Irrigation	25.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.400%
Only Effects New Accts	☐

Comments

Drought tolerant plants require little dry season irrigation. Native plants require no irrigation or fertilizer, and provide habitat for native insects and birds. Rainwater infiltration features such as swales or rain gardens capture water runoff from roofs and paved surfaces. Enhanced infiltration increases soil porosity, which provides moisture to trees and landscape plants during dry periods, reducing stress on trees during droughts. In some areas, rainwater that infiltrates the landscape recharges aquifers, adding to our water supply. For example, Kennedy/Jenks estimates that water infiltration modifications could add 300-500 acre feet per year to the aquifer beneath Scotts Valley. In areas with less permeable clay soils, rainwater infiltration slows runoff into local creeks, reducing stormwater erosion and increasing creek flows during dry months, enhancing biodiversity. Paving can be done with permeable materials and/or in conjunction with infiltration swales. Examine the implementation of these systems at schools as part of the Drought Response Outreach for Schools State program.

References:

Irrigation:
http://cuwcc.org/Portals/0/Document%20Library/Resources/Publications/Potential%20BMP%20Reports/2014%20Drip%20Irrigation%20PBMP.pdf
http://www.rainbird.com/documents/drip/LandscapedripConversionGuide.pdf

Infiltration: See Infiltration documents in the Infiltration folder on our Google Drive.

Water Transfers Santa Cruz County:
http://scceh.com/Home/Programs/WaterResources/IntegratedRegionalWaterManagement.aspx

Drought Response Outreach for Schools: http://ca.gov/drought/news/story-97.html

Costs

View: Summary

	Utility	Customer	Total
2015	$175,841	$226,796	$402,637
2016	$176,730	$227,884	$404,615
2017	$177,620	$228,972	$406,592
2018	$178,510	$230,060	$408,570
2019	$179,399	$231,148	$410,547
2020	$180,289	$232,236	$412,525
2021	$180,975	$233,072	$414,048
2022	$181,662	$233,908	$415,570
2023	$182,348	$234,744	$417,092
2024	$183,035	$235,580	$418,615
2025	$183,721	$236,416	$420,137
2026	$184,614	$237,501	$422,114
2027	$185,506	$238,585	$424,092
2028	$186,399	$239,670	$426,069
2029	$187,291	$240,755	$428,046
2030	$188,184	$241,839	$430,023
2031	$189,027	$242,898	$431,925
2032	$189,869	$243,958	$433,827
2033	$190,712	$245,017	$435,729
2034	$191,555	$246,076	$437,632
2035	$192,398	$247,136	$439,534

Targets

View: Accounts

	SF	MF	COM	MUN	Total
2015	76	11	8	1	96
2016	77	11	8	1	96
2017	77	11	8	1	97
2018	77	11	8	1	97
2019	78	11	8	1	98
2020	78	12	8	1	98
2021	78	12	8	1	98
2022	78	12	8	1	99
2023	79	12	8	1	99
2024	79	12	8	1	100
2025	79	12	8	1	100
2026	80	12	8	1	101
2027	80	12	8	1	101
2028	80	12	8	1	101
2029	81	12	8	1	102
2030	81	12	8	1	102
2031	81	13	8	1	103
2032	82	13	8	1	103
2033	82	13	8	1	104
2034	82	13	8	1	104
2035	83	13	8	1	105

Water Savings (mgd)

	Total Savings (mgd)
2015	0.001214
2016	0.002408
2017	0.003577
2018	0.004725
2019	0.005849
2020	0.006951
2021	0.008067
2022	0.009170
2023	0.010259
2024	0.011335
2025	0.012397
2026	0.013439
2027	0.014474
2028	0.015503
2029	0.016527
2030	0.017545
2031	0.018566
2032	0.019584
2033	0.020598
2034	0.021609
2035	0.022617

Single Family Multifamily Dishwasher

Overview	
Name	Single Family Multifamily Dishwas
Abbr	31
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2018
Last Year	2022
Measure Length	5

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$50.00	$350.00	1
MF	$50.00	$350.00	6

Administration Costs	
Markup Percentage	25%

Description

Provide incentives for installation of water efficient dishwashers (Residential WF of 6.25 or less). Assume Department of Energy continues to regulate dishwashers to require state of the art technolgy, using less water over time.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☐	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐						
Urinals								
Lavatory Faucets	☐	☐						
Showers	☐	☐						
Dishwashers	☑	☑						
Clothes Washers	☐	☐						
Process								
Kitchen Spray Rinse								
Internal Leakage	☐	☐						
Baths	☐	☐						
Other	☐	☐						
Irrigation	☐	☐						
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐						
Indoor								
Outdoor								
Cooling								
tory/Kitchen Faucets	☐	☐						

Results	
Average Water Savings (mgd)	0.000452
Lifetime Savings - Present Value ($)	
Utility	$6,772
Community	$42,119
Lifetime Costs - Present Value ($)	
Utility	$102,692
Community	$677,766
Benefit to Cost Ratio	
Utility	0.07
Community	0.06
Cost of Savings per Unit Volume ($/mg)	
Utility	$29,602

End Use Savings Per Replacement	% Savings per Account
SF Dishwashers	15.0%
MF Dishwashers	15.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Comments

Recommendations from July 17, 2015 WSAC Agenda Item 6A "Summary of WSAC Work on Demand Management Options and Options for Integrating Demand Management into potential Water Supply Advisory Committee Recommendations and Agreement": Dishwashers have seen similar technological advances as clothes washers with some machines now offering 2.5 GPL. The old standard of 10-15 GPL has been updated to 5.5 GPL for an Energy Star certified product.
https://www.energystar.gov/products/certified-products/detail/dishwashers
Units cost between $500-$1000. Customer costs include installation.

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$22,652	$126,849	$149,501
2019	$22,816	$127,771	$150,587
2020	$22,981	$128,693	$151,673
2021	$23,095	$129,333	$152,428
2022	$23,209	$129,973	$153,182
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	SF	MF	Total
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	193	28	221
2019	194	29	222
2020	195	29	223
2021	195	29	224
2022	196	29	225
2023	0	0	0
2024	0	0	0
2025	0	0	0
2026	0	0	0
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0
2031	0	0	0
2032	0	0	0
2033	0	0	0
2034	0	0	0
2035	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000129
2019	0.000255
2020	0.000378
2021	0.000501
2022	0.000623
2023	0.000617
2024	0.000612
2025	0.000606
2026	0.000600
2027	0.000594
2028	0.000589
2029	0.000583
2030	0.000578
2031	0.000574
2032	0.000570
2033	0.000567
2034	0.000563
2035	0.000559

Hot Water Recirculation Systems

Overview	
Name	Hot Water Recirculation Systems
Abbr	32
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2018
Last Year	2022
Measure Length	5

Measure Life	
Permanent	☐
Years	25
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$300.00	$700.00	1
MF	$300.00	$700.00	5
COM	$300.00	$700.00	5

Administration Costs	
Markup Percentage	25%

Description

Provide incentives for the installation of a hot water recirculation system. Having hot water discharge promptly is important for energy and water use efficiency. A hot water recirculating system enables the cold water in the hot water pipes to be continually returned to the water heater and reheated before the hot water faucet is turned on. Rebates are available to the following water customer groups:
- single family dwellings, including townhomes and mobile homes
- apartment complexes
- commercial institutions
- commercially zoned businesses or institutions
• Maximum rebates allowable:
a) $300 per single family account
b) $3,000 per commercial, industrial or institutional account, such as laundromats and apartments, per year
• Some installations may be selected for a random inspection. At reasonable times and with reasonable notice, you agree to allow the City of Santa Cruz to inspect the system at the installation address for up to one year after purchase.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐	☐					
Urinals			☐					
Lavatory Faucets	☑	☑	☑					
Showers	☑	☑	☑					
Dishwashers	☐	☐	☐					
Clothes Washers	☐	☐	☐					
Process			☐					
Kitchen Spray Rinse			☐					
Internal Leakage	☐	☐	☐					
Baths	☐	☐						
Other	☐	☐	☐					
Irrigation	☐	☐	☐					
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐	☐					
Indoor								
Outdoor								
Cooling			☐					
tory/Kitchen Faucets	☐	☐	☐					

Comments

Recommendations from July 17, 2015 WSAC Agenda Item 6A "Summary of WSAC Work on Demand Management Options and Options for Integrating Demand Management into potential Water Supply Advisory Committee Recommendations and Agreement": Hot Water Demand Recirculation Systems are a tool that helps address the water loss we all Experience while waiting for hot water-for showers, hand washing and dishwashing. The simpler sytems are installed into existing plumbing and act by returning the cooled water back through the cold water line at the push of a button-even from the warmth of your bed. For a shower the wait can waste 2 gallons or more of water.
http://www.osti.gov/scitech/biblio/885864

Results	
Average Water Savings (mgd)	
0.003045	
Lifetime Savings - Present Value ($)	
Utility	$45,599
Community	$161,188
Lifetime Costs - Present Value ($)	
Utility	$365,578
Community	$1,047,989
Benefit to Cost Ratio	
Utility	0.12
Community	0.15
Cost of Savings per Unit Volume ($/mg)	
Utility	$15,650

End Use Savings Per Replacement	% Savings per Account
SF Lavatory Faucets	11.6%
MF Lavatory Faucets	11.6%
COM Lavatory Faucets	11.6%
SF Showers	11.6%
MF Showers	11.6%
COM Showers	11.6%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$80,770	$150,770	$231,539
2019	$81,283	$151,728	$233,010
2020	$81,796	$152,685	$234,481
2021	$82,150	$153,347	$235,497
2022	$82,504	$154,008	$236,512
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	SF	MF	COM	Total
2015	0	0	0	0
2016	0	0	0	0
2017	0	0	0	0
2018	97	14	10	120
2019	97	14	10	121
2020	97	14	10	121
2021	98	15	10	122
2022	98	15	10	122
2023	0	0	0	0
2024	0	0	0	0
2025	0	0	0	0
2026	0	0	0	0
2027	0	0	0	0
2028	0	0	0	0
2029	0	0	0	0
2030	0	0	0	0
2031	0	0	0	0
2032	0	0	0	0
2033	0	0	0	0
2034	0	0	0	0
2035	0	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000865
2019	0.001712
2020	0.002541
2021	0.003369
2022	0.004186
2023	0.004151
2024	0.004115
2025	0.004079
2026	0.004039
2027	0.004001
2028	0.003965
2029	0.003931
2030	0.003899
2031	0.003871
2032	0.003845
2033	0.003819
2034	0.003795
2035	0.003772

Rewarding Businesses For Adopting

Overview	
Name	Rewarding Businesses For Adoptin
Abbr	33
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2020
Last Year	2035
Measure Length	16

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
COM	$500.00	$5,000.00	1

Administration Costs	
Markup Percentage	25%

Description

Recommendations from July 17, 2015 WSAC Agenda Item 6A "Summary of WSAC Work on Demand Management Options and Options for Integrating Demand Management into potential Water Supply Advisory Committee Recommendations and Agreement": Offer commercial customers who employ best practices increased supply reliability and lower price. For a business, the imposition of rationing during severe drought years hits the bottom line. This proposal suggests that the City's Water Shortage Contingency Plan be modified so that businesses who adopt best practices such as efficient plumbing fixtures, hotel laundry recycling, and climate-appropriate landscaping, would incur a lower level of curtailment in a severe drought. For example, in a Stage 4 drought, with a system-wide goal of 35% curtailment, the current plan is to ration businesses to 87% of their normal year water use. Under our recommendation, businesses adopting best practices would be expected to cut back to 95% of normal use. These businesses could also be rewarded with a lower rate for their water use. Target is to reach 20% of the accounts (400).

As with residential clothes washers, the City could facilitate the financing of landscape retrofits, hotel laundry recycling, compressed air pre-wash stations, etc.

References:

http://www.aquarecycle.com/WastewaterRecycle_8-13-14.pdf

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☐	☐	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets			☑					
Urinals			☑					
Lavatory Faucets			☑					
Showers			☑					
Dishwashers			☑					
Clothes Washers			☑					
Process			☑					
Kitchen Spray Rinse			☑					
Internal Leakage			☑					
Baths								
Other			☐					
Irrigation			☑					
Pools								
Wash Down								
Car Washing								
External Leakage			☑					
Indoor								
Outdoor								
Cooling			☑					
tory/Kitchen Faucets			☑					

Comments

Rewarding Businesses for Adopting Best Practices. Two ideas were set forth here by the working group. One involves granting relief to businesses that adopt best practices in future periods of water curtailment. This concept has already been instituted in the City's Water Shortage Contingency Plan and associated water shortage regulations and restrictions, beginning in Stage 4, through the granting of an exception. The Municipal Code allows for the Director to provide an exception under the following circumstances: A business customer has already implemented environmental sustainability measures that have reduced water consumption to the maximum extent feasible. As used in this subsection the term "environmental sustainability measures" refers to installation of high efficiency plumbing fixtures, devices, equipment, and appliances, recycled water systems, and landscaping consisting exclusively of low-water-using plant materials using drip or similar high efficiency, nonspray irrigation systems, or to buildings that are designed, built, and continuously operated according to Leadership in Energy and Environmental Design (LEED) certification standards.

The second idea involves the City facilitating/financing various promoting water efficiency improvements, such as hotel laundry recycling, as a way to reduce peak water use by reducing indoor usage in visitor serving facilities. This idea is consistent with both the Commercial Incentives measure proposed in the Conservation Plan, as well as with past programs the City has offered its commercial customers (LightWash and Smart Rebates programs) in the past.

Results	
Average Water Savings (mgd)	
0.004095	
Lifetime Savings - Present Value ($)	
Utility	$57,463
Community	$208,065
Lifetime Costs - Present Value ($)	
Utility	$189,426
Community	$1,704,833
Benefit to Cost Ratio	
Utility	0.30
Community	0.12
Cost of Savings per Unit Volume ($/mg)	
Utility	$6,030

End Use Savings Per Replacement	% Savings per Account
COM Toilets	5.0%
COM Urinals	5.0%
COM Lavatory Faucets	3.0%
COM Showers	3.0%
COM Dishwashers	3.0%
COM Clothes Washers	3.0%
COM Process	3.0%
COM Kitchen Spray Rins	5.0%
COM Internal Leakage	3.0%
COM Irrigation	3.0%
COM External Leakage	3.0%
COM Cooling	3.0%
Non-Lavatory/Kitchen Fa	3.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.250%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$15,220	$121,757	$136,977
2021	$15,256	$122,048	$137,304
2022	$15,292	$122,339	$137,632
2023	$15,329	$122,630	$137,959
2024	$15,365	$122,921	$138,286
2025	$15,401	$123,212	$138,613
2026	$15,459	$123,674	$139,133
2027	$15,517	$124,136	$139,653
2028	$15,575	$124,598	$140,173
2029	$15,633	$125,060	$140,693
2030	$15,690	$125,522	$141,212
2031	$15,764	$126,111	$141,875
2032	$15,837	$126,700	$142,537
2033	$15,911	$127,289	$143,200
2034	$15,985	$127,878	$143,862
2035	$16,058	$128,466	$144,525

Targets — View: Accounts

	COM	Total
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	24	24
2021	24	24
2022	24	24
2023	25	25
2024	25	25
2025	25	25
2026	25	25
2027	25	25
2028	25	25
2029	25	25
2030	25	25
2031	25	25
2032	25	25
2033	25	25
2034	26	26
2035	26	26

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000655
2021	0.001305
2022	0.001949
2023	0.002588
2024	0.003222
2025	0.003851
2026	0.004477
2027	0.005099
2028	0.005718
2029	0.006334
2030	0.006947
2031	0.007558
2032	0.008167
2033	0.008774
2034	0.009379
2035	0.009983

Additional Building Code Requirements

Overview	
Name	Additional Building Code Requirements for New Develc
Abbr	34
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2018
Last Year	2035
Measure Length	18

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$100.00	$500.00	1
MF	$100.00	$1,000.00	1
COM	$200.00	$5,000.00	1
MUN	$200.00	$5,000.00	1
IND	$200.00	$5,000.00	1

Administration Costs	
Markup Percentage	25%

Description

NEW CALGREEN INCLUDED, FUTURE CALGREEN UPDATES 2017, 2021.
Recommendations from July 17, 2015 WSAC Agenda Item 6A "Summary of WSAC Work on Demand Management Options and Options for Integrating Demand Management into potential Water Supply Advisory Committee Recommendations and Agreement":
Convene a working group of planners, builders, conservation groups, and Water Dept personnel to evaluate possible additions to current codes and fee structures that would encourage water conservation. Some examples include:
a. Requiring high efficiency washers in new development
b. Require hot water on demand/structured plumbing in new development
Currently there is a spurt of innovation in water efficiency. A working group could evaluate innovative measures for cost effectiveness and recommend them for inclusion in local code. Some possible measures:
a) Require .25 gal/flush urinals in new development.
b) Require efficient dishwashers in new development.
c) Require plumbing for gray water in new development.
d) Ordinance requiring fixture replacement in existing buildings (e.g. toilets).
e) Require efficient dish wash sprayers in restaurants.
f) Require replacement of all toilets using more than 1.6 gallons per flush in existing buildings.
g) Require low-flush urinals in existing buildings.
h) Require highest efficiency toilets & faucets in new construction & retrofit upon sale.
i) Require weather-based controllers in new landscapes.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☑	☑	☑	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☑	☑	☑	☑	☑			
Urinals			☑	☑	☑			
Lavatory Faucets	☑	☑	☑	☑	☑			
Showers	☑	☑	☑	☑	☐			
Dishwashers	☑	☑	☑	☑	☐			
Clothes Washers	☑	☑	☑	☐	☐			
Process			☐	☐				
Kitchen Spray Rinse			☑	☐				
Internal Leakage	☐	☐	☐	☐	☐			
Baths	☐	☐						
Other	☐	☐	☐	☐	☐			
Irrigation	☑	☑	☑	☑	☑			
Pools	☑	☑						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☐	☐	☐	☐	☐			
Indoor								
Outdoor								
Cooling			☐	☐	☐			
tory/Kitchen Faucets	☐	☐	☐	☐	☐			

Comments

Results	
Average Water Savings (mgd)	0.000000
Lifetime Savings - Present Value ($)	
Utility	$0
Community	$0
Lifetime Costs - Present Value ($)	
Utility	$0
Community	$0
Benefit to Cost Ratio	
Utility	0.00
Community	0.00
Cost of Savings per Unit Volume ($/mg)	
Utility	$0

End Use Savings Per Replacement	% Savings per Account
SF Toilets	10.0%
MF Toilets	10.0%
COM Toilets	10.0%
MUN Toilets	10.0%
IND Toilets	10.0%
COM Urinals	10.0%
MUN Urinals	10.0%
IND Urinals	10.0%
SF Lavatory Faucets	10.0%
MF Lavatory Faucets	10.0%
COM Lavatory Faucets	10.0%
MUN Lavatory Faucets	10.0%
IND Lavatory Faucets	10.0%
SF Showers	10.0%
MF Showers	10.0%
COM Showers	10.0%
MUN Showers	10.0%
SF Dishwashers	10.0%
MF Dishwashers	10.0%
COM Dishwashers	10.0%
MUN Dishwashers	10.0%
SF Clothes Washers	10.0%
MF Clothes Washers	10.0%
COM Clothes Washers	10.0%
OM Kitchen Spray Rins	10.0%
SF Irrigation	10.0%
MF Irrigation	10.0%
COM Irrigation	10.0%
MUN Irrigation	10.0%
IND Irrigation	10.0%
SF Pools	10.0%
MF Pools	10.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.000%
Only Effects New Accts	☑

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$0	$0	$0
2028	$0	$0	$0
2029	$0	$0	$0
2030	$0	$0	$0
2031	$0	$0	$0
2032	$0	$0	$0
2033	$0	$0	$0
2034	$0	$0	$0
2035	$0	$0	$0

Targets — View: Accounts

	SF	MF	COM	MUN	IND	Total
2015	0	0	0	0	0	0
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	0	0	0
2019	0	0	0	0	0	0
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0
2025	0	0	0	0	0	0
2026	0	0	0	0	0	0
2027	0	0	0	0	0	0
2028	0	0	0	0	0	0
2029	0	0	0	0	0	0
2030	0	0	0	0	0	0
2031	0	0	0	0	0	0
2032	0	0	0	0	0	0
2033	0	0	0	0	0	0
2034	0	0	0	0	0	0
2035	0	0	0	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000000
2022	0.000000
2023	0.000000
2024	0.000000
2025	0.000000
2026	0.000000
2027	0.000000
2028	0.000000
2029	0.000000
2030	0.000000
2031	0.000000
2032	0.000000
2033	0.000000
2034	0.000000
2035	0.000000

Overview	
Name	Innovation Incubator Program
Abbr	35
Category	Default
Measure Type	Standard Measure

Time Period	
First Year	2021
Last Year	2035
Measure Length	15

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$300.00	$0.00	1
MF	$300.00	$0.00	1
COM	$300.00	$0.00	1
MUN	$300.00	$0.00	1

Administration Costs	
Markup Percentage	25%

Description

Recommendations from July 17, 2015 WSAC Agenda Item 6A "Summary of WSAC Work on Demand Management Options and Options for Integrating Demand Management into potential Water Supply Advisory Committee Recommendations and Agreement":
Establish an Innovation Incubator Program. Santa Cruz can continue its leadership in water stewardship by creating a program that: supports innovations in:
• Supports innovative new technologies, customer financing programs, and customer outreach programs
• Supports pilot projects to facilitate popular adoption of: rainwater for toilets & washers composting toilets in institutional buildings onsite recycling of graywater rainwater irrigated lawns promotion of native plant landscapes onsite recycling of graywater
Modest grants would be offered to local businesses and/or collaboration with state and national organizations like California Urban Water Conservation Council, California Water Foundation, California Urban Water Agencies, University of California (Santa Cruz or Davis), Alliance for Water Efficiency, Water Research Foundation, US Bureau of Reclamation or other coalitions of utilities or research focused organizations.

Customer Classes	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
	☑	☑	☑	☑	☐	☐	☐	☐

End Uses	SF	MF	COM	MUN	IND	UCSC	IRR	GOLF
Toilets	☐	☐	☐	☐				
Urinals			☐	☐				
Lavatory Faucets	☐	☐	☐	☐				
Showers	☐	☐	☐	☐				
Dishwashers	☐	☐	☐	☐				
Clothes Washers	☐	☐	☐	☐				
Process			☑					
Kitchen Spray Rinse			☐	☐				
Internal Leakage	☑	☑	☑	☑				
Baths	☐	☐						
Other	☐	☐	☐	☐				
Irrigation	☑	☑	☑	☑				
Pools	☐	☐						
Wash Down	☐	☐						
Car Washing	☐	☐						
External Leakage	☑	☑	☑	☑				
Indoor								
Outdoor								
Cooling			☑	☑				
tory/Kitchen Faucets	☐	☐	☐	☐				

Comments

The Innovation Incubator Program identifies and supports entrepreneurs in their development and distribution of innovative learning technologies related to water use efficiency. The program will provide mentorship for products and companies in their efforts to improve water use efficiency and education through the use of software, digital content and related technologies. The Innovation Incubator Program finalists will be selected from an applicant pool based on key selection criteria, including:
•Ability to positively impact end users of the product
•Ability to succeed in the water use efficiency tech market
•Level of originality and innovation

The Innovation Incubator Program is a 12-month program of activities, master classes and coaching sessions, mentoring support, and business-to-business meetings that will facilitate and accelerate the market entry of technologies addressing water management challenges.
The Program will aim to ensure more efficient and effective practices across the water industry and across water-using sectors.

Innovators taking part in the Innovation Incubator Program will have access to a range of benefits that will support them with the successful market entry of their technology.

Results	
Average Water Savings (mgd)	
0.001148	
Lifetime Savings - Present Value ($)	
Utility	$15,845
Community	$43,706
Lifetime Costs - Present Value ($)	
Utility	$1,071,611
Community	$1,071,611
Benefit to Cost Ratio	
Utility	0.01
Community	0.04
Cost of Savings per Unit Volume ($/mg)	
Utility	$121,679

End Use Savings Per Replacement	% Savings per Account
COM Process	1.0%
SF Internal Leakage	1.0%
MF Internal Leakage	1.0%
COM Internal Leakage	1.0%
MUN Internal Leakage	1.0%
SF Irrigation	1.0%
MF Irrigation	1.0%
COM Irrigation	1.0%
MUN Irrigation	1.0%
SF External Leakage	1.0%
MF External Leakage	1.0%
COM External Leakage	1.0%
MUN External Leakage	1.0%
COM Cooling	1.0%
MUN Cooling	1.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Costs

View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
2021	$92,284	$0	$92,284
2022	$92,665	$0	$92,665
2023	$93,045	$0	$93,045
2024	$93,426	$0	$93,426
2025	$93,806	$0	$93,806
2026	$94,252	$0	$94,252
2027	$94,697	$0	$94,697
2028	$95,143	$0	$95,143
2029	$95,588	$0	$95,588
2030	$96,034	$0	$96,034
2031	$96,437	$0	$96,437
2032	$96,841	$0	$96,841
2033	$97,245	$0	$97,245
2034	$97,649	$0	$97,649
2035	$98,053	$0	$98,053

Targets

View: Accounts

	SF	MF	COM	MUN	Total
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	195	29	20	2	246
2022	196	29	20	2	247
2023	197	29	20	2	248
2024	198	30	20	2	249
2025	199	30	20	2	250
2026	199	30	20	2	251
2027	200	30	20	2	253
2028	201	31	20	2	254
2029	202	31	20	2	255
2030	203	31	20	2	256
2031	203	31	20	2	257
2032	204	32	20	2	258
2033	205	32	20	2	259
2034	206	32	20	2	260
2035	206	32	21	2	261

Water Savings (mgd)

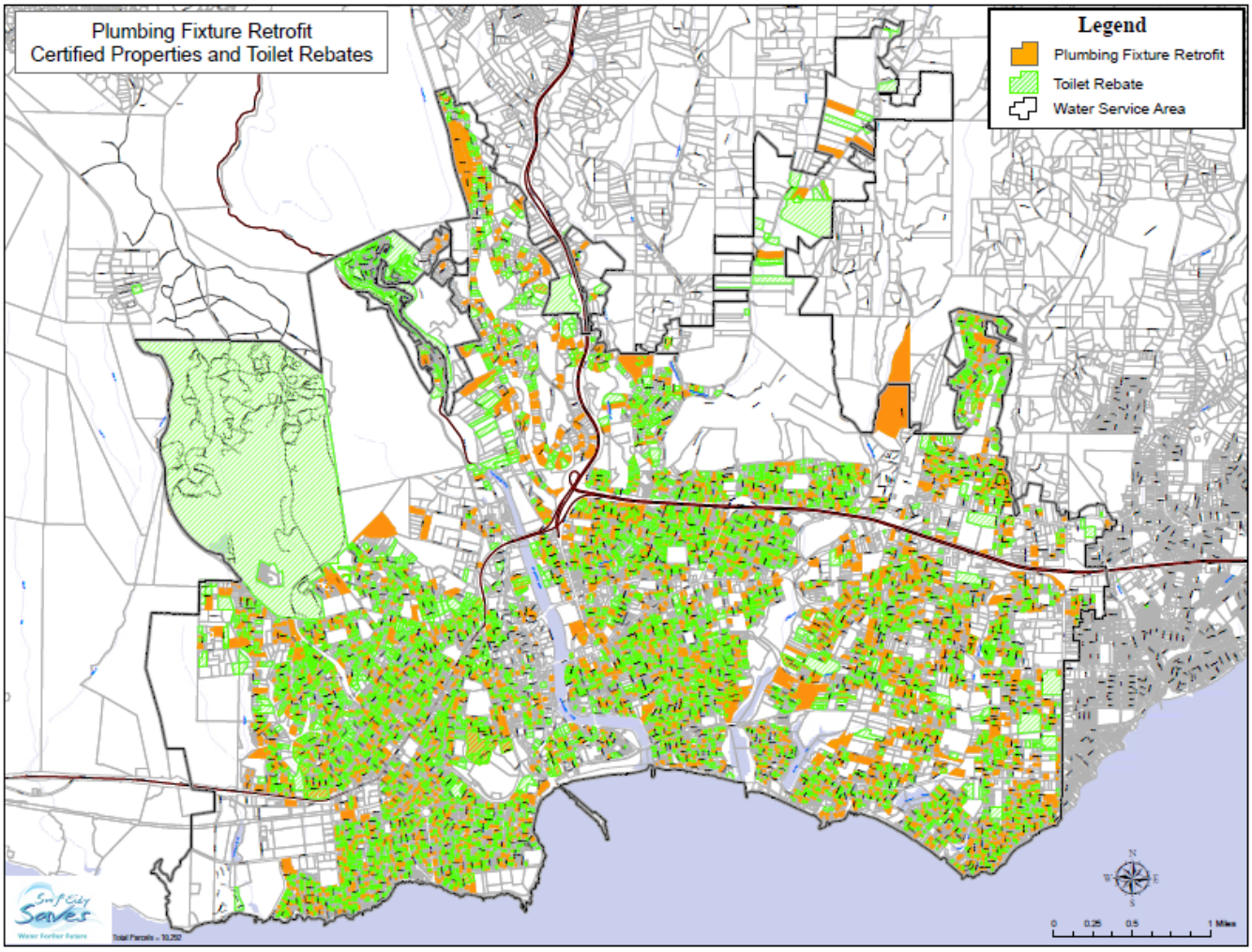
	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000000
2021	0.000211
2022	0.000419
2023	0.000625
2024	0.000829
2025	0.001030
2026	0.001229
2027	0.001426
2028	0.001621
2029	0.001815
2030	0.002007
2031	0.002199
2032	0.002390
2033	0.002581
2034	0.002770
2035	0.002959

APPENDIX D – WATER USE EFFICIENCY MEASURE IMPLEMENTATION MAPS

The City has created maps to illustrate their efforts for their water use efficiency measure.

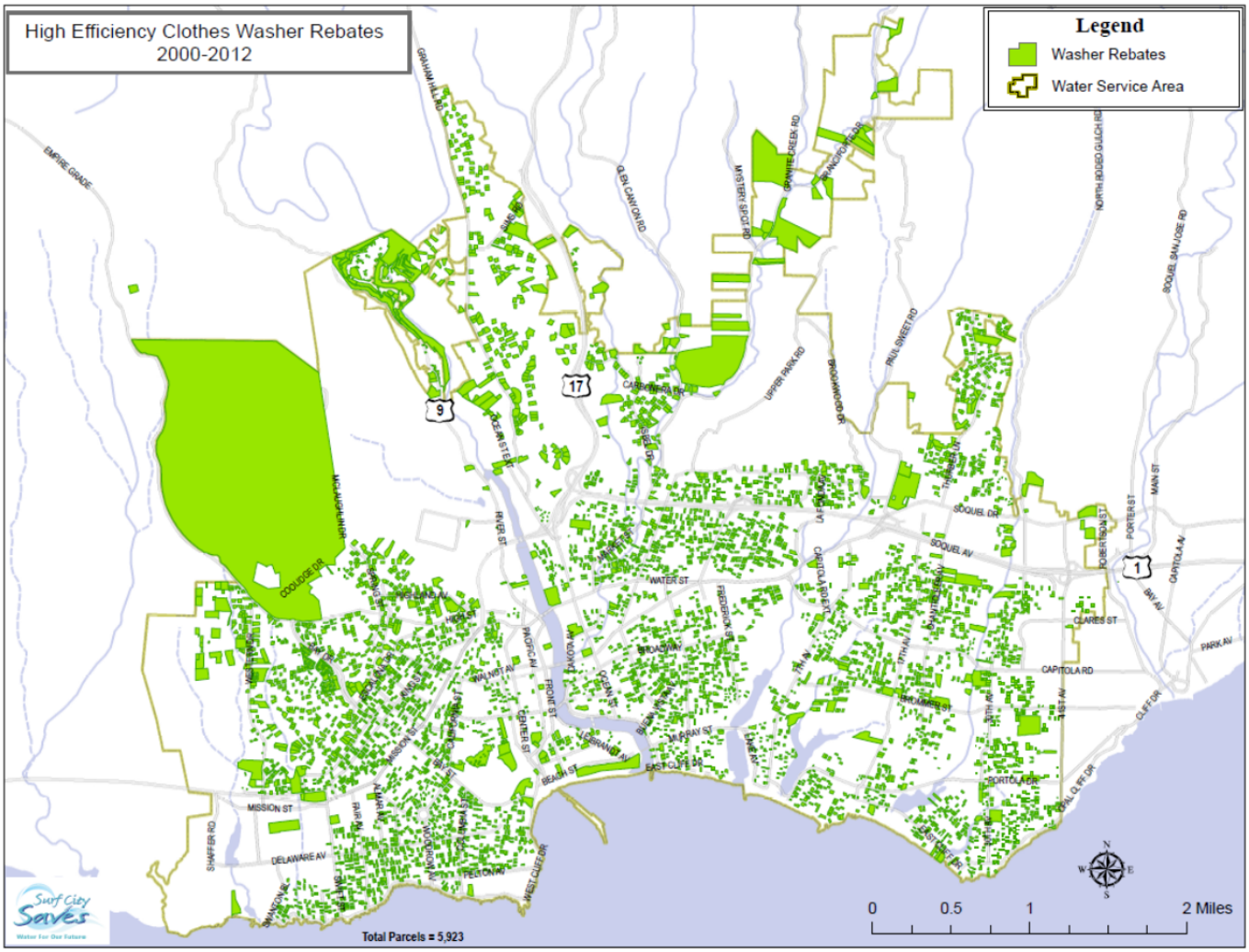
The following figure indicates the City's properties that have participated in a toilet rebate program or have been certified as complying with plumbing fixture retrofit regulations.

Figure D-1. Plumbing Fixture Retrofit Certified Properties and Toilet Rebates



The following figure presents an example of one map for all the properties that participated in their high efficiency clothes washer rebate incentive programs between 2000 and 2012. This map was created using Geographical Information System (GIS) mapping software and the database of customers that participated in the program.

Figure D-2. Map of Incentives for High Efficiency Clothes Washers (Domestic and Commercial)



CUWCC BMP Retail Coverage Report 2014

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices

ON TRACK

6270 City of Santa Cruz Water Department

1. Conservation Coordinator provided with necessary resources to implement BMPs?	Name:	Toby Goddard
	Title:	Administrative Services Manager
	Email:	tgoddard@cityofsantacruz.com

2. Water Waste Prevention Documents

WW Document Name	WWP File Name	WW Prevention URL	WW Prevention Ordinance Terms Description
Option A Describe the ordinances or terms of service adopted by your agency to meet the water waste prevention requirements of this BMP.		http://www.codepublishing.com/CA/SantaCruz/html/SantaCruz16/SantaCruz16.html	See Santa Cruz Municipal Code Chapter 16 for the following: a) 16.01 Water Shortage Regulations and Restrictions b) 16.02 Water Conservation/Water Waste Prohibition Ordinance c) 16.16 Water Efficient Landscape Ordinance
Option B Describe any water waste prevention ordinances or requirements adopted by your local jurisdiction or regulatory agencies within your service area.			
Option C Describe any documentation of support for legislation or regulations that prohibit water waste.			
Option D Describe your agency efforts to cooperate with other entities in the adoption or enforcement of local requirements consistent with this BMP.			
Option E Describe your agency support positions with respect to adoption of legislation or regulations that are consistent with this BMP.			
Option F Describe your agency efforts to support local ordinances that establish permits requirements for water efficient design in new development.			

At Least As effective As No

CUWCC BMP Retail Coverage Report 2014

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices ON TRACK

Exemption	No

Comments:

The City of Santa Cruz declared a Stage 3 Water Shortage Emergency effective May 1, 2014 and instituted water rationing for all residential and irrigation accounts, drought regulations for CII accounts, and outdoor water restrictions for all users.

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control — NOT ON TRACK

6270 City of Santa Cruz Water Department

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
City of Santa Cruz 2014 Annual Water Audit.xls	
AWWA Water Audit Validity Score?	66
Complete Training in AWWA Audit Method	Yes
Complete Training in Component Analysis Process?	No
Component Analysis?	No
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	No
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
227	119438.04	244565		False		

At Least As effective As No

Exemption No

Comments:

The City of Santa Cruz has contracted with Water Systems Optimization, Inc to conduct a water loss control project. The contract is for FY16, but the test period to be validated is 2014. See comment in 2013 re: AWWA OEI data not uploading properly

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

6270 City of Santa Cruz Water Department

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	737
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	Yes
Feasibility Study provided to CUWCC?	Yes

Date: 12/16/2013

Uploaded file name:

Completed a written plan, policy or program to test, repair and replace meters	Yes

At Least As effective As No

Exemption No

Comments:

The City instituted water rationing in 2014 in response to a water shortage emergency and migrated all its customers to monthly billing effective April 2014. Previously most outside City accounts were billed bimonthly.

NOT ON TRACK

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.4 Retail Conservation Pricing

6270 City of Santa Cruz Water Department

Implementation (Water Rate Structure) ON TRACK

Customer Class	Water Rate Type	Conserving Rate?	(V) Total Revenue Comodity Charges	(M) Total Revenue Fixed Carges
Single-Family	Increasing Block	Yes	4097421.24	4674757.04
Multi-Family	Uniform	Yes	3615070.34	1333880.79
Commercial	Uniform	Yes	3178492.82	1131061.45
Industrial	Uniform	Yes	1178030.78	168046.78
Institutional	Uniform	Yes	183173.76	168907.53
Dedicated Irrigation	Uniform	Yes	853359.46	338205.43
Agricultural	Uniform	Yes	35224.07	37459.42
Other	Uniform	Yes	33070.92	12069.64
			13173843.39	**7864388.08**

Calculate: V / (V + M) **63 %**

Implementation Option: Use Canadian Water Wastewater Association Rate Design Model

☐ Use 3 years average instead of most recent year

Canadian Water and Wastewater Association

Upload file:

Agency Provide Sewer Service: Yes NOT ON TRACK

Customer Class	Rate Type	Conserving Rate?
Single-Family	Non-Volumetric Flat Rate	No
Multi-Family	Non-Volumetric Flat Rate	No
Commercial	Uniform	Yes
Industrial	Uniform	Yes
Institutional	Uniform	Yes
Dedicated Irrigation	Service Not Provided	No

At Least As effective As No

Exemption No

Comments:

Note to CUWCC staff: The City of Santa Cruz is using Option 3 for BMP 1.4. Coverage calculator does not seem to work; City earned 39 points in its matrix score.

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

6270 City of Santa Cruz Water Department **Retail**

Does your agency perform Public Outreach programs? Yes

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Newsletter articles on conservation	8
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	24
Website	100
Landscape water conservation media campaigns	2
General water conservation information	100
Total	**234**

Did at least one contact take place during each quater of the reporting year? Yes

Number Media Contacts	Number
Articles or stories resulting from outreach	50
News releases	24
Newspaper contacts	100
Total	**174**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Public Information and Outreach	28000
Total Amount:	**28000**

Public Outreah Additional Programs
Stage 3 Water Shortage Emergency and associated water restrictions
Water Supply Advisory Committee

Description of all other Public Outreach programs

Green Gardener program

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach ON TRACK

In addition to Water Conservation, there was considerable public outreach about future water supply. The City created a citizen's Water Supply Advisory Committee which met twice a month during 2014.		
At Least As effective As	No	
Exemption	No	0

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs — ON TRACK

6270 City of Santa Cruz Water Department — Retail

Does your agency implement School Education programs? Yes

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

Materials meet state education framework requirements? Yes

12 local 4th and 5th grade classes participated in the Wetlands and Watersheds program. The program includes a teacher workshop and day-long field trip to the City's reservoir and the San Lorenzo River to learn about water supply and water quality.

Materials distributed to K-6? Yes

Each student receives a copy of "Our Water Works in Santa Cruz County" booklet and a journal they complete at the river. Techers receive a county watershed map and background material to support watershed education in the classroom.

Materials distributed to 7-12 students? Yes (Info Only)

As part of Watershed Academy, described below, materials include scientific literature, news articles, hydrographs, data sheets, etc.

Annual budget for school education program: 27000.00

Description of all other water supplier education programs

Watershed Academy: City staff teaches a small group of 10th grade students in the San Lorenzo Valley about watershed processes, fisheries, land use and drinking water source protection, both in the classroom and through a series of field trips

Comments:

Budget figure above is for the Coastal Watershed Council contract managed by Water Resources section.

At Least As effective As No

Exemption No 0

CUWCC BMP Coverage Report 2014

6270 City of Santa Cruz Water Department

Baseline GPCD: 123.83

GPCD in 2014 75.8

GPCD Target for 2018: 101.50

Biennial GPCD Compliance Table **ON TRACK**

		Target		Highest Acceptable Bound	
Year	Report	% Base	GPCD	% Base	GPCD
2010	1	96.4%	119.40	100%	123.80
2012	2	92.8%	114.90	96.4%	119.40
2014	3	89.2%	110.50	92.8%	114.90
2016	4	85.6%	106.00	89.2%	110.50
2018	5	82.0%	101.50	82.0%	101.50

CUWCC BMP Retail Coverage Report 2013

Foundational Best Management Practices for Urban Water Efficiency

BMP 1.1 Operation Practices

ON TRACK

6270 City of Santa Cruz Water Department

1. Conservation Coordinator provided with necessary resources to implement BMPs?

Name: Toby Goddard

Title: Water Conservation Manager

Email: tgoddard@cityofsantacruz.com

2. Water Waste Prevention Documents

WW Document Name	WWP File Name	WW Prevention URL	WW Prevention Ordinance Terms Description
Option A Describe the ordinances or terms of service adopted by your agency to meet the water waste prevention requirements of this BMP.		http://www.codepublishing.com/CA/SantaCruz/html/SantaCruz16/SantaCruz16.html	See Santa Cruz Municipal Code Chapter 16 for the following: a) 16.01 Water Shortage Regulations and Restrictions b) 16.02 Water Conservation/Water Waste Prohibition Ordinance c) 16.16 Water Efficient Landscape Ordinance
Option B Describe any water waste prevention ordinances or requirements adopted by your local jurisdiction or regulatory agencies within your service area.			
Option C Describe any documentation of support for legislation or regulations that prohibit water waste.			
Option D Describe your agency efforts to cooperate with other entities in the adoption or enforcement of local requirements consistent with this BMP.			
Option E Describe your agency support positions with respect to adoption of legislation or regulations that are consistent with this BMP.			
Option F Describe your agency efforts to support local ordinances that establish permits requirements for water efficient design in new development.			

At Least As effective As No

CUWCC BMP Retail Coverage Report 2013

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices ON TRACK

Exemption No

Comments:

The City of Santa Cruz declared a Stage 1 Water Shortage Alert effective May 1, 2013 and insitituted water restrictions throughout the year. Two temporary staff were hired to patrol the service area leading to 731 water waste enforcement actions.

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control — NOT ON TRACK

6270 City of Santa Cruz Water Department

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
City of Santa Cruz 2013 Annual Water Audit.xls	
AWWA Water Audit Validity Score?	65
Complete Training in AWWA Audit Method	Yes
Complete Training in Component Analysis Process?	No
Component Analysis?	No
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	No
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
267	100884	320768		False		

At Least As effective As No

Exemption No

Comments:

To CUWCC Staff: Please note that the operational efficiency indicators from the AWWA water audit software did not automatically populate the BMP database after uploading and saving. We tried converting format from .xlsx to .xls. We are using V5.0

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

6270 City of Santa Cruz Water Department

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	737
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	Yes
Feasibility Study provided to CUWCC?	Yes
Date: 12/16/2013	
Uploaded file name:	
Completed a written plan, policy or program to test, repair and replace meters	Yes

At Least As effective As No

Exemption No

Comments:

1) The City bills all inside City and some large outside City customers on a monthly basis; outside City customers are billed bi-monthly. 2) Recent analysis of CII accounts shows 940 accounts with no outdoor water use, and 737 with mixed use.

NOT ON TRACK

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.4 Retail Conservation Pricing

6270 City of Santa Cruz Water Department

ON TRACK

Implementation (Water Rate Structure)

Customer Class	Water Rate Type	Conserving Rate?	(V) Total Revenue Comodity Charges	(M) Total Revenue Fixed Carges
Single-Family	Increasing Block	Yes	5918548.95	4472338.86
Multi-Family	Uniform	Yes	4107973.04	1268495.67
Commercial	Uniform	Yes	3379123.99	1074308.13
Industrial	Uniform	Yes	1320577.7	164488.08
Institutional	Uniform	Yes	313841.02	165728.5
Dedicated Irrigation	Uniform	Yes	1423156.26	325452.27
Agricultural	Uniform	Yes	39245.11	35365.59
Other	Uniform	Yes	36483.72	12810.98
			16538949.79	**7518988.08**

Calculate: V / (V + M) **69 %**

Implementation Option: Use Canadian Water Wastewater Association Rate Design Model

☐ Use 3 years average instead of most recent year

Canadian Water and Wastewater Association

Upload file:

NOT ON TRACK

Agency Provide Sewer Service: Yes

Customer Class	Rate Type	Conserving Rate?
Single-Family	Non-Volumetric Flat Rate	No
Multi-Family	Non-Volumetric Flat Rate	No
Commercial	Uniform	Yes
Industrial	Uniform	Yes
Institutional	Uniform	Yes
Dedicated Irrigation	Service Not Provided	No

At Least As effective As No

Exemption No

Comments:

Note to CUWCC staff: We are using Option 3 for BMP 1.4. Coverage calculator does not seem to work; the City earned 37 points in our matrix score.

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

6270 City of Santa Cruz Water Department **Retail**

Does your agency perform Public Outreach programs? Yes

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Newsletter articles on conservation	8
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	4
Website	12
Landscape water conservation media campaigns	2
General water conservation information	6
Total	**32**

Did at least one contact take place during each quater of the reporting year? Yes

Number Media Contacts	Number
Articles or stories resulting from outreach	12
News releases	12
Newspaper contacts	24
Total	**48**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Public Information and Outreach	28000
Total Amount:	**28000**

Public Outreah Additional Programs
Stage 1 Water Shortage Alert and associated water restrictions

Description of all other Public Outreach programs

Green Gardener program

Comments:

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach ON TRACK

In addition to Water Conservation, there was considerable public outreach about future water supply. In late 2013, the City created a citizen's Water Supply Advisory Committee. The Water Department also hired its first Community Relations Specialist

At Least As effective As	No	
Exemption	No	0

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

6270 City of Santa Cruz Water Department **Retail**

Does your agency implement School Education programs? Yes

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

Materials meet state education framework requirements? Yes

15 local 4th and 5th grade classes participated in the Wetlands and Watersheds program. The program includes a teacher workshop and day-long field trip to the City's reservoir and the San Lorenzo River to learn about water supply and water quality.

Materials distributed to K-6? Yes

Each student receives a copy of "Our Water Works in Santa Cruz County" booklet and a journal they complete at the river. Techers receive a county watershed map and background material to support watershed education in the classroom.

Materials distributed to 7-12 students? Yes (Info Only)

As part of the Watershed Academy, described below, materials include scientific literature, news articles, hydrographs, data sheets, etc.

Annual budget for school education program: 27000.00

Description of all other water supplier education programs

Watershed Academy: City staff teaches a small group of 10th grade students in the San Lorenzo Valley about watershed processes, fisheries, land use and drinking water source protection, both in the classroom and through a series of field trips

Comments:

Budget figure above is for the Coastal Watershed Council contract managed by Water Resources section.

At Least As effective As No

Exemption No 0

APPENDIX F – POTENTIAL WATER CONSERVATION MEASURES SCREENING PROCESS AND RESULTS

At its April 1, 2013 meeting, the City's Water Commission reviewed 1) the comprehensive list of existing and possible new water conservation measures prepared by MWM, and 2) the criteria proposed to rank and screen the measures down to a more manageable number for further modeling and analysis. In doing so, the Commission requested staff make more effort to solicit public ideas and input in the planning process.

In response to this request, City staff prepared and published display ads in the Santa Cruz Sentinel on both April 5, 2013 and April 12, 2013. A total of 63 suggestions were submitted by 22 individuals by the April 15, 2013 cutoff date. These community ideas for future water conservation programs are summarized in Figure F-1.

City staff and the consultant reviewed these 63 suggestions April 18, 2013. Many were considered to be sufficiently covered in the existing measure description, thus no change was needed. For others, conservation measure descriptions were modified, or a new line was added with the suggested measure incorporated. Finally, there were a handful of comments that either didn't fit into any particular demand management category or dealt with the subject of alternative water supplies, which is beyond the scope of this project.

On April 24, 2013 water conservation staff and the consultant performed the measure screening process. To make the ratings more understandable, consistent, and transparent, staff developed various qualitative/quantitative definitions for each of the numbers associated with the following six criteria:

1. Water Savings Potential (Service Area Match)
2. Sustainable Water Savings – emphasis on savings lifetime/reliability
3. Quantifiable Water Savings
4. Widespread Community & Social Acceptance (Technology/Market Maturity)
5. Feasibility of Implementation/Secondary Impacts – emphasis on ability to achieve objectives
6. Additional Service Area Benefits (GHG, Stormwater)

In some cases, ratings were obvious and straightforward. In others, it triggered deliberation and discussion involving different viewpoints, resulting in a score that fairly represented the consensus of the group.

The outcome of this process is shown in Table F-1. Essentially, the rating process resulted in the following four categories:

Group 1: The 23 top-rated measures that are recommended to be modeled for further analysis. Some of these measures have multiple components and therefore consist of more than one line-item.

Group 2: Measures that are considered important elements of a comprehensive water conservation program that were passed but will not be modeled. These include:

- Public education
- Water waste prohibition
- Landscape water conservation in new development
- Research

Group 3: The lower rated measures that are not recommended for modeling.

Group 4: Measures that were individually left unrated but potentially will be included in the design the measure included as part of the following measures to be modeled:

- Water loss control program
- Future public education initiatives
- Independent water rate study

The Water Commission was encouraged to review and comment on the screening outcome and consider including another 4-5 items from Group 3 to be modeled for further analysis. The project budget provided for a total of 30 measures to be analyzed in detail for costs and benefits. Though additional measures were not planned to be added after the modeling phase had started, many measures were modified, cut and/or added.

The following figure presents a compiled list of the community's ideas for future conservation programs.

Figure F-1. Community Ideas for Future Water Conservation Programs

Program Type	Suggestion	Already Included in the Potential Measures List?
Water Loss	Collect annual flushing water into tanks and use as reclaimed water.	Item 3C
Water Loss	Include an estimate of future water lost to leakage when considering a program for replacing distribution system pipes.	Item 3B
Adv. Meter Infrastruct.	Allow customers to monitor their own water consumption via the computer.	Item 5A
Water Rates	Charge more for water usage.	Items 6A-B
Water Rates	Develop a formula for tying the price of water to population.	
Water Rates	Drastically reduce the 'Ready to Serve' charge while increasing the per unit water charge in a revenue neutral manner.	
Water Rates	Eliminate the 'Ready to Serve' charge, increase the per unit water charge in a revenue neutral manner, and charge a nominal fee when usage does not register as a billable water unit.	
Water Rates	Develop a separate billing category for individually metered apartments and multi-family residences.	
Water Rates	Charge more for water used to irrigate golf courses.	Item 6C
Water Rates	Increase the rates between tiers.	Item 6A
Water Rates	Study and implement a new and improved tiered rate structure that significantly encourages water conservation.	Items 6A-C
Indoor Plumb. Fixtures	Install pressure regulators on properties with high pressure.	Item 9D
Indoor Plumb. Fixtures	Require businesses to install 1.28gpf toilets and waterless urinals.	Items 15B, 18
Indoor Plumb. Fixtures	Promote composting toilets.	Item 48A
Indoor Plumb. Fixtures	Make installation showerheads with shutoffs, ulfts, and waterless urinals mandatory in all hotels and motels.	Items 12A, 13, 15A, 17, 18
Indoor Plumb. Fixtures	Require waterless urinals as part of the building code.	
Hot Water on Demand	Promote hot water recirculation pumps.	
Hot Water on Demand	Study water savings for hot water on demand pumps and potentially fund program using developer funded offsets.	Items 20A-B
Clothes Washers	Buy everyone a High Efficiency Clothes Washer.	
Clothes Washers	Offer an immediate "no interest" loan for every household in the service area to purchase a high efficiency clothes washer.	
Irrigation/ Washers	Increase incentives to save water e.g. lawn removal, water catchment, and water/energy efficient clothes washers.	Items 21A-B, 26-31, 35A-35B
Irrigation	Give rebates to customers who plant drought-resistant and native plants.	Item 26
Irrigation	Ban sprinkler systems.	
Irrigation	Increase the turf replacement rebate from $0.50/sq ft to $1.00/sq ft with an upper limit of $1,000.	27A
Irrigation	Develop water conservation programs for agricultural customers focusing on irrigation practices.	
Irrigation	New home and business construction should include drought resistant landscaping and permeable paving.	Item 32
Irrigation	Provide funding for drought tolerant landscaping	Items 26, 27A-B
Rainwater Catchment	Establish large rain water collection tanks.	
Rainwater Catchment	Every new home must be built with a catchment system to collect rainwater. Every existing home must install one too.	Item 35B
Rainwater Catchment	Install rainwater catchment systems and use water for flushing toilets.	
Rainwater/Graywater	Revise local building code to facilitate use of rainwater and graywater, e.g. rainwater to toilet.	Items 36B, D
Graywater	Offer incentives for graywater installation.	Items 36A,C, D
Graywater	Plumb for reuseable grey water to be available outdoors or for toilets.	Items 36A-D
Graywater	Require golf courses use to use graywater.	
Graywater	Every new and existing home should catch and use graywater to water the yard.	Items 36A-C
Public Education	Publish a weekly report of the service area's water consumption.	
Public Education	Develop a public awareness campaign focusing on total water consumption.	Item 47D
Public Education	Publish water consumption data by neighborhood and by large users.	Item 47D

The following table presents the City's measure screening results.

Table F-1. Measure Screening Results

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
Group 1 - Top Rated Measures Planned to be Modeled															
1A	Clothes Washers	Residential Washer Rebate	SF, MF Indoor	Provide a rebate for efficient washing machines to single family homes and apartment complexes that have common laundry rooms. It is assumed that the rebates would remain consistent with relevant state and federal regulations (Department of Energy, Energy Star) and only offer the best available technology. This program would be similar the City's current program. Current rebate $100. Rebate could be modified to increase incentive for the most efficient washers *up to full replacement cost*.	5	3.5	5	5	5	2	25.5	Yes	Yes	19) Buy everyone a High Efficiency Clothes Washer. 20) Offer an immediate "no interest" loan for every household in the service area to purchase a high efficiency clothes washer.	

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
1B	Clothes Washers	High Efficiency Washer Rebate	CII Indoor	Provide a $400 rebate for the installation of a high efficiency commercial washer (HEW). Rebate amounts would reflect the incremental purchase cost. Program will be shorter lived as it is intended to be a market transformation measure and eventually would be stopped as efficient units reach saturation.	4	3.5	5	5	5	2	24.5	Yes	Yes	Buy everyone a High Efficiency Clothes Washer.	Uses per machine is higher than residential, less accounts
2	Clothes Washers	Require High Efficiency Clothes Washers in New Developme nt	New SF Indoor	Require developers to install an efficient clothes washer (meeting certain water efficiency standards, such as gallons/load), Building Department would be requested to ensure that an efficient washer was installed before new home or building occupancy. Verify that the Utility can enforce conditions of water service that may include efficiency	4	3.5	5	5	3	2	22.5	Yes	No		Requires changing local codes

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				standards for washing machines. Pattern after the North Marin Water District Program.											
3	Water Loss	Water Loss Control Program	System	City of Santa Cruz's water losses are relatively low. This measure would seek to maintain low non-revenue water rates through controlling both apparent and real water losses. This would be annual tracked through the AWWA Water Balance Water System Audit.	4	4	5	5	3	1	22	Yes	No		
4	Indoor Plumbing Fixtures	Ultra High Efficiency Toilet (UHET) Rebates	SF MF	Provide a rebate or voucher for the installation of an ultra high efficiency toilet (UHET). (Toilets flushing 1.0 gpf or less and include dual flush technology. Rebate amounts would reflect the incremental purchase cost and have been at least $150.	4	5	4	3	5	0	21	Yes	No		Modify UHET Program <1.0 gpf toilets

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
5	Hot Water on Demand	Provide a Rebate for Hot Water on Demand Pump Systems	SF Indoor	Provide a rebate to equip homes with efficient hot water on demand systems. These systems use a pump placed under the sink to recycle water sitting in the hot water pipes to reduce hot water waiting times by having an on-demand pump on a recirculation line. Can be installed on kitchen sink or master bath, wherever hot water waiting times are more than 1/2 minute. Requires an electrical outlet under the sink, which is not common on older home bathrooms but is on kitchen sinks.	4	2	3	5	5	2	21	Yes	No	17) Promote hot water recircu-lation pumps.	

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
6	Irrigation	Outdoor Water Audit	Large Irrigation Customers - Outdoor Only	Outdoor water audits offered for existing large landscape customers. Normally those with high water use are targeted and provided a customized report on how to save water. All large multi-family residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. Tied to the Water Budget Program.	4	1	4	5	5	2	21	Yes	No		Measureable on Waterfluence
7A	Irrigation	Landscape Conversion or Turf Removal	SF	Provide a per square foot incentive for to remove turf and replace with low water use plants or permeable hardscape. Pattern after the City's current program. Rebate is currently $0.50 per square foot removed, and capped at an upper limit of $500 for single family residence. *Consider higher rebate amount.*	4	2.5	4	5	4	1	20.5	Yes	Yes	Increase incentives to save water e.g. lawn removal, water catchment, and water/ energy efficient clothes washers.	

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
7B	Irrigation	Landscape Conversion or Turf Removal	MF CII	Provide a per square foot incentive for to remove turf and replace with low water use plants or hardscape. Pattern after the City's current program. Rebate is currently $0.50 per square foot removed, and capped at an upper limit of $2,500 for multi-family or commercial residence.	3	3	4	5	4	1	20	Yes	Yes		
8A	Advanced Meter Infrastruct ure (AMI)	Targeted AMI to Irrigation or Large User Accounts	ALL	Require that larger or irrigation customers install such AMI meters as described above and possibly purchase means of viewing daily consumption by landscape/property managers, or business either through the Internet (if available) or separate device. The AMI system would, on demand, indicate to the customer and Utility where and how their water is used,	2	4	4	4	4	2	20	Yes	Yes		

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				facilitating water use reduction and prompt leak identification. This would require Utility to install an AMI system.											
8B	Advanced Meter Infrastruct ure (AMI)	Install AMI System-wide	ALL	Retrofit system with AMI meters and associated network capable of providing continuous consumption data to Utility offices. Improved identification of system and customer leaks is major conservation benefit. Some of costs of these systems are offset by operational efficiencies and reduced staffing, as regular meter reading and those for opening and closing accounts are accomplished without need for physical or drive-by meter reading. Also enables enhanced billing options and ability to monitor	4	4	3	4	2	2	19	Yes	Yes	Allow customers to monitor their own water consump-tion via the computer.	

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				unauthorized usage (such as use/tampering with closed accounts or irrigation if time of day or days per week are regulated). Customer service is improved as staff can quickly access continuous usage records to address customer inquiries. Optional features include online customer access to their usage, which has been shown to improve accountability and reduce water use. A ten-year change-out would be a reasonable objective.											
9	Indoor Plumbing Fixtures	Real Customer Water Loss Reduction - Leak Repair and Plumbing Emergency Assistance	SFR, MFR	Customer leaks can go uncorrected at properties where owners are least able to pay costs of repair. These programs may require that customer leaks be repaired, but either subsidize part of the repair and/or pay the cost with revolving	4	2	4	5	4	1	20	Yes	No		Social justice benefits to low income households

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				funds that are paid back with water bills over time. May also include an option to replace inefficient plumbing fixtures at low-income residences.											
10A	Indoor Plumbing Fixtures	High Efficiency Faucet Aerator/ Shower-head Giveaway	SF MF	Utility would buy showerheads and faucet aerators in bulk and give them away at Utility office or community events.	2	3	4	4	5	2	20	Yes	Yes		Giveaway, don't know if installed
10B	Indoor Plumbing Fixtures	High Efficiency Faucet Aerator/ Shower-head Giveaway	CII	Utility would buy showerheads and faucet aerators in bulk and give them away at Utility office or community events.	1	3	4	4	5	2	19	Yes	Yes		Hotel opportunities ?
11	Indoor Plumbing Fixtures	Toilet Retrofit at Time of Sale	ALL	Work with real estate industry to require a certificate of compliance be submitted to Utility that verifies a plumber has inspected property and efficient fixtures were either already there or were installed at time of sale.	2	5	4	4	5	0	20	Yes	No		Saturated and 1.6 gpf would get an exemption

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
12	Irrigation	Outdoor Water Surveys	SF MF	Outdoor water surveys offered for existing customers. Normally those with high water use are targeted and provided a customized report on how to save water. Can be combined with indoor surveys or focused on certain customer classes. All single family and multi-family residential would be eligible for free landscape water surveys upon request.	4	1	3	5	5	2	20	Yes	No		Customer service, water quality runoff benefits
13A	CII Equip-ment	Customized Top Users Incentive Program	CII Indoor/ Outdoor	After the free water use survey has been completed at site, the Utility will analyze the recommendations on the findings report that is provided and determine if site qualifies for a financial incentive. Financial incentives will be provided after analyzing the cost benefit ratio of each proposed project. Incentives are tailored	3	4	4	4	4	1	20	Yes	No		

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				to each individual site as each site has varying water savings potentials. Incentives will be granted at the sole discretion of the Utility while funding lasts.											
13B	CII Equip-ment	Promote Restaurant Spray Nozzles	CII Indoor	Provide free 1.3 gpm (or lower) spray nozzles and possibly free installation for the rinse and clean operation in restaurants and other commercial kitchens. Thousands have been replaced in California going door to door, very cost-effective because saves hot water.	4	4	5	4	4	2	23	Yes	No		

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
14	CII Equip-ment	CII Surveys and Top Water Users Program (Top customers from each customer category)	CII Indoor/ Outdoor	Top water customers from each category would be offered a professional water survey that would evaluate ways for the business to save water and money. The surveys would be for large accounts (such as, accounts that use more than 5,000 gallons of water per day) such as hotels, restaurants, stores and schools. Emphasis will be on supporting the top 25 users for each customer category.	3	2	3	3	4	1	16	Yes	No		

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)					
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No	Community Suggestions	WD Comments
15	Water Rates	Water Budget Based Billing	Dedicated Meters – Outdoor Use is primary focus	Develop individualized monthly water budgets for all or a selected category of customers. Water budgets are linked to a rate schedule where rates per unit of water increase when a customer goes above their budget, or decreases if they are below their budget. Budgets typically are based on such factors as the size of the irrigated area and often vary seasonally to reflect weather during the billing period. These rates have been shown to be effective in reducing landscape irrigation demand (AWWARF Reports). Could combine this measure with Measures 6A -6C. This measure would require rate study and capable billing software.	2	4	4	4	4	1	19	Yes	No		

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
16	Indoor Plumbing Fixtures	Single Family Water Surveys	SF Indoor	Indoor water surveys for existing single family residential customers. Target those with high water use and provide a customized report to owner. May include give-away of efficient shower heads, aerators, toilet devices. Usually combined with outdoor surveys (See Irrigation Measures).	3	1	3	5	5	2	19	Yes	No		Important customer service benefits
17	Indoor Plumbing Fixtures	Pressure Reduction	ALL	Provide incentive to install pressure regulating valve on existing properties with pressure exceeding 80 psi.	2	5	3	5	3	1	19	Yes		11) Install pressure regulators on properties with high pressure.	
18	Indoor Plumbing Fixtures	High Efficiency Urinal Rebates	CII	Provide a rebate or voucher for the installation of a high efficiency urinals. WaterSense standard is .5 gpf or less, though models flushing as low as 0.125 gpf (1 pint) are available and function well, so could be specified. Rebate	3	4	4	5	3	0	19	Yes	No		Unsure about capability to retrofit existing CII Buildings

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				amounts would reflect the incremental purchase cost and have been about $300.											
19	Indoor Plumbing Fixtures	Install High Efficiency Toilets, Shower-heads, and Faucet Aerators in Residential Buildings	SF, MF	Utility would subsidize installation cost of a new HET purchased by the utility. Licensed plumbers, pre-qualified by the Utility would solicit customers directly. Customers would get a new HET installed at a discounted price. *Example: the Niagara City Smart Program*	4	4	4	2	4	1	19	Yes	No		
20	Indoor Plumbing Fixtures	Install sensor-activated faucets	CII Indoor	Consider direct install program, rebates or grants for installation of high efficiency sensor faucet fixtures in all or selected high-use commercial or institutional buildings.	2	3	2	5	5	2	19	Yes	No		

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)					
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No	Community Suggestions	WD Comments
21	Hot Water on Demand	Require Hot Water on Demand/ Structured Plumbing in New Develop-ments	SF Indoor	Work with developers to equip new homes or buildings with efficient hot water on demand systems such as structured plumbing systems. These systems use a pump placed under the sink to recycle water sitting in the hot water pipes to the water heater or to move the water heater into the center of the house and/or reduce hot water waiting times by having an on-demand pump on a recirculation line.	2	2	3	5	5	2	19	Yes	No		
22	CII Equip-ment	School Building Retrofit	CII Indoor/ Outdoor	School retrofit program wherein school receives a grant to replace fixtures and upgrade irrigation systems. Expand current City Program, pattern after EBMUD program.	2	4	4	5	4	0	19	Yes	No		

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
23A	Irrigation	Financial Incentives for Irrigation and Landscape Upgrades	ALL	For SF, MF, CII, and IRR customers with landscape, provide a Smart Landscape Rebate Program with rebates for substantive landscape retrofits or installation of water efficient upgrades; Rebates contribute towards the purchase and installation of water-wise plants, compost, mulch and selected types of irrigation equipment upgrades. Rebate for residential accounts and up to 50% more for commercial customers.	4	2.5	3	5	3	1	18.5	Yes	Yes		
23B	Irrigation	Rotating Sprinkler Nozzle Rebates	ALL Outdoor	Provide rebates to replace standard spray sprinkler nozzles with rotating nozzles that have lower application rates. Nozzles cost about $6 and rebates have been on the order of $4 with a minimum purchase of about 20 nozzles.	4	3	5	5	4	1	22	Yes	Yes		

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
24	Irrigation	Shade Tree Program	ALL	Provide incentives and information to promote shade tree planting as a water conservation measure. Potential for Water-Energy Partnership.	2	5	2	5	5	1	20	Yes	Yes		
25	Rainwater Catchmen t	Provide Rain Barrel Incentive	SFR Outdoor	Provide incentive for installation of rain barrels. This could involve rebates or bulk purchase and giveaways of barrels plus workshops on proper installation and use of captured rain water for landscape irrigation. Pattern after Honolulu Board of Water Supply program.	2	3	2	5	4	1	17	Yes	Yes	Every new home must be built with a catchment system to collect rainwater. Every existing home must install one too.	Current Program
26	Irrigation	Weather-Based Irrigation Controller Rebates	ALL	Provide a per station rebate (typically $25 per station) up to a 50% cost-share for the purchase of a weather based irrigation controller. These controllers have on-site weather sensors or rely on a signal from a central weather station that modifies irrigation times at least	3	2	3	2	3	1	14	No			Retrofitted existing homes only

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				weekly. Requires local irrigation contractors who are competent with these products, so may require sponsoring a training program in association with this measure.											
27	Irrigation	Require Rain Sensors	Outdoor ALL or Selected	Require installation of rain sensor shut-off devices when installing new irrigation systems.	1	2	2	3	4	1	13	No			
28	Rainwater Catch-ment	Provide Incentive for Large Rainwater Catchment Systems	MFR CII IRR Outdoor	Provide incentive for installation of large rainwater catchment systems. This could involve rebates, grants and other cost share methods. Might require simultaneous installation of water efficient landscaping to assure that amount of water collected is capable of lasting into peak irrigation season.	1	3	2	3	3	1	13	No			
29	Gray water	Gray water Retrofit SF	SF Outdoor	Provide a rebate to assist a certain percentage of single family homeowners per year to install gray water systems.	3	2	1	3	3	0	12	No		Offer incentives for graywater installation.	

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
30	Indoor Plumbing Fixtures	High Efficiency Toilet (HET) Rebates	CII	Provide a rebate or voucher for the installation of a high efficiency toilet (HET). (Toilets flushing 1.28 gpf or less and include dual flush technology. Rebate amounts would reflect the incremental purchase cost and have been at least $200.	3	5	4	3	3	0	18	No	Consider Including		CII difficult to motivate the change
31	Indoor Plumbing Fixtures	Plumber Initiated High Efficiency Toilet and/ or Urinal Retrofit Program	CII	Utility would subsidize installation cost of a new HET/ urinals purchased by the utility. Licensed plumbers, pre-qualified by the Utility would solicit customers directly. Customers would get a new HET installed at a discounted price. Pattern after Sonoma County program.	3	5	4	3	3	0	18	No	Consider Including		Mixed response from CII Customers, Practical obstacles of direct install type program

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
Group 2 - Measures Intended for Plan, not to be Modeled															
	Public Education	ALL	ALL	Comprehensive education and public awareness campaign that would evolve over the years and seek to drive participation in other conservation programs.							0	Yes	Yes		
	Other	Prohibit Once through Cooling, Non-Recycling Fountains, Water Wasting Fixtures and Practices	CII	Prohibit certain obvious wastes of water in new and existing facilities, such as those listed. Consider requiring retrofits of existing situations, allowing reasonable time for compliance.							0	Yes	Yes		Not ranked. Included.
	Other Outdoor	Prohibit Water Waste and Practices	All Outdoor	Adopt or modify ordinance that prohibits the waste of water defined as gutter flooding and failure to repair leaks in a timely manner.	4	1	1	5	5	1	17	No			Required, stormwater benefits

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
City Code	Irrigation	Water Conserving Landscape and Irrigation Codes	ALL	Develop and enforce Water Efficient Landscape Design Standards. Standards specify that development projects subject to design review be landscaped according to climate appropriate principals, with appropriate turf ratios, plant selection, efficient irrigation systems and smart irrigation controllers. There are many examples that have demonstrated significant water savings. The ordinance could require certification of landscape professionals.	1	4	3	4	4	1	17	Yes	Yes	New home and business construc-tion should include drought resistant landscaping and permeable paving.	Current Code

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
City Code	Irrigation	Require Weather Adjusting Smart Irrigation Controllers and/or Rain Sensors in New Develop-ment	ALL	Require developers for all properties of greater than four residential units and all commercial development to install the weather based irrigation controllers. Some utilities offer rebates for rain sensors. For example, see Cal Green building code that requires this on all new buildings with an irrigation system. Like line 28, may require landscaper training.	1	2	2	3	4	1	13	No			Current Ordinance for City
City Code	Irrigation	Require Irrigation Designers/ Installers be Certified – possibly by Irrigation Association or CA Landscape Contractors Association	CII Outdoor	Require design/ installation of irrigation systems by trained/certified contractors. Certification might be through the CLCA, Irrigation Association (IA) and/or specialized training provided by utility. Model after Cary North Carolina's program.	1	4	2	4	4	1	16	Yes	Yes		Current Code

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
	Other	Research	ALL	*Support the potential Best Management Practices, including hot water recirculation pumps, and other emerging technologies or approaches to conservation. End Use analysis, savings evaluations, continued monitor Baseline Study and AWWA studies and CUWCC support.*							0			18) Study water savings for hot water on demand pumps and potentially fund program using developer funded offsets.	Not ranked. Include in plan
Group 3 - Measures Not Selected for Plan or to be Modeled															
	Indoor Plumbing Fixtures	Multi-Family Water Surveys	MF Indoor	Indoor water surveys for existing multifamily residential customers (2 units or more). Target those with high water use and provided a customized report to owner. Usually combined with outdoor surveys (see Irrigation Measures) and sometimes with single family surveys.	2	3	2	5	5	1	18	No	Consider Including		Economy of scale – many customers when property manager, and facility maintenance.

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)					
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No	Community Suggestions	WD Comments
	Indoor Plumbing Fixtures	High Efficiency Toilet (HET) Rebates	CII	Provide a rebate or voucher for the installation of a high efficiency toilet (HET). Toilets flushing 1.28 gpf or less and include dual flush technology. Rebate amounts would reflect the incremental purchase cost and have been at least $200.	3	5	4	3	3	0	18	No	Consider Including		CII difficult to motivate the change
	Indoor Plumbing Fixtures	Plumber Initiated High Efficiency Toilet and/ or Urinal Retrofit Program	CII	Utility would subsidize installation cost of a new HET/urinals purchased by the utility. Licensed plumbers, pre-qualified by the Utility would solicit customers directly. Customers would get a new HET installed at a discounted price. Pattern after Sonoma County program.	3	5	4	3	3	0	18	No	Consider Including		Mixed response from CII Customers, Practical obstacles of direct install type program
	Indoor Plumbing Fixtures	Install High Efficiency Fixtures in Governmen t Buildings	CII Indoor	Provide rebates or grants to install high efficiency faucets, toilets, urinals and showerheads in local and state government facilities.	2	5	4	4	3	0	18	No	Consider Including		Consider county jail, use Otay WD example (William Granger)

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
	Indoor Plumbing Fixtures	Install High Efficiency Toilets, Urinals, and Showerheads in Commercial Buildings	CII Indoor	Consider direct install program-type for installation of high efficiency fixtures in all or selected commercial or institutional buildings. Replacements would include high efficiency toilets, showerhead, and waterless or high efficiency urinals.	3	5	4	3	3	0	18	No	Consider Including	Require businesses to install 1.28gpf toilets and waterless urinals.	Same as 13A – could be more turn-key with City Smart Program. Schools?
	Dish-washers	Efficient Dishwasher Rebates	SF Indoor	Provide a rebate to encourage homeowner to purchase an efficient dishwasher (meeting certain water efficiency standards, such as a limit on the gallons/load) when replacing an existing dishwasher.	2	3	2	5	5	1	18	No	Consider Including		Baseline study shows relatively modern machines in service area
	Irrigation	Artificial Turf Sports Fields	IRR Outdoor	Provide a rebate (up to $10,000) as a cost share for customer wishing to install artificial grass on sports fields, parks, or golf courses.	2	3	4	3	5	1	18	No	Consider Including		

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)					
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No	Community Suggestions	WD Comments
	Sub-metering	MF Submeter Incentive	Existing MF Indoor	Provide a rebate (per unit) to assist MF building owners installing submeters on each existing individual apartment or condominium unit.	3	4	4	4	1	1	17	No			
	Indoor Plumbing Fixtures	Install High Efficiency Fixtures in Low Income Housing	SFR/MFR	Direct install type toilet replacement program in in low income housing operated a government agency/ housing authority.	1	5	4	4	3	0	17	No			
	CII Equip-ment	CII Rebates to Replace Inefficient Equipment	Existing Customers CII	Expand on the City's program to provide rebates for a standard list of water efficient equipment. Included: x-ray machines, icemakers, air-cooled ice machines, steamers, washers, spray valves, efficient dishwashers, replace once through cooling, and add conductivity controller on cooling towers. Pattern after San Diego County Water Authority or Seattle Water Department programs.	2	3	3	4	4	1	17	No			

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)					
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No	Community Suggestions	WD Comments
	CII Equip-ment	Hotels/Mot els Retrofit w/Financial Assistance	CII Indoor	Following a free water audit offer motels a rebate for equipment identified that would save water. Or provide a rebate schedule for certain efficient equipment such as air-cooled ice machines that motels could apply for without an audit. Pattern after San Antonio, Texas program.	2	3	3	4	4	1	17	No			
	Sub-metering	Mobile Home Park Sub-metering	MF Indoor	Require or provide a partial cost rebate to meter all remaining mobile home parks that are currently master metered but not separately metered, pattern after Santa Clara Valley Water District program.	1	4	4	4	3	0	16	No			Most already accomplished this.
	Sub-metering	Require Multifamily Sub-metering for New Developme nts	New MF Indoor	Require the submetering of individual units in new multi-family, condos, townhouses, and mobile-home parks.	1	4	4	4	2	1	16	No			Require Code Change

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
	Indoor Plumbing Fixtures	Require Fixture Replacement by a Deadline	ALL	Utility would pass an ordinance that requires certain targeted sectors of businesses to bring fixtures up to efficient standard by a fixed date at their own expense.	2	4	5	2	2	1	16	No			Look to sectors
	Irrigation	Landscape irrigation restricted to designated days and times	ALL Outdoor	Specify specific irrigation schedules, including which days and times watering is allowed. Would help with load balancing system demands with planning for water areas can water on what days. Consider water waste enforcement approach. For an example see the Southern Nevada Water Authority program. http://www.snwa.com/consv/restrictions_landscape.html	4	2	4	3	2	1	16	No			Requires local codes

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
	Indoor Plumbing Fixtures	Require <0.25 gal/flush urinals in new develop-ment	CII (New Develop-ment)	Require that new building be fitted with 0.25 gpf (or one pint) *or less* urinals rather than the current standard of 0.5 gal/flush models.	1	4	4	4	2	0	15	No		Require businesses to install 1.28gpf toilets and waterless urinals. 16) Require waterless urinals as part of the building code.	
	Dishwash ers	Require Efficient Dish-washers in New Develop-ment	SF Indoor	Require developers to install an efficient dishwasher (meeting certain water efficiency standards, such as gallons/load).	1	3	2	5	3	1	15	No			Requires changing local codes
	CII Equip-ment	Water Savings Performanc e Program	CII Indoor	Water Districts such as the East Bay Municipal Utility District and Metropolitan Water District of Southern California provide about $0.50 per 748 gallons (1 billing unit) saved to sites within the City's service area. Incentive is based on the potential for savings over 5 years.	2	3	3	2	4	1	15	No			Switch to non-potable supply?

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				Eligible project costs include labor, hardware and up to 1 year of water management fees.											
	Other	Low Impact New and Remodeled Developme nt	ALL	City would require developers of new/remodeled sites to follow Low Impact Development concepts/standards/Be st Management Practices for stormwater and water conservation benefits. Encourage or require use of bio-retention facilities, rain water cisterns, graywater plumbing, etc.	1	4	1	4	4	1	15	No			Public Works Dept.

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
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	Advanced Meter Infrastruct ure (AMI)	Install AMI New Develop-ment Only	ALL	Require that new customers install such AMI meters as described above and possibly purchase means of viewing daily consumption inside their home/business either through the Internet (if available) or separate device. The AMI system would, on demand, indicate to the customer and Utility where and how their water is used, facilitating water use reduction and prompt leak identification. This would require Utility to install an AMI system.	1	4	3	4	0	2	14	No			
	Sub-metering	MF Submeter Incentive	New MF Indoor	Provide a rebate (per unit) to assist MF building owners installing submeters on each new individual apartment unit.	1	4	4	4	0	1	14	No			Already required unless space is not available.

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
	Indoor Plumbing Fixtures	High Efficiency Toilet and/ or Urinal Bulk Purchase Program	ALL	Utility would buy HETs or urinals in bulk and give them away or sell them at a discounted price for customers who want to replace a 3.5 gallon/flush toilet or >1 gal/flush urinal.	3	4	4	2	1	0	14	No			
	Irrigation	Weather-Based Irrigation Controller Rebates	ALL	Provide a per station rebate (typically $25 per station) up to a 50% cost-share for the purchase of a weather based irrigation controller. These controllers have on-site weather sensors or rely on a signal from a central weather station that modifies irrigation times at least weekly. Requires local irrigation contractors who are competent with these products, so may require sponsoring a training program in association with this measure.	3	2	3	2	3	1	14	No			

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
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	Irrigation	Rebate or Free Rain Sensors	Outdoor ALL or Selected	Provide a rebate or free rain sensor shut-off device for existing irrigation controllers. These cancel scheduled sprinkling when sufficient rain has been received. This measure is most effective in areas with intermittent rain in peak watering seasons.	2	2	2	4	3	1	14	No			
	Rainwater Catch-ment	Require Rain Barrel	SFR Outdoor	*All new homes would need a rainwater catchment*	1	3	2	4	3	1	14	No		Every new home must be built with a catchment system to collect rainwater. Every existing home must install one too.	Explain - plumbed for non-potable (or potable use) use for irrigation. Code change required
	CII Equip-ment	Require Plan Review for new CII	CII Indoor / Outdoor	Require plan reviews for water use efficiency for all new business customers.	1	3	2	4	4	0	14	No			

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
	CII Equip-ment	Focused Water Audits for Hotels/ Motels	CII Indoor/ Outdoor	Proved free water audits to hotels and motels. Standardize on the types of services offered to reduce costs. Included would be bathrooms, kitchens, ice machines, laundry, landscaping, and irrigation systems and schedules.	1	1	3	4	4	1	14	No			
	CII Equip-ment	Hotels/Mot els Retrofit	CII Indoor	*Require schedule for certain efficient plumbing fixtures be replaced by a deadline.*	2	3	4	2	2	1	14	No		Make installation showerhea ds with shutoffs, ULFT's, and waterless urinals mandatory in all hotels and motels.	
	Irrigation	Require Weather Adjusting Smart Irrigation Controllers and/or Rain Sensors in New Develop-ment	ALL	Require developers for all properties of greater than four residential units and all commercial development to install the weather based irrigation controllers. Some utilities offer rebates for rain sensors. For example,	1	2	2	3	4	1	13	No			

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				see Cal Green building code that requires this on all new buildings with an irrigation system. Like line 28, may require landscaper training.											
	Irrigation	Require Rain Sensors	Outdoor ALL or Selected	Require installation of rain sensor shut-off devices when installing new irrigation systems.	1	2	2	3	4	1	13	No			
	Rainwater Catch-ment	Provide Incentive for Large Rainwater Catchment Systems	MFR CII IRR Outdoor	Provide incentive for installation of large rainwater catchment systems. This could involve rebates, grants and other cost share methods. Might require simultaneous installation of water efficient landscaping to assure that amount of water collected is capable of lasting into the peak irrigation season.	1	3	2	3	3	1	13	No			
	Gray water	Gray water Retrofit SF	SF Outdoor	Provide a rebate to assist a certain percentage of single family homeowners per year to install gray water systems.	3	2	1	3	3	0	12	No		Offer incentives for graywater installation.	

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
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	Other Outdoor	Require or Rebate Swimming Pool Covers	ALL Outdoor	Provide a rebate through pool equipment supply stores for purchase of a swimming pool cover.	1	2	1	3	4	0	11	No			
	Other	Regulations	ALL	*Ban Sprinkler Systems*	5	0	3	1	0	1	10	No			
	Indoor Plumbing Fixtures	Garbage Disposal	SF Indoor	Encourage 1% of single family homeowners per year to remove garbage disposals. Could provide a rebate.	2	2	1	1	3	0	9	No			
	Rainwater Catchmen t	Promote Rain Barrel	SFR Outdoor/In door	*Promote with an incentive rainwater catchment for toilet flushing.*	1	3	2	2	1	0	9	No		Install rainwater catchment systems and use water for flushing toilets.	
	Gray water	Require Plumbing for Gray Water in New SF Develop-ment	SF Outdoor	Require builders of single family homes to provide plumbing for and/or install a gray water system in new homes.	1	2	1	3	2	0	9	No		Revise local building code to facilitate use of rainwater and graywater, e.g. rainwater to toilet. Plumb for	Requires Code Change and enforcement

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
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														reusable grey water to be available outdoors or for toilets.	
	Gray Water	SF Toilet Reuse	SFR, MFR	*Recycle lavatory sink water for toilet flushing, such as Aqus System*	1	2	1	3	2	0	9	No		Every new and existing home should catch and use graywater to water the yard.	
	Indoor Plumbing Fixtures	Compost-ing Toilet Promotions	Residential	*Promote composting toilets.*	3	2	2	1	0	0	8	No		14) Promote composting toilets.	Change of law
	Gray water	Rebate for Gray Water Systems in New CII Develop-ment	CII Outdoor	Provide a rebate for gray water systems in new CII development, in accordance with existing codes. *Consider graywater for golf courses.*	0	2	1	3	2	0	8	No		Require golf courses use to use graywater.	Domestic use in hotels only

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	Other	Agricultural	ALL	*Develop water conservation programs for agricultural customers focusing on irrigation practices.*	1	2	1	3	0	1	8	No			Most north coast agriculture customers do not use City water. Water Department operational benefits on raw water transmission line.
	CII Equip-ment	Rebates for Submeters on Cooling Towers	CII Indoor	Offer a rebate to buildings that install submeters to measure the make-up and bleed-off water of the facility cooling towers. Provide educational brochures and a phone contact of a knowledgeable person to provide conservation information.	See WD comment						0	No			Only applies to one site. Not ranked

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	CII Equipmen t	Rebates for Conduc-tivity Controllers on Cooling Towers	CII Indoor	Offer a rebate ($900-$1,200 dependent on type) to buildings that install conductivity controllers to reduce bleed-off water of the facility cooling towers. Provide educational brochures and a phone contact of a knowledgeable person to provide conservation information.	See WD comment						0	No			UC completed this. One more site eligible.
	CII Equipmen t	Cooling Tower Regulations	CII Indoor	Prohibit discharge of cooling tower blow down unless the TDS of the water is at least a certain level (that would ensure 5-10 cycles of concentration). Pattern regulations after the State of Arizona.	See WD comment						0	No			Not applicable
	CII Equipmen t	Dry Vacuum Pump	CII Indoor	Provide a rebate to assist CII with installation of dry vacuum pumps. (Possibly combine into Measure #40B CII Inefficient Equipment)	See WD comment						0	No			Not ranked. Few sites.

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	Other	Encourage "Life Cycle Analysis" Mentality of Sustain-ability and Reliability	ALL	Encourage customers to "save water" instead of "sell water". This is a suggested fundamental business model change that would focus on infrastructure delay or prevention by focusing on lowering production. Key would be to get customers to believe in this idea and message as well as management and directors. This is a paradigm shift to the importance of the entire "life cycle" cost of water including review and inclusion of the energy and Green House Gas components associated with each and every gallon of water use.	See WD comment						0				Education program. Cultural philosophy of efficient water use. Add more into energy education of water use, for example.
Group 4 - Unrated Measures May Be Included in Group 1 Measures Design when Modeled															

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)					
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Included in above Water Loss Measure	Water Loss	Conduct Annual System Water Use Audit	System	Maintain a thorough annual accounting of water production, sales by customer class and quantity of water produced but not sold (non-revenue water). In conjunction with system accounting, include audits that identify and quantify known legitimate uses of non-revenue water in order to determine remaining unaccounted for water losses. Goal would be to lower Infrastructure Leakage Index (ILI) and non-revenue water every year by a pre-determined amount based on cost-effectiveness. These programs typically pay for themselves based on savings in operational costs (and saved rate revenue can be directed more to system repairs/replacement and other costs).							0	No			

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	Water Loss	Apparent Loss Reduction - Billing System	System	Continuously analyze billing data for system errors and under-registering meters. Identify and quickly notify customers of apparent leaks.							0	No			
	Water Loss	Apparent Loss Reduction - Meter Testing	System	Address meter testing and repair/ replacement to insure more accurate meter reads and revenue collection. Actions could include meter calibration and accelerated meter replacement.							0	No			
	Water Loss	Real Water Loss Reduction - Leak Repair	System	Measure covers efforts to find and repair leaks in the distribution system to reduce real water loss. More aggressive actions could include installation of data loggers and proactive leak detection. Leak repairs would be handled by existing crews at no extra cost. Specific goals and methods to be developed by Utility.							0	No			

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
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				May include accelerated main and service line replacement.											
	Water Loss	Real Water Loss Reduction	System	Capture water from water main flushing and hydrant flow testing for reuse										Collect annual flushing water into tanks and use as reclaimed water.	
	Water Loss	Real Water Loss Reduction – Reduce Backgroun d Losses with Main Replace-ment	System	Enhanced real loss reduction may include more ambitious main replacement and active leak detection.							0	No		Include an estimate of future water lost to leakage when considering a program for replacing distribution system pipes.	

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)					
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	Water Loss – Pressure Regula-tion	Distribution System Pressure Regulation	System	Install additional pressure regulators in portions of distribution system to maintain pressure within limits so accounts do not receive excessive pressure. There is a high correlation between high water usage and high pressure, due to higher leakage, atomization of sprinklers and ease of using excessive water.							0	No			

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To be included in Public Educa-tion Measure above	Public Education	Conservati on Print Media	ALL	Use a range of printed materials to raise awareness of conservation measures available to customers, including incentive programs offered by Utility. This can include newsletters, bill stuffers, brochures (self-developed or purchased), working with local newspapers, signage at retailers, signs on public buses. Regional participation and development can help assure consistent message. Such programs would continue indefinitely. *"Develop the public awareness campaign to focus on total water consumption." "Display water conservation banners." "Educate customers on water conservation measures." "Change culture of water use through advertising and publicity."*							0	Yes			

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	Public Education	Electronic Conserva-tion Options/ Web Site/ Social Media	ALL	Provide variety of conservation information on city or utility web site, distribution of "videos." Also consider social media options such as cell phone apps, Facebook, interactive kiosk with view screen, etc. *Publish a weekly report of the service area's water use. Educate customers on water conservation measures.*							0				
	Public Education	Speakers Bureau/ Event Participa-tion	ALL	Conduct presentations at various venues, from radio and TV to service organizations and focused groups. Have booths at relevant community events. Participate in parades, etc. *"Disseminate education materials, and give talks and tours promoting drought tolerant landscaping."*							0				

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	Public Education	Media Campaign: such as the "Use Only What You Need" or "Beat the Peak"	ALL	*Suggest a general "Use Only What You Need" message like Denver Water's program or a "Beat the Peak" message media campaign like Cary, North Carolina or Tucson Arizona: aahttp://cms3.tucsonaz.gov/water/beatthepeak. Also considered a program with focused action like: "Take Control of your Controller" Campaign for a focused social media based campaign as a media campaign. Consider determining appropriate usage and media campaign message with marketing study/focus groups. Develop the public awareness campaign to focus on total water consumption.*							*0*				

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	Public Education	Billing Report Educational Tool	ALL	*Example: Water Smart Software with online and print billing consumptions to customers.* Public Comment: *"Publish water consumption data by neighborhood and by large users." "Use WaterSmart Software or similar program to help customers understand and reduce their water demand."*							0	Yes - stand alone			
	Public Education	*Ambassa-dor Program*	*SFR, MFR*	*Have water ambassadors within neighborhoods to promote awareness. Could be staff by volunteers or student interns. Pattern after Town of Cary, North Carolina or Regional Water Authority in Sacramento, CA. "Have a water patrol of students inform neighborhoods about water conservation and promote water wise landscapes."*								Yes			

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	Public Education	Recogni-tion Programs for Water Savings by Residences & Apartments Program	SFR Outdoor	Sponsor an annual awards program for residences and multi-family properties that significantly reduce water use. They would receive a plaque/ recognition. This could include innovative customers that install compost toilets, gray-water, bio-swales and rainwater cisterns in an effort to maximize practical home water use efficiency. *"Praise people with xeriscapes. Make them public heroes for others to emulate."*							0				
	Public Education	Recogni-tion Programs for Water Savings by Businesses	CII Indoor/ Outdoor	Sponsor an annual awards program for businesses that significantly reduce water use. They would receive a plaque/recognition.							0				

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	Public Education: Irrigation Focus	Outdoor Residential Focused Public Awareness Informa-tion Program	SF Outdoor Only	Programs could continue efforts including poster contests, speakers to community groups, conservation hotline, website, video loan, radio and television time, demonstration gardens and printed educational material such as bill inserts, etc. Could also consider increasing current Utility efforts possibly adding social media such as cell phone apps, Facebook, interactive kiosk with view screen, etc. Program would continue indefinitely. *"Promote the removal of front lawns as they are more ornamental in general than a back lawn."*							0	Yes			

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	Public Education: Irrigation Focus	Efficient Outdoor Use Education and Training Programs	SF/MF/CII Outdoor	Utility would offer, organize and sponsor a series of educational workshops or other means for educating homeowners, landscapers and contractors in efficient landscaping and irrigation principals. Utilize guest speakers, native demonstration gardens, incentives, such as a nursery plant coupon. *"Support consistent and long term educational workshops and events." "For customers wishing to retain a lawn, promote the use of eco-friendly, high drought tolerant, low maintenance turf."*							0				

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	Public Education: Irrigation Focus	Train Landscape Mainte-nance Workers (Green Gardener Program)	ALL Outdoor	Utility would sponsor bilingual training for managers and workers in landscape maintenance methods that will save irrigation water. Model after Green Gardener Program. Santa Barbara County Water Agency example: http://www.greengardener.org/. With some of these programs, names of businesses that have obtained training are included in Utility publications and/or Web sites (as an incentive to participate). *"Provide the Qualified Water Efficient Landscaper (QWEL) course to landscapers."*							0				
	Public Education: Irrigation Focus	Networking with Landscap-ing Industry	ALL Outdoor	Meet with and become members in "Green Industry" organizations; partner with projects and outreach material development. Outreach to nurseries							0				

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				for information distribution, provide "water wise plant" signage, etc.											
	Public Education: Irrigation Focus	Landscape Water Calculator	ALL	Develop Landscape Watering Calculator and Watering Index, and actively market these. Consider cell phone app with Watering Index, following up in person with large landscape customers on a frequent basis to encourage use of Watering Index.							0				
	Public Education: Irrigation Focus	Climate appropri-ate (Water Efficient) Demonstra tion Gardens	ALL	Donate or acquire a portion of public or private land to create a demonstration garden displaying living examples of low water-using gardens and landscaping. The Utility would provide signs and brochures to educate those people visiting the garden.							0				

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	Public Education	Promote Green Buildings	ALL	Assign Staff a position to work with local Green Building associations, developers, designers, vendors to promote incorporating water efficiency into building design. Possibly work with other partner utilities or agencies energy/wastewater/ stormwater. Co-sponsor award program.							0	Not WC Mea-sure			
	Public Education	Schools Education Programs	ALL	Work with local school districts to develop classroom programs that they would embrace. Consider poster contests, etc. Some programs would require dedicated utility staff to assist & present.							0	Yes			

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Model-ing will be comple-ted at conclu-sion of Future Rate Study	Water Rates	Rate Structure Evaluation	ALL	Rates must meet Utility costs, but some features can improve customer accountability by better imposing cost impacts for high water usage. Conservation oriented rate structures in California generally collect less than 30% of water revenue through base charges. Tiered rate structures are the most popular form of conservation rates, and can be very effective provided there are sufficient tiers (3 to 4 is recommended), and price differences between tiers is sufficient and tiers are placed at usage levels that appropriately reflect low, medium and high usage levels for the Utility. This measure would also require a rate study. *Consider "drastically*							0	No		6) Drastically reduce the 'Ready to Serve' charge while increasing the per unit water charge in a revenue neutral manner. 7) Eliminate the 'Ready to Serve' charge, increase the per unit water charge in a revenue neutral manner, and charge a nominal fee when usage does not register as a billable water unit.	

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				reducing" the base charge.											
	Water Rates	Modifica-tion to or Implemen-tation of Tiered Rate Conserva-tion Pricing	Multi-Family CII Outdoor is Primary Focus	Consider revising City's tiered rates or seasonal pricing for other customer classes. Some utilities utilize percentages of average winter usage as the basis for individualized summer tiers. Multi-Family Residential tiers could be based on number of housing units served by meters. This							0	No		4) Charge more for water usage. 8) Develop a separate billing category for individually metered apartments and multi-family	

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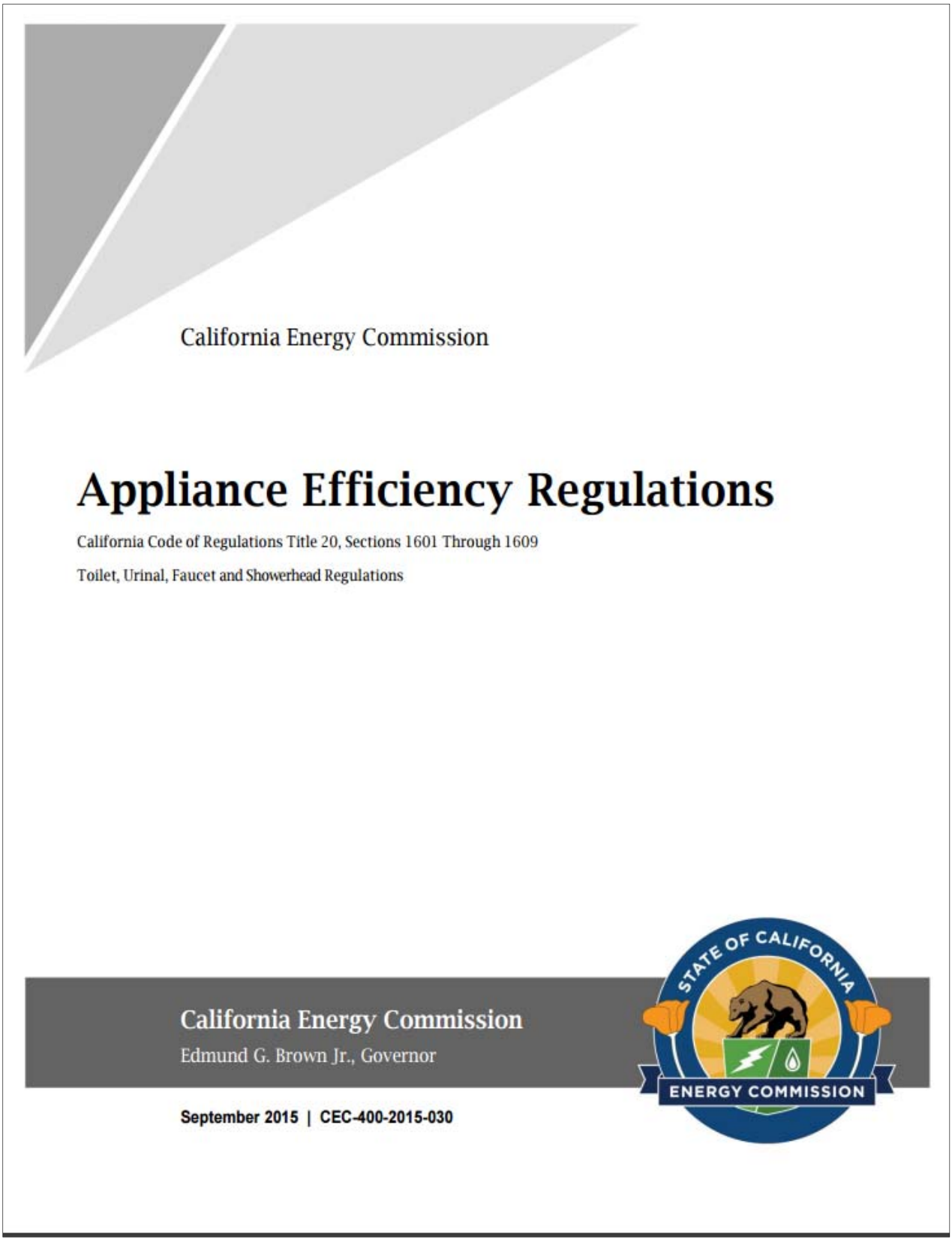
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
				measure would require a rate study and advanced billing system capabilities. *Consider developing a separate billing category for individually metered apartments and multi-family residences.*										residences. 9) Increase the rates between tiers. 10) Study and implement a new and improved tiered rate structure that significantly encourages water conserva-tion.	
	Water Rates	Establish Separate Pricing Structure for Irrigation Accounts	All large irrigation	Implementing conservation-oriented pricing for dedicated irrigation customers would encourage more efficient irrigation practices. This is best combined with Measures 7B and 8. Would require a rate study. *Consider charging more for water used to irrigate golf courses.*							0	No		Charge more for water used to irrigate golf courses.	

Existing or Potential New Measures					Ranking Criteria and Score (0 to 5). See attachment for scale.					Ranking and Criteria (0 to 2). (2 = excellent)				Community Suggestions	WD Comments
Measure No. for Model-ing	Equip-ment or Program Type	Specific Program	Focus of Program	Measure Description	Water Savings Potential (Service Area Match)	Sustain-able Water Savings – emphasis on savings lifetime/ reliability	Quanti-fiable Water Savings	Widespread Community & Social Acceptance (Technology/ Market Maturity)	Feasibility of Implemen-tation/ Secondary Impacts – emphasis on ability to achieve objectives	Additional Service Area Benefits (GHG, Storm water)	Total Score	Pass Yes or No	Combine? Yes/No		
	Water Rates	Water Budget Based Billing	ALL	Develop individualized monthly water budgets for all or a selected category of customers. Water budgets are linked to a rate schedule where rates per unit of water increase when a customer goes above their budget, or decreases if they are below their budget. Budgets typically are based on such factors as size of the irrigated area and often vary seasonally to reflect weather during billing period. These rates have been shown to be effective in reducing landscape irrigation demand (AWWARF Reports). Could combine this measure with Measures 6A - 6C. This measure would require rate study and capable billing software.	4	4	4	4	3	2	21	Yes	No	Develop a formula for tying the price of water to population.	Major modification or New Billing System required

Notes: I – Indoor Use; L – Landscape Demand; I, L – Both Indoor and Sprinkling Demand; O – Other.

APPENDIX G – CALIFORNIA ENERGY COMMISSION APPLIANCE EFFICIENCY REGULATIONS



California Energy Commission

Appliance Efficiency Regulations

California Code of Regulations Title 20, Sections 1601 Through 1609

Toilet, Urinal, Faucet and Showerhead Regulations

California Energy Commission

Edmund G. Brown Jr., Governor

September 2015 | CEC-400-2015-030

California Energy Commission

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Executive Director

Amendments to Appliance Efficiency Regulations

Section 1601. Scope.

...

This Article applies to the following types of new appliances, if they are sold or offered for sale in California, except those sold wholesale in California for final retail sale outside the state and those designed and sold exclusively for use in recreational vehicles, or other mobile equipment. Unless otherwise specified, each provision applies only to units manufactured on or after the effective date of the provision.

...

(h) Plumbing fittings, which are showerheads, lavatory faucets, kitchen faucets, metering faucets, replacement aerators, wash fountains, tub spout diverters, public lavatory faucets, and commercial pre-rinse spray valves.

...

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code. Sections 16, 26 and 30, Governor's Executive Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code. Section 16, Governor's Executive Order No. B-29-15 (April 1, 2015).

Section 1602. Definitions.

...

(h) Plumbing Fittings.

...

"Plumbing fitting" means a device that controls and guides the flow of water in a supply system. Examples include showerhead, lavatory faucet, kitchen faucet, metering faucet, lavatory replacement aerator, kitchen replacement aerator, wash fountain, commercial pre-rinse spray valve, public lavatory faucet, or tub spout diverter.

"Public lavatory faucet" means a fitting intended to be installed in non-residential bathrooms that are exposed to walk-in traffic.

"Showerhead" means a device through which water is discharged for a shower bath and includes a body sprayer and handheld showerhead but does not include a safety showerhead.

"Water use" means the quantity of water flowing through a showerhead or faucet, at point of use, as determined using the test method in Section 1604(h).

...

(i) Plumbing Fixtures.

"Dual-flush effective flush volume" means the average flush volume of two reduced flushes and one full flush.

"Dual-flush water closet" is a water closet incorporating a feature that allows the user to flush the water closet with either a reduced or a full volume of water.

"Plumbing fixture" means an exchangeable device, which connects to a plumbing system to deliver and drain away water and waste. A plumbing fixture includes a water closet or a urinal.

...

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code. Sections 16, 26 and 30, Governor's Executive Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code. Section 16, Governor's Executive Order No. B-29-15 (April 1, 2015).

2

Section 1604. Test Methods for Specific Appliances.

...

(h) Plumbing Fittings.

(1) The test method for commercial pre-rinse spray valves is 10 C.F.R. Sections 431.263 and 431.264.

(2) The test methods for showerheads are:

(A) **Maximum flow rate test.** The test method for determining maximum flow rate of a showerhead is 10 C.F.R. Section 430.23(t) (Appendix S to Subpart B of Part 430).

(B) **Minimum flow rate test.** The test method for determining minimum flow rate of a showerhead is ASME A112.18.1-2012 / CSA B125.1-2012, Section 5.12.

(C) **Showerheads with multiple nozzles.** Showerheads with multiple nozzles shall be tested with all nozzles in use at the same time.

(3) The test method for other plumbing fittings is 10 C.F.R. Section 430.23(s) (Appendix S to Subpart B of part 430).

(4) Showerhead-tub spout diverter combinations shall have both the showerhead and tub spout diverter tested individually.

...

(i) Plumbing Fixtures.

The test methods for plumbing fixtures are:

(1) **Water Closets.** The test method for testing gallons per flush of water closets is 10 C.F.R. Section 430.23 (u) (Appendix T to Subpart B of part 430). See Section 1604(i)(3) for the required waste extraction test.

(2) **Urinals.** The test method for testing gallons per flush of urinals is 10 C.F.R. Section 430.23(v) (Appendix T to Subpart B of part 430).

(3) Waste Extraction Test (Section 7.10) of ASME A112.19.2/CSA B45.1-2013.

The following documents are incorporated by reference in Section 1604.

...

The American Society of Mechanical Engineers (ASME)

ASME A112.19.2/CSA B45.1-2013	Ceramic Plumbing Fixtures
ASME A112.18.1-2012/CSA B125.1-2012	Plumbing Supply Fittings

3

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Phone: 800-843-2762 (U.S./Canada)
001-800-843-2763 (Mexico)
973-882-1170 (outside North America)
Email: CustomerCare@asme.org

...

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code. Sections 16, 26 and 30, Governor's Executive Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code. Section 16, Governor's Executive Order No. B-29-15 (April 1, 2015).

4

Section 1605.1. Federal and State Standards for Federally-Regulated Appliances.

...

(h) Plumbing Fittings.

(1) **Metering Faucets and Wash Fountains.** The flow rate of wash fountains and metering faucets shall be not greater than the applicable values shown in Table H-1.

Table H-1: Standards for Plumbing Fittings

Appliance	Maximum Flow Rate
Wash fountains	$2.2 \times \frac{rim\ space\ (inches)}{20}\ gpm\ at\ 60\ psi$
Metering faucets	0.25 gallons/cycle[1,2]
Metering faucets for wash fountains	$0.25 \times \frac{rim\ space\ (inches)}{20}\ gpm\ at\ 60\ psi$[1,2]

[1]**Sprayheads with independently controlled orifices and metered controls.** The maximum flow rate of each orifice that delivers a preset volume of water before gradually shutting itself off shall not exceed the maximum flow rate for a metering faucet.

[2]**Sprayheads with collectively-controlled orifices and metered controls.** The maximum flow rate of a sprayhead that delivers a preset volume of water before gradually shutting itself off shall be the product of (a) the maximum flow rate for a metering faucet and (b) the number of component lavatories (rim space of the lavatory in inches [millimeters] divided by 20 inches [508 millimeters]).

(5) **Showerheads, lavatory faucets, kitchen faucets, aerators, and public lavatory faucets**. See Section 1605.3 (h) for standards for all showerheads, lavatory faucets, kitchen faucets, aerators, and public lavatory faucets sold or offered for sale in California.

...

The following documents are incorporated by reference in Section 1605.1.

...

(i) Plumbing Fixtures.

See Section 1605.3(i) for water efficiency standards for plumbing fixtures.

...

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code. Sections 16, 26 and 30, Governor's Executive Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code. Section 16, Governor's Executive Order No. B-29-15 (April 1, 2015).

5

Section 1605.2. State Standards for Non-Federally-Regulated Appliances.

...

(i) Plumbing Fixtures.

See Section 1605.3(i) for water efficiency standards for plumbing fixtures.

...

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code. Sections 16, 26 and 30, Governor's Executive Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code. Section 16, Governor's Executive Order No. B-29-15 (April 1, 2015).

Section 1605.3. State Standards for Non-Federally-Regulated Appliances.

...

(h) Plumbing Fittings.

(1) Tub Spout Diverters and Showerhead Tub Spout Diverter Combinations. The leakage rate of tub spout diverters manufactured on or after March 1, 2003 shall be not greater than the applicable values shown in Table H-2. Showerhead tub spout diverter combinations shall meet both the standard for showerheads and the standard for tub spout diverters.

...

(2) **Lavatory Faucets and Aerators.** The flow rate of lavatory faucets and lavatory replacement aerators shall be not greater than the applicable values shown in Table H-3.

Table H-3: Standards for Lavatory Faucets and Aerators

Appliance	Maximum Flow Rate		
	Manufactured prior to September 1, 2015	Manufactured on or after September 1, 2015, and prior to July 1, 2016	Manufactured on or after July 1, 2016
Lavatory faucets and aerators	2.2 gpm at 60psi[1,2]	1.5 gpm at 60 psi[1,2]	1.2 gpm at 60 psi[1,2]

[1]**Sprayheads with independently-controlled orifices and manual controls**. The maximum flow rate of each orifice that manually turns on or off shall not exceed the maximum flow rate for a lavatory faucet.
[2]**Sprayheads with collectively-controlled orifices and manual controls**. The maximum flow rate of a sprayhead that manually turns on or off shall be the product of (a) the maximum flow rate for a lavatory faucet and (b) the number of component lavatories (rim space of the lavatory in inches (millimeters) divided by 20 inches (508 millimeters).

...

(3) **Kitchen Faucets and Aerators and Public Lavatory Faucets and Aerators.** The flow rate of kitchen faucets, kitchen replacement aerators, public lavatory faucets, and public lavatory replacement aerators shall be not greater than the applicable values shown in Table H-4.

(A) For the plumbing fittings identified in Table H-4, noncompliant products may not be sold or offered for sale on or after January 1, 2016, regardless of manufactured date.

Table H-4: Standards for Kitchen Faucets and Aerators and Public Lavatory Faucets and Aerators

Appliance	Maximum Flow Rate	
	Sold or offered for sale prior to January 1, 2016	Sold or offered for sale on or after January 1, 2016
Kitchen faucets and aerators	2.2 gpm at 60 psi	1.8 gpm with optional temporary flow of 2.2 gpm at 60 psi
Public lavatory faucets and aerators	2.2 gpm at 60 psi	0.5 gpm at 60 psi

...

(4) **Commercial Pre-rinse Spray Valves**.

(A) Commercial pre-rinse spray valves manufactured on or after January 1, 2006, shall be capable of cleaning 60 plates in an average time of not more than 30 seconds per plate.

(B) See Section 1605.1(h) for water consumption standards for commercial pre-rinse spray valves.

...

(5) **Showerheads**. The flow rate of showerheads shall be not greater than the applicable values shown in Table H-5.

Table H-5: Standards for Showerheads

Appliance	Maximum Flow Rate		
	Manufactured on or after January 1, 1994 and prior to July 1, 2016	**Manufactured on or after July 1, 2016 and prior to July 1, 2018**	**Manufactured on or after July 1, 2018**
Showerheads	2.5 gpm at 80 psi	2.0 gpm at 80 psi[1,2,3]	1.8 gpm at 80 psi[1,2,3]

[1] The maximum flow rate shall be the highest value obtained through testing at a flowing pressure of 80 ±1 psi and shall not exceed the maximum flow rate in Table H-5.

[2] **Minimum flow rate.** The minimum flow rate, determined through testing at a flowing pressure of 20 ± 1 psi, shall not be less than 60 percent of the maximum flow rate in Table H-5. The minimum flow rate determined through testing at flowing pressures of 45 and 80 ± 1 psi shall not be less than 75 percent of the maximum flow rate in Table H-5.

[3] Showerheads with multiple nozzles. The total flow rate of showerheads with multiple nozzles must be less than or equal to the maximum flow rate in Table H-5 when any or all nozzles are in use at the same time.

...

(6) **Other Plumbing Fittings**. See Section 1605.1(h) for water efficiency standards for plumbing fittings that are federally-regulated consumer products.

...

(i) Plumbing Fixtures.

(1) The water consumption of water closets, and urinals, other than those designed and marketed exclusively for use at prisons or mental health care facilities shall be no greater than the values shown in Table I-2.

Table I-2 Standards for Plumbing Fixtures

Appliance	Maximum Gallons per Flush or Dual-flush effective flush volume	
	Sold or offered for sale on or after January 1, 2014[1]	**Sold or offered for sale on or after January 1, 2016[1]**
All water closets	1.28	1.28
Trough-type urinals	$\frac{\text{trough length (inches)}}{16}$	$\frac{\text{trough length (inches)}}{16}$
Wall mounted urinals	0.5	0.125
Other urinals	0.5	0.5

[1]For the items identified in Table I-2, non-compliant products may not be sold or offered for sale on or after the designated date, regardless of manufacture date

9

(2) Water closets sold or offered for sale or after January 1, 2016 shall pass the Waste Extraction Test (Section 7.10) of ASME A112.19.2.

...

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code. Sections 16, 26 and 30, Governor's Executive Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code. Section 16, Governor's Executive Order No. B-29-15 (April 1, 2015).

Section 1606. Filing by Manufacturers; Listing of Appliances in Database.

...

Table X Continued – Data Submittal Requirements

	Appliance	Required Information	Permissible Answers
H	Plumbing Fittings	*Type	Showerhead, lavatory faucet (independent or collective), public lavatory faucet, kitchen faucet, metering faucet (independent or collective), lavatory replacement aerator, kitchen replacement aerator, wash fountain, lift- type tub spout diverter, turn-type tub spout diverter, pull-type tub spout diverter, and push-type tub spout diverter.
		Flow Rate	
		Pulsating (for showerheads only)	Yes, no
		Minimum Flow Rate at 45 psi and 80 psi (for showerheads manufactured on or after July 1, 2016)	
		Minimum Flow Rate at 20 psi (for showerheads manufactured on or after July 1, 2016)	
		Rim Space (for wash fountains only)	
		Tub Spout Leakage Rate When New	
		Tub Spout Leakage Rate After 15,000 Cycles	
	Commercial Pre-rinse Spray Valves	Flow Rate (gpm)	
		Cleaning ability test	Pass, fail

...

Table X Continued – Data Submittal Requirements

	Appliance	Required Information	Permissible Answers
I	Plumbing Fixtures	*Type	Blowout water closet, gravity tank type water closet, dual-flush water closet, electromechanical hydraulic water closet, flushometer tank water closet, urinal, prison-type urinal, prison-type water closet, flushometer valve water closet, trough-type urinal, wall-mounted urinal, waterless urinal, vacuum other type urinal, vacuum type water closet
		Water Consumption (dual-flush effective flush volume for dual-flush water closet)	
		Passes waste extraction test	Yes, No
		Waste extraction value	grams
		Trough Length (trough-type urinals only)	

...

(4) Declaration.

(A) Each statement shall include a declaration, executed under penalty of perjury of the laws of California, that

...

4. the appliance was tested under the applicable test method specified in Section 1604, and, for the following appliances, was tested as follows:

...

j. for kitchen faucets that utilize an optional and temporary higher flow rate than 1.8 gpm, the higher flow rate has been tested utilizing the test procedure identified for kitchen faucets in Section 1604(h) at 60 psi and verified to have a flow rate less than or equal 2.2 gpm.

...

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and Sections 16, 26 and 30, Governor's Executive Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c), 25402.5.4 and 25960, Public Resources Code; and Section 16, Governor's Executive Order No. B-29-15 (April 1, 2015).

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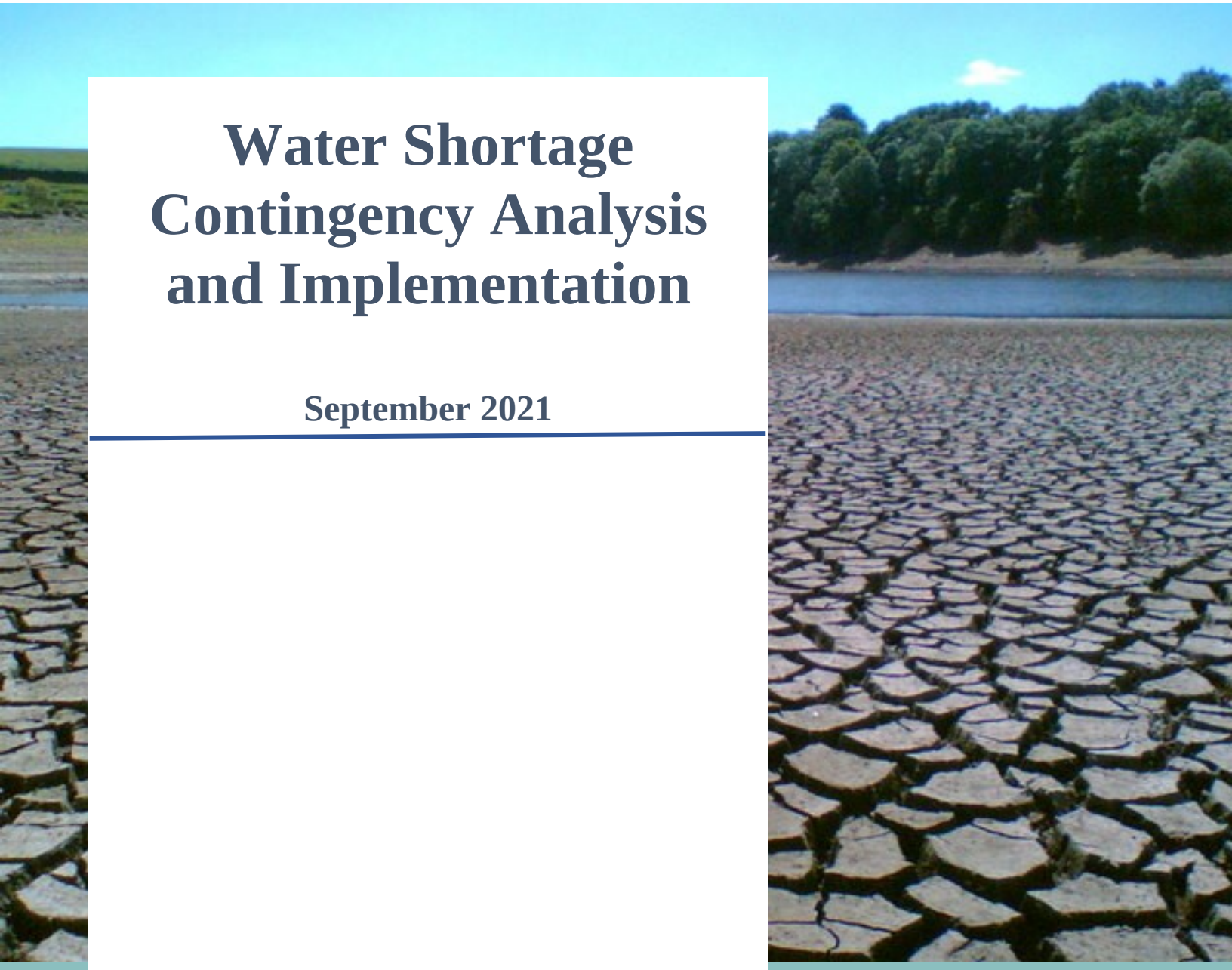
APPENDIX O: 2021 Water Shortage Contingency Analysis and Implementation



Water Shortage Contingency Analysis and Implementation

September 2021

Written by Benjamin Pink
Environmental Programs Analyst

City of Santa Cruz
Water Department

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Executive Summary

Changes in customer water use characteristics and changes in state law have prompted the update of the City of Santa Cruz's 2009 Water Shortage Contingency Plan (WSCP). New state legislation (SB 606) requires every urban water supplier to prepare and adopt a water shortage contingency plan as part of its Urban Water Management Plan (UWMP). The legislation also has new requirements for what must be included in the WSCP, including annual water supply and demand assessment procedures, standard water shortage levels, shortage response actions, and communication protocols and procedures. The bill also requires an urban water supplier to make the WSCP available to its customers and any city or county within which it provides water supplies no later than 30 days after adoption.

The new WSCP replaces the plan adopted in 2009, a project that was an outgrowth of the 2005 UWMP. Many elements of water use in the Santa Cruz service area have changed since 2009. Overall water demand now is the most notable characteristic that has changed over time and is the primary driver for how this plan proposes to reduce demand during a shortage.

The Interim Updated WSCP was adopted in February 2021. The reason for adopting an interim plan was to have a plan ready to implement if needed by the start of the 2021 peak season; this turned out to be necessary as a Stage 1 Water Shortage Warning was declared starting on May 1st 2021. This final version of the plan is being adopted in October 2021 taking into account lessons learned from implementing the plan over the 2021 season.

The water use base year period for this plan is 2016-2018, in contrast to the last plan that was based on the years 2002-2004. The new base year period was chosen due to it being a recent period in which water use was both stable and there was no shortage emergency. The 2002-2004 period was selected as being representative of typical water consumption patterns in a stable period marked by normal weather and water conditions. At that time, total annual water demand measured about 3.9 billion gallons per year. The total annual demand in the 2016-2018 base year period measures 2.6 billion gallons per year, a decrease of about 33 percent.

The updated demand characteristics have several important ramifications. Primarily, there is significantly less discretionary water available to cut now should a shortage occur. For example, whereas in the past when a shortage took place the city could look primarily to outdoor water use restrictions as the main demand reduction tool, today this is no longer the case. With the new demand characteristics, a whole new approach to demand reduction is needed.

The recommended approach throughout this plan is to use customer allocations at all stages of shortage and for all customer groups. An allocation is an amount of water that each customer is allowed to use on a monthly basis once a shortage begins; water used over the allocated amount may result in excess use penalty fees being applied to the customer bill. It should be noted that those customers who have already been conserving water will likely find it easier to stay within their allocation. However, customers who have not yet taken steps to become more efficient may have a harder time adjusting to the new system during a shortage.

Each customer class is different and the approach to creating allocations that are reasonable for one group does not necessarily apply to other groups. A primary example of this is the difference between allocations for residential customers and those of business customers. Residential customer allocations are based on the average residential use in the peak season during the base years 2016-2018. The approach for businesses is different, given their unique usage characteristics, thus the allocation design for them uses an individual reduction approach and not a class-wide average.

Given that this plan relies primarily on customer allocations as the primary demand reduction tool, and that the new allocations are considerably lower than those contained in the prior plan, significant education and outreach will be essential in order for successful implementation of this plan during a shortage. Not only will there need to be significant communication to the public in different forms, conveying the main messages of the plan and providing resources to customers, but there will also need to be new tools available for customers to aid them in reducing their water use and staying within allocation. A significant tool for customers will be access to their detailed water use information; the planned meter replacement program that will be initiated in early 2021 will enable customers to access this information. The department has already implemented a new software platform called WaterSmart Software that can display the usage information from the new meters to customers, and has the ability to notify users when they are nearing specified thresholds such as water rate tiers or allocations. These new tools will be essential in assisting customers with staying within the new allocations.

Although this plan presents a strategy and various actions to take at every shortage stage, the city recognizes three key points about the overall idea of implementing a plan with such deep reduction targets at higher stages:

1) The City's overall water supply augmentation strategy (WSAS) must be pursued and new water supplies developed. Water conservation alone will only aid the city to a certain degree and, given current customer use characteristics cannot be depended upon to routinely address the potential shortages the system may experience, particularly in an extended or severe drought. Developing new water supplies, such as aquifer storage and recovery, water transfers, advanced treated recycled water and others, have the potential to alleviate the supply gap, reduce the frequency and severity of shortage experienced, and limit the need to implement this plan.

2) The new state legislation requires that water suppliers examine six standardized shortage levels ranging from 10% to greater than 50%. Although this plan does examine all the required shortage levels, the city recognizes that the feasibility of actually implementing the necessary allocations and restrictions at higher stages, particularly at 20% (Stage 2) and higher, will present significant challenges and will create economic and physical harm to the community. It is for this reason that the strategy of the city and water department will be to avoid such drastic measures if at all possible in the first place.

3) Recognizing both the need to act and the difficulty in implementing some or all of the actions listed at each stage, the City will gauge the necessity of any listed action and decide whether it is feasible and appropriate to implement when the time comes. For example, the use of allocations for the business and other industrial customers is a listed action at all stages; this may or may not be feasible to implement depending on the economic conditions given at a particular time of shortage. An example, in 2021, business customers were still recovering from

the COVID-19 pandemic and it was decided not to implement allocations for this customer group as a result.

Introduction

This document is entitled 2021 Water Shortage Contingency Analysis and Planning. Together with Chapter 8 of the 2020 UWMP, this document forms the full WSCP. The 2021 WSCP is an update of the City of Santa Cruz 2009 WSCP.

Although many things have changed since the time when the prior plan was written, as will be discussed in detail below, there are some key characteristics that haven't changed. The fundamental nature of why the City of Santa Cruz is subject to water shortages hasn't changed: water supply storage is constrained in Loch Lomond Reservoir, which lacks storage capacity to ensure supply reliability during severe droughts or during a multiple year drought. This situation is made worse by the fact that our water system city is entirely dependent on water sources within our local watersheds and is not connected to imported water sources or to neighboring utilities with robust supplies.

There are several other important local characteristics of Santa Cruz related to water supply that are different now from when the prior WSCP was written. These include: increased commitments to providing water to support protection and recovery of threatened steelhead trout and endangered Coho salmon, greater recognition and integration into local water planning of the effects of climate change and the volatile nature of precipitation patterns, new conservation tools, experience in implementing the WSCP, and routine water rate increases to cover rising costs of capital reinvestments in the system. Additionally, and perhaps most importantly, the water demand in the city is significantly lower in recent years compared to the baseline years used the prior plan.

Another significant change that has occurred since the time the prior WSCP was written is the new water conservation legislation at the state level, SB 606 and AB 1668. These new laws strengthen the requirements for WSCPs in Water Code 10632 for all urban water suppliers. Specifically, water suppliers preparing the 2020 updates to their Urban Water Management Plans must include a WSCP that includes the examination of "Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage."

Core Principles

During the development of the 2009 WSCP, the City Water Commission developed a set of principles to guide the planning process. These principles remain mostly the same today (with some minor adjustments) and have been used to guide development of this plan update. The principles are as follows:

- Shared Contribution: All customers will be asked to save their share in order to meet necessary reduction goals during water shortages.

- Reduce non-essential uses first: The plan gives priority to health and safety uses of water and targets non-essential uses for reductions first. However, even some amounts of essential use are

reduced under this plan at higher stages due to the overall low levels of demand.

- Preserve jobs and the local economy to the extent possible: Given today's demand characteristics, the business customer class will be subject to the allocation system at each stage of shortage. However, the amount of water the business customer class will need to reduce at each stage is relatively low given that there is a substantial amount of health and safety related use in the overall usage by business customers.

- Existing conservation measures recognized: Customers who have already been conserving will have an easier time maintaining consumption below the allocation levels set out in the plan. This will be especially true in earlier stages of shortage. Customers who haven't conserved as much or at all will find it harder to stay within allocation amounts.

- Communication at every stage: A public information campaign at every level of shortage is essential for customer preparation and will encourage confidence in the City's ability to respond to water shortages.

- Flexibility: The Department will gauge the necessity of implementing each set of actions at each stage of shortage and evaluate whether they make sense at the time. Not all actions must be implemented simply by virtue of being listed in the plan at that stage.

- Even-handedness: The policies and rules developed under this plan to manage a shortage will be applied to all customer groups in a consistent, even-handed manner.

Relationship to Other Plans

This document can be used as a stand-alone implementation plan for the purposes of managing a water shortage. It also constitutes one of several elements in the City's UWMP, 1 as required by State Law.

Although water supply interruptions and shortages may result from a variety of causes, including facility failure, such as a major pipeline break, earthquake, flood, or other natural disaster, this plan specifically addresses longer-term water shortages that occur as a result of drought conditions that may extend for several months or span several years. For shorter-term water supply interruptions and outages, the Water Department maintains a separate Emergency Response Plan, which is subordinate to and complements the Citywide Emergency Operations Plan, to guide emergency operations response and recovery.

Updated Water Use Characteristics

As mentioned in the introduction, one of the most significant changes between the 2009 plan and this update is the decline in system-wide water demand that has occurred over the last two decades. The

2009 plan uses customer water use levels and characteristics from 2002-2004 as the basis for normal (unconstrained) water demand.

The 2002-2004 period was selected as being representative of typical water consumption patterns in a stable period marked by normal weather and water conditions. At the time, total annual water demand measured about 3.9 billion gallons per year. **This plan uses 2016-2018 as the base year period**. Total annual demand now measures about 2.6 billion gallons per year, a decrease of about 33 percent. Besides the overall reduction, changes have also occurred in the seasonality or shape of demand as well as the composition of use among and within various customer categories.

In addition to total system production, water demands during the 2016-2018 time-period peak season production and peak daily production were significantly different from those in the 2002-2004 base period. Specifically, in regard to peak season production, the average for years of 2002-2004 was 2,641 MG while for the years 2016-2018 it was 1,630 MG. This is a reduction of 38%.

In terms of daily production, for the 2002-2004 period the average peak daily production was 15.3 MGD. For the 2016-2018 period the average peak daily production was 10.1 MGD. This represents a 34% reduction in peak daily production.

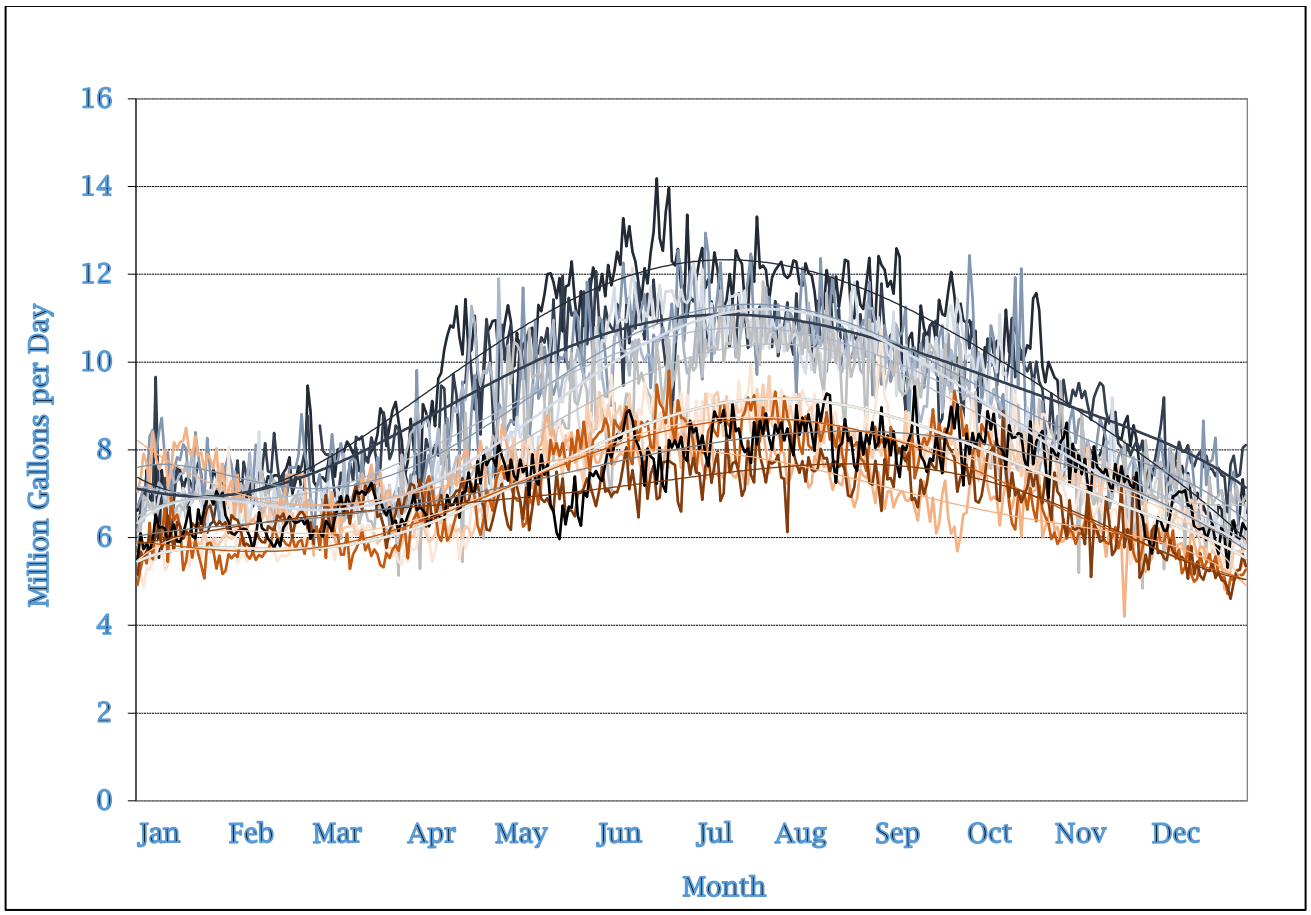
Table 1 summarizes these changes. One item that stands out about the new characteristics of water demand is that while demand has decreased the population in the service area has increased by roughly 10,000 people.

Table 1 Water Use Comparison Current Base Year Period vs. Old Base Year Period

	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)	?	?	?		↑

Figure 1 shows the daily water production for each year 2008 to 2019 in million gallons per day (MGD). The lower set of curves represent water production in years 2014-2019. The upper set of curves represent water production in years 2008-2013. The substantially lower trend of both overall and peak season water production in recent years is clear from the graph.

Figure 1 Daily Water Production, 2008 – 2019 (MGD)

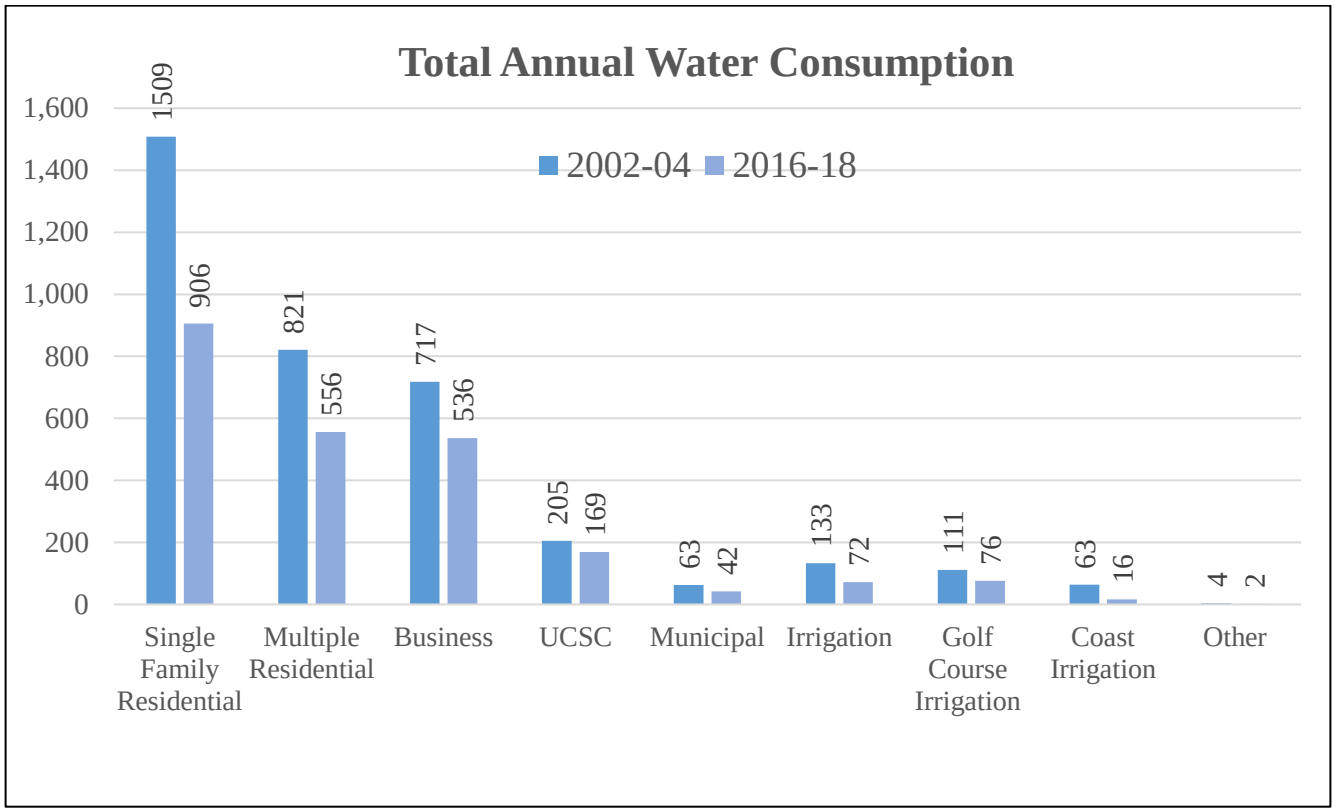


The decline in peak season water use is significant in that it means less water is generally available for cutting back during times of drought. Peak season water usage typically includes various outdoor uses such as irrigation, which is viewed as a more discretionary use than indoor water use. Water providers will often target discretionary uses for greater levels of curtailment than indoor uses. With less discretionary water use in the system, there needs to be a greater focus on curtailing indoor use when shortages occur.

On the other hand, generally speaking, lower system demand means that total volume of shortages will be lower than would be the case under a higher peak season demand. This is good news, but unfortunately, even with lower system demand, the potential for significant shortages continues to be a real issue.

Figure 2 shows the comparison of annual water use for each customer class between the old base year period for the 2009 WSCP compared to the new base year period for this update. What is clear from the figure is that use in the largest customer classes has significantly declined over this time period.

Figure 2 Water Use by Customer Class, 2002-2004 compared to 2016-2018



Updated Peak Season Composition and Demand Reduction Targets for WSCP Stages

In Santa Cruz, it is typically the peak summer season during which water supplies are more limited because the system's flowing surface water sources, about 45% of total system supply, are less available during the peak season than they are in the wet season, and because stored water is very limited. If winter rains have not replenished Loch Lomond's storage, peak season usage reductions are typically applied in order to ensure that water for essential uses will continue to be available throughout the peak season and into the following water year as well. Demand management through restrictions is the only real tool the Water Department has to manage this risk.

In the existing WSCP (2009), the peak season is defined as the seven-month period April through October and accounts for 1,630 MG of the total annual demand. In this WSCP update, the peak season has been revised to include the six-month period May through October (water actually consumed from May 1 to October 31st) which is represented by the June through November utility bills. As a result of both the change in customer demand and the reduction of the peak use period from seven months to six months, the updated peak season usage figure being used in this plan is 1,358 MG.

The change to the definition of the peak season was made because water supplies are historically adequate to meet demand in April. In addition, water shortage regulations usually are not put into effect until May 1st or June 1st during a shortage year.

The new water demand characteristics, as well as the state's new standardized WSCP requirements for shortage plans, are the main factors that influence this update of the WSCP. The allocation scheme to be described in this and subsequent sections, which is a major change from the existing WSCP, is driven primarily by the new demand characteristics. In other words, if it were not for the new lower demand in the service area, the demand reduction approaches proposed here would probably be more akin to those in the existing plan including a mix of prescriptive measures and restrictions with allocations only implemented at higher stages. With the new demand, however, those approaches are not sufficient or suitable, thus a new demand reduction approach that would ensure that necessary reductions would be achieved, even given the low demand characteristics, had to be created for this update.

An essential step in updating the WSCP is to determine how much water would need to be cut, overall and from each customer group, at each demand reduction stage. The four steps below were used to generate both the reductions required and the water remaining for use at each WSCP stage:

1. Examine the level and seasonality of water use in each customer category, by breaking down water use in each sector into indoor uses and outdoor/seasonal components;

2. Divide the peak season usage into three usage priorities: 1) health and safety, 2) commerce, and 3) irrigation and other outdoor usage;

3. Determine the level of reductions required at each stage and from each use priority; and

4. Calculate the percentage reductions needed to develop a specific reduction goal for each customer class at each stage of shortfall.

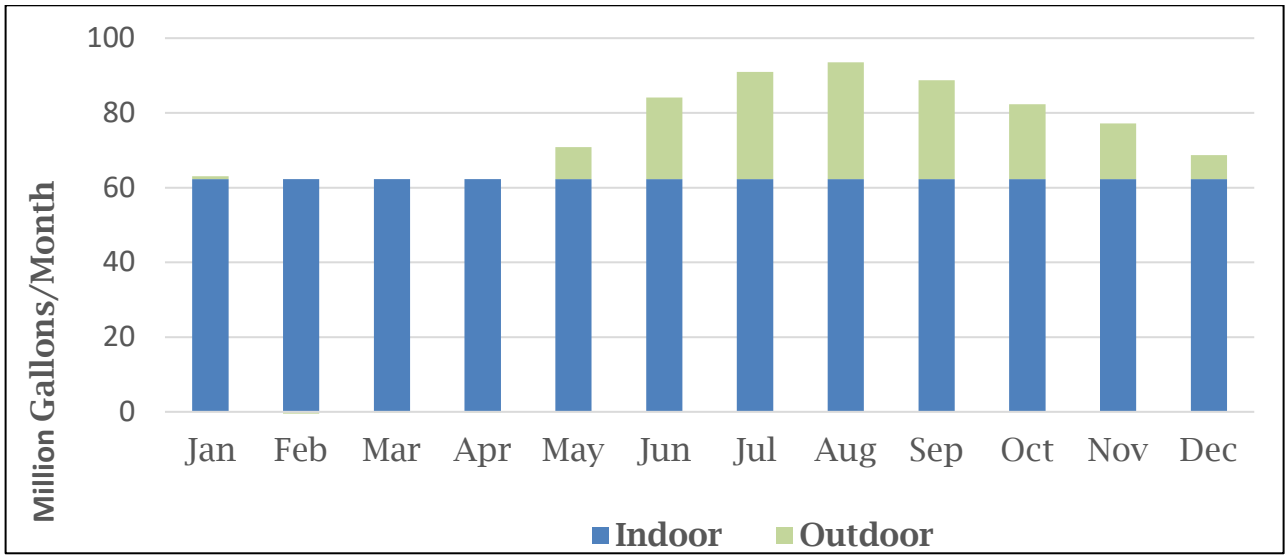
Each of these steps is described in more detail below.

Examine the level and seasonality of water use in each customer category

Using the customer sales data for the base year period 2016-2018, each customer group was analyzed as to how water was used over the course of each month of the year. For the analysis, the average usage in each month was calculated for the three-year base period.

For example, **Figure 3** shows the seasonal consumption composition of the single-family residential sector (SFR). SFR is the largest single customer category with the predominance of the total meters and total consumption. For the analysis, wintertime usage, defined as the average of the usage in the months January through April, is used as a proxy for indoor use. This amount was held constant over the whole year. Figure 3 shows this amount plotted in blue for each month. The remainder of the usage in each month is assumed to be outdoor usage. In Figure 3 the outdoor usage is plotted in green and does not appear until the peak season begins in the month of May (the May billing period contains consumption that occurs both in late April and the month of May). The graph shows that there is a relatively small component of overall water use in the new base year period that is outdoor use.

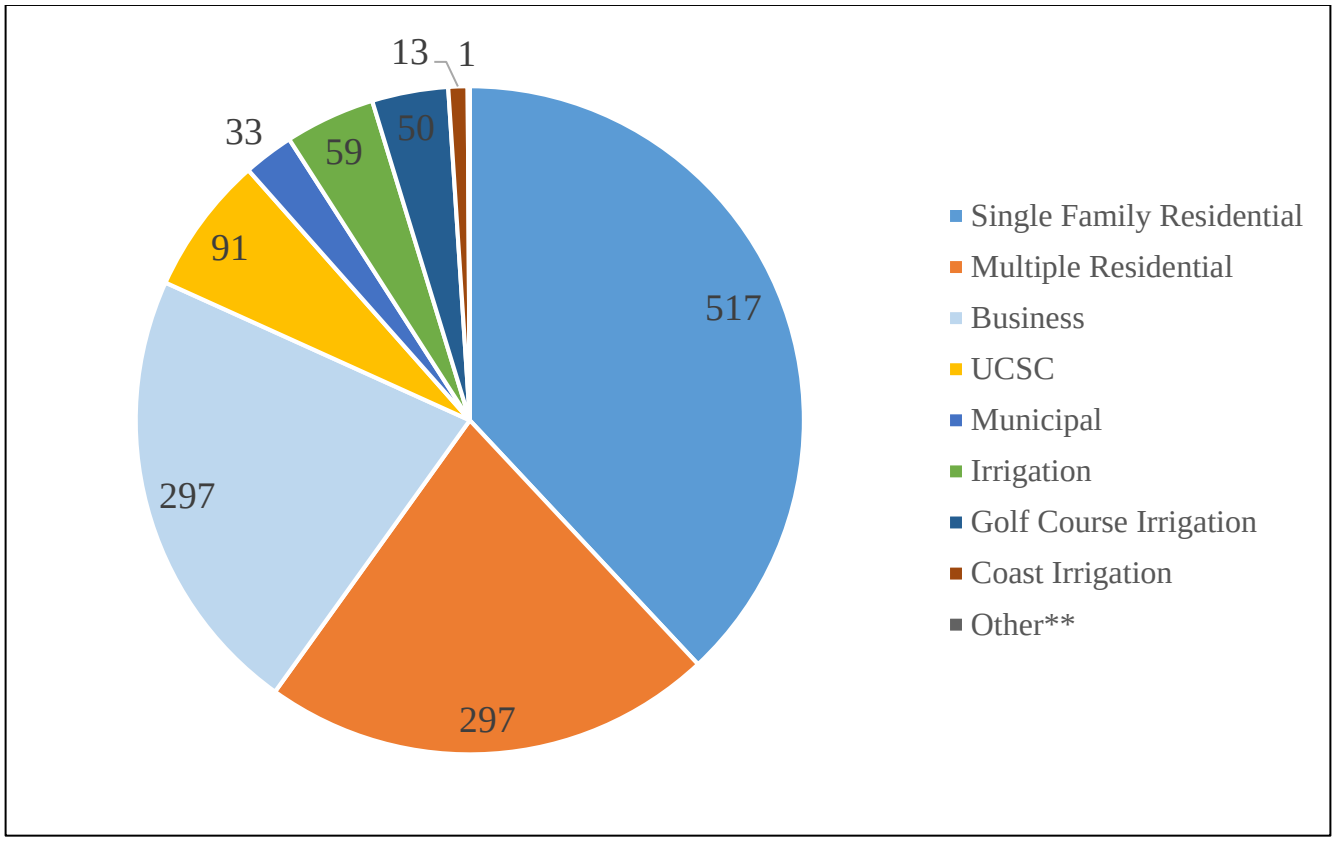
Figure 3 Single-Family Residential Sector Composition 2016-2018 (Million Gallons per Month)



The same analysis of seasonal composition of water use discussed above for SFR customers was repeated for all other customer classes. The purpose of this analysis is to characterize how much water is used during the peak season and how much is outdoor use (discretionary) vs indoor use (more related to health and safety).

Figure 4 shows the usage composition of the peak season in the new base year period by customer class. Single and multi-family residential customer classes are the predominant users of water followed by business use and by usage at UCSC.

Figure 4 Peak Season Composition by Customer Class (2016-2018) Million Gallons



Divide the peak season usage into the three usage priorities: Health and Safety, Commerce and Irrigation

Once the seasonality and indoor/outdoor composition of the peak season water use has been characterized for each customer class, the next step in the process of allocating water is to divide up water use into three **usage priorities.**

Establishing usage priorities is a way of differentiating the importance of various types of water use. As was the case in the existing WSCP, the three usage priorities that have been identified and are important in allocating water are:

1. **Health and Safety**
2. **Commerce**
3. **Irrigation**

These usage priorities are listed in descending order of importance, with #1 being essential to human health, and #3 being more discretionary in nature. These priorities of water use are the same as in the existing plan.

More specifically, health and safety is defined as water use that is related to essential (indoor) needs such as drinking, sanitation, washing clothes, cooking, etc. This is the highest priority use of water in the scheme; when there is a shortage, water is retained as long as possible for health and safety uses.

Commerce is defined as water use that is related to business and commercial activity. This is the second highest priority of water use in the scheme; water for businesses will be retained as long as possible during a shortage, but it will eventually need to be reduced as a shortage intensifies. An example of this type of usage is water used for cooking at a restaurant, or water used for dishwashing or laundry at a hotel.

It should be noted however that there also exist health and safety uses of water at businesses. Health and safety use is, for example, water used for sanitation, health care, drinking and similar purposes. Water use for commerce is different in that the water will be used directly for commercial activity. A good example to illustrate the difference is at restaurants. At a restaurant, a majority of the water used is likely for commerce. That is, the water is used in preparation of food which is then sold to customers. However, a portion of the water used by the restaurant is for sanitation purposes and thus can be thought of as health and safety. Examples of the health and safety uses at restaurants include staff sanitation and cleaning, customer and staff restrooms and general cleaning. Many other business types have a mix of commerce related water use as well as health and safety uses.

Irrigation is defined as water use that is related to outdoor irrigation. This is the lowest priority water use in the scheme; irrigation is considered to be discretionary and thus it is the first use that is cut back and also the first to be completely eliminated when a shortage gets severe enough. Irrigation can be related to any customer class.

A specific case of irrigation water use that is somewhat different is that of irrigation at Golf Courses. Golf course irrigation is actually a separate category, as shown below, due to the fact that golf is a mixture of both business and irrigation water use.

Additionally, another separate category is that of irrigation for North Coast agriculture. This is an irrigation related customer class but under this plan North Coast agriculture is treated like a business customer in that this group uses the water to grow food which is sold in a business enterprise.

The following is an example of how water is divided into usage priorities using the SFR customer class. Figure 4 shows that the total peak season usage of 1,358 MG is substantially the result of use by SFR customers (517 MG), accounting for 38% of the total peak season use.

Table 2 below shows the SFR peak season composition by usage priority. This breakdown of usage is based on the analysis of how much water is used in this sector indoor vs. outdoor. Using the data developed for Figure 4, the amount of peak season water use that is considered discretionary irrigation water is approximately 28% of the total usage in this customer class, or 143 MG during the peak season. The remaining 374 MG is used for usage priority #1: health and safety purposes.

Table 2 Assigning Usage Priority for Single-Family Residential Class (Million Gallons)

Customer Class:	Health/Safety	Commerce	Irrigation	SFR Total for Peak Season	Percent of Total Peak Season Use
Single Family Residential	374	0	143	517	38%

A similar process is followed for each customer class to develop the overall reduction goals for all customer classes. These results are shown in **Table 3**.

Table 3 Overall Composition of Peak Season Usage, by Usage Priority

Peak Season (May 1-Oct 31st) average for 2016-2018 Usage Priority (million gallons)				
Customer Class:	**1 Health/Safety**	**2 Commerce**	**3 Irrigation**	Total
Single-Family Residential	374		143	517
Multiple Residential	252		45	297
Business	223	74		297
University of California	71		20	91
Municipal	7		26	33
Irrigation			59	59
Golf Course Irrigation		17	33	50
Coast Irrigation		13		13
Other		1		1
SUBTOTAL	**917**	**115**	**326**	**1,358**

Table 4 shows how the peak season composition for all customer classes has changed between the old base year period and the new one.

Table 4 Comparing the Peak Season from the base years 2002-2004 to 2016-2018 by usage priority for all customer classes

Usage Priority:	Health/Safety	Commerce	Irrigation	Total
2016-2018 Percent of Total	68%	8%	24%	100%
2002-2004 Percent of Total[1]	53%	16%	31%	100%

To put the figures in Tables 2, 3 and 4 in a more relatable context, over the 180 day peak season, SFR irrigation use in 2002 – 2004 was about 2.1 MGD and in the 2016 – 2018 period that use was about 0.8 MGD. Further, irrigation demand for all customers in 2002 – 2004 was about 4.2 MGD versus 1.8 MGD in the 2016 – 2018 period. The SFR irrigation water use for the new base period is just 38% of that used during the 2002 – 2004 base period used in the 2009 WSCP. Overall, use of water for irrigation in the new base period is only 43% of the amount of water used for irrigation in the earlier base period.

What these data show is that customer demand management efforts, especially with respect to water used for irrigation, have substantially reduced the amount of discretionary water that is typically a major target in any water shortage strategy.

Determine the level of reductions required at each stage and from each use priority

Under the new state requirements for Urban Water Management Plans and WSCPs, there is a specific requirement for standardized shortage levels. From the California Water Code Section 10632, the language is as follows:

> *Section (3) (A) Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage. Urban water suppliers shall define these shortage levels based on the suppliers' water supply conditions, including percentage reductions in water supply, changes in groundwater levels, changes in surface elevation or level of subsidence, or other changes in hydrological or other local conditions indicative of the water supply available for use.*

Based on the new water use characteristics, water use reductions by volume at each stage are shown in **Table 5**.

[1] 2002 – 2004 Data is from Table 3-4 on page 3-10 of the 2009 Water Shortage Contingency Plan

Table 5 Water Use Reductions Targets by Stage

Peak season total consumption of 1,358 MG				
Stage	Overall System Shortfall:	Cutback (MG)	Consumption (MG)	Cutback (MGD)
1	10%	-136	1,222	-0.7
2	20%	-272	1,086	-1.5
3	30%	-407	951	-2.2
4	40%	-543	815	-3.0
5	50%	-679	679	-3.7
6	>50%		-680 or more	-3.8 or more

The next step in the process is to show how deliveries would be reduced at each stage according to usage priority. Following the Core Principles described earlier, discretionary water use in category 3 is cut by the largest percentage in the earliest stages while cuts in water for commerce and health and safety are subject to smaller, and similarly sized reductions. Once Stage 4 is reached, however, cuts to water for commerce get bigger, in part because there is no longer any irrigation water to cut, and in part because the water supply situation is dire enough that most of the available water needs to be preserved for health and safety uses. **Table 6** shows the percent of water allocated to each use for each of the required drought response plan stages.

Table 6 Reduction in Water Consumption by Priority

Priority:	**1 Highest**	**2 Next highest**	**3 Lowest**
Stage	Health/Safety (% of normal delivery)	Commerce (% of normal delivery)	Irrigation (% of normal delivery)
1	95%	95%	75%
2	90%	90%	50%
3	85%	85%	25%
4	80%	75%	0
5	70%	30%	0
6	60%	20%	0

Irrigation is reduced by 25% beginning at Stage 1, and by Stage 4 there is no irrigation water left to curtail. The other characteristic of this schedule is that while business usage is maintained to the degree possible, it, too, is curtailed beginning at Stage 1 and becomes harder to preserve as the shortage intensifies. Thus, even the water for Commerce priority is impacted significantly at higher stages.

Apply the percentage reductions to develop a specific reduction goal for each customer class

The last step in setting up customer reduction goals for each stage of a shortage is to apply the percentage reductions determined above to each customer class.

The following example for the SFR customer class demonstrates how this process works; the same technique is then applied to all customer classes. **Table 7** illustrates how when starting out with 374 MG for health and safety and 143 MG for irrigation in the peak season, a 95 percent delivery for health and safety equals 355 MG and a 75 percent delivery for irrigation equals 107 MG. The total volume of that combined demand reduction is 54 MG which equals 89% total delivery in this customer class at Stage 1.

Table 7 Example of Applying Percentage Reduction Goals to SFR Customer Class
Showing example of Stage 1 reductions

		Usage Priority			
	Single Family Residential	Health /Safety	Commerce	Irrigation	Total
Peak Season Total	Volume (MG)	374	N/A	143	517
Stage 1 Reduction	Percent Delivery	95%	N/A	75%	
	Volume (MG)	355	N/A	107	463

When the full table is assembled for all customer classes for each stage, the result is **Table 8.** The information in Table 8 guides the development of the rest of this shortage plan update in terms of strategy around how to achieve the reduction goals for each stage.

Table 8 Customer Class Reduction Goals

Customer Class	Peak Season Demand 2016-2018 (Million Gallons)	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
		Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)
		Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)
Single Family Residential	517	89%	79%	68%	58%	51%
		463	408	354	299	262
Multiple Residential	297	92%	84%	76%	68%	59%
		273	249	225	202	176
Business	297	95%	90%	85%	79%	60%
		282	267	252	234	178
UC Santa Cruz	91	91%	81%	72%	62%	55%
		82	74	65	57	50
Municipal	33	79%	58%	38%	17%	15%
		26	19	12	6	5
Irrigation	59	75%	50%	25%	0%	0%
		44	30	15	0	0
Golf Course Irrigation	50	82%	64%	45%	26%	10%
		41	32	23	13	5
North Coast Agriculture	13	95%	90%	85%	75%	30%
		12	12	11	10	4
Other	1	95%	90%	100%	100%	100%
		1	1	1	1	1
Total	**1,358**	**1,225**	**1,092**	**959**	**820**	**677**
		Overall reduction in each stage				
		10%	20%	30%	40%	50%

In looking at the results presented in Table 8, two facts stand out: 1) the new demand characteristics mean that reductions at higher stages will be very difficult to achieve and, 2) any strategy for demand reductions will need to be designed with a high likelihood of success. The reason for this requirement is that in a serious shortage, it will be critical to have a system in place that not only is likely to succeed but is also fair to all customer groups and stays true to the core principles set out at the beginning of this plan.

General Approaches to Demand Reduction

A key assumption during a water shortage is that it will take demand reduction measures, communication actions, and internal utility actions working together to reduce water demand.

To achieve reduction in customer demand, there are generally two main approaches that are used. The first approach relies on prescriptive measures (rules, requirements, and prohibitions) for customers to

follow. For example, many shortage plans contain progressively more stringent restrictions on outdoor irrigation, such as limits on days per week, minutes per day, or time of day that customers are allowed to water.

The second general approach does not rely on prescriptive measures. Rather this approach relies on customer allocations. This method assigns each customer a monthly allocation of water and then uses penalties (administrative enforcement methods in the form of excess use penalties) when a customer uses more than their allocation.

These two broad approaches, prescriptive measures and allocations, are not mutually exclusive. The existing (2009) WSCP contains prescriptive measures as well as customer allocations, with allocations coming into play at Stage 3 for residential customers. **However, for this WSCP update, given the new demand characteristics and the need to ensure successful reductions at each stage, an allocation only approach is recommended**. The rationale for why this type of approach is best suited for the current situation in Santa Cruz is explained in the next section.

Recommended demand reduction approach

The recommended approach to demand management in this WSCP update is to provide customer allocations starting at Stage 1 of the plan and reducing these allocations at each successive stage of the plan. This approach gives customers an amount of water to use each month and allows them to use that water as they see fit to meet their needs.

The allocation approach will help to maximize the probability that the demand reductions required at each stage will be achieved. As would be the case regardless of what shortage reduction strategy was pursued, the allocation strategy requires a significant communications and public information, education and outreach campaign to be implemented before and during any use of the Plan.

Water Allocation System for Each Customer Class

The information in Table 8 above shows the peak-season volume for each customer class both for unconstrained demand (no shortage) and for each of the five-plus demand reduction stages. This information is the starting point for establishing allocations for each customer within each class. The detailed methodology will be described for each customer class in sections below.

Using the SFR customer class as an example, the following information is used to calculate the average usage (in hundred cubic feet (CCF)) per year and per month for unconstrained demand:

- Peak season demand for the SFR customer class
- The reduction targets required at each stage of shortage
- The number of customers in the SFR class

Once these data points are available, target allocations can be set for SFR customers for each demand reduction stage. A similar approach is used to translate percentage cuts for other customer classes into monthly allocations.

Single-Family Residential

Given the current characteristics of water demand, under a new allocation system for single-family residential customers the amount allotted per month would need to be considerably less than in the existing WSCP. Under the existing plan, at Stage 3, single-family residential customers were given an allocation of 10 CCF per month for a family of four persons.

Table 9 shows the reduction amounts that will be required for each stage of shortage, both in terms of overall amount in million gallons but also in terms of the average usage in CCF per month for a single-family account.

Table 9 SFR Reduction Targets in CCF/Year and CCF/Month

	CCF	MG	ACCOUNTS	CCF/YR	AVE CCF/MONTH
Peak Season Demand 2016-2018 (unconstrained)	691,176	517	19,000	36.4	6.1
Stage 1	618,984	463	19,000	32.6	5.4
Stage 2	545,455	408	19,000	28.7	4.8
Stage 3	473,262	354	19,000	24.9	4.2
Stage 4	399,733	299	19,000	21.0	3.5
Stage 5	350,267	262	19,000	18.4	3.1

Using the average peak season usage per SFR account produces an unconstrained average customer demand of 6.1 CCF per month as the logical basis for establishing a new SFR allocation for the five stages of the WSCP.

Table 10 shows the recommended allotment for each WSCP stage for SFR customers. The allotments are shown in CCF (1 CCF = 1 billing unit = 748 gallons). Given that the billing system can currently only accommodate whole numbers for an allocation, the average CCF per month for unconstrained demand of 6.1 from Table 9 is rounded down to 6.0. Similar rounding is used when calculating allocations as described further below.

This new SFR allotment is for a three-person household. The decision to use three persons instead of four comes after reviewing the most recent data available in terms of average residency in the service area. The average residency in the service area is approximately 2.35 persons per household; the value 3 is rounded up from 2.35. The value average residency comes from a calculation of service area population divided by the number of dwelling units in the service area. The data for population and number of dwelling units is presented in Appendix D of the 2020 UWMP, which is the final technical memorandum of the update to the City of Santa Cruz's Long-Range Water Demand Forecast. Clearly there are homes with more permanent residents and an exception process will be used to adjust allocations for customers with more than three people residing in the residence. The exception process is presented in the implementation section of this plan.

Table 10 SFR Customer Allotments (data in CCF)

PEAK SEASON 2016-2018	100%	AVE CCF/MONTH 6.1		
	PERCENT OF NORMAL DELIVERY	RESULTING AVE CCF/MONTH	RECOMMENDED ALLOTMENT (CCF/MONTH)	ENFORCEMENT MECHANISM
Stage 1	89% (11% reduction)	5.4	5	None- Target allotment only
Stage 2	79% (21% reduction)	4.8	5	Excess use penalties begin
Stage 3	68% (32% reduction)	4.2	4	Excess use penalties continue
Stage 4	58% (42% reduction)	3.5	3	Excess use penalties continue
Stage 5	51% (49% reduction)	3.1	3	Excess use penalties continue

Table 10 also refers to administrative enforcement/excess use penalties. These are the monetary penalties that will be applied to customer accounts when usage exceeds the allotment. The schedule of administrative enforcement/excess use penalties is further presented and discussed in the implementation section.

As shown in Table 10, excess use penalties are not applied to use over the customer's allocation in Stage 1. This recommendation is the result of Water Commission input during one of the Commission's multiple reviews and discussions with staff during plan development. The thinking was that for low percentage curtailments, such as required in Stage 1, excess use penalties are too burdensome and severe for the customer base to experience at a low stage.

It is important to note that implementing Stage 1 is not a strategy for easing people into a higher tier curtailment structure and readying them for implementation of further restrictions when penalties would be applied. For example, the City could declare a Stage 2 or Stage 3 shortage based on the annual water supply and demand assessment process. This could occur without a previous Stage 1 shortage and result in excess use penalties being in effect without any "warm up" phase.

Multi-Family Family Residential

The allocation system for multi-family residential (MFR) customers will be similar to that of the SFR sector. The same three person per dwelling unit assumption used in SFR is used for MFR customers. This assumption is made knowing that it covers the majority of MFR properties but also with the realization that there are some large MFR properties that have a higher occupancy per dwelling unit. As would be the case for SFR customers, an exception process for properties where there is higher residency would be available.

In the prior WSCP, the amount of water allocated for MFR properties was determined by the number

of dwelling units at the property; smaller properties with 2-4 units were given a specified allocation, then properties with 5-20 units were given a slightly smaller "per unit" allocation, and lastly properties with over 20 units were given a slightly smaller "per unit" allocation. This system is one of three alternatives that were presented in the prior plan. One of the other two alternatives was a gallons per person per day (GPCD) approach, and the other was a general approach that MFR customers would be treated as the same as SFR in the allocation system.

After evaluating how rationing worked for MFR customers during 2014 and 2015, staff determined to eliminate the three-tiered allocation structure for different MFR property sizes and use an appropriate base allocation of 5 CCF per unit regardless of property size. The reasons for this distinction are listed below:

1) The usage data for MFR properties support a Stage 1 allocation of 5 CCF across the board. In other words, when examining the usage data for MFR properties, the wintertime usage, used as a proxy for essential indoor use, is in the range of 3-5 CCF across the board, regardless of the number of dwelling units at the property. As a result of this usage profile, it does not make sense to differentiate between MFR properties based on the number of dwelling units when proposing the allocation.

2) The current tiered rate structure for MFR properties already allocates water based on the number of dwelling units per property. Specifically, the amount of water per tier for MFR properties is based on number of dwelling units. For example, the first tier (0-5 CCF) for a 3 unit property would be (0-15 CCF).

3) The third reason that the MFR allocation scheme should be the same as the SFR allocation is that this approach is easily understood and easy to communicate to customers. The approach is fair, and in outreach and communication of the overall allocation system, this component will not stand out as confusing or perceived to give MFR customers more or less water than SFR customers.

Table 11 shows the MFR allotment schedule. MFR allocations are based on whether or not the property has a dedicated irrigation meter. The presence of a separate meter for irrigation means that outdoor water use for the property is not combined with the usage on the main meter that measures indoor water use, and thus for allocation purposes, the main meter account can be allocated slightly less water. Irrigation meters all have a water budget associated with them and reductions to those budgets during a shortage will be discussed in a later section of this plan. It should be noted that MFR properties that do have a dedicated irrigation meter have the option of shutting off said irrigation meter for the season in order to receive the higher allotment amount.

Table 11 MFR Customer Allotments

Multiple Family Residential Allotment Schedule			
		Separate Irrigation Meter Serving Property?	
		Yes	No
	Stage 1	4	5
	Stage 2	4	5
	Stage 3	3	4
	Stage 4	2	3
	Stage 5	2	3

Business

The allocation system for the business customer class differs significantly from the residential customer classes described thus far. Due to the diversity of uses in this class of customers, it is not reasonable to design a one-size-fits-all allocation approach. The types of customers in this class range from small businesses of all kinds with relatively low water use, primarily indoors, to large customers such as the Santa Cruz Boardwalk or large hotels and everything in between. Furthermore, the diversity of the business class is compounded by the fact that a single business account with a single master meter may serve many downstream businesses (e.g., shopping centers, strip malls, and industrial parks). This diversity is reflected in the billing system, with the business class being separated into three sub-categories: Business-general, Business-hotel/motel, and Business-restaurant.

Given the wide variation in water use in the business customer class, using any kind of business customer sub-group average to set allocation doesn't recognize the diversity of water uses even within each sub-group. For example, Santa Cruz's tourist based economy and the often relatively rapid turn-over in restaurant business uses makes it appropriate to create user allocations that are reasonably adapted for each user. This need resulted in a decision to create customer specific allocations for business customers. The detailed reasons behind this decision and how such an approach is planned to be implemented are presented below.

In addition, it is important to reiterate the usage priorities as described in Table 3 as they pertain to the business customer class. The following **Table 12** is a summary of the usage priorities for business, data pulled from Table 3.

It should be noted that the business customer class includes the small group of customers that had previously been classified, under the prior WSCP, as industrial customers. The usage from this group of customers has been incorporated into the business class. The reason for this change is that upon examination, the majority of the accounts in this group are now primarily typical businesses and are no longer actually manufacturing or using water exclusively for process water. The changing nature of these accounts made it more appropriate to classify them as businesses for the purposes of this plan.

Table 12 Usage priority chart for Business Customer Class

Peak Season 2016-2018	Usage Priority (million gallons)			
Customer Class:	**1 Health/Safety**	**2 Commerce**	**3 Irrigation**	Total
Business	223	74		297

The breakout in Table 12 reveals that the business class has a majority of water used for health and safety, and a lesser amount for true commercial activity. For this reason, the reduction targets at each stage of shortage are less severe than for other customer classes. This is a good opportunity to reiterate the basic premise of usage priorities as discussed earlier in the plan. Health and safety is water use for sanitation, health care, drinking and similar purposes. Water use for commerce is different in that the water use will be used directly for commercial activity.

Table 13 is an excerpt from Table 8 that shows the reduction goals just for the business class. The percent reductions for each stage are shown as well as the resulting volume of water. The reduction goals shown here are the result of the makeup of usage priority in the business class. As shown in

Table 12, the usage priority spread in this class is primarily in health and safety and some commerce, with no irrigation. Therefore, the reduction goals at each stage are less severe than another class that includes irrigation use.

Table 13 Sample Business Allocation Example (data in CCF)

Customer Class	Peak Season Demand 2016-2018	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
		Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)
Business	297	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)
		95%	90%	85%	79%	60%
Total Business Use		282	267	252	234	178

The methodology used for developing allocations for business customers

The system will start with the usage profile of each individual customer for each month of the peak season in a selected base year. The selection of a base year is both important and difficult. For the business sector, it is appropriate to select a non-drought year that is as close as possible to plan implementation. A non-drought year is defined as one in which no water shortage declaration was made. The point of that choice is to reflect a time period that has the most recent stable period of usage, capturing the latest possible profile of how each business has been operating. To illustrate the base year choice, if this plan needs to be implemented in 2021, the base year will be 2019, the most recent year pre-Covid19 and in which there was no water shortage. Going forward, the base year for this customer class will be updated at the time of implementation to reflect the most recent year for which there was no water shortage and was not a year influenced by external factors (e.g. a natural disaster, global pandemic).

This approach is an attempt to use the most relevant data available for setting individual business allocations. Although setting allocations for individual businesses may be more complicated than that used for residential allocations, the variability of use within the peak season is a factor that weighs heavily against using an approach involving seasonal averages. An example of this is a hotel with a lot of seasonality. A hotel may have its highest occupancy in the late summer months, with lower occupancy in the first few months of the peak season. If an average season approach were used, the resulting allocation may be too much in the early months and not enough in the latter months, possibly resulting in operational issues and economic harm.

Table 14 presents an example of how the allocation would work for a sample business. As shown, in the month of May, the 2019 base year usage for this sample business is 70 CCF (1 CCF= 1 billing unit = 748 gallons).

Table 14 Sample Business Allocation Example (data in CCF)

	May	June	July	August	September	October
2019 Base Usage (CCF)	70	102	122	110	93	51
Stage 1 (95% of normal)	67	97	116	105	88	48
Stage 2 (90% of normal)	63	92	110	99	84	46
Stage 3 (85% of normal)	60	87	104	94	79	43
Stage 4 (79% of normal)	55	81	96	87	73	40
Stage 5 (60% of normal)	42	61	73	66	56	31

An important caveat for the business sector is the exemption process and the complete exclusion of some customers from the allocation system. Due to the fact that, as noted above and shown in Table 12, a large component of usage in the business class is for health and safety, there are some important considerations with specific customers when considering how to implement an allocation system. The main issue is that amongst the business customer class there exist many accounts that are specifically related to health care. Examples of said accounts are hospitals, surgery centers, various doctors' offices, maternity centers, nursing homes, etc. All of these "businesses" are classified under the North American Industry Classification System (NAICS) in category 62, the broad sector called "Health Care and Social Assistance".

Under this plan, all business accounts that are classified in this sector for health care related businesses will be automatically exempt from the allocation system. The obvious rationale for this is that water used by these businesses is directly related to health and safety and not commerce. Additionally, under the exemption process, which will be described further in the implementation section, other business customers that have a component of health and safety usage will be able to file for an exemption to receive additional water beyond their allocation to account for health and safety requirements.

When it comes time to implement the plan, it should be noted that not all business accounts will have baseline data for the given implementation year. That is because, for example, there may be new business accounts that don't have any consumption history. For such accounts, internal review will occur to determine the appropriate baseline consumption figures for the nature of the given account.

Other Customer Classes

This section covers the various other main customer classes and how the allocation system will apply to them. The section irrigation below contains information on three sub-classes: landscape irrigation, golf courses and finally north coast agriculture. The other remaining classes that will be discussed are the University of California Santa Cruz (UCSC), and municipal.

Irrigation

Landscape Irrigation Class

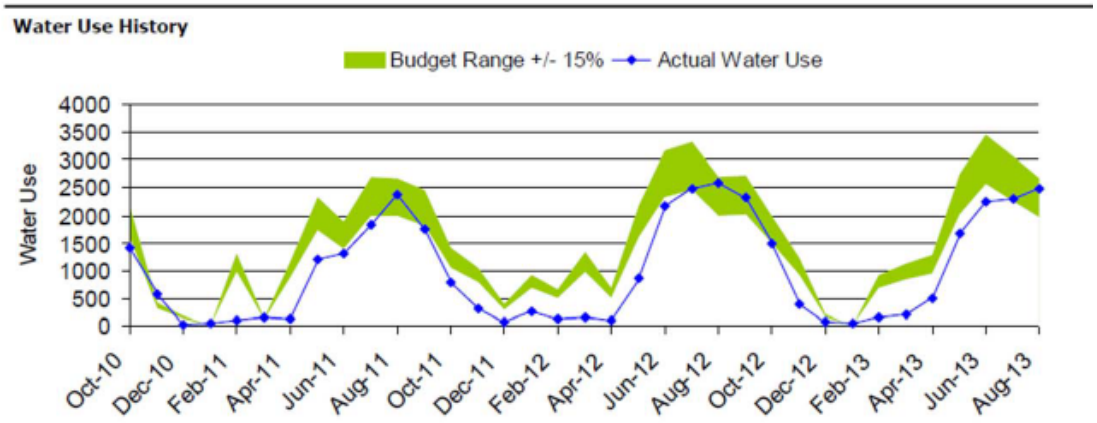
The irrigation class consists of all dedicated irrigation meter accounts in the service area. These accounts serve landscape irrigation that is all in the irrigation usage priority, meaning discretionary in nature. This type of irrigation consists of turf and shrubs at various commercial, residential, and some public properties. During a water shortage emergency, this discretionary use of water is reduced more

significantly than other uses of water. The result is that, in a severe shortage, landscapes that are served by these dedicated irrigation accounts will be significantly impacted.

All irrigation meter accounts in the service have been under a water budget system since approximately 2010. This includes all City and County parks, schools, business park irrigation when a dedicated irrigation meter is present and large residential properties that have a dedicated irrigation meter. The early system was an advisory water budget program called WaterFluence. This program was innovative in that it provided a water budget report to customers on a monthly basis. The water budget for each site is calculated using a combination of factors including the site irrigated area in square feet, and actual weather conditions such as evapotranspiration, precipitation and temperature.

The water reports show the site water usage on a graph in comparison to the water budget. An example of the budget graph is shown below in **Figure 5**.

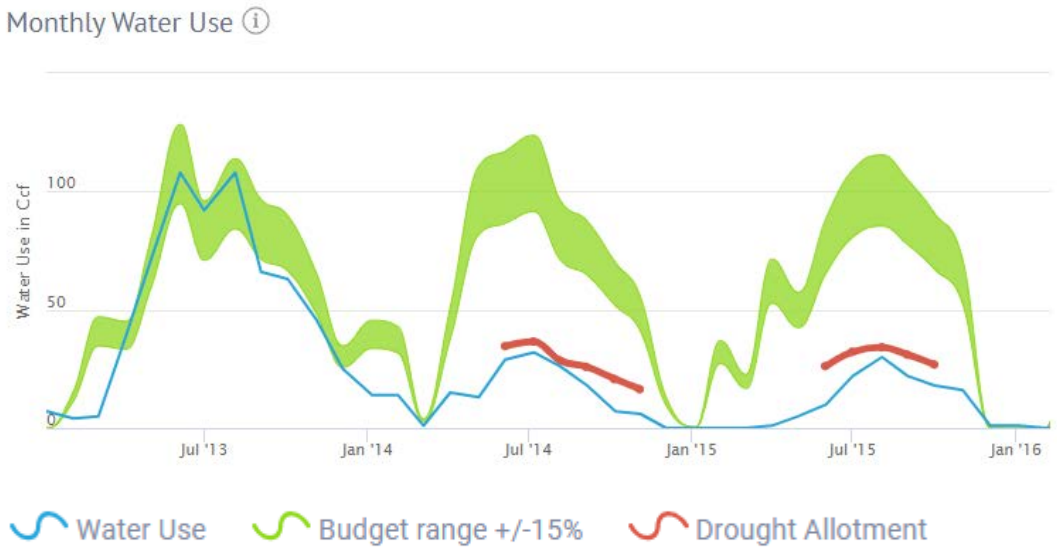
Figure 5 WaterFluence Water Budget Example
(Water Use in CCF)



During the drought of 2014-2015, the irrigation customer class was “rationed” by reducing its water budget using WaterFluence. This was an innovative methodology at the time; it was a new way to easily communicate the shortage level to irrigation customers.

Figure 6 shows an example of a site water budget during the drought; the red line shows the rationed drought allotment. In this example, actual water use is below the allotment, meaning this customer was adhering to the new allotment and lowered actual water use to stay within it.

Figure 6 WaterFluence Drought Allotment Water Budget Example



The WaterFluence program is still being implemented today with some advancements in technology. However, one limitation to the program is that it provides information after the fact. That is, customers get a water report showing the usage for the prior month and how that usage compared to the budget.

In 2016 Santa Cruz Water introduced new water rates as the beginning of a five year rate increase. Included in the new rates was the introduction of water budget based rates for irrigation accounts. In order to implement budget based rates for irrigation customers, a new water budget approach had to be designed that would be forward looking, instead of the WaterFluence that looks at the prior month's consumption. The new water budgets were developed using a formula based on the site irrigated area, a crop coefficient, and average reference evaporation (ETo) from the Santa Cruz Delaveaga CIMIS weather station. This process allows the calculation of water budgets for each account for all 12 months of the year. The compromise of this approach is that the water budget is calculated using average monthly weather (ETo as a proxy) instead of the approach of WaterFluence which takes into account the actual weather and rainfall that occurred during the month that the usage occurs.

With the new methodology, all dedicated irrigation meters, with the exception of City of Santa Cruz accounts (such as city parks, median strips, etc.), are now on water budget based rates. Now that the city has water budget based rates, it is possible to create drought allocations for each account for each stage of a shortage. The allocations will be a percent reduction from the current monthly water budget amount.

Given that City of Santa Cruz accounts are in the municipal class, including city parks which have a considerable amount of irrigation but not budget based rates, these accounts will be handled slightly differently, as described in a subsequent section. **Table 17** shows the reduction amounts for each stage for the landscape irrigation class.

Table 17 Percent of normal deliveries during a shortage for Landscape Irrigation

Customer Class	Peak Season Demand 2016-2018	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
		Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)
Landscape Irrigation	59	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)
		75%	50%	25%	0%	0%
		44	30	15	0	0

Table 18 shows an example of an irrigation account and the water budget for the water budget based rates system. The site irrigated area is 8,452 square feet, which results in an annual water budget of 281 CCF. By the time Stages 4, 5 & 6 are reached, water available for irrigation has been fully restricted and all landscape irrigation is prohibited.

Table 18 Irrigation Account Water Budget & Drought Allocation

Monthly Distribution					Peak Season							
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Budget CCF	11	14	20	28	33	33	36	33	28	22	14	9
Stage 1					25	25	27	25	21	17		
Stage 2					17	17	18	17	14	11		
Stage 3					8	8	9	8	7	6		
Stage 4					0	0	0	0	0	0		
Stage 5					0	0	0	0	0	0		

Golf Course Irrigation

The golf customer class consists of the two major golf course accounts located in the service area of the Santa Cruz Water Department. These two courses are 1) the public Delaveaga Course and 2) the private Pasatiempo Course. Golf course water use is considered to be a combination of both the commerce and the irrigation usage priority, as shown below in Table 19. This determination, which takes into account the nature of the golf course both as business use and discretionary irrigation use, was a result of a compromise during the development of the last WSCP. This plan will continue to use this determination of usage priority for golf courses.

Table 19 Usage priority chart for Golf Course Irrigation

Peak Season 2016-2018	Usage Priority (million gallons)			
Customer Class:	1	2	3	Total
	Health/Safety	Commerce	Irrigation	
Golf Course Irrigation	0	17	33	50

Table 20 shows an example showing the golf course irrigation sector. In this example, you can see that in higher stages of shortage golf irrigation is mostly reduced to the point where it is effectively eliminated.

Table 20 Percent of normal deliveries during a shortage for Golf Course Irrigation

Customer Class	Peak Season Demand 2016-2018 (Million Gallons)	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
		Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)
Golf Course Irrigation	50	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)
		82%	64%	45%	26%	10%
		41	32	23	13	5

To provide an allocation for the golf course, the approach will be based on the peak season average for the 2016-2018 base year period.

Table 21 shows the golf course usage for Delaveaga Golf Course and the corresponding allocations for each stage.

Table 21 Example of Allocation for Delaveaga Golf Course

Peak Season Demand 2016-2018 (CCF)	7,149
Allocation @ Stage 1 (82% of normal)	5862
Allocation @ Stage 2 (64% of normal)	4575
Allocation @ Stage 3 (45% of normal)	3217
Allocation @ Stage 4 (26% of normal)	1859
Allocation @ Stage 5 (10% of normal)	715

North Coast Agriculture

The North Coast Irrigation customer class is different yet again from all the other customer classes. This group of customers consists of approximately 12 separate farms that stretch along the north coast of Santa Cruz from the northern city limits all the way to roughly Liddell Springs. These farms have a mix of water supplies including some limited groundwater, surface water and metered connections to the City of Santa Cruz raw water system. Although there is not a huge variety in the types of crops grown on these farms, the water usage from account to account does vary widely. The variation in water use from account to account is based on a range of factors including the crop type planted in any given season, the availability of water from non-city water sources, leaks on the account's water system and other factors.

Table 22 below is an excerpt from Table 8 that shows the reduction goals just for the North Coast Irrigation class. The percent reductions for each stage are shown as well as the resulting volume of water.

Table 22 Reduction Goals for the North Coast Agriculture Class

Customer Class	Peak Season Demand 2016-2018 (Million Gallons)	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
		Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)
Coast Irrigation	13	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)
		95%	90%	85%	75%	30%
		12	12	11	10	4

The intent of designing an allocation system for the Coast Agriculture class is to treat this class similar to the business class. That is, it would be ideal to mimic the business class allocation system by using an individual customer account allocation, reducing at each stage from a base year. This approach makes sense given the unique water use characteristics of the coast irrigation customers. However, what is different between this group and the business class is that with the north coast irrigation customers, it seems impossible to pick a base year that would work for all the accounts. For the business customer class, we are using a base year that is the most recent year without a drought, which is when usage was considered to be "normal". For north coast irrigation class, given that these customers have other water sources that they would prefer to use during normal years, and then only rely on city water heavily during drought years, it does not make sense to select the most recent single year without a drought as base year. If that were done, then the allocation would end up giving this group of customers much less water than they would need to operate if a drought did occur. On the other hand, one of the goals of the allocation system is to ensure that reduction goals are met for each and every customer class, so that overall reduction goals are met at each stage of a shortage. Thus picking a drought year as the base year doesn't work either, as it would provide much more water to these customers (given that they historically use more city water during a drought) than is appropriate for the overall plan.

Our solution to the allocation system for this customer class is to use the base year period that is used throughout this plan: 2016-2018. This is a period in which overall usage for the service area was

relatively stable and not a drought. The approach would be to take the three year average for each month of the peak season using the base years 2016-2018. This monthly average is then the basis from which reductions are made according to Table 22. **The following Table 23** shows an example Coast Agriculture account and the resulting allocations for Stage 1 and for Stage 2 (higher stages not shown for brevity).

Table 23 Example Reduction by Stage for a Coast Agriculture Account

2016-2018 Baseline (data in CCF)	May	June	July	August	September	October
	29	37	56	44	35	50
Allocation at Stage 1 (95%)	28	35	53	42	33	48
Allocation at Stage 2 (90%)	25	32	48	38	30	43

UCSC

The University of California Santa Cruz (UCSC) is one of the largest single customers of the City of Santa Cruz Water Department. In 2019, UCSC used 162.7 MG, or nearly 7% of the total consumption for the calendar year. This usage amount is a combination of the main campus (154.3 MG) and the Marine Science Campus (8.34 MG). Of this total, 91 MG was used during the peak season.

Table 24 shows the breakdown of usage by usage priority in the peak season from the 2016-2018 base years. What is apparent from the table is that the majority of usage in the UCSC category is for health and safety. For this reason, the reduction targets during a shortage are not as dramatically cut as with a category that has more discretionary use.

Table 24 Usage priority chart for UCSC

Peak Season Demand 2016-2018 (Million Gallons)	Usage Priority (million gallons)			
Customer Class:	1 Health/Safety	2 Commerce	3 Irrigation	Total
UCSC	71		20	91

Table 25 shows the reduction targets at each stage for UCSC. Although the cuts at each stage are not as dramatic as with some other customer categories, these reduction targets still represent significant challenges for usage reduction at the campus. This is due to the fact that UCSC has a history of implementing significant water use efficiency measures over the last decade. While UCSC population has grown over the years, the University has implemented extensive conservation measures to keep demand from growing. The usage for the main campus only a decade ago in 2009 was 151 MG and in 2019 it was 154 MG, despite campus enrollment going from about 16,000 to close to 19,000. The

efforts by UCSC to keep demand low are laudable but, given conservation measures already put in place, it may pose some challenges in terms of meeting reduction targets during a severe shortage. The challenges that UCSC faces during a severe shortage parallel those of the City at large.

The allocation scheme for UCSC is similar to the north coast agriculture class; the average usage for each month of the peak season will be calculated from the base year 2016-2018. These monthly averages will be the basis for which the reductions will be taken at each shortage stage.

Table 25 Percent of normal deliveries during a shortage for UCSC

Customer Class	Peak Season Demand 2016-2018 (Million Gallons)	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
		Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)
UC Santa Cruz	91	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)
		91%	81%	72%	62%	55%
		82	74	65	57	50

Municipal

The Municipal category is comprised of City of Santa Cruz accounts. These accounts are primarily for city owned facilities such as offices, civic centers, the city corporation yard, as well as all city irrigation accounts for parks, public facilities and median strips. The municipal category of accounts are called “interdepartmental” within the customer billing system. Interdepartmental accounts are charged at the uniform water rate, similar to the business customer class. The fact that there is a significant portion of irrigation in the municipal class, as illustrated in **Table 26**, means that there needs to be a mechanism by which city irrigation accounts receive an allocation. Unlike regular irrigation accounts, city irrigation accounts do not get charged water budget based rates. There are several reasons for why this is the case. The primary reason is that most city irrigation accounts are parks. City parks were constructed decades ago and were not designed with dedicated irrigation meters at all sites. The majority of the parks have complicated systems with irrigation and some facility use on the same meter (such as bathrooms and drinking fountains). The process to go through each park now and separate the meters and piping to dedicate a meter to only irrigation would be cost prohibitive.

Therefore, the water budget approach as described in the irrigation section, for demand reductions is not possible for the municipal class. City irrigation accounts do receive an advisory water budget, but for the purposes of this plan another approach is needed.

The simplest solution is to create allocations using the 2016-2018 base year similar to what was proposed for UCSC. The month by month average during the peak season from these base years will be the basis from which the reductions will take place. **Table 27** shows the reduction targets for each stage of a shortage for the municipal class.

Due to the mixed nature of the water uses at parks and park facilities (bathrooms, pools, drinking fountains in addition to landscape irrigation) and the difficulty of managing water allocations at such sites, the Parks Department may opt to aggregate a select number of sites together for the purposes of managing the shortage.

Table 26 Usage priority chart for the municipal customer class

Peak Season Demand 2016-2018 (Million Gallons)	Usage Priority (million gallons)			
Customer Class:	1 Health/Safety	2 Commerce	3 Irrigation	Total
Municipal	7		26	33

Table 27 Percent of normal deliveries during a shortage for the municipal class

Customer Class	Peak Season Demand 2016-2018 (Million Gallons)	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
		Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)	Delivery (%)
Municipal	33	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)	Volume (MG)
		79%	58%	38%	17%	15%
		26	19	12	6	5

Implementation

Timeline for Declaring Water Shortage

Water Department staff typically begins assessing the potential for a peak season shortage in early winter. However, staff's recommendation to the City Council for a water shortage declaration can occur as soon as water supply conditions warrant. Typically, staff completes the annual assessment and develops any recommendation for a shortage near the end of March when the water supply outlook for the year ahead becomes more certain. **Table 30** shows the timeline for declaration of a water shortage.

Table 30 Timeline for Declaration of a Water Shortage

Target Date	Action
Months of Oct -Dec	Monitor rainfall, reservoir level, and runoff amounts
Late January	Prepare written status report on water supply conditions
Early February	Present initial estimate of water supply availability for year ahead
March	Conduct revised estimate of water supply availability for year ahead and need for shortage declaration
Early April	Present final supply outlook and recommendation to Water Commission; notice of public hearing published if a shortage will be declared
Mid-April	City Council formally declares water supply shortage, adopts emergency ordinance (if needed)
May 1st	Water shortage regulations become effective (if needed)

Shortages are declared for one season at a time. Typically the Department does not change the shortage stage within a season but has the discretion to do so if warranted. Long-range weather forecasting has not yet advanced to the point where it is possible to know with any degree of certainty whether drought conditions might persist for more than one year. Given the City's vulnerability to droughts, resulting from having limited seasonal storage, City staff's annual supply analysis will typically emphasize maintaining reasonable levels of carry over storage in Loch Lomond from one year to the next in order to mitigate the potential impacts of a second dry year on available supply.

Process for Declaring Water Shortage

Monthly Water Commission meetings serve as a routine public forum for discussing water conditions and for hearing issues associated with implementation of the water shortage ordinance throughout the entire duration of the water shortage event. In mid-winter staff provides a first look at the water supply situation for the upcoming peak season, with a more definitive forecast and drought declaration recommendation, if any, presented to the Water Commission in March or April.

Following consideration by the Water Commission, formal action declaring a water shortage is taken by City Council. The section of the Santa Cruz Municipal Code that references shortage declaration is as follows:

> **16.01.020 DECLARATION OF WATER SHORTAGE**
> *The provisions of this chapter shall take effect whenever the director, upon engineering analysis of city water supplies, finds and determines that a water shortage exists or is imminent within the city of Santa Cruz water service area and a declaration of a water shortage is made by a resolution of the city council, and they shall remain in effect for the duration of the water shortage set forth in the resolution.*

Effects of Water Shortages on Water Revenues and the Drought Cost Recovery Fee

Starting with the 2016 water rate increase, implementation of a Drought Cost Recovery Fee specified in the rate resolution and linked to each stage of restrictions is available for automatic implementation once the Council declares a shortage. The Drought Cost Recovery Fee is set to recover lost revenue associated with restricting water demand and is collected as a monthly fixed fee based on meter size for a whole fiscal year. The reason for collecting the fee over a full year rather than over just the six peak season months where restrictions are typically in place is to mitigate the financial impact of the fee by spreading it out. **Table 31** provides the new 5-year drought cost recovery fees for each meter size. This table only shows the amount for a Stage 2 shortage as an example. To view the drought cost recovery fee for other shortage levels, please refer to the 2020 UWMP Appendix S, the Proposition 218 Notification for the new rate package.

Table 31 Drought Cost Recovery Fee Details

Meter Size	Proposed FY 2023 Charge	Proposed FY 2024 Charge	Proposed FY 2025 Charge	Proposed FY 2026 Charge	Proposed FY 2027 Charge
5/8 inch	$21.05	$24.46	$28.42	$30.38	$32.48
3/4 inch	$31.58	$36.70	$42.64	$45.58	$48.73
1 inch	$52.63	$61.16	$71.06	$75.97	$81.21
1-1/2 inch	$105.25	$122.30	$142.11	$151.92	$162.40
2 inch	$168.40	$195.68	$227.38	$243.07	$259.84
3 inch	$368.37	$428.05	$497.39	$531.71	$568.40
4 inch	$663.06	$770.48	$895.29	$957.07	$1,023.11
6 inch	$1,368.21	$1,589.86	$1,847.42	$1,974.89	$2,111.16
8 inch	$2,946.91	$3,424.31	$3,979.05	$4,253.60	$4,547.10
10 inch	$4,420.37	$5,136.47	$5,968.58	$6,380.41	$6,820.66

The approach for implementing a drought cost recovery fee will be updated and will continue to be used to mitigate the impact of lower water sales on the Water Department's revenues. As is currently the case, any Drought Cost Recovery Fee will only be levied during an officially declared incident of water restrictions. The amount recovered by the fee is indexed to the shortage stage. The fee will be implemented over a whole fiscal year as a fixed charge, by meter size, on the customer's water bill.

Communication Protocols

After decades of frequent water supply shortages, Santa Cruz Water Department customers are predisposed to use water wisely, and are typically responsive to calls for increased conservation. With that said, the community's ongoing commitment to water use efficiency also means that it is more difficult for customers to further cut their already slim household daily water use. Therefore a robust communications plan utilizing many communications tools and platforms will be necessary to ensure that customers understand the seriousness of additional calls for conservation. In addition, given that this shortage plan, unlike the prior plan, relies on allocations at all stages of shortage, it is crucial that all communications will explain the basic concepts regarding the allocation system and point the

customers to various resources that will be available to help them both understand and adapt to the new allocation system.

Drawing from past experiences with supply shortages as well as mandatory water rationing, SCWD will utilize two sets of communication protocols: **general messaging**, focusing on the broad public including residents and visitors; and **specific messaging**, focusing on individual customers. All messaging will be shared in both English and Spanish languages.

The general structure of the communications protocol is as follows:

1) **General Messaging**: This section of communication will be broad in nature and be directed to all customers groups, visitors and water users. General messaging will be akin to an awareness campaign to inform water users about the nature of the water shortage and the implementation of the water shortage plan including the new allocation system. The tools or means of communication for the general messaging will include, but not be limited to: social media channels, email and print newsletters as well as paid & earned media.

2) **Specific/Targeted Messaging**: This section of communication will be a second element in the overall communication strategy. Specific messaging is designed for informing individual customers of their allocation and primarily for those customers who, based on their recent usage history, are expected to exceed their allocation. The specific messaging will come in the form of personalized direct print or email letters. Examples of these specific customer letters are included in Appendix B. These two letters were used in the past and similar letters will be used again under this plan.

   The first letter is an example of an initial notification to let customers know, based on their average use in the peak season, that their usage is above the allocation that has been set for the given stage of shortage. The example of a second letter, the so called “last chance” letter, is to inform customers that the allocation system is about to begin and they may be subject to the excess use penalties if their high usage continues.

   In addition to the letters mentioned above, customers will be referred to the Department’s new WaterSmart customer web portal. This is a web resource where customers will be able to view their water use and how it compares to their allocation. Customers can also use this resource to find customized water conservation tips for their particular property.

3) **Customer Resources**: In addition to the two communication strategies (general messaging and specific messaging) described above, a third and important communication element is that of customer resources. These resources, primarily in the form of various customer web pages, forms and online tools, are available in order to provide a wide variety of information to help customers during a shortage. These resources include, among others, information about the allocation exception process. For example, these web pages provide information about the health & safety exception and the exception process to increase a customer allocation based on additional occupancy. The web pages will also explain the allocation system for business and other customer classes and provide example allocations for informational purposes. In addition to web resources about the allotment system, a complementary set of resources will be

available on conservation topics, providing a suite of advice for customers to assist them in assessing their water use and identifying strategies to lower their usage to stay within the allocations.

Examples of each of the communication elements are shown below in **Table 32**.

Table 32

Communication Element	Tools/Methodology	Concept
(1) General	Social media, paid and earned media, newsletters, bill inserts	Broad messages regarding nature of water shortage and shortage stage, need for allocations and basic structure of allocation
Example: "The Water Department has evaluated water supply conditions and has determined that a Stage 2 shortage declaration is warranted. Due to the low water demand characteristics in recent years, the Department has developed a shortage response plan that is based on customer allocations at all stages of shortage. Please refer to the customer resource web pages on the Department website for information about the allocation system"		
(2) Specific	Pesonalized customer letter/email communications	Individual personalized letters for customers who the department expects to exceed their allotment, based on historical usage patterns
Example: "Based on your recent usage patterns, it appears that typical usage for your household is 7 CCF. Given that the new customer allocation for single family residential homes is 5 CCF, if your normal usage continues you will be over allocation by 2 CCF. Please refer to the Department's web resources for information on how you can reduce your usage and stay within your allocation."		
(3) Resources	Water Department Web Pages, WaterSmart Software Customer Portal Information	Customer service related web pages that explain allocation system and provides information about the exception process.
Example: "The Water Shortage Contingency Plan has a process for exceptions to the alloation system. Exceptions are made for only two types of reasons: 1) Health & Safety issues and 2) Additional household occupancy. The following sections explain each of these exception categories and provide the corresponding forms to applying for an exception."		

Administrative Enforcement

The Santa Cruz Municipal Code Section 16.01.140 (c), Penalties, includes the following statement that describes the fundamental purpose for and goal of establishing and implementing an administrative enforcement mechanism for the provisions of the Water Shortage Contingency Plan:

> *"The purpose of the administrative penalties assessed pursuant to this section is to assure future chapter compliance by the cited customer through the imposition of increasingly significant penalties so as to create a meaningful disincentive to commit future chapter violations. In acknowledgment of the fact that the city's water is a scarce and irreplaceable commodity and that this chapter is intended to equitably distribute that commodity among water department customers and to assure that, to the extent feasible, city water is conserved and used only for purposes deemed necessary for public health and safety, the penalty schedule herein prescribed is not to be construed as creating a "water pricing" structure pursuant to which customers may elect to pay for additional water at significantly higher rates. To this end, a customer's repeated violation of this chapter shall result in either the installation of a flow restriction device or disconnection of the customer's property from the city's water service system at the customer's cost."*

Excessive Use Penalty

The foundation of the demand reduction measures in this plan is the water allocation system. In order for an allocation system to work, there needs to be a financial disincentive for customers to stay within their allocation. The way this typically works is to use Excessive Use Penalty fees for use above customer allocations. These penalties are applied to a customer's water bill when the billing system detects that usage in a month exceeds the customer's allocation. The account holder is the party that is responsible for paying any excess use penalties applied to the account as a result of use over-allotment.

The schedule for the administrative penalties will be the same as in the prior plan, a two-tiered as shown below in **Table 33**.

Table 33 Administrative Penalties

Excess Use Range	Percent of water used in excess of allotment	Excessive Us Penalty Fee per 100 Cubic Feet for all water used in excess of allotment (in addition to regular water consumption charges)
A	1 CCF over allotment up to 10%	$25
B	Greater than 10% over allotment	$50

The purpose of a two-tier excess use structure is to avoid very large penalties for households that make a good faith effort to stay within their allocation but wind up going over a little. If a customer's water use exceeds one's allocation by a large amount, though, the penalty should be very steep.

Examples of the impacts of applying excess use penalties for single-family residential customers when Stage 2 or above restrictions are in place are shown below in **Table 34**.

Table 34 How Excess Use Penalties Would Apply

	Monthly Allocation (CCF)	Actual Usage (CCF)	Level 1, Excessive Use (1 CCF to 10%), $25/CCF	Level 2, Excessive Use (over 10%), $50/CCF	Total Excessive Use Penalties
Single Family Residential	5	6	1	0	$25
	5	7	1	1	$75
	5	10	1	4	$225
*meter charge, infrastructure reinvestment fee, and other fees not shown					

As described later in this section, SFR or MFR customers whose household size is larger than three people will have the opportunity to provide documentation to increase their household allocations. This exception provision is designed to avoid having larger households routinely exceed their

allotments and receive excessive use penalties. However, to maintain equity and ensure that all similarly situated customers are treated fairly, customers who don't qualify for additional allocations and who persistently use more than their allocated amounts are subject to additional measures to bring their consumption in line with requirements. One such measure is the installation of flow restrictors. Another is disconnecting a customer's service. These measures are briefly described below. Additional administrative enforcement measures are described in the Santa Cruz Municipal Code Title 16, Chapter 16.01.

Water School

During the drought of 2014 & 2015, Santa Cruz implemented a novel approach for working with customers who had incurred large excess use penalties. A process was set up to allow for a one-time forgiveness of excess use penalties while under water rationing. To be considered for such forgiveness, the customer was required to sign up and complete a short weekend or evening course that became known as "water school". This course covered topics such as basic meter reading, leak detection, and other topics relevant to the water restrictions in place at the time. This approach (like traffic school) would help reduce the number of cases heard by the hearing officer, provide financial relief to customers receiving high bills, and most importantly, would give them the opportunity, education, and tools they need to achieve ongoing compliance with water use rules and regulations for the remainder of the shortage. Similarly, water school would give customers the tools and education needed to help them stay within the new allocations.

The process of providing penalty forgiveness for customers by attending water school will continue under this new plan. By the time this plan is implemented there may be an online version of water school available so customers wouldn't need to attend in person.

Flow Restriction

Some customers will continue to exceed their allotment regardless of the amount of their water bill. In such instances, the Water Department is authorized to install a flow restricting device to provide minimal water flow, just enough for health and safety purposes. In these cases the customer is charged a fee to cover the staff time needed to install the flow restrictor and another fee for its removal. The Water Department would not use this method where fire suppression sprinklers are on the same supply line as domestic water.

Disconnection/reconnection fees: Water suppliers have the legal authority to enforce water shortage regulations by terminating service for egregious violations. In such cases, the customer would be charged for both disconnection and reconnection.

Water Waste Prohibition and Enforcement of Water Waste Prohibitions

During a water shortage, in addition to complying with water allocations, customers will also need to comply with existing water waste prohibitions. In cases such as a report of water waste, Water Department staff will take steps to communicate with the customer by telephone, letter, door tag, or by making personal contact in the field to provide information about water waste regulations. Many times this contact is all that is required to get the problem resolved. If not, enforcement progresses to a written notice of violation. Beyond this, there are several methods in the City's existing water conservation and water shortage ordinances that can be used to enforce water waste restrictions and regulations. These methods are described below.

Penalty fees for Water Waste: For repeated violations of the City's water waste ordinance, a penalty fee may be issued to a customer's utility bill. This would occur after written notice sent to the customer in advance. The penalty fee would increase with subsequent violations as follows:

1st Violation $100
2nd Violation $250
3rd Violation $500
4th Violation $1,000

Exceptions

No water shortage plan can account for all situations. The exception procedure allows the Water Department to provide for special or exceptional circumstances that otherwise would create undue hardship for an individual customer or class of customers.

An exception allows a customer to be relieved of a particular regulation or receive an increased allocation for the duration of the shortage. Therefore, it should be granted only when justified on specific grounds that warrant allocating more water than is allocated to other similarly situated customers and when consistent with the intent of the water shortage regulations, while providing equal treatment of all customers.

As stated previously in other sections, the allotments are assuming a household or dwelling unit with 3 person occupancy. A customer may request more water on the basis of having additional occupancy beyond the base 3 persons per household or dwelling unit. Exceptions for more water will be processed on a case by case basis. Exceptions will be evaluated by the department and if granted, additional water will be granted at the amount number of residents greater than three times 1.67 (rounded up). 1.67 is the product of five CCF divided by three people.

Additional water allotment will only be granted for the following reasons:

- Additional occupancy beyond three persons per household
- Requests specifically related to health and safety purposes including:
    - Operating a home day care facility or providing in home medical care for an individual with serious medical issues.
    - Operation of a sober living home.
    - Specific medical conditions that require an individual to use more water at home to treat or maintain quality of life related to that medical condition.

The following situations are common inquiries made by customers asking for additional water allotment, however these situations do not qualify for an exception.

- Water for growing edible food, vegetable gardens, fruit trees
- Water for maintaining common area landscaping that is served by the water meter of an individual residence
- Water for overnight visitors/guests or for hosting large events/parties
- Water for livestock, pets, horses
- Water to maintain pools, spas, ponds or other water features
- Water to maintain landscape areas for fire protection purposes or erosion control

- Water for in-home businesses such as hair or nail salons, cottage industry production, or any other in-home business (with the exception of child-care centers and sober living homes)

Another situation that is a common topic of an exception request by customers is that of water for short-term vacation rental (STVR) properties. Both the City and the County of Santa Cruz issue STVR permits of two types: 1) Hosted STVR permits, and 2) Non-hosted STVR permits. Hosted STVR permits indicate that the residents live at the property as well as rent-out a portion of the property. Non-hosted STVR permits indicate that the entire property is rented out and that the account holder does not live at the property. Additional water allotments may be granted only for the permanent residents living at hosted STVR properties and not for the vacationers. Conversely, no additional water allotment may be granted for non-hosted STVR properties.

The Department's customer resources will include web pages dedicated to explaining the customer allotments and the exception process. The forms to apply for an exception will be posted on the forms section of the WaterSmart customer web portal. Customers will need to complete and submit an exception form certifying that they have a health and safety related reason for applying for the exception. Such requests for additional allotment due to a medical condition will require the provision of a signed note from the individual's doctor in order to substantiate the request. For exceptions related to occupancy, specifically for households that have greater than three residents, customers are directed to use the WaterSmart portal to change their household occupancy, which will then result in the department updating the customer's water allotment.

Appeals

To ensure fairness and due process, customers should be able to appeal a denial by the Water Director of such an exception request to the hearing officer. Section 16.01.130 of the City's Municipal Code (Water Shortage Appeals) allows any water service customer who considers an enforcement action to have been erroneously undertaken to appeal their case before a City appointed administrative hearing officer. The independent hearing officer is usually a local attorney, chosen from a hearing officer panel that is updated periodically by the City Attorney's Office. The officer would consider the evidence presented by the customer and the Department and decide whether to uphold the enforcement action or to provide relief.

Monitoring and Reporting

There are two general components to monitoring and reporting. One part is the ongoing reporting to the state, which the department is already doing. This is the ongoing monthly production reporting to the State Water Resources Control Board. Each month the department reports both overall production as well as gallons per capita per day to the board. This reporting will continue throughout any water shortage that may occur. In that sense, the department is already committed to tracking production and reporting it. The data that the department reports is publicly available and thus customers can see how water use is tracking over time.

Another phase of monitoring and reporting that could come into play specifically during a shortage is that of month-by-month presentation of usage data to customers. In other words, during a shortage, a

special web page would be created to display usage data and progress on meeting reduction goals.

Water Shortage Recovery and Plan Termination

A water shortage ends when local rainfall, runoff, and reservoir storage levels improve to the point where the water system is once again capable of supporting unrestricted water demand. Any water use rules and regulations in effect at the time are officially rescinded by City Council and public notice is given that the water shortage is over. The Water Director would then oversee any remaining termination and plan review activities. These activities could include:

- Publicize gratitude for the community's cooperation
- Restore water utility operations, organization, and services to pre-event levels
- Document the event and response and compile applicable records for future reference
- Continue to maintain liaison as needed with external agencies
- Collect cost accounting information, assess revenue losses and financial impact, and review deferred projects or programs
- Debrief staff to review effectiveness of actions, to identify the lessons learned, and to enhance response and recovery efforts in the future
- Complete a detailed evaluation of affected facilities and services to prepare an "after action" report
- Update the water shortage contingency plan as needed

Procedure for Making Refinements to the Water Shortage Contingency Plan

Following implementation of this shortage plan there will be an internal department process that will look at the experience overall and make recommendations for how the process could be improved. The review process will be conducted by a sub-section of Water Department managers who were involved with different aspects of administering the plan. In order to make sure that the implementation of the shortage plan improves over time until the plan is updated again, the review process will occur each time that there is a shortage and the plan is implemented. The results of the review will be documented in a department memo and a team will be designated to put the recommendations into effect for improvement during the next shortage plan implementation.

The water saving goals of each stage, and the means of achieving these goals have been carefully considered and crafted. Implementation of each stage requires actions (staffing and other resources) early in the water year. Deviations from the plan and its procedures during a water shortage should only be done after careful analysis of the savings to date, the degree to which water savings goals are being met, and how changing the plan mid-water shortage would benefit the community and the water situation.

Appendix A: Implementation Actions by Stage

Note about pools, spas and water features:

As stated in California Water Code Section 10632 (b), *an urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.* Furthermore, guidance from the California Department of Water Resources (DWR) states the following: *Applicable only to Retail Supplier's planning, water features that are not pools or spas are analyzed and defined separately from pools and spas in the WSCP. Non-pool or non-spa water features may use or be able to use recycled water, whereas pools and spas must use potable water for health and safety considerations. Limitations to pools and spas may require different considerations compared to non-pool or non-spa water features.*

This WSCP relies on an allocation system and does not state any prescriptive restrictions on the filling of pools, spas, or water features at various stages of shortage. Customers may use potable water for the purposes of filling pools, spas or water features, at their own discretion but while staying within their water allotment at each stage. It should be noted that the use of recycled water is not allowed for the filling of pools and spas specifically, as noted above in the California Water Code. Also, as stated in the implementation section above, customers may not receive any additional water allotment for the purposes of maintaining or filling of pools, spas, or other water features.

Stage 1 – Water Shortage Warning

Stage 1 applies to relatively minor water shortage that requires up to a 10% level of demand reduction. In the existing WSCP, this level of shortage was considered to be only require voluntary demand reduction measures along with some implementation of water waste enforcement. In this WSCP update the new allocation system applies to all stages. At Stage 1, advisory allocations are provided to customers but excess use penalties are not yet implemented.

An example of a public message that will be used in outreach to customers regarding a Stage 1 Water Shortage Alert will be similar to the following (subject to change):

"Due to abnormally dry conditions this winter, we're asking all customers to voluntarily cut back water use this summer by 10 percent to stretch the available water supply. City water users should stop using water for non-essential purposes and conserve where possible in case the dry period experienced this past winter continues into next year. If everyone cooperates, we may avoid imposing more stringent watering restrictions. As always, wasting water is prohibited by law."

Stage 1 Water Shortage **Warning**

If it is deemed necessary to declare a Stage 1 Water Shortage Warning, based on the water supply outlook made during the spring of each year, the following implementation actions will be taken (not in order of importance or timing):

Demand Reduction Measures:

- Implement and distribute advisory water allocations for all customers at the Stage 1 allocation level
- Step up enforcement of water waste ordinance

• Prohibit non-essential water use:

- Serving drinking water by restaurant or food service establishments except upon request
- Use of potable water for washing driveways, patios, parking lots or other paved surfaces
- Require hotel, motel, and other commercial lodging establishments to offer option of not laundering towels and linen daily
- Require hoses used for any purpose to have shut off nozzles

Publicity/Communications

- Create communication tool to inform customers of ways to reduce water use.
- Distribute and post press release to media, social media channels, City website.
- Create communication pieces including social media posts, direct mail, paid advertising.
- Create dedicated webpage.
- Dedicate monthly SCMU email newsletters to disseminating water shortage information.
- Utilize bi-annual utility newsletter.
- Inform large landscape/property manager/green industry of irrigation restrictions.
- Disseminate information for customers to learn how to read their meters.

Operating Actions

- Coordinate water conservation actions with other City Departments and public agencies
- Adopt water shortage ordinance prohibiting non-essential water use
- Eliminate system water uses deemed non-essential
- Delegate water waste patrol duties to all field personnel
- Undertake contingency planning for continuing/escalating shortage

Stage 2 – Water Shortage Alarm

Stage 2 applies to moderate water shortages with a demand reduction requirement of up to 20%. This condition requires more vigorous public information and outreach. The primary demand reduction measure that will be implemented at this stage and all stages going forward is the use of excess use penalties for water use above customer allocations.

An example of a public message that will be used in outreach to customers regarding a Stage 2 Water Shortage Alarm will be similar to the following (subject to change):

"It is necessary to impose mandatory restrictions on water use to ensure that throughout the duration of this water shortage an adequate supply of water is maintained for public health and safety purposes. Our overall goal is to reduce water use by 20 percent, which can be achieved if everyone adheres to their allocation. Unlike the advisory nature of the allocations at Stage 1, the seriousness of the shortage situation requires that the allocations are now mandatory. Excess use penalties will be applied to customer bills for water usage above allocation."

Stage 2 Water Shortage Alarm

If it is deemed necessary to declare a Stage 2 Water Shortage Alarm, based on the water supply outlook made during the spring of each year, the following implementation actions will be taken (not in order of importance or timing):

Demand Reduction Measures:

- Implement mandatory water allocations for all customers at the Stage 2 allocation level
- Implement excess use penalties for use over allocation
- Step up enforcement of water waste ordinance

Continue to prohibit non-essential water use described in Stage 1

Publicity/Communications

- All actions in Stage 1 Water Shortage Warning in addition to:
- Disseminate PSAs to targeted local radio and television stations.
- Regularly update the public on consumption and supply numbers.
- Include information in City Manager's monthly email newsletter.
- Initiate presentations to local Chambers of Commerce, business associations, board of realtors, etc.
- Inform large landscape/property managers/green industry of water budget reductions.
- Consult with major customers to develop conservation plans.
- Conduct workshops on large landscape requirements for property owners, contractors, and maintenance personnel.

Operating Actions

- Coordinate with all City Departments and public agencies to reduce water use
- Optimize existing sources (increase groundwater production, reduce transmission losses)
- Suspend main flushing except as required for emergency and essential operations
- Intensify distribution system leak detection and repair
- Hire, train, dispatch water waste patrol
- Undertake contingency planning for continuing/escalating shortage
- Develop strategy to mitigate revenue losses
- Stop issuing bulk water permits

Stage 3 – Water Shortage Emergency

Stage 3 applies to a serious water shortage with a demand reduction requirement of up to 30%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 3 levels (see Table 10 & 11 for SFR and MFR allocations).

An example of a public message that will be used in outreach to customers regarding a Stage 3 Water Shortage Emergency will be similar to the following (subject to change):

"The City faces a serious water shortage emergency due to prolonged drought.
Our overall goal is to reduce water use by 30 percent, which can be achieved if everyone adheres to their allocation. The situation is more serious than it was at stage 2; all customers are urgently asked to make every effort to conserve water and abide by watering restrictions or face further reductions in water allotments."

Stage 3 Water Shortage Emergency

If it is deemed necessary to declare a Stage 3 Water Shortage Emergency, based on the water supply outlook made during the spring of each year, the following implementation actions will be taken (not in order of importance or timing):

Demand Reduction Measures:

- Implement mandatory water allocations for all customers at the Stage 3 allocation level
- Continue to implement excess use penalties for use over allocation
- Further increase of water waste enforcement
- Institute a temporary water service connection ban
- Require all commercial customers to prominently display "save water" signage with specified language at specified location

<u>Continue to prohibit non-essential water use described in Stage 1</u>

Publicity/Communications

- All actions in Stage 2 Water Shortage Alarm in addition to:
- Provide regular, prescriptive media briefings.
- Provide regular and ongoing briefings to Water Commission, City Council, and other key stakeholders.
- Prepare communication pieces for possible future service connection moratorium.

Operating Actions

- Continue all operating actions listed under Stage 2
- Increase customer service training to address high bills and irate customers
- Expand size and coverage of water waste patrol
- Expand, strengthen water conservation education, activities, and program
- Increase frequency of monitoring and reporting of water production and consumption
- Undertake contingency planning for continuing/escalating shortage
- Develop strategy to mitigate revenue losses
- Shut down all bulk water stations

- Increase monitoring of unauthorized use from hydrants and other sources
- Stop issuing construction hydrant meters

Stage 4 – Severe Water Shortage

Stage 4 applies to a serious water shortage with a demand reduction requirement of up to 40%. This condition is a serious situation that will require significant reductions by each customer class. Allocations will be reduced to Stage 4 levels (see Table 10 & 11 for SFR and MFR allocations). The water supply conditions that would trigger Stage 4 parallel the difficult situation the City experienced in the drought of late 1970s. Under this scenario, virtually all available water must be reserved either for health and safety purposes or to sustain local business.

The public message that will be used in outreach to customers regarding a Stage 4 Water Shortage Emergency will be similar to the following (subject to change):

"Due to continuing deterioration in storage and overall scarcity of available supply, all customers, residential and business alike, are now unavoidably subject to water rationing. The current water shortage is among the most severe ever faced in modern times. We must all continue to conserve water to the maximum extent possible and strive to maintain water use within our established rationing allotments as long as the drought endures in order to avert a water crisis."

Severe Water Shortage

If it is deemed necessary to declare a Stage 4 Severe Water Shortage, based on the water supply outlook made during the spring of each year, the following implementation actions will be taken (not in order of importance or timing):

Demand Reduction Measures:

- Reduce water allocations for all customer classes to Stage 4 levels

<u>Continue to prohibit non-essential water use described in Stage 1</u>

Publicity/Communications

All actions in Stage 3 Water Shortage Emergency in addition to:

- Contract with outside PR agency to manage comprehensive public awareness campaign, including paid ads, earned media, direct mail, etc.
- Promote xeriscape landscaping.
- Partner with other water agencies to promote appropriate grey water use, etc.
- Prepare emergency messaging for possible critical water shortage utilizing Nixel, CodeRed, reverse 911.

Operating Actions

- Scale up administrative appeals staff to support hearing officer(s)
- Expand water waste enforcement to 24/7

Stage 5– Critical Water Shortage

Stage 5 represents an imminent and extraordinary crisis threatening health, safety, and security of the entire community. Under this dire situation, extreme measures are necessary to cut back water use by up to half the normal amount. Not enough water would exist even to meet the community's full health and safety needs, the top priority. **All water should be reserved for human consumption, sanitation, and fire protection purposes and any remaining amount allocated to minimize economic harm.** A shortage of this severity could be expected to generate stress and confusion, much the same as any major emergency and at some point could transform into a full blown natural disaster that can no longer be governed by local ordinance and may need to be managed by the basic principles and command structures of the state Standardized Emergency Management System. The City has experienced water shortages in the past but never one of such large proportion.

The Stage 5 public message is as follows:

"The City of Santa Cruz is confronted with a critical water shortage emergency of unprecedented proportions. At this time, there exists barely enough drinking water for the most essential human health, sanitation, and safety needs. As a result, all outdoor watering is now prohibited. We understand the hardship this extraordinary condition poses to every resident and business in the City and appreciate the sacrifices people are making to ensure that water system does not run dry. Everyone is urgently requested to do whatever is necessary to maintain water use within or below their allotted amount."

Critical Water Shortage

If it is deemed necessary to declare a Stage 5 Critical Water Shortage, based on the water supply outlook made during the spring of each year, the following implementation actions will be taken (not in order of importance or timing):

Demand Reduction Measures:

- Further reduce allocations for all customer classes
- Prohibit all outdoor irrigation
- No water for outdoor washing or recreational purposes; close pools, public showers
- Continue all measures initiated in prior stages as appropriate

Continue to prohibit non-essential water use described in Stage 1

Publicity/Communications

- All actions in Stage 4 Severe Water Shortage in addition to:
- Implement crisis/emergency communications including establishment of a Joint Information Center (JIC).
- Deploy prepared emergency messaging on Nixel, CodeRed, reverse 911.

Operating Actions

- Consider shifting to EOC model of command management for overall policy guidance and coordination
- Coordinate with CA Division of Drinking Water, District Engineer and other emergency response agencies regarding water quality, public health issues
- Coordinate with law enforcement agencies to address enforcement challenges
- Continue water waste enforcement 24/7
- Delegate field staff to assist in enforcement (shut offs, flow restrictors)
- Continue all applicable operating actions listed under Stage 4
- Coordinate with local sanitation agencies regarding sewer line maintenance
- Continue close monitoring and reporting of water production and consumption
- Investigate potential for reduced in-stream release
- Procure resources to utilize dead storage, if needed
- Undertake emergency planning for continuing/escalating shortage

Stage 6– Catastrophic Water Shortage

The required standardized shortage stages that are specified in CA Water Code Section 10632 do go up to a new required sixth stage which is "greater than 50 percent shortage." Although this stage is required in the plan, the local characteristics of water demand in Santa Cruz that have been described in this document make for a unique and challenging situation when it comes to implementing higher levels of shortage reduction. When it comes to Stage 6, the approach in this plan is that the Santa Cruz Water Department does not plan on ever reaching this stage in a shortage. Even when it comes to Stages 4 and 5, our approach is that the department will do everything in its power in terms of water supply augmentation in order to never reach these higher stages of shortage.

As was stated in the introduction, today's Water Supply Augmentation Strategy contains a number of new elements that were not being considered at the time the excising WSCP was written. The new strategy focuses on in-lieu water exchanges, aquifer storage and recovery (ASR), advanced treated recycled water and/or desalination, as well as ongoing water conservation. It is the Department's policy that working on and developing these new water supplies will reduce the number of occasions that this WSCP will need to be implemented. Furthermore, even small water supply augmentation efforts such as ASR or transferring water to neighboring water agencies for groundwater banking and eventual use during a shortage, can make incremental additions to water supplies that can decrease chances that a low level shortage will occur.

In terms of a Stage 6 Catastrophic Water Shortage, Santa Cruz takes the position that this level of shortage would most likely only occur due to a major disaster that caused significant damage to our water treatment and/or distribution infrastructure. In such a disaster, such as a large earthquake, the Santa Cruz response would not come from this WSCP, but rather from the main Santa Cruz Water Department Emergency Response Plan.

Appendix B: Customer Letters

Initial customer letter

Santa Cruz Municipal Utilities | 212 Locust Street, Suite D | Santa Cruz, CA 95060 | 420-5220

JOHN DOE

100 ANYWHERE ST
SANTA CRUZ CA 95060

INSERT DATE

Account:	001-00001-001
Service Address	100 ANYWHERE ST
Account Type:	Single Family Residential

Dear JOHN DOE:

A drought emergency has been declared for Santa Cruz Municipal Utilities customers. Rationing will begin May 1st for all residential customers. **You are receiving this letter because your average summer consumption is over your allotment, and steep penalties will be applied to any water used in excess of your allotment.***

Your average summer water use is	**7 CCF** per month.
Your allotment is	**5 CCF** per month.

Depending on how much you are over your allotment, you may be required to take significant action to avoid receiving excess use penalties. Remember: allotments are provided to meet basic indoor needs—landscape irrigation may need to be severely curtailed or shutoff to remain within your monthly allotment.

To track your water usage and see how you are doing compared to your allotment, please log into our WaterSmart customer web portal at https://santacruz.watersmart.com/index.php/welcome. On that website you can view your allotment as well as your monthly, daily, and hourly water use. This website also has personalized suggestions for you to save water based on your property information.

If you believe that you are over allotment because more than 3 people live at this address, you may apply for an additional allotment by visiting www.cityofsantacruz.com/drought and filling out an Application for Additional Water Allotment for Large Single Family Households.®

Sincerely,

Santa Cruz Municipal Utilities

*Your allotment may have changed if you have applied and qualified for an additional allotment. Your average summer consumption may have changed if you have made landscape changes in the last few months.

® Application for Additional Water Allotment for Large Single Family Households is not intended for short-term vacation rentals.

Second customer letter “Last chance letter”

Santa Cruz Municipal Utilities | 212 Locust Street, Suite D | Santa Cruz, CA 95060 | 420-5220

JOHN DOE

100 ANYWHERE ST
SANTA CRUZ CA 95060

INSERT DATE

Account:	001-00001-001
Service Address:	100 ANYWHERE ST

Dear JOHN DOE:

We want to alert you that your water consumption during the April – May service period exceeded your allotment:

April – May consumption:	7 CCF per month.
Your allotment:	5 CCF per month.

Fortunately, the April – May service period was not subject to excess use penalties. However, the current service period is, and steep penalties will be applied to any water used over your allotment from now until the water shortage emergency has ended.

To track your water usage and see how you are doing compared to your allotment, please log into our WaterSmart customer web portal at https://santacruz.watersmart.com/index.php/welcome. On that website you can view your allotment as well as your monthly, daily, and hourly water use. This website also has personalized suggestions for you to save water based on your property information.

For more information or questions, please contact conservation@cityofsantacruz.com

Sincerely,

Santa Cruz Municipal Utilities

Appendix C: Californian Water Code Section 10632

State of California WATER CODE Section 10632 10632. (a) Every urban water supplier shall prepare and adopt a water shortage contingency plan as part of its urban water management plan that consists of each of the following elements: (1) the analysis of water supply reliability conducted pursuant to Section 10635. (2) The procedures used in conducting an annual water supply and demand assessment that include, at a minimum, both of the following: (A) The written decision-making process that an urban water supplier will use each year to determine its water supply reliability. (B) The key data inputs and assessment methodology used to evaluate the urban water supplier's water supply reliability for the current year and one dry year, including all of the following: (i) Current year unconstrained demand, considering weather, growth, and other influencing factors, such as policies to manage current supplies to meet demand objectives in future years, as applicable. (ii) Current year available supply, considering hydrological and regulatory conditions in the current year and one dry year. The annual supply and demand assessment may consider more than one dry year solely at the discretion of the urban water supplier. (iii) Existing infrastructure capabilities and plausible constraints. (iv) A defined set of locally applicable evaluation criteria that are consistently relied upon for each annual water supply and demand assessment. (v) A description and quantification of each source of water supply. (3) (A) Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage. Urban water suppliers shall define these shortage levels based on the suppliers' water supply conditions, including percentage reductions in water supply, changes in groundwater levels, changes in surface elevation or level of subsidence, or other changes in hydrological or other local conditions indicative of the water supply available for use. Shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, and other potential emergency events. (B) An urban water supplier with an existing water shortage contingency plan that uses different water shortage levels may comply with the requirement in subparagraph (A) by developing and including a cross-reference relating its existing categories to the six standard water shortage levels.
(4) Shortage response actions that align with the defined shortage levels and include, at a minimum, all of the following: (A) Locally appropriate supply augmentation actions.
(B) Locally appropriate demand reduction actions to adequately respond to shortages.
(C) Locally appropriate operational changes. (D) Additional, mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and appropriate to the local conditions. (E) For each action, an estimate of the extent to which the gap between supplies and demand will be reduced by implementation of the action. (5) Communication protocols and procedures to inform customers, the public, interested parties, and local, regional, and state governments, regarding, at a minimum, all of the following: (A) Any current or predicted shortages as determined by the annual water supply and demand assessment described pursuant to Section 10632.1. (B) Any shortage response actions triggered or anticipated to be triggered by the annual water supply and demand assessment described pursuant to Section 10632.1. (C) Any other relevant communications. (6) For an urban retail water supplier, customer compliance, enforcement, appeal, and exemption procedures for triggered shortage response actions as determined pursuant to Section 10632.2. (7) (A) A description of the legal authorities that empower the urban water supplier to implement and

enforce its shortage response actions specified in paragraph (4) that may include, but are not limited to, statutory authorities, ordinances, resolutions, and contract provisions. (B) A statement that an urban water supplier shall declare a water shortage emergency in accordance with Chapter 3 (commencing with Section 350) of Division 1. (C) A statement that an urban water supplier shall coordinate with any city or county within which it provides water supply services for the possible proclamation of a local emergency, as defined in Section 8558 of the Government Code. (8) A description of the financial consequences of, and responses for, drought conditions, including, but not limited to, all of the following: (A) A description of potential revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4). (B) A description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4). (C) A description of the cost of compliance with Chapter 3.3 (commencing with Section 365) of Division 1. (9) For an urban retail water supplier, monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance and to meet state reporting requirements. (10) Reevaluation and improvement procedures for systematically monitoring and evaluating the functionality of the water shortage contingency plan in order to ensure shortage risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented as needed. (b) For purposes of developing the water shortage contingency plan pursuant to subdivision (a), an urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code. (c) The urban water supplier shall make available the water shortage contingency plan prepared pursuant to this article to its customers and any city or county within which it provides water supplies no later than 30 days after adoption of the water shortage contingency plan. (Repealed and added by Stats. 2018, Ch. 14, and Sec. 32. (SB 606) Effective January 1, 2019.)

POLICY ANALYSIS FOR THE PUBLIC AND PRIVATE SECTORS
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Technical Memorandum

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Subject: Water/Sewer Service Affordability Analysis

Contents

Background

M.Cubed completed a water service affordability analysis for the Water Department in 2016. That study addressed two questions in relation to proposed rate increases:

1. Is the ratio of annual water service cost to median household income (MHI) expected to exceed 2%?
2. What percentage of households are expected to pay more than 2% of their income for water service?

The 2% MHI threshold was based on proposed state legislation (AB 2334), which included it as a statewide standard for assessing water service affordability.[1] Similar thresholds also have been used by US EPA and the California Department of Public Health to assess water and sewer service affordability. More recently, other metrics have been proposed for assessing utility service affordability which are discussed in the next section.

The 2016 study concluded that annual water cost was expected to be less than 2% of MHI under all rate increase proposals, averaging slightly under 1% for inside-city customers and slightly over 1% for outside-city customers. However, the study also concluded that the percentage of customers paying more than 2% of their income for water service would likely increase from less than 10% under the rates existing at the time of the study to more than 20% under the proposed rates. Thus, water service costs potentially could constitute a financial burden for approximately one-fifth of residential customers under the proposed rate increases.

In 2016 the Water Department adopted a new rate design and a schedule of rate increases in order to pay for major water system rehabilitation and upgrade projects.[2] By 2020, the cost of residential water service had increased in nominal terms by roughly 50% to 100%, depending on the amount of water used by a household.[3]

Given the magnitude of the increases, the Water Department has requested that we update the water service affordability analysis we completed in 2016. The scope of work for this update specifies completion of the following tasks:

1. Compile data on household water use, income level, and other socio-economic status (SES) variables for all census block groups fully or partially within the Water Department's service

[1] Introduced in 2012, AB 2334 ultimately was not passed by the legislature.
[2] See https://www.cityofsantacruz.com/home/showdocument?id=53194.
[3] Current rates are based on those in effect between July 1, 2019 and June 30, 2020 (https://www.cityofsantacruz.com/home/showdocument?id=76586). A household using 4 CCF/Mo, the median monthly usage in 2019, would face an increase of 61%; a household using 7 CCF/Mo, the typical pre-2016 monthly usage, would face an increase of 78%; and a household using 10 CCF/Mo, a typical level of residential water use in other parts of California, would face an increase of 98%.

area. Using these data, calculate median monthly water use, MHI, and other SES indicators for each census block group.[4]

2. Calculate water service affordability metrics at the block group level. In addition to the metrics used in the 2016 study, affordability metrics used in more recent studies, such as the Alliance for Water Efficiency's study on Water Affordability in Detroit, Michigan (Alliance for Water Efficiency, 2020), should be developed.
3. Prepare a technical memorandum describing the data and methodology and summarizing the results of the affordability analysis.

This Technical Memorandum constitutes the completion of these tasks. The remainder of the memorandum is organized as follows. In the next section, we review alternative metrics that have been proposed for assessing utility service affordability. We then describe the construction of the affordability metrics used in this analysis. Lastly, we summarize our findings and recommendations. Attachment A provides the data and results of the analysis by census block group.

Review of Utility Service Affordability Metrics

Most water and sewer service affordability indicators stem from affordability criteria developed by EPA in the mid-1990s for assessing whether federal water and wastewater-related mandates might result in undue economic hardship within a community (Raucher, et al., 2019). Within the context of wastewater regulation, EPA put forward two impact measures:

- **Residential Indicator (RI)**. This indicator computes the average household cost of sewer service relative to service area MHI and bins the result into one of three categories:
    - Low financial impact: costs per household are less than 1% of MHI.
    - Mid-range financial impact: costs per household are between 1% and 2% of MHI.
    - High financial impact: costs per household are greater than 2% of MHI.

- **Financial Capability Index (FCI)**. This is a composite of six economic indicators of a municipality's financial capacity: municipal bond rating, net debt service, MHI, unemployment rate, property tax burden, and property tax rate. Lower composite scores imply weaker economic conditions and thus a greater likelihood federal mandates would cause substantial economic impact on the community or service area.

Whereas the RI is focused on household affordability, the FCI addresses the community's overall ability to pay for compliance costs. As noted by Raucher, et al. (2013), the two concepts are interrelated in the

[4] Block groups are statistical divisions of census tracts and generally defined to contain between 600 and 3,000 people. A block group covers a contiguous area and each census tract contains at least one block group. Within the standard census geographic hierarchy, block groups never cross state, county, or census tract boundaries. There are 84 block groups wholly or partially within the Water Department's service area.

sense that the community's ability to comply with water quality mandates depends on "the ability (and willingness) of its residential and other customers to provide sufficient revenue to assure sustainable utility operation and credit-worthiness."

During the same time period, EPA also considered the affordability of drinking water regulations within the context of small communities (those with populations under 10,000). Specifically, EPA stated it would deem a National Primary Drinking Water Regulation to be unaffordable to small communities if it resulted in an average bill in excess of 2.5% of national MHI. According to Raucher, et al. (2019), the 2.5% of national MHI benchmark was specific to small water systems. EPA did not develop similar benchmarks for the category of medium and large utilities.

Nonetheless, the following benchmarks are frequently advanced in the context of water and sewer service affordability:

- Sewer service is deemed affordable if the typical household bill is less than 2% of service area MHI.
- Water service is deemed affordable if the typical household bill is less than 2.5% of service area MHI.
- Combined water and sewer service is deemed affordable if the typical household bill is less than 4.5% of service area MHI.

These benchmarks have been subject to a number of critiques (Raucher, et al. 2013, Raucher, et al. 2019, Teodoro 2018) which generally distill into the following three points:

- **Average vs Essential Indoor Use (EIU)**. Using average demand to calculate utility costs will overstate the cost of essential service. Average demand imbeds a lot of discretionary water use and is skewed by a small proportion of customers using very large amounts of water. Affordability should instead be assessed in terms of the ability of customers to pay to meet their basic needs for drinking, cooking, health, and sanitation. In this respect, median or minimum monthly water use is likely to provide a better measure of essential water use. Median monthly water use in Santa Cruz is currently about 4 CCF while median February water use, which is almost entirely indoor water use, is about 3.5 CCF. The state has set an indoor water use standard of 55 GPCD, which for the average Santa Cruz household size equates to about 5.3 CCF. The CPUC requires the utilities it regulates to use 6 CCF in their affordability assessments. Both the state and the CPUC thresholds are too high for Santa Cruz. Santa Cruz median February water use, equal to approximately 36 gallons/capita/day (GPCD), provides a reasonable measure of EIU.
- **Median vs Low Income**. Measuring affordability on the basis of an entire community's MHI is likely to gloss over impacts on lower-income households. This was shown in our 2016 analysis where up to 20% of residents were expected to confront affordability issues even though none

of the proposed rate designs exceeded the service area wide MHI threshold. Other income thresholds have been proposed, most notably, the 20th percentile income level (Raucher et al. 2019; Teodoro, 2018). Teodoro (2018) argues that the 20th percentile income level is typically identified with the lower boundary of the middle class where households may have very limited financial resources, but also may not qualify for income assistance programs. Another approach is to disaggregate the analysis. Rather than calculate affordability for the entire service area, break it up into smaller pieces and separately calculate affordability for each piece. As well as allowing for geographic differences in household income, occupancy, and water use, this approach has the advantage of pinpointing which neighborhoods within a service area are most likely to struggle with affordability issues.

- **Income vs Disposable Income**. Water and sewer bills may be low as a percentage of income, but much higher as a percentage of disposable income after deducting other essential living costs, such as food, housing, and health care. The difference can be especially large in communities, such as Santa Cruz, with high housing costs.

In response to these critiques, several alternative affordability metrics have been proposed. Here we provide a general overview of the five approaches that have received the most attention. For a more detailed discussion of their advantages and limitations, see Raucher et al. (2019).

- **Household Burden Indicator (HBI)**. The HBI metric was proposed in Raucher et al. (2019). It is a variant of EPA's RI discussed previously. There are two key differences between the HBI and RI. First, HBI is calculated using the combined cost of water and sewer service whereas RI only considers sewer service. Second, HBI uses the 20th rather than the 50th percentile income level. Justifications for using the 20th percentile income level include: (1) households at or below the 20th percentile typically are the most economically challenged members of the community; (2) the 20th percentile is generally considered the demarcation between low income and middle-class households; (3) many assistance programs have eligibility cut-offs at or near the 20th percentile; and (4) income distribution data are readily available from the US Census facilitating computation of the metric.

- **Affordability Ratio at 20th Income Percentile (AR_{20})**. The AR_{20} metric was proposed in Teodoro (2018). It compares the cost of essential water and sewer service to the 20th percentile income level net of costs for housing, food, health care, energy, and taxes. As a general rule of thumb, a 10% threshold is suggested by Teodoro, meaning water and sewer service would be deemed affordable if it cost less than 10% of disposable income at the 20th percentile income level. The primary limitation of this metric is its reliance on disposable income. Computation of representative costs for housing, food, health care, etc., is anything but straightforward. While the American Community Survey compiles data on housing costs, it does not do so for the other

living expenses included in the AR_{20} metric.

- **Weighted Average Residential Index (WARI)**. The WARI metric was proposed as a way to account for geographic differences in household income, occupancy, and water use in assessing water and sewer service affordability. WARI leverages the fact that the US Census reports the number of households in each census tract by income category (e.g. number of households with income between 10-20K, 20-40K, 40-60K, etc.). The average or minimum bill is calculated for each census tract using customer-level billing data and this bill is then divided by the midpoint of each income category. These income-category-specific RIs are then formed into a weighted average RI for the census tract where the weights are equal to the number of households in each income category. A service area weighted average RI can then be formed from the census tract RIs where the weights are the number of households in each census tract. The main advantage of this approach is that it provides geographically disaggregated estimates of utility service affordability. This is useful for pinpointing what parts of the service area are most likely to struggle with paying for water and sewer service. However, it is not clear that the service area metric has any clear advantage over the basic RI. Additionally, it is not obvious that calculating separate RIs for each income category and then forming a weighted average for the tract is preferable to simply using the tract's MHI to compute the tract's RI. It is useful to note that using block groups rather than census tracts will result in roughly a three-fold increase in the level of geographic disaggregation. The tradeoff, however, is that ACS block group estimates are subject to more sampling error than are census tract estimates.

- **Hours at Minimum Wage (HM)**. The HM metric divides the cost of essential water and sewer service by the locally prevailing minimum wage to determine the number of hours a minimum wage worker would need to work in order to pay for water and sewer service. This is not a particularly useful metric for assessing utility service affordability because there is no clear relationship between the metric and a household's income.[5] For example, it cannot be used to determine the percentage of households that are above or below some benchmark HM because household income derives from many possible sources, only some of which may be related to the minimum wage.[6] We do not consider this metric further in this analysis.

[5] Nonetheless it has recently been proposed by the CPUC as one of three metrics for assessing utility service affordability. See CPUC D.20-07-032.

[6] For instance, household income reported in the Census American Community Survey is the sum of the amounts reported separately for wage or salary income; net self-employment income; interest, dividends, or net rental or royalty income or income from estates and trusts; Social Security or Railroad Retirement income; Supplemental Security Income (SSI); public assistance or welfare payments; retirement, survivor, or disability pensions; and all other income.

- **Poverty Prevalence Indicator (PPI)**. The PPI was proposed by Raucher, et al. (2019). PPI is not a water and sewer service affordability indicator. Rather it indicates the percentage of households that have income below 200% of the Federal Poverty Level (FPL). According to Raucher, et al. (2019), 200% of FPL is a commonly used cutoff point for a range of Federal and state income assistance programs. PPI is meant to be used in conjunction with an affordability metric such as the HBI metric. Areas where both the HBI and PPI are high are more likely to face affordability challenges than areas where only one or the other is high. In this sense, the two metrics can be used to provide a fuller picture of the extent to which utility service affordability is likely to be an issue. For example, the Alliance for Water Efficiency used HBI and PPI in conjunction with one another to assess water and sewer service affordability in Detroit, Michigan (Alliance for Water Efficiency, 2020).

Affordability Metric Construction

Our analysis does not rely directly on any single metric discussed in the previous section. Instead, we developed a composite metric that attempts to balance the advantages and disadvantages of the different approaches. The metric we use most closely aligns with the WARI metric in that it relies on geographically disaggregated household water use and income data. We feel this is superior to providing a single service area wide measure of affordability since it will usually be the case that water and sewer service will be deemed affordable for the majority of customers. The key question is for how many customer is this unlikely to be the case? A disaggregated analysis is better able to answer this question.

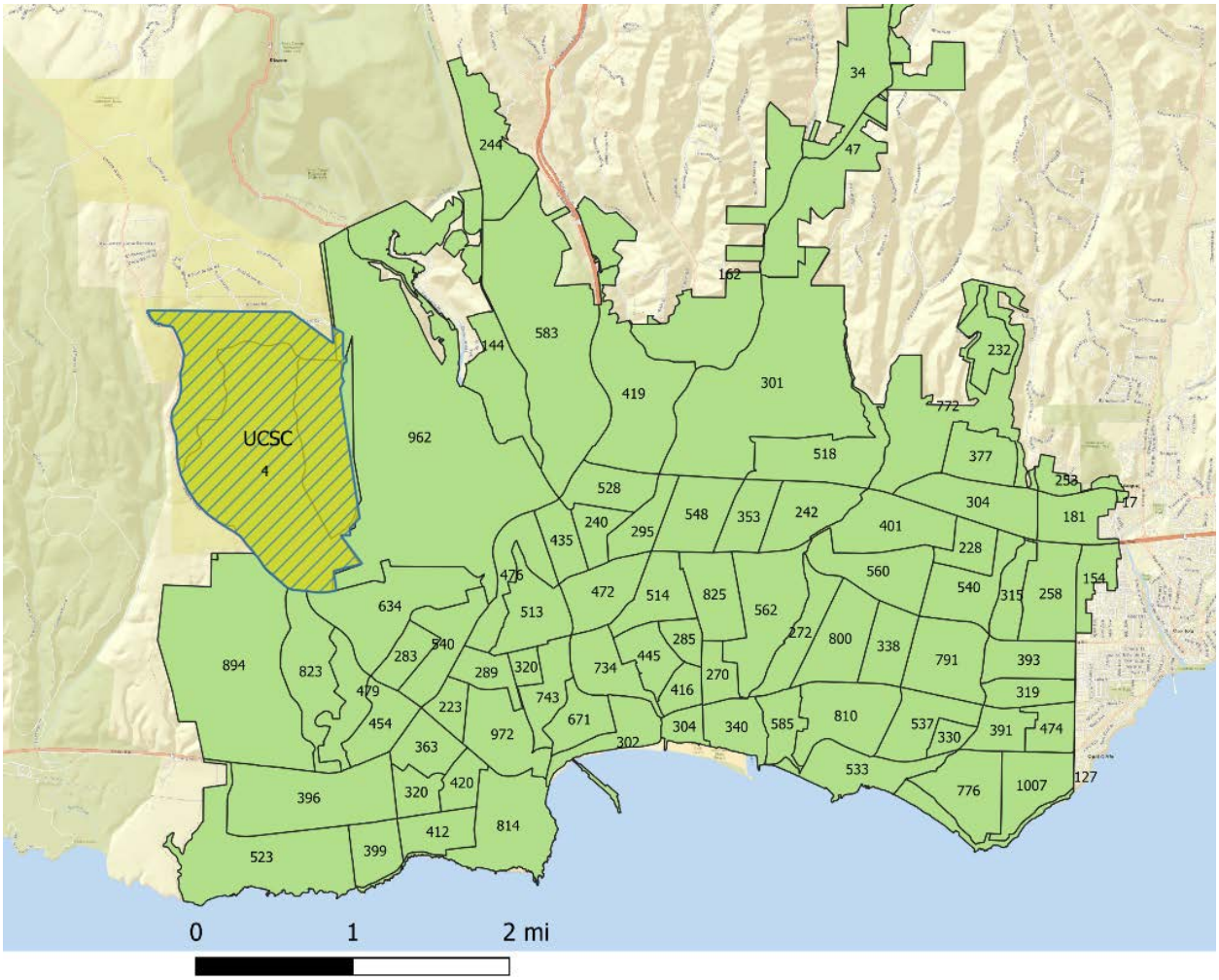
Here we outline the steps we used to construct our affordability metric:

- We compute an affordability ratio for each census block group in the service area. This divides the service area into 84 different block groups, as shown in Figure 1. We use 2019 customer billing data to determine the number of households that are served by the Water Department within each block group.[7] The household count is shown within the boundary of each block group in Figure 1.

- We use February metered water use in 2019 as a proxy for EIU. We divide a meter's water use by the number of housing units it serves in order to determine water use per household. We then use this data to calculate median February water use per household for each block group.

[7] For each residential service meter, the Water Department records the number of housing units served. This information is used by the Water Department for billing purposes.

Figure 1. Santa Cruz Water Department Service Area Intersected with Census Block Groups



These medians vary by block group. For the service area as a whole, median February water use was about 3.5 CCF per household in 2019, which equates to approximately 36 GPCD.

- Next we calculate the water and sewer service cost per household based on each block group's median EIU. We use the water and sewer service rates that were in effect between July 2019 and June 2020 for this calculation. Separate bills are calculated using the inside and outside city rates and then a weighted average bill is formed using the number of households in the block that are located within versus outside of the city limits. To calculate the water service meter charge, we calculate the meter charge for each meter in the block group, divide by the number of households served by the meter, and then calculate the median of these values. A similar conversion is not required for fixed sewer service charges because these charges are already denominated in dollars per housing unit. The sewer charge for outside city customers, however, is part of their property tax assessment. We convert these annual assessments into equivalent dollar per month sewer charges for purposes of this analysis.

- Using these data, we construct two affordability ratios – one only for water service and another for both water and sewer service. For the ratio's denominator, we use MHI adjusted for median housing costs (MHC).[8] In this regard, we are following guidance for assessing utility service affordability recently adopted by the CPUC.[9] Essentially, this approach splits the difference between assessing affordability on the basis of disposable income, as advocated by Teodoro (2018), versus using gross income, which ignores cost of living considerations. While economic theory favors using disposable income, the CPUC concluded that developing robust measures of disposable income is usually impractical. However, it also noted that in California housing costs constitute the single largest household expense, can vary significantly across and within regions, and are estimated by the US Census. Importantly, in addition to basic rent and mortgage costs, US Census estimates of MHC include other housing-related expenses, including real estate taxes, property insurance, electricity, gas, water and sewer costs, and home owner association dues and fees. Thus adjusting MHI for MHC goes a long ways towards estimating disposable income. Because MHC includes water and sewer costs, we add back the calculated water and water and sewer bill when constructing the denominator of the affordability ratios so as not to double count.

- An important difference between this analysis and the one we completed in 2016 is our incorporation of multi-family households into the construction of the affordability metrics. The 2016 analysis only considered single-family households, and while they comprise the majority of residential customers, the analysis nonetheless excluded an important demographic for assessing utility service affordability. Using disaggregated data allows us to calculate water use and billing statistics per housing unit rather than per meter. This treatment aligns better with the MHI and MHC estimates from the American Community Survey which are based on all sampled housing units in the block group regardless of structure type (e.g. single- vs. multi-unit structures) and tenure (e.g. owner vs. renter).

The final affordability ratios for water and combined water and sewer are:

$$AR_{W,i} = \frac{Bill_{W,i}}{MHI_i - MHC_i + Bill_{W,i}}$$

$$AR_{W\&S,i} = \frac{Bill_{W\&S,i}}{MHI_i - MHC_i + Bill_{W\&S,i}}$$

where i indexes the block group, $Bill_W$ is the bill for water service at median February water use and $Bill_{W\&S}$ is the combined bill for water and sewer service at median February water use. As with WARI, the

[8] MHI estimates are from ACS Table B19013 while median housing cost estimates are from ACS Table B25105.
[9] See CPUC D.20-07-032.

block group affordability ratios can be formed into a weighted average service area wide affordability ratio where the number of housing units in each block group are used as the weights.

In addition to the affordability ratios, we also estimate PPI – the poverty prevalence indicator -- for each block group. This estimates the percentage of households in each block group with income less than 200% of FPL.

We use the PPI in conjunction with the $AR_{W\&S}$ to construct the Water & Sewer Service Financial Burden Matrix shown in Table 1. This is similar to the matrix developed by Raucher et al. (2019) using the PPI and HBI metrics. However, we use different thresholds for $AR_{W\&S}$ than Raucher et al. use for HBI since $AR_{W\&S}$ is based on MHI whereas HBI is based on 20th percentile income. That said, it is important to emphasize that the thresholds we use for $AR_{W\&S}$, while informed by affordability thresholds found in the literature, are nonetheless based on our professional judgement.

Table 1. Water & Sewer Service Financial Burden Matrix

$AR_{W\&S}$	Poverty Prevalence Indicator (PPI)			
	< 10%	10 – 30%	30 – 50%	> 50%
< 1.5%	Low	Low	Low-Moderate	Low-Moderate
1.5% - 2.5%	Low	Low-Moderate	Moderate	Moderate
2.5% - 3.5%	Low-Moderate	Moderate	Moderate	Moderate-High
3.5% - 4.5%	Moderate	Moderate	Moderate-High	High
> 4.5%	Moderate-High	Moderate-High	High	High

Notes:
$AR_{W\&S}$: Combined water and sewer cost at essential level of service as a percentage of MHI adjusted for housing costs
PPI: Percentage of households in block group with income less than 200% FPL.

Analysis Results

First we present summary statistics on water use, water and sewer bills, and household income and housing costs. We then provide tabulated and graphical results on water and combined water and sewer service affordability and financial burden.

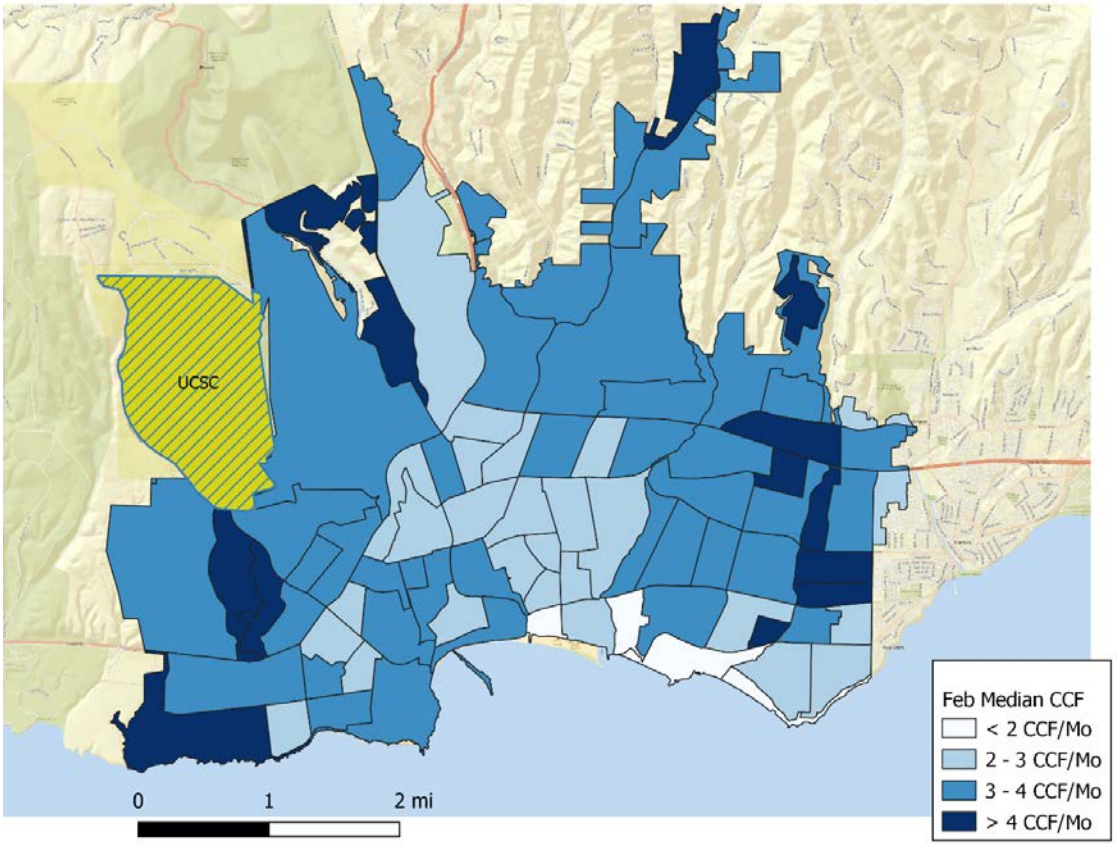
Essential Indoor Use (EIU)

Table 2 and Figure 2 show the distribution of median February 2019 water use per housing unit by census block group. As noted above, we are using median February water use as a proxy for essential indoor water use for basic drinking, cooking, health, and sanitation requirements. Approximately 85% of housing units served by the Water Department are located in census block groups with median water use between 2 and 4 CCF. The census block groups in Figure 2 showing water use of less than 2 CCF/Mo. contain a large number of second homes and vacation rentals, which may explain the very low February water use in these block groups.

Table 2. Number of Households by Essential Water Use Level

Median Feb Water Use	Freq.	Percent	Cum.
< 2 CCF/Mo	1,549	4.23	4.23
2-3 CCF/Mo	12,394	33.86	38.09
3-4 CCF/Mo	18,536	50.64	88.73
> 4 CCF/Mo	4,124	11.27	100.00
Total	36,603	100.00	

Figure 2. Essential Water Use by Census Block Group (CCF/Mo/Household)



Water and Sewer Bills for EIU

Table 3 and Figure 3 show the distribution of EIU water bills by census block group. Approximately 96% of households served by the Water Department are located in census block groups where the EIU water bill is $60/month or less and approximately 39% are located in block groups where the EIU water bill is $40/month or less.

Table 3. Number of Households by Water Bill Amount for Essential Water Use

EIU Water Bill	Freq.	Percent	Cum.
$20-$40	14,098	38.52	38.52
$40-$60	20,875	57.03	95.55
> $60	1,630	4.45	100.00
Total	36,603	100.00	

Figure 3. Water Bill for Essential Water Use by Census Block Group ($/household)

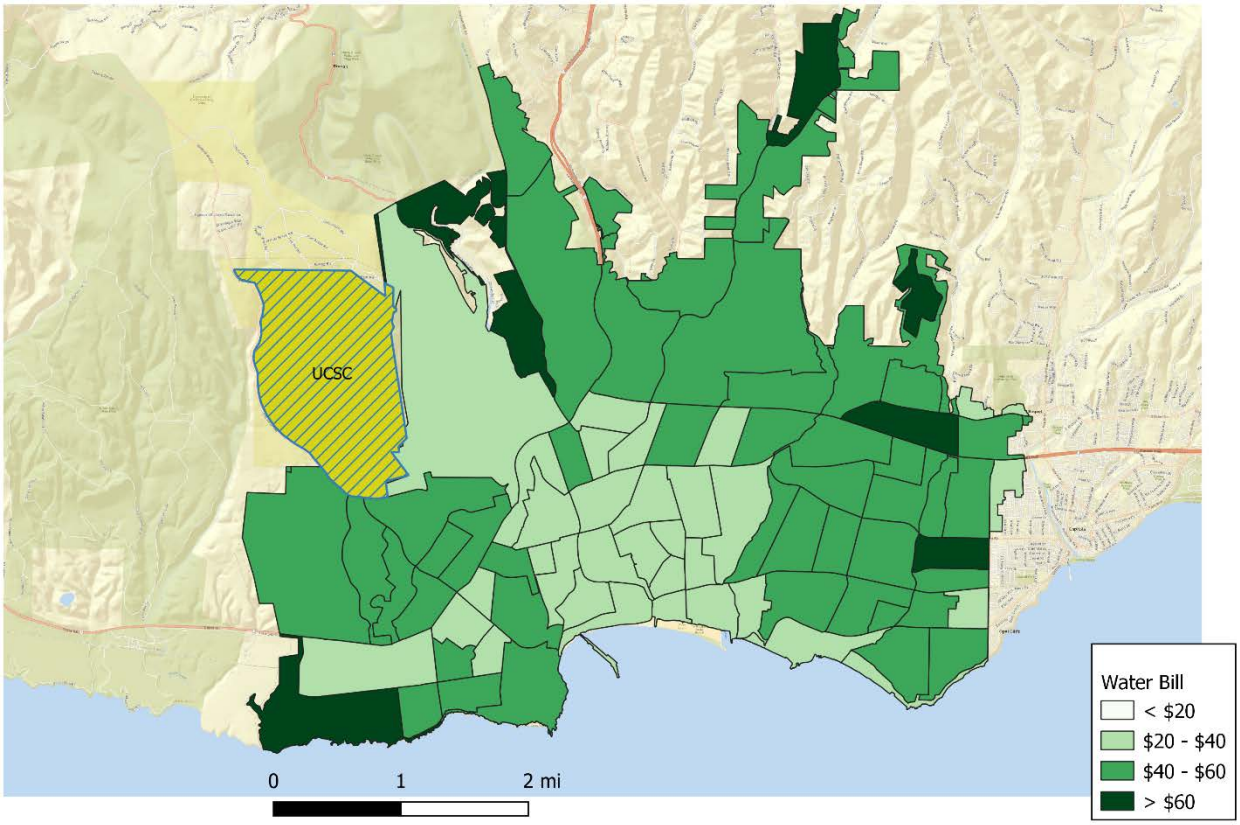
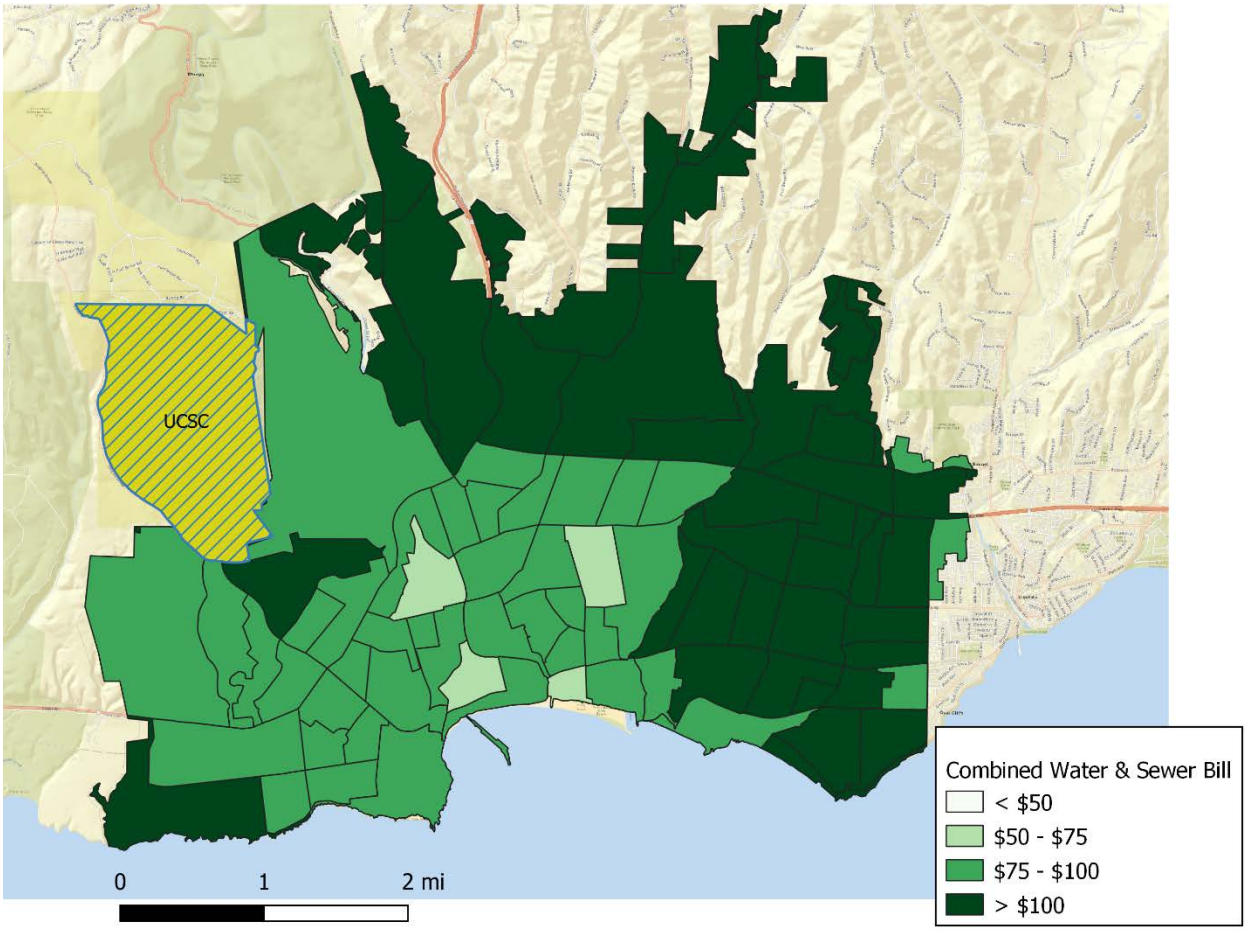


Table 4 and Figure 4 show the distribution of combined water and sewer bills for EIU by census block group. Approximately 60% of households served by the Water Department are located in census block groups where the combined water and sewer bill for EIU is $100/month or less.

Table 4. Number of Households by Combined Water & Sewer Bill Amount for Essential Water Use

EIU Water & Sewer Bill	Freq.	Percent	Cum.
$50-$75	2,313	6.32	6.32
$75-$100	19,562	53.44	59.76
> $100	14,728	40.24	100.00
Total	36,603	100.00	

Figure 4. Combined Water & Sewer Bill for Essential Water Use by Census Block Group ($/household)



Income and Housing Costs

Table 5 and Figure 5 show the distribution of households by MHI. Approximately 15% of households served by the Water Department are located in census block groups with MHI less than $50,000. Households in these census block groups are likely to have incomes that are at or below 200% of the Federal Poverty Level (FPL) and may be significantly more likely to struggle with meeting basic living expenses.

Table 5. Number of Households by MHI

MHI	Freq.	Percent	Cum.
< $50k	5,480	14.97	14.97
$50-$75k	12,438	33.98	48.95
$75-$100k	8,496	23.21	72.16
$100-$150k	8,858	24.20	96.36
> $150k	1,331	3.64	100.00
Total	36,603	100.00	

Figure 5. MHI by Census Block Group

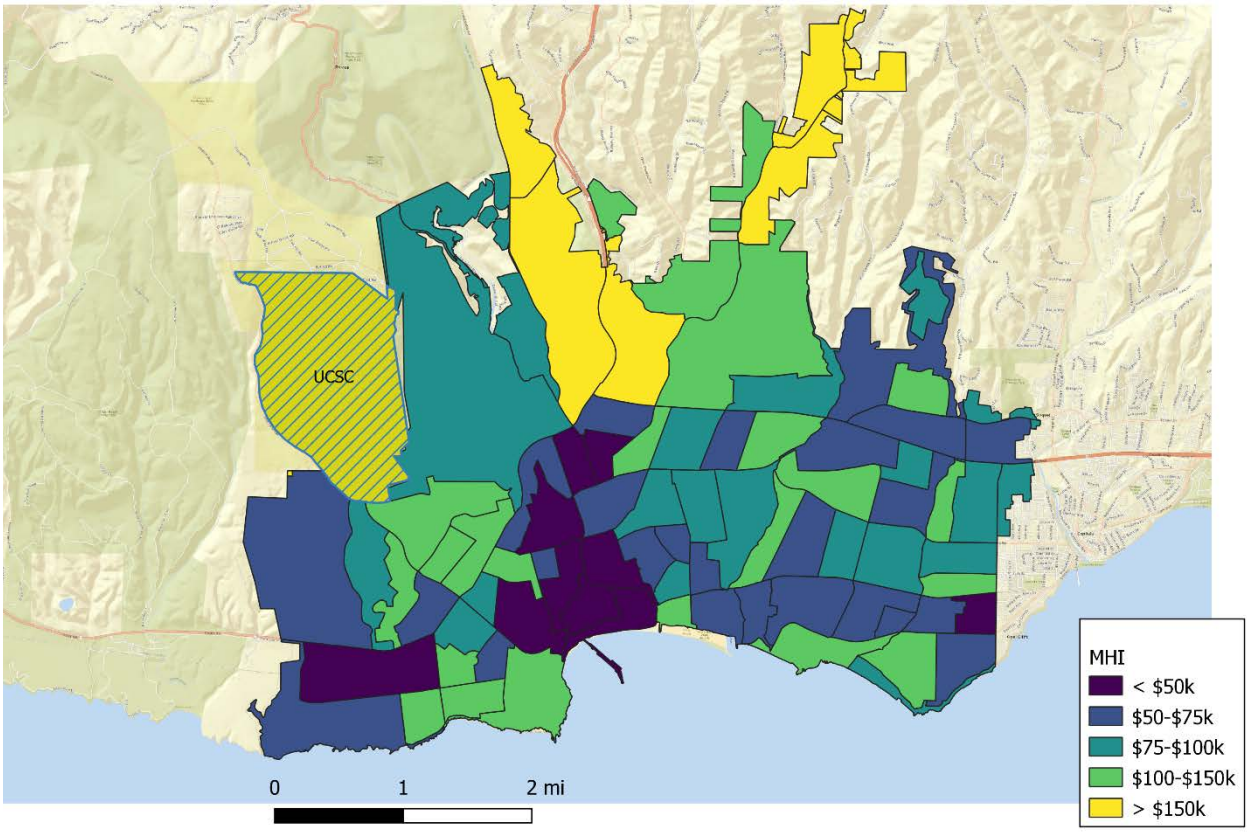
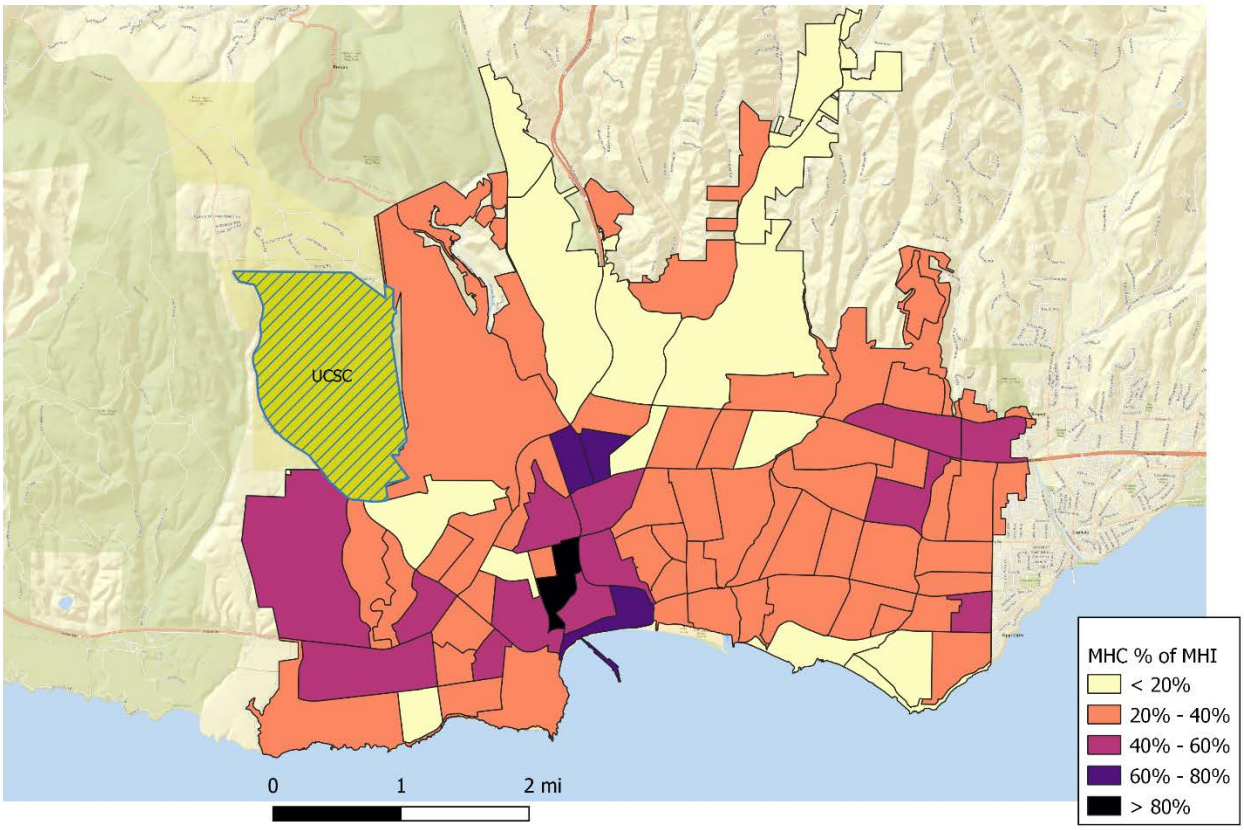


Table 6 and Figure 6 show the distribution of households by median housing cost (MHC) relative to median household income (MHI). Approximately 24% of households served by the Water Department are located in census block groups where MHC exceeds 40% of MHI. Households in these census block groups may be significantly more likely to struggle with meeting basic living expenses after paying for housing costs.

Table 6. Number of Households by MHC as a Percent of MHI

MHC as % MHI	Freq.	Percent	Cum.
< 20%	4,927	13.46	13.46
20%-40%	22,931	62.65	76.11
40%-60%	7,025	19.19	95.30
60%-80%	977	2.67	97.97
> 80%	743	2.03	100.00
Total	36,603	100.00	

Figure 6. MHC as a Percent of MHI by Census Block Group



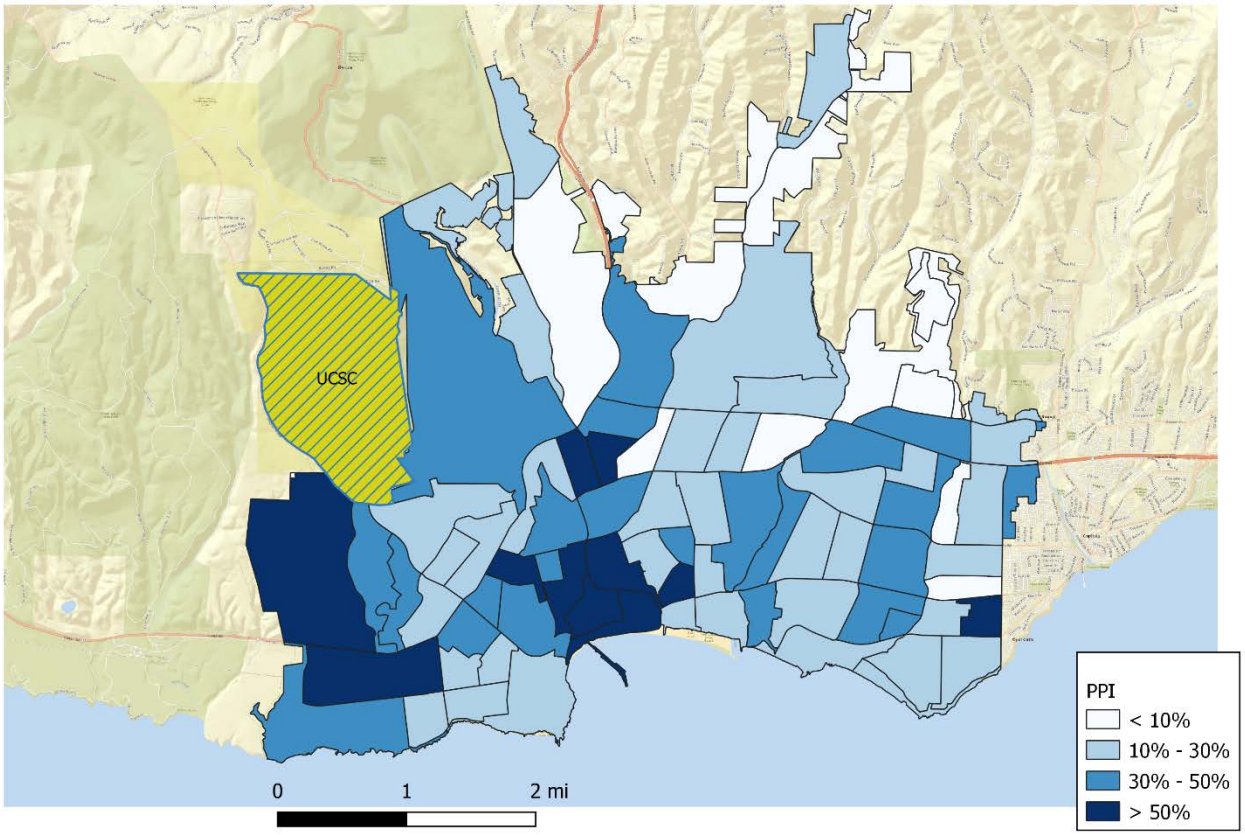
Poverty Prevalence

Table 7 and Figure 7 show the distribution of households by poverty prevalence indicator (PPI). This shows the percentage of households in each block group with incomes less than 200% of FPL. Approximately 15% of households served by the Water Department are located in census block groups where more than 50% of households have incomes less than 200% of FPL. Households in these census block groups may be significantly more likely to struggle with meeting basic living expenses after paying for housing costs.

Table 7. Number of Households by Poverty Prevalence

PPI Level	Freq.	Percent	Cum.
< 10%	3,348	9.15	9.15
10% - 30%	16,247	44.39	53.53
30% - 50%	11,414	31.18	84.72
> 50%	5,594	15.28	100.00
Total	36,603	100.00	

Figure 7. Poverty Prevalence Indicator by Census Block Group



Affordability Ratios

Table 8 and Figure 8 show the affordability ratios for water service. The average affordability ratio for the service area is 1.3%. Approximately 5% of households served by the Water Department are located in census block groups with a water service affordability ratio greater than 2.5%. Recall that 2.5% of MHI is a commonly used benchmark for assessing water service affordability. Approximately 13% of households are located in census block groups with a water service affordability ratio greater than 2.0%. Because we have adjusted MHI for housing cost, the 2% and 2.5% thresholds provide conservative benchmarks for assessing affordability.

Table 8. Number of Households by Water Service Affordability Ratio

Water Service AR	Freq.	Percent	Cum.
< 0.5%	2,612	7.14	7.14
0.5% - 1.0%	19,883	54.32	61.46
1.0% - 1.5%	6,186	16.90	78.36
1.5% - 2.0%	3,273	8.94	87.30
2.0% - 2.5%	2,625	7.17	94.47
> 2.5%	2,024	5.53	100.00
Total	36,603	100.00	

Figure 8. Water Service Affordability Ratio by Census Block Group

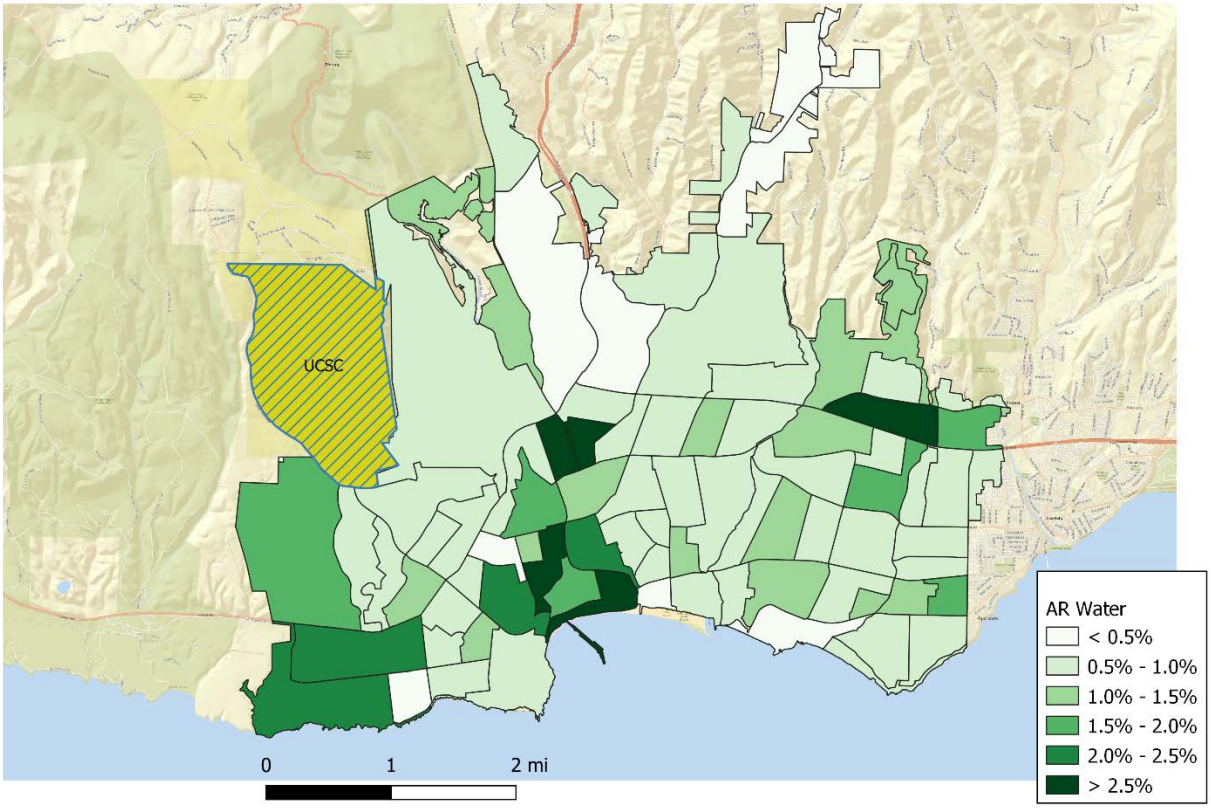
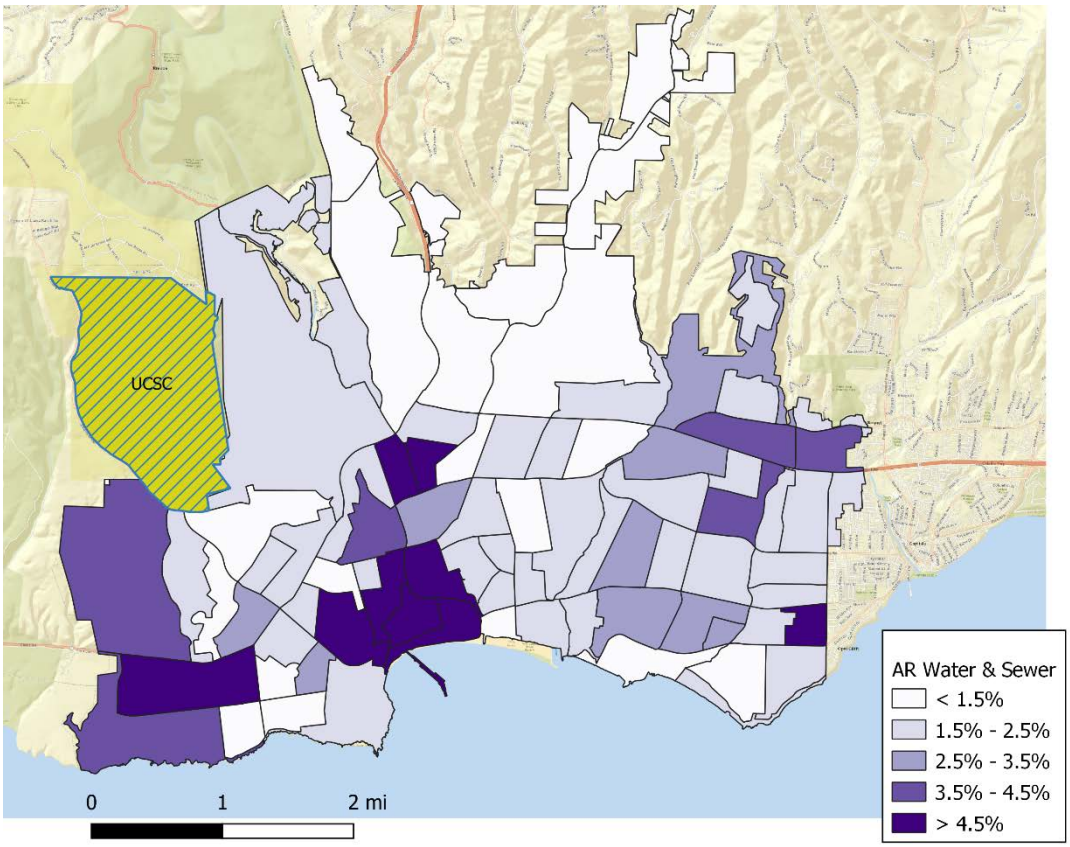


Table 9 and Figure 9 show the affordability ratios for combined water and sewer service. The average for the service area is 2.9%. Approximately 14% of households are located in census block groups with a combined water and sewer service affordability ratio greater than 4.5%. Recall that 4.5% of MHI is a commonly used benchmark for assessing combined water and sewer service affordability. Again we note that because we have adjusted MHI for housing cost, the 4.5% threshold provides conservative benchmark for assessing affordability. As a rule of thumb, Teodoro (2018) recommended a 10% threshold for his proposed affordability ratio. However, this is too high for the metric we are using for two reasons. First, Teodoro's ratio is based on 20th percentile income whereas ours uses median income. Second, Teodoro's ratio uses disposable income whereas ours adjusts income only for housing costs.

Table 9. Number of Households by Combined Water & Sewer Service Affordability Ratio

W & S AR	Freq.	Percent	Cum.
< 1.5%	7,302	19.95	19.95
1.5% - 2.5%	16,383	44.76	64.71
2.5% - 3.5%	4,996	13.65	78.36
3.5% - 4.5%	2,955	8.07	86.43
> 4.5%	4,967	13.57	100.00
Total	36,603	100.00	

Figure 9. Combined Water & Sewer Service Affordability Ratio by Census Block Group



Water & Sewer Service Financial Burden Matrix

Table 10 repeats the Water & Sewer Service Financial Burden Matrix from Table 1. Recall that it is based on a similar approach in Raucher et al. (2019) which uses an affordability metric in conjunction with poverty prevalence to assess the likely level of financial burden of water and sewer service. Table 11 shows the number households falling into each cell in the financial burden matrix. Table 12 tallies up these counts by burden level. This analysis indicates that approximately 79% of households served by the Water Department are located in census block groups where the expected financial burden of water and sewer service is scored moderate or better. Approximately 16% of households are located in census block groups where the expected financial burden is scored high due to the combination of high AR and high PPI. The census block groups in which these households are located are shown in Figure 10.

Table 10. Water & Sewer Service Financial Burden Matrix

$AR_{W\&S}$	Poverty Prevalence Indicator (PPI)			
	< 10%	10 – 30%	30 – 50%	> 50%
< 1.5%	Low	Low	Low-Moderate	Low-Moderate
1.5% - 2.5%	Low	Low-Moderate	Moderate	Moderate
2.5% - 3.5%	Low-Moderate	Moderate	Moderate	Moderate-High
3.5% - 4.5%	Moderate	Moderate	Moderate-High	High
> 4.5%	Moderate-High	Moderate-High	High	High

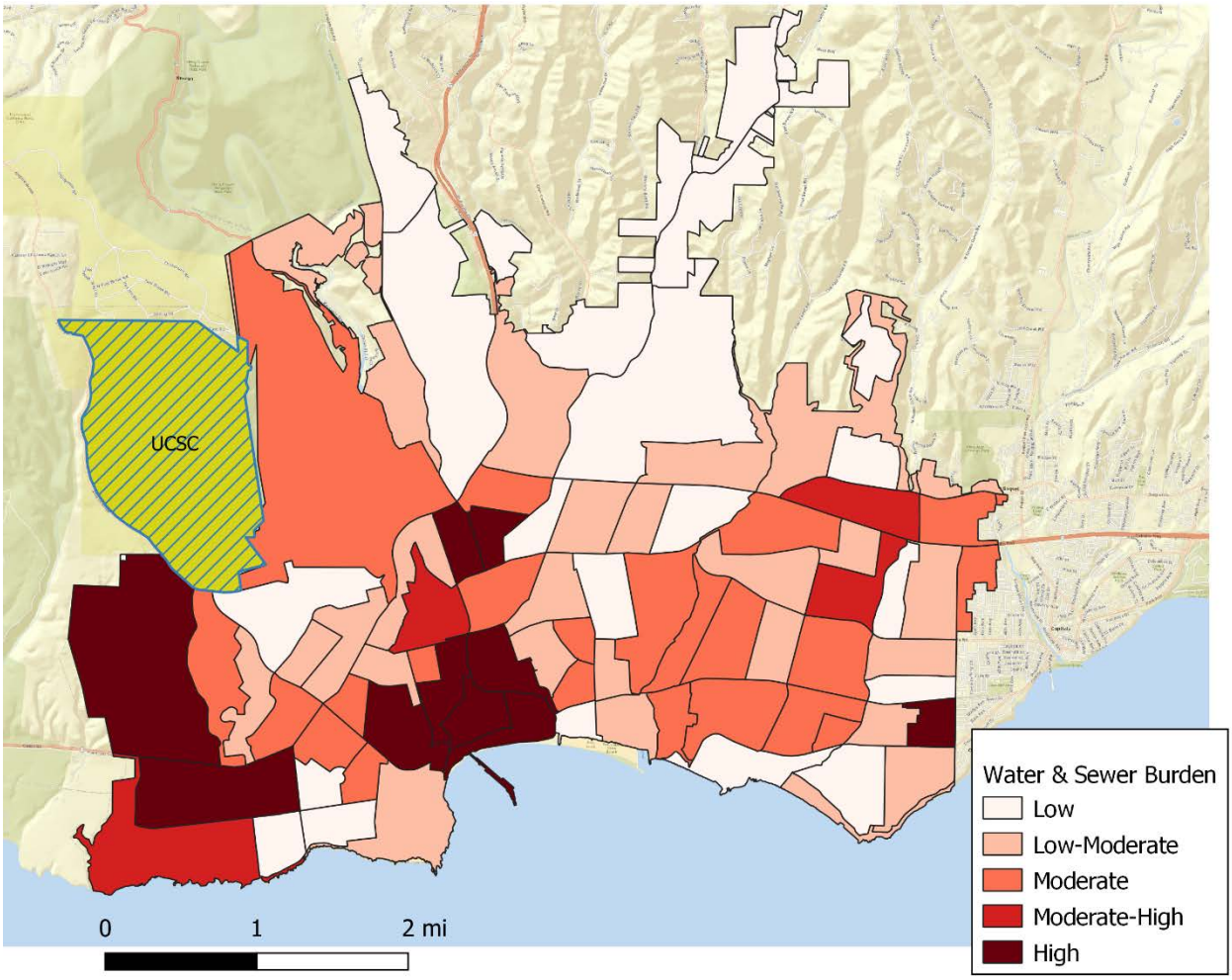
Table 11. Number of Households by Water & Sewer AR and PPI Level

W & S AR	PPI Level < 10%	10% - 30%	30% - 50%	> 50%	Total
< 1.5%	1,333	4,782	898	289	7,302
1.5% - 2.5%	1,243	8,800	5,924	416	16,383
2.5% - 3.5%	772	2,484	1,740		4,996
3.5% - 4.5%		181	1,880	894	2,955
> 4.5%			972	3,995	4,967
Total	3,348	16,247	11,414	5,594	36,603

Table 12. Number of Households by Water & Sewer Service Burden

W&S Financial Burden	Freq.	Percent	Cum.
Low	7,358	20.10	20.10
Low-Moderate	10,759	29.39	49.50
Moderate	10,745	29.36	78.85
Moderate-High	1,880	5.14	83.99
High	5,861	16.01	100.00
Total	36,603	100.00	

Figure 10. Water & Sewer Financial Burden by Census Block Group



Summary

The primary results of this analysis include the following:

- Essential water and sewer service in Santa Cruz remain affordable for most Water Department customers. The water service only affordability ratio for the entire service area is 1.3% of adjusted MHI, which is well below conventional thresholds for water service affordability. The water and sewer service affordability ratio for the entire service area is 2.9% of adjusted MHI, also well below conventional thresholds for combined water and sewer service costs.

- Approximate 6% of households served by the Water Department are located in census block groups with affordability ratios for water service greater than 2.5% while approximately 14% are in census block groups with affordability ratios for combined water and sewer service greater than 4.5%. For these households, water and sewer service costs may constitute a financial

burden.

- Approximately 16% of households are located in census block groups where the financial burden of the combined costs of water and sewer service is scored high due to both high affordability ratios and high poverty prevalence. These customers are most likely to struggle with meeting basic living expenses, of which water and sewer service are a part.

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Stratus Consulting (2013). Affordability Assessment Tool for Federal Water Mandates. Report prepare for United States Conference of Mayors, American Water Works Association, and Water Environment Federation.

Teodoro, Manuel P. (2018). Measuring Household Affordability for Water and Sewer Utilities. Journal AWWA, January 2018, 110:1.

Attachment A

Census block group data set

GEOID	Housing Units	% In-City Housing Units	Median Feb CCF	Median Water Bill	Median Water Bill Category	Median Water & Sewer Bill	Median Water & Sewer Bill Category	Median Monthly Income	Median Annual Income Category	Median Monthly Housing Cost	Median Housing Cost % of MHI	Median Housing Cost % of MHI Category	Poverty Prevalence %	Poverty Prevalence Category	AR Water	AR Water Category	AR Water & Sewer	AR Water & Sewer Category	Water & Sewer Financial Burder Score
60871001001	301	100%	4	50.52	$40-$60	100.35	100.352	> $100	$100-$150k	2,380	19.7%	< 20%	28%	10% - 30%	0.5%	0.5% - 1.0%	1.0%	< 1.5%	Low
60871001002	518	100%	4	50.49	$40-$60	100.28	100.284	> $100	$75-$100k	2,380	29.0%	20%-40%	15%	10% - 30%	0.9%	0.5% - 1.0%	1.7%	1.5% - 2.5%	Low-Moderate
60871002001	242	100%	4	49.99	$40-$60	99.27	99.2738	$75-$100	$100-$150k	1,816	19.7%	< 20%	9%	< 10%	0.7%	0.5% - 1.0%	1.3%	< 1.5%	Low
60871002002	353	100%	3	39.53	$20-$40	87.92	87.922	$75-$100	$50-$75k	1,816	34.0%	20%-40%	22%	10% - 30%	1.1%	1.0% - 1.5%	2.4%	1.5% - 2.5%	Low-Moderate
60871002003	548	100%	3.5	44.10	$40-$60	92.38	92.3801	$75-$100	$75-$100k	1,816	26.3%	20%-40%	16%	10% - 30%	0.9%	0.5% - 1.0%	1.8%	1.5% - 2.5%	Low-Moderate
60871002004	295	100%	3	39.39	$20-$40	87.80	87.8008	$75-$100	$100-$150k	1,816	18.9%	< 20%	4%	< 10%	0.5%	0.5% - 1.0%	1.1%	< 1.5%	Low
60871002005	528	100%	2.71	33.41	$20-$40	79.43	79.4301	$75-$100	$50-$75k	1,816	31.9%	20%-40%	36%	30% - 50%	0.9%	0.5% - 1.0%	2.0%	1.5% - 2.5%	Moderate
60871002006	435	100%	3.75	41.49	$40-$60	85.21	85.2059	$75-$100	< $50k	1,816	64.4%	60%-80%	54%	> 50%	4.0%	> 2.5%	7.8%	> 4.5%	High
60871002007	240	100%	3	38.55	$20-$40	86.29	86.293	$75-$100	< $50k	1,816	64.7%	60%-80%	59%	> 50%	3.7%	> 2.5%	8.0%	> 4.5%	High
60871003001	962	59%	3.21	38.18	$20-$40	82.79	90.8962	$75-$100	$75-$100k	1,965	28.9%	20%-40%	39%	30% - 50%	0.8%	0.5% - 1.0%	1.8%	1.5% - 2.5%	Moderate
60871003002	634	100%	4	50.35	$40-$60	100.05	100.052	> $100	$100-$150k	1,965	19.6%	< 20%	13%	10% - 30%	0.6%	0.5% - 1.0%	1.2%	< 1.5%	Low
60871004001	4	0%	3.5	49.64	$40-$60	95.54	115.418	> $100	> $150k	1,575	11.9%	< 20%	10%	< 10%	0.4%	< 0.5%	1.0%	< 1.5%	Low
60871005001	479	100%	4.04	47.68	$40-$60	94.76	94.7602	$75-$100	$100-$150k	2,156	22.7%	20%-40%	32%	30% - 50%	0.6%	0.5% - 1.0%	1.3%	< 1.5%	Low-Moderate
60871005002	823	100%	4.44	51.50	$40-$60	98.64	98.6434	$75-$100	$75-$100k	2,156	29.5%	20%-40%	48%	30% - 50%	1.0%	0.5% - 1.0%	1.9%	1.5% - 2.5%	Moderate
60871005003	894	98%	3.8	46.04	$40-$60	93.38	93.8503	$75-$100	$50-$75k	2,156	47.8%	40%-60%	50%	> 50%	1.9%	1.5% - 2.0%	3.8%	3.5% - 4.5%	High
60871006001	540	100%	4	48.97	$40-$60	96.76	96.7643	$75-$100	$100-$150k	2,251	27.0%	20%-40%	28%	10% - 30%	0.8%	0.5% - 1.0%	1.6%	1.5% - 2.5%	Low-Moderate
60871006002	454	100%	3.5	44.67	$40-$60	93.28	93.2804	$75-$100	$50-$75k	2,251	40.0%	40%-60%	18%	10% - 30%	1.3%	1.0% - 1.5%	2.7%	2.5% - 3.5%	Moderate
60871006003	283	100%	4	50.12	$40-$60	99.39	99.3882	$75-$100	$100-$150k	2,251	26.6%	20%-40%	27%	10% - 30%	0.8%	0.5% - 1.0%	1.6%	1.5% - 2.5%	Low-Moderate
60871007001	476	100%	3	34.45	$20-$40	78.58	78.5756	$75-$100	$50-$75k	1,409	24.3%	20%-40%	27%	10% - 30%	0.8%	0.5% - 1.0%	1.8%	1.5% - 2.5%	Low-Moderate
60871007002	513	100%	2.68	30.06	$20-$40	73.29	73.2928	$50-$75	< $50k	1,409	45.3%	40%-60%	44%	30% - 50%	1.7%	1.5% - 2.0%	4.1%	3.5% - 4.5%	Moderate-High
60871008001	514	100%	2.88	35.63	$20-$40	81.19	81.1921	$75-$100	$75-$100k	1,789	25.8%	20%-40%	18%	10% - 30%	0.7%	0.5% - 1.0%	1.6%	1.5% - 2.5%	Low-Moderate
60871008002	416	100%	2.75	34.97	$20-$40	81.20	81.2048	$75-$100	$75-$100k	1,789	26.6%	20%-40%	51%	> 50%	0.7%	0.5% - 1.0%	1.6%	1.5% - 2.5%	Moderate
60871008003	472	100%	2.85	32.16	$20-$40	75.72	75.7215	$75-$100	$50-$75k	1,789	41.1%	40%-60%	37%	30% - 50%	1.2%	1.0% - 1.5%	2.9%	2.5% - 3.5%	Moderate
60871008004	734	100%	3.06	35.49	$20-$40	79.34	79.3365	$75-$100	< $50k	1,789	54.3%	40%-60%	58%	> 50%	2.3%	2.0% - 2.5%	5.0%	> 4.5%	High
60871008005	445	100%	3	37.25	$20-$40	83.06	83.0592	$75-$100	$50-$75k	1,789	31.9%	20%-40%	15%	10% - 30%	1.0%	0.5% - 1.0%	2.1%	1.5% - 2.5%	Low-Moderate
60871008006	285	100%	3	38.36	$20-$40	85.18	85.1803	$75-$100	$50-$75k	1,789	31.5%	20%-40%	36%	30% - 50%	1.0%	0.5% - 1.0%	2.1%	1.5% - 2.5%	Moderate

GEOID	Housing Units	% In-City Housing Units	Median Feb CCF	Median Water Bill	Median Water Bill Category	Median Water & Sewer Bill	Median Water & Sewer Bill Category	Median Monthly Income	Median Annual Income Category	Median Monthly Housing Cost	Median Housing Cost % of MHI	Median Housing Cost % of MHI Category	Poverty Prevalence %	Poverty Prevalence Category	AR Water	AR Water Category	AR Water & Sewer	AR Water & Sewer Category	Water & Sewer Financial Burder Score
60871009001	562	100%	3	37.41	$20-$40	84.44	84.4393	$75-$100	$75-$100k	1,976	29.4%	20%-40%	39%	30% - 50%	0.8%	0.5% - 1.0%	1.7%	1.5% - 2.5%	Moderate
60871009002	825	100%	2.37	28.77	$20-$40	73.15	73.15	$50-$75	$75-$100k	1,976	27.9%	20%-40%	22%	10% - 30%	0.6%	0.5% - 1.0%	1.4%	< 1.5%	Low
60871009003	270	100%	3	37.90	$20-$40	84.03	84.0338	$75-$100	$50-$75k	1,976	36.9%	20%-40%	28%	10% - 30%	1.1%	1.0% - 1.5%	2.4%	1.5% - 2.5%	Low-Moderate
60871009004	340	100%	2.27	29.22	$20-$40	75.04	75.0391	$75-$100	$50-$75k	1,976	31.9%	20%-40%	14%	10% - 30%	0.7%	0.5% - 1.0%	1.7%	1.5% - 2.5%	Low-Moderate
60871009005	304	100%	2	27.17	$20-$40	73.46	73.4647	$50-$75	$100-$150k	1,976	22.8%	20%-40%	18%	10% - 30%	0.4%	< 0.5%	1.1%	< 1.5%	Low
60871010001	743	100%	3.15	33.71	$20-$40	76.14	76.1393	$75-$100	< $50k	1,438	83.7%	> 80%	79%	> 50%	10.8%	> 2.5%	21.4%	> 4.5%	High
60871010002	320	100%	3.2	36.65	$20-$40	80.36	80.3647	$75-$100	$50-$75k	1,438	28.9%	20%-40%	44%	30% - 50%	1.0%	1.0% - 1.5%	2.2%	1.5% - 2.5%	Moderate
60871010003	289	100%	3.75	46.36	$40-$60	94.02	94.0239	$75-$100	$100-$150k	1,438	12.9%	< 20%	52%	> 50%	0.5%	< 0.5%	1.0%	< 1.5%	Low-Moderate
60871010004	302	100%	3.09	33.81	$20-$40	76.15	76.1489	$75-$100	< $50k	1,438	73.8%	60%-80%	94%	> 50%	6.2%	> 2.5%	13.0%	> 4.5%	High
60871010005	223	100%	3	39.60	$20-$40	88.08	88.0788	$75-$100	$75-$100k	1,438	20.5%	20%-40%	49%	30% - 50%	0.7%	0.5% - 1.0%	1.6%	1.5% - 2.5%	Moderate
60871010006	972	100%	3.94	42.04	$40-$60	84.97	84.969	$75-$100	< $50k	1,438	44.7%	40%-60%	50%	30% - 50%	2.3%	2.0% - 2.5%	4.6%	> 4.5%	High
60871010007	671	100%	2.36	26.65	$20-$40	69.34	69.3365	$50-$75	< $50k	1,438	50.9%	40%-60%	52%	> 50%	1.9%	1.5% - 2.0%	4.8%	> 4.5%	High
60871011001	412	100%	4	49.97	$40-$60	99.02	99.0215	$75-$100	$100-$150k	2,336	24.6%	20%-40%	18%	10% - 30%	0.7%	0.5% - 1.0%	1.4%	< 1.5%	Low
60871011002	420	100%	2.5	32.63	$20-$40	79.85	79.845	$75-$100	$50-$75k	2,336	48.0%	40%-60%	22%	10% - 30%	1.3%	1.0% - 1.5%	3.1%	2.5% - 3.5%	Moderate
60871011003	320	100%	4	50.19	$40-$60	99.60	99.6022	$75-$100	$100-$150k	2,336	23.4%	20%-40%	18%	10% - 30%	0.7%	0.5% - 1.0%	1.3%	< 1.5%	Low
60871011004	814	100%	3.73	45.95	$40-$60	93.88	93.881	$75-$100	$100-$150k	2,336	27.8%	20%-40%	20%	10% - 30%	0.8%	0.5% - 1.0%	1.5%	1.5% - 2.5%	Low-Moderate
60871011005	363	100%	3	39.81	$20-$40	88.68	88.6848	$75-$100	$75-$100k	2,336	29.1%	20%-40%	50%	30% - 50%	0.7%	0.5% - 1.0%	1.5%	1.5% - 2.5%	Moderate
60871012001	396	100%	3.38	39.05	$20-$40	84.40	84.3963	$75-$100	< $50k	1,833	50.7%	40%-60%	68%	> 50%	2.1%	2.0% - 2.5%	4.5%	> 4.5%	High
60871012002	399	100%	3	40.13	$40-$60	89.45	89.4513	$75-$100	$100-$150k	1,833	16.8%	< 20%	13%	10% - 30%	0.4%	< 0.5%	1.0%	< 1.5%	Low
60871012003	523	100%	6	77.67	> $60	124.41	124.406	> $100	$50-$75k	1,833	36.8%	20%-40%	32%	30% - 50%	2.4%	2.0% - 2.5%	3.8%	3.5% - 4.5%	Moderate-High
60871202001	39	0%	4	54.45	$40-$60	100.94	120.844	> $100	$75-$100k	1,688	22.9%	20%-40%	31%	30% - 50%	0.9%	0.5% - 1.0%	2.1%	1.5% - 2.5%	Moderate
60871207003	144	0%	5	69.08	> $60	119.33	139.396	> $100	$75-$100k	1,915	25.1%	20%-40%	12%	10% - 30%	1.2%	1.0% - 1.5%	2.4%	1.5% - 2.5%	Low-Moderate
60871208002	244	0%	4	57.59	$40-$60	107.79	127.857	> $100	> $150k	2,118	16.1%	< 20%	12%	10% - 30%	0.5%	0.5% - 1.0%	1.1%	< 1.5%	Low
60871208003	583	26%	3	43.84	$40-$60	92.91	107.677	> $100	> $150k	2,118	15.4%	< 20%	5%	< 10%	0.4%	< 0.5%	0.9%	< 1.5%	Low
60871211002	253	0%	2.53	29.37	$20-$40	70.89	90.5753	$75-$100	$75-$100k	1,682	26.4%	20%-40%	26%	10% - 30%	0.6%	0.5% - 1.0%	1.9%	1.5% - 2.5%	Low-Moderate
60871212001	34	0%	4.5	61.53	> $60	109.59	129.567	> $100	> $150k	2,534	16.3%	< 20%	15%	10% - 30%	0.5%	< 0.5%	1.0%	< 1.5%	Low
60871212003	162	37%	4	54.40	$40-$60	103.70	116.294	> $100	$100-$150k	2,534	23.1%	20%-40%	10%	< 10%	0.6%	0.5% - 1.0%	1.4%	< 1.5%	Low
60871212004	47	0%	3.33	47.46	$40-$60	94.43	114.36	> $100	> $150k	2,534	19.5%	< 20%	9%	< 10%	0.5%	< 0.5%	1.1%	< 1.5%	Low
60871212005	419	84%	4	50.96	$40-$60	100.37	103.559	> $100	> $150k	2,534	18.0%	< 20%	30%	30% - 50%	0.4%	< 0.5%	0.9%	< 1.5%	Low-Moderate

GEOID	Housing Units	% In-City Housing Units	Median Feb CCF	Median Water Bill	Median Water Bill Category	Median Water & Sewer Bill	Median Water & Sewer Bill Category	Median Monthly Income	Median Annual Income Category	Median Monthly Housing Cost	Median Housing Cost % of MHI	Median Housing Cost % of MHI Category	Poverty Prevalence %	Poverty Prevalence Category	AR Water	AR Water Category	AR Water & Sewer	AR Water & Sewer Category	Water & Sewer Financial Burder Score
60871213001	772	0%	4	51.32	$40-$60	96.68	116.533	> $100	$50-$75k	2,131	35.3%	20%-40%	9%	< 10%	1.3%	1.0% - 1.5%	2.9%	2.5% - 3.5%	Low-Moderate
60871213002	232	0%	5	69.12	> $60	119.62	139.696	> $100	$100-$150k	2,131	25.6%	20%-40%	5%	< 10%	1.1%	1.0% - 1.5%	2.2%	1.5% - 2.5%	Low
60871213003	377	0%	3.88	52.52	$40-$60	99.36	119.28	> $100	$100-$150k	2,131	24.0%	20%-40%	5%	< 10%	0.8%	0.5% - 1.0%	1.7%	1.5% - 2.5%	Low
60871213004	304	0%	5.57	77.56	> $60	120.34	140.083	> $100	$50-$75k	2,131	41.4%	40%-60%	38%	30% - 50%	2.5%	> 2.5%	4.4%	3.5% - 4.5%	Moderate-High
60871214011	401	0%	3.25	43.01	$40-$60	88.16	108.011	> $100	$50-$75k	1,903	36.0%	20%-40%	43%	30% - 50%	1.3%	1.0% - 1.5%	3.1%	2.5% - 3.5%	Moderate
60871214012	560	0%	4	55.22	$40-$60	103.11	123.076	> $100	$100-$150k	1,903	21.4%	20%-40%	19%	10% - 30%	0.8%	0.5% - 1.0%	1.7%	1.5% - 2.5%	Low-Moderate
60871214021	540	0%	4	52.11	$40-$60	97.01	116.844	> $100	$50-$75k	1,819	41.2%	40%-60%	33%	30% - 50%	2.0%	1.5% - 2.0%	4.3%	3.5% - 4.5%	Moderate-High
60871214022	791	0%	3.37	44.58	$40-$60	89.70	109.541	> $100	$75-$100k	1,819	25.7%	20%-40%	36%	30% - 50%	0.8%	0.5% - 1.0%	2.0%	1.5% - 2.5%	Moderate
60871214023	228	0%	4.25	55.10	$40-$60	101.20	121.093	> $100	$75-$100k	1,819	22.2%	20%-40%	16%	10% - 30%	0.9%	0.5% - 1.0%	1.9%	1.5% - 2.5%	Low-Moderate
60871214031	800	0%	3.31	43.23	$40-$60	88.17	108.013	> $100	$50-$75k	1,788	35.9%	20%-40%	26%	10% - 30%	1.3%	1.0% - 1.5%	3.3%	2.5% - 3.5%	Moderate
60871214032	338	0%	3.96	52.63	$40-$60	99.00	118.895	> $100	$75-$100k	1,788	22.4%	20%-40%	11%	10% - 30%	0.8%	0.5% - 1.0%	1.9%	1.5% - 2.5%	Low-Moderate
60871214033	272	0%	4	50.73	$40-$60	95.34	115.167	> $100	$100-$150k	1,788	20.2%	20%-40%	41%	30% - 50%	0.7%	0.5% - 1.0%	1.6%	1.5% - 2.5%	Moderate
60871215001	533	0%	2	32.00	$20-$40	79.51	99.4638	$75-$100	$100-$150k	1,453	15.6%	< 20%	22%	10% - 30%	0.4%	< 0.5%	1.3%	< 1.5%	Low
60871215002	537	0%	3	40.83	$40-$60	86.28	106.138	> $100	$50-$75k	1,453	26.0%	20%-40%	45%	30% - 50%	1.0%	0.5% - 1.0%	2.5%	2.5% - 3.5%	Moderate
60871215003	810	0%	3.69	43.81	$40-$60	86.01	105.728	> $100	$50-$75k	1,453	32.2%	20%-40%	29%	10% - 30%	1.4%	1.0% - 1.5%	3.3%	2.5% - 3.5%	Moderate
60871215004	585	0%	2	31.62	$20-$40	78.25	98.0951	$75-$100	$50-$75k	1,453	27.4%	20%-40%	33%	30% - 50%	0.8%	0.5% - 1.0%	2.5%	1.5% - 2.5%	Moderate
60871215005	330	0%	4.61	54.86	$40-$60	97.39	117.119	> $100	$50-$75k	1,453	26.6%	20%-40%	42%	30% - 50%	1.4%	1.0% - 1.5%	2.8%	2.5% - 3.5%	Moderate
60871216001	391	0%	3.5	46.09	$40-$60	91.18	111.023	> $100	$50-$75k	1,499	25.5%	20%-40%	26%	10% - 30%	1.0%	1.0% - 1.5%	2.5%	1.5% - 2.5%	Low-Moderate
60871216002	127	0%	2	33.35	$20-$40	81.89	101.885	> $100	$75-$100k	1,499	19.7%	< 20%	15%	10% - 30%	0.5%	0.5% - 1.0%	1.6%	1.5% - 2.5%	Low-Moderate
60871216003	1007	0%	3	41.33	$40-$60	87.14	107.013	> $100	$50-$75k	1,499	24.8%	20%-40%	16%	10% - 30%	0.9%	0.5% - 1.0%	2.3%	1.5% - 2.5%	Low-Moderate
60871216004	776	0%	2.96	42.04	$40-$60	88.87	108.786	> $100	$100-$150k	1,499	15.6%	< 20%	21%	10% - 30%	0.5%	0.5% - 1.0%	1.3%	< 1.5%	Low
60871216005	474	0%	2.74	33.07	$20-$40	75.46	95.1881	$75-$100	< $50k	1,499	47.7%	40%-60%	62%	> 50%	2.0%	1.5% - 2.0%	5.5%	> 4.5%	High
60871217001	154	0%	2.54	34.03	$20-$40	79.04	98.8784	$75-$100	$75-$100k	1,829	26.4%	20%-40%	30%	30% - 50%	0.7%	0.5% - 1.0%	1.9%	1.5% - 2.5%	Moderate
60871217002	258	0%	3.79	51.47	$40-$60	98.55	118.481	> $100	$75-$100k	1,829	25.0%	20%-40%	27%	10% - 30%	0.9%	0.5% - 1.0%	2.1%	1.5% - 2.5%	Low-Moderate
60871217003	315	0%	4.23	55.25	$40-$60	101.34	121.232	> $100	$100-$150k	1,829	20.6%	20%-40%	0%	< 10%	0.8%	0.5% - 1.0%	1.7%	1.5% - 2.5%	Low
60871217005	393	0%	4.65	60.54	> $60	106.59	126.48	> $100	$75-$100k	1,829	23.0%	20%-40%	28%	10% - 30%	1.0%	0.5% - 1.0%	2.0%	1.5% - 2.5%	Low-Moderate
60871217006	319	0%	4.23	53.22	$40-$60	97.66	117.476	> $100	$100-$150k	1,829	20.5%	20%-40%	3%	< 10%	0.7%	0.5% - 1.0%	1.6%	1.5% - 2.5%	Low
60871220034	17	0%	4	54.21	$40-$60	99.30	119.144	> $100	$75-$100k	1,968	26.9%	20%-40%	33%	30% - 50%	1.0%	1.0% - 1.5%	2.2%	1.5% - 2.5%	Moderate
60871220035	181	0%	3.54	41.15	$40-$60	82.96	102.659	> $100	$50-$75k	1,968	44.5%	40%-60%	21%	10% - 30%	1.6%	1.5% - 2.0%	4.0%	3.5% - 4.5%	Moderate

March 2023

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San Lorenzo River and North Coast Watersheds Sanitary Survey Update

FINAL

Photo courtesy of San Lorenzo Valley Water District

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San Lorenzo River and North Coast Watersheds Sanitary Survey Update

March 6, 2023

Prepared for

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715 Graham Hill Road
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In association with
San Lorenzo Valley Water District

K/J Project No. 2268009*00

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Executive Summary

Watershed sanitary surveys are required by the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW), formerly the California Department of Public Health, to be completed for each watershed that is a drinking water source. Updates are required every five years per the State of California Surface Water Treatment regulations (Chapter 17, Title 22). These requirements incorporate the Surface Water Treatment Rule (SWTR) mandated by the United States Environmental Protection Agency (EPA) and enforced by DDW as a primacy agency for federal regulations.

This sanitary survey includes the San Lorenzo River and North Coast watersheds, all within Santa Cruz County, California. This update reflects changes that have occurred since the 2018 update was prepared.

Watersheds and Water Supply Systems: - The City of Santa Cruz (City) owns 3,880 acres, and San Lorenzo Valley Water District (SLVWD) owns 2,291 acres of the estimated 76,400 total acres within the San Lorenzo River watershed upstream of the Tait Street Diversion. While the City and SLVWD can influence water quality management activities within the lands they control, protection of the majority of other lands requires outside entities, including Santa Cruz County (County), California State Parks, and non-profit organizations to protect watershed lands for water quality benefit through ownership or regulation. Almost one-quarter of the lands in the San Lorenzo River watershed are under ownership by entities that retain them as preserves. However, private landowners, especially residential landowners, can be the source of pollutants such as those from septic systems, from road erosion, and from domestic animals such as horses.

The North Coast watershed sources fall under a range of public and private ownership with associated benefits and challenges, such as public access and associated water quality risks. The 7,600 acres of the North Coast watershed sources are mostly under private ownership. In 2011, a large swath of the CEMEX properties was acquired by a group of private organizations, resulting in the protection of an additional 8,532 acres of land. Called the San Vicente Redwoods, some of the area drains into the upper reaches of Laguna Creek and potentially into Liddell Spring via the interconnected Laguna-Liddell karst system. A portion of this land is upstream of the City's diversion. The land is owned by the Sempervirens Fund and Peninsula Open Space Trust (POST) with funding support from Save the Redwoods League, the Nature Conservancy, the Santa Cruz County Land Trust, and a number of foundations. The San Vicente Redwoods land is currently under the management of the Land Trust of Santa Cruz County with plans for a park ranger program. Access to the San Vicente Redwoods may be provided through the adjacent federally owned Cotoni Coast Dairies National Monument which will be managed by the US Bureau of Land Management. The quarry in the Liddell Springs watershed, which is one of the City's North Coast sources, is also privately owned. As discussed in Section 2.2.2, the karst limestone provides subterranean connectivity between the Laguna and Liddell watersheds.

Potential Contaminant Sources: As discussed in Section 3, Section 6.2 and summarized in Table 6-2, a number of contaminant sources can contribute sediments, pathogens, and chemicals with the potential to significantly impair drinking water quality. These sources include:

- Wastewater and Urban Runoff
- Unauthorized Activity such as homeless encampments, illegal grading, and unauthorized waste dumping.
- Wildfire
- Roads including rural unpaved roads
- Confined Animal Facilities
- Mining/Quarry Activities
- Agriculture
- Geologic Hazards including landslides after significant rains/fires
- Chemical Spills
- Pesticides and Herbicides

In 2020, the CZU Lightning Complex fires resulted in tens of thousands of acres of watershed lands in Santa Cruz County being burned. With over 900 structures and hundreds of vehicles, propane tanks, septic systems, and water and wastewater pipes and other infrastructure burned in the fires, there is a real threat that contaminants such as benzene, toluene, ethylbenzene and xylene, as well as plastics and other common household materials will exist well into the future. However, data through 2021 (the period covered for this update) show that SLVWD and City drinking water source waters are so far uncontaminated, in large part due to a proactive initial cleanup and erosion control response by the EPA, the County, the Santa Cruz County Resource Conservation District, SLVWD and the City, combined with a lack of and substantial storm events and associated landslides in 2021.

Watershed Management Activities: As discussed in Section 4, watershed management jurisdiction in the San Lorenzo and North Coast watersheds is distributed; the majority of the watershed is governed by Santa Cruz County and/or regulated by Federal and state agencies such as US Army Corps of Engineers, California Regional Water Quality Control Board (RWQCB), California State Parks, California Department of Forestry and Fire Protection (CalFire), and California Department of Fish and Wildlife (CDFW) with the water purveyors jurisdiction limited mostly to those areas that they have land ownership as summarized earlier. In addition, local non-governmental organizations (NGOs) can play a role in watershed protection and water quality improvement as partners as well as individually.

Watershed management includes regulatory activities and management/planning activities which are detailed in Section 4. Regulatory activities include the County's ordinances on cannabis cultivation, wastewater management, water quality, riparian, and sensitive habitats; State regulations on beneficial use and permitting of stormwater, urban runoff, riparian zone construction, and timber harvest; and federal water quality regulations for waste discharge and wetland filling. In addition, state, and federal regulation to protect threatened and endangered species provide ancillary water quality benefits. Specific discussion regarding the non-drinking water quality regulatory activities is discussed further below.

Management and planning activities also occur at the local, state, and federal levels. At the local level, watershed lands management activities by the City and SLVWD can include patrol of agency-owned lands and riparian areas, restoration efforts and implementation of the various planning documents including Habitat Conservation Plans. At the County level, activities include

implementation of the County's General Plan, San Lorenzo River Watershed Management Plan, San Lorenzo Nitrate Management Plan, sewer system management plans, and ordinances such as those related to cannabis cultivation and general environmental protection ordinances. In addition, the Resource Conservation District of Santa Cruz County (RCD) has a suite of programs geared towards educating and supporting land owners with tools and resources to assist with projects such as road management, horse stable management, fire protection, fish passage and water quality improvement. Further, State fire and fuel management plans within the State Parks provide management of other watershed lands . Collectively, these management and planning tools generally provide a high level of oversight of activities that impact and improve water quality, which is supported by the long-term water quality data trends. However, improving coordination efforts between the entities and their activities is an ongoing effort.

In addition, City and SLVWD staff has been creative in implementing measures that have the potential to directly improve water quality. Measures include coordinating efforts for habitat restoration and watershed protection; wildfire planning; establishing conservation agreements on private lands to allow staff to patrol upstream of drinking water diversions; and funding for patrols relating to homeless encampments. On a broader basis, the City and SLVWD have partnered with NGOs such as the RCD to educate San Lorenzo River watershed users by installing watershed identification signs and signs at creek crossings and watershed divides. Watershed interpretive and outreach programming has increased in recent years, with the City and SLVWD partnering with the County, the RCD and the Coastal Watershed Council to produce the annual State of the Sn Lorenzo River Symposium. The City and SLVWD have also been involved in significant fire preparedness work on their watershed lands surrounding critical water infrastructure and the City's Loch Lomond Reservoir. Other water quality improvement activities significantly benefit drinking quality, such as participating in a county-wide Fire Safe Council, continuing to support efforts by organizations such as Sempervirens Fund, and POST's efforts to acquire and protect watershed lands.

Non- Drinking Water Regulation: While various local, state, and federal plans and regulations can provide protection of water quality beneficial uses, weak enforcement of those plans and regulations within the watersheds continue to challenge the City and SLVWD. For example, while implementation of TMDLs for pathogens and nutrients can provide benefits to water quality, water purveyors must rely on others to remove these constituents. In addition, while implementation of instream flow targets related to various water rights and the City's existing and pending Habitat Conservation Plans(described in greater detail in Section 2.7.4) have the benefit of improving water quality in source water streams, they limit the City's use of their high-quality North Coast water sources, increasing reliance on other sources with higher total organic carbon, resulting in disinfection challenges that require the City to balance many factors when managing their water supply portfolio.

Water Quality Data Summary: Water quality data for the period from 2017—2021 (found in Figures and Tables in Section 5) indicate seasonally appropriate changes in total coliform, turbidity, or nitrate concentrations in the City's North Coast or the San Lorenzo River watershed sources for the City or SLVWD; expected seasonal and dry/wet year variations have occurred. Nitrates are well below maximum contaminant levels but are showing gradual long-term increases. The North Coast sources, in particular Liddell Spring, continue to have lower total coliform levels when compared to the San Lorenzo River sources. While acute water quality

impacts from the CZU Fire were largely averted due to the coordinated agency response, the threat of long-term impacts due to remaining contamination from burned homes, cars, and other infrastructure remains.

Conclusions and Recommendations: The San Lorenzo and North Coast watersheds are generally providing high water quality, with some expected variability during the wet season. The water utilities closely manage the high turbidity events by bypassing stormflows, using stored water and/or alternative sources, that, when combined with the water treatment processes at the WTPs, are delivering a consistently safe drinking water to the residents. However, the City and SLVWD faces future regulatory challenges and interest in wintertime flows for regional water supply reliability. The City is undertaking improvements at the Graham Hill Water Treatment Plant (GHWTP) to continue to meet the drinking water regulations while using higher turbidity waters.

More specific conclusions and recommendations are discussed in Section 6 and include activities such as continuing:

- Coordination of acquisition and review of water quality monitoring data (including increased winter water quality testing), particularly as it relates to wastewater constituents, fire-related retardant (particularly after significant fire events), and to a lesser extent, cannabis cultivation, which is now regulated

- Implementation of County wastewater management, including consolidation efforts of small wastewater plants, other management plans, cannabis regulations, road maintenance practices, and ordinances as well as coordinating with County agencies such as emergency response for toxic spills

- Review of developments in the watersheds including accessory dwelling units and associated wastewater treatment impacts in rural areas, especially near diversions, overlying sandy soils or karst areas

- Support of local NGOs in public education, riparian protection/restoration, homeless camp cleanups, implementation of best management practices for roads and confined animals, as well as land acquisition for preserves

- Improving collaboration with state regulatory agencies with regard to forest fuel management and fisheries habitat improvement; NGOs like the Fire Safe Council of Santa Cruz County; and local fire agencies and with private landowners.

Section 1 Introduction

Sanitary surveys are required by the State Water Resources Control Board, Division of Drinking Water (DDW), formerly the California Department of Public Health to be completed for each watershed that is a drinking water source. Updates are required every five years per the State of California Surface Water Treatment regulations (Chapter 17, Title 22). These requirements incorporate the Surface Water Treatment Rule (SWTR) mandated by the United States Environmental Protection Agency (EPA) and enforced by DDW as a primacy agency for federal regulations.

This sanitary survey includes the San Lorenzo River and North Coast watersheds (as shown on Figure 1-1 all within Santa Cruz County, California. The first sanitary survey for this area was completed in 1996 by Camp Dresser & McKee. It was updated in 2001 by the City of Santa Cruz Water Department (SCWD or City), and subsequently updated in 2007, 2013, and 2018 in collaboration with the San Lorenzo Valley Water District (SLVWD)[1], whose source water diversions are contained within portions of the San Lorenzo River watershed. This sanitary survey update is based on numerous discussions with utility and agency staff, review of various reports, an evaluation of historic and recent water quality monitoring results, and analyses of the ongoing management practices within the watershed area.

1.1 Study Area

Figure 1-1 illustrates the approximate watershed boundaries of the San Lorenzo River and North Coast watersheds, all within Santa Cruz County. The San Lorenzo River is the watershed for numerous water purveyors including City and SLVWD. The North Coast watersheds included in this study provide water to the City as well as some private diverters. Figure 1-1 also shows the key sub watersheds, location of the raw water intakes, primary roadways, and streams within the study area.

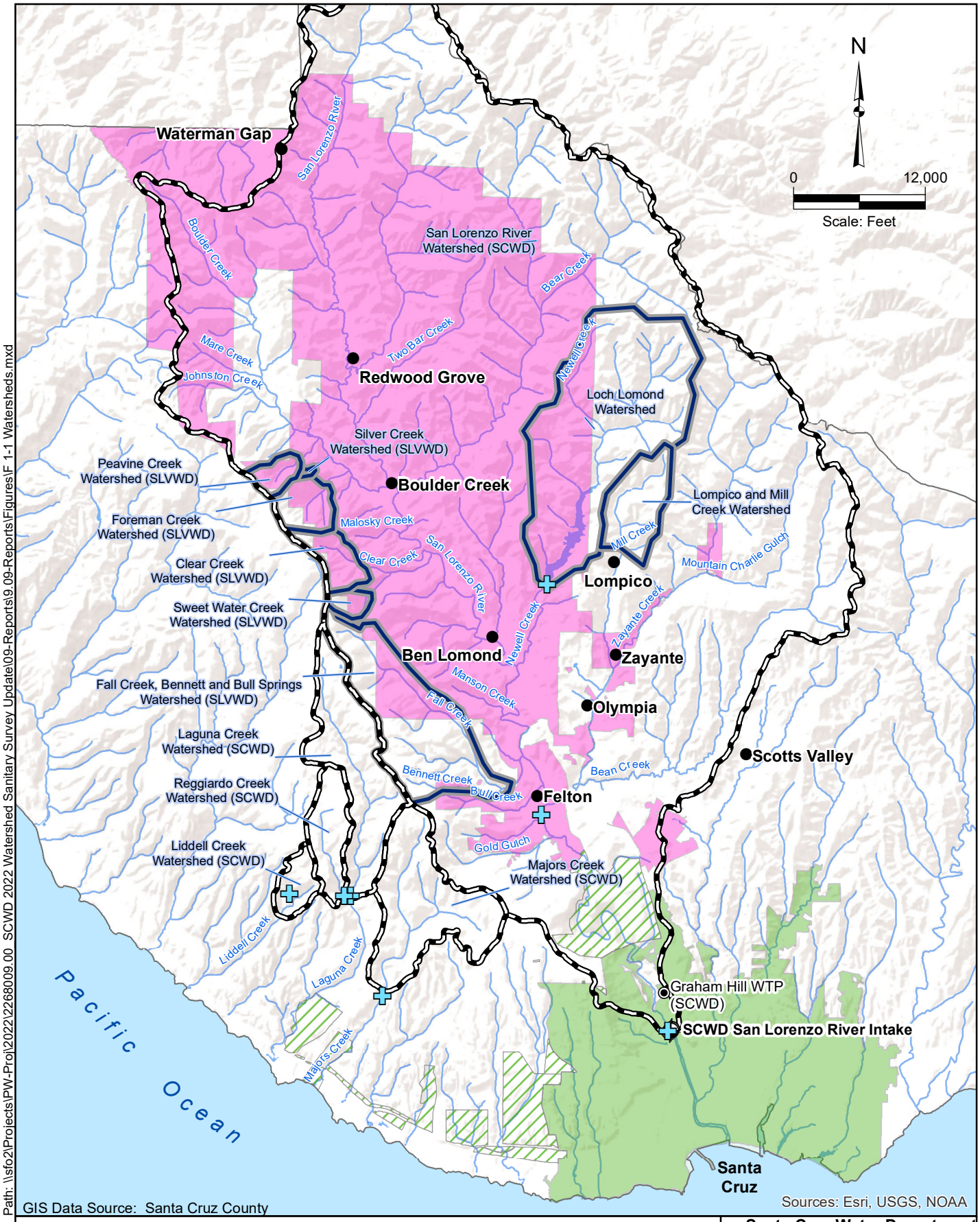
1.2 Watershed Sanitary Survey Requirements

A watershed sanitary survey is a detailed evaluation of surface water sources and their vulnerability to contamination. It is more comprehensive than a Source Water Assessment (SWA) and can be used in place of a SWA to fulfill the requirements of California's 1996 Drinking Water Source Assessment and Protection (DWSAP) Program. Whereas a SWA ranks, and inventories possible contaminating activities (PCAs) located within the source area, a sanitary survey provides more background, descriptive information, and review of all relevant monitoring data.

Specific sanitary survey requirements are:

1. Conduct a sanitary survey of the watershed(s) at least every five years.

[1] Reference to SLVWD includes the areas previously known as Lompico County Water District, which merged with SLVWD in 2016.



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Santa Cruz Water Department
WSS Update

Figure 1-1: San Lorenzo Valley and North Coast Watersheds

2. Describe the hydrological conditions of the watershed, summarize source water quality data, describe activities and possible contamination sources, and identify any significant changes since a previous survey was conducted.
3. Describe watershed control and management practices.
4. Evaluate compliance with the SWTR with a focus on disinfection requirements.
5. Recommend corrective actions to maintain or improve water quality.

1.3 Objectives

The objectives of this project are to:

- Prepare a stand-alone document that complies with the DDW requirements to update the 2018 Watershed Sanitary Survey.
- Identify potential sources where chemical and microbiological contaminants may enter the water supply.
- Establish the baseline information needed for a watershed management program.
- Recommend actions to enhance water quality protection and watershed management.

The drinking water purveyors involved in this project should use this report to compare existing water quality conditions with future monitoring data, implement practices to improve water quality, and reduce the risk of source water contamination.

1.4 Participating Drinking Water Utilities

The two water purveyors that participated in this update are the City of Santa Cruz Water Department and the San Lorenzo Valley Water District, both of whom draw from the San Lorenzo River watershed. The City also draws water from the North Coast watersheds.

1.5 Report Organization

This report follows the format in the *Watershed Sanitary Survey Guidance Manual* as required by DDW so that it conforms with reports developed by other suppliers for their watershed areas. Specific sections are:

Section 1: Introduction

Section 2: Watershed and Water Supply System

Section 3: Potential Contaminant Sources in the Watersheds

Section 4: Watershed Management and Control Practices

Section 5: Water Quality Regulations and Evaluation

Section 6: Conclusions and Recommendations

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Section 2 Watersheds and Water Supply Systems

2.1 Watershed Description

The San Lorenzo River and North Coast watersheds and water purveyors which use surface water are described in this section. The watershed area, sub watersheds within the San Lorenzo Valley, and approximate land areas are listed in Table 2-1.

Table 2-1: Watershed Areas and Drinking Water Purveyors Served[1]

Watershed Area	*Utilities Served*	*Watershed Area[3]*	
		Acres	*Square Miles*
San Lorenzo River (upstream of the City intake in Santa Cruz)	City, SLVWD [2]	74,000	115
Subwatersheds			
Loch Lomond Reservoir on Newell Creek	City and SLVWD	5,728	8.95
Fall Creek, Bennett, and Bull Springs	SLVWD	2,600	4.1
Sweetwater Creek	SLVWD	180	0.3
Clear Creek	SLVWD	460	0.7
Foreman Creek	SLVWD	500	0.8
Silver Creek	SLVWD	20	0.03
Peavine Creek	SLVWD	230	0.4
North Coast Watersheds			
Liddell Spring	City	3,994	6.24
Laguna Creek	City	2,560	4.0
Reggiardo Diversion	City	3,584	5.60
Majors Creek	City	2,500	3.9

[1] Figure 1-1 shows the study area primary watersheds and subwatersheds within the San Lorenzo River, the North Coast watersheds, and the general locations for each utility.

[2] Numerous other drinking water purveyors with less than 200 service connections use surface water from this watershed.

[3] The watershed area is the drainage area above the intakes and not the full watershed for the water body

2.1.1 Regional Hydrologic Setting

The project area includes the San Lorenzo River watershed and the North Coast watersheds, all located in north central Santa Cruz County. The San Lorenzo River watershed is the largest contiguous watershed area in the study area with an overall area of about 74,000 acres. The North Coast watersheds have a total area of about 7,000 acres.

City's primary diversion is located on the San Lorenzo River towards the south end of the watershed (Figure 1-1). City's North Coast watershed diversions are located on Majors Creek, Reggiardo Creek, Laguna Creek, and Liddell Spring. The flow from Reggiardo Creek, which is typically minimal, is diverted into Laguna Creek just upstream of the Laguna Diversion. City

maintains the Loch Lomond Reservoir on Newell Creek, a tributary to the San Lorenzo River, which provides water to both City and SLVWD.

SLVWD diverts water from Fall Creek, Bull Creek, and Bennett Springs within the town of Felton, and from Sweetwater Creek, Clear Creek, Foreman Creek, Silver Creek, and Peavine Creek watersheds, which are located on the east side of Ben Lomond Mountain. Diversions on Fall and Bull creeks and Bennett Spring supply the SLVWD Felton System. The Fall Creek diversion has a watershed area of approximately 2,770 acres (4.3 square miles), including the 225-acre watershed above the Bennett Spring diversion. The two Bull Creek diversions have a combined watershed area of 175 acres. Bennett Spring and the springs supplying the Bull Creek diversions may have contributing groundwater recharge areas that differ from their respective drainage areas. Together, the Felton System diversion watersheds comprise 4.3 percent of the San Lorenzo River watershed above the Big Trees gage. Surface diversions make up the entire supply for the Felton System, while a combination of groundwater and surface water supply the San Lorenzo Valley System.

2.1.2 Prior Studies

The City, SLVWD, and the County of Santa Cruz, have conducted evaluations of watershed management, water supply, and water quality protection. Key existing information sources include hydrologic and water quality studies conducted by the County of Santa Cruz, U.S. Geological Survey (USGS), U.S. Army Corps of Engineers, Central Coast RWQCB, California Department of Water Resources (DWR), local water purveyors, and consulting specialists. Much of this work is considered and cited in several summary reports (Ricker, 1994; Hecht and others, 1991; Camp Dresser & McKee, 1994; Swanson, 2001; and the San Lorenzo River Watershed Plan Update, 2001). Recent studies reviewed for the development of the 2023 WSS include, but are not limited to, a USGS study of sedimentation in the San Lorenzo River (East et al, 2018), a USGS study on storage capacity of Loch Lomond Reservoir, City's annual source water monitoring study report, and various documentation on the impacts of the CZU Lightning Complex Fire on water quality and other watershed conditions.

Streamflow in the area has been measured by several resource agencies throughout the last several decades. On the San Lorenzo River, the USGS operates long-term stream gages at Big Trees (at the Henry Cowell State Park entrance road) and at Santa Cruz (near the City San Lorenzo River intake in Santa Cruz) as shown on Figure 1-1.

In the past, USGS operated gages for multi-year periods at: San Lorenzo River near Boulder Creek, Boulder and Bear Creeks near Boulder Creek, Newell Creek (prior to the construction of Loch Lomond Reservoir), Zayante Creek at Zayante, Bean and Carbonera Creeks in Scotts Valley, and Branciforte Creek in Santa Cruz. In the North Coast watersheds, the USGS operated gages for multi-year periods at: Majors Creek, Laguna Creek, and San Vincente Creek, an adjoining watershed of similar size immediately to the west of Laguna Creek.

From 2000 to the present, the City established ten gaging stations within the study area to help manage the water resource and in-stream habitat, some of which occupy former USGS gaging stations. Two gages are located within the San Lorenzo River watershed: on Newell Creek, above and below Loch Lomond. Eight gages are located in the North Coast watersheds: three gages are on Laguna Creek; three gages are located on Majors Creek; and two gages are located on Liddell Creek. Some of these stations are equipped with specific conductance and

temperature sensors or have had such measurements made routinely over the past several years. Historically, Scotts Valley Water District had two gaging stations on Bean Creek near Scotts Valley: one at Mount Hermon Camp, and the other upstream at Mount Hermon Road (former USGS site); these gages may restart soon.[2]

Water quality stations were operated for several years at the San Lorenzo River gages by the USGS or the DWR.[3] Water quality and instantaneous flow were monitored intermittently in Kings, Two Bar, Love, Fall, and Lompico Creeks, and on lower Zayante Creek below Bean Creek, although no daily records were developed. Much of the USGS water-quality information has been summarized in a report by Sylvester and Covay (1978). Santa Cruz County has routinely sampled an array of other stations in the San Lorenzo River watershed. The City regularly samples water quality from San Lorenzo River sources (Loch Lomond, the Felton Diversion, and the intakes in Santa Cruz) and from North Coast sources (Liddell Spring, Laguna Creek, and Majors Creek). The City measures turbidity, with varying frequency, for each of its water sources.

Since 2013, SLVWD has worked with Balance Hydrologics, Inc. to gage flows in channels that serve as SLVWD water sources, with the goal being to utilize data to better understand how diversions affect flow and habitat values in the San Lorenzo River and its tributaries. In 2019, SLVWD and Balance Hydrologics began a parallel project to monitor Fall and Clear Creek flows for operational purposes.

SLVWD also regularly samples water quality at each point of diversion: Clear Creek, Peavine Creek, Sweetwater Creek and Foreman Creek. Meters have been installed on all diversions to measure diverted water. Up until 2020, SLVWD measured bypass flows on Clear Creek; however, this gage was destroyed in the 2020 CZU fire, and the Clear Creek diversion is offline awaiting repairs.

While streamflow gaging has diminished in the San Lorenzo Valley over the past 25 years, the number of stations at which water-quality sampling is conducted generally remained consistent. Periodic changes to frequency of sampling and the number of constituents tested can occur, particularly for special studies in response to events like significant fires and/or to evaluate seasonal water quality changes.

2.1.3 Significance of Storms, Droughts, Geology, and Baseflow

Streamflow in the Santa Cruz Mountains varies seasonally. About 85 percent of annual rainfall occurs in the six months from December through May. Winter precipitation generally does not increase and sustain streamflow until after soil saturation occurs, following the initial rains of the season, with the highest flows typically occurring from late December through March. Peak streamflow resulting from storm events declines rapidly, while elevated baseflow declines gradually after the winter rains cease. Snows are relatively rare in the Santa Cruz Mountains and do not create a snowmelt-runoff season.

[2] Bean Creek at Mount Hermon is a continuous turbidity monitoring station, while upstream Bean Creek at Mount Hermon Road is a continuous specific conductance monitoring station.
[3] DWR also sampled the coastal streams for water quality on a monthly, and then on an intermittent basis, during the 1960s and 1970s.

California and the western states have been affected by a multi-year drought with below average rainfall starting in 2012 and continuing into the fall of 2016. The drought was followed by an extremely wet winter with precipitation from October 2016 to March 2017 at 162 percent of average. Since then, 2018 was a dry water year, 2019 was a normal water year, and 2020 was a dry water year. Due to extreme heat and lack of rain and snow, 2021 was the second driest water year on record. Currently, all 58 counties in California have been placed under an emergency drought proclamation.

2.1.4 Streamflow Summary

The longest continuous period of record for streamflow in the area is the USGS gage on the San Lorenzo River at Big Trees, located downstream of the Fall Creek intake just south of Felton (USGS Station No. 11160500). This gage has operated since 1937 and measures discharge from about 85 percent of the watershed. . The maximum recorded discharge was 30,400 cubic feet per second (cfs) (19,600 million gallons per day or 'mgd') on December 23, 1955. The minimum instantaneous daily discharge was 5.6 cfs (3.6 mgd) on July 27 and 28, 1977, during an intense drought. The annual mean runoff for the period of water year 1937 to water year 2021 is 128 cfs (83 mgd). Recent water years have experienced a similar range of variability with very high stream flows in the San Lorenzo River in January—March 2017 where ten distinct, major storm systems produced very significant peak flows, five of which registered higher than 10,000 cfs. The highest events (January 10 and February 7, 2017) resulted in flooding and some damage of critical water system infrastructure as well as increased potential for septic systems to overflow and impact groundwater. The lowest daily flows in the recent years occurred in September 2021, when flows dropped as low as 9.16 cfs. Low flows can result in warm, stagnant waters, and conditions favorable to harmful algal blooms (HAB), the rapid growth of algae or cyanobacteria that can cause harm to people, animals, or the local ecology.

2.1.5 Geology and Surface Water Quality

Surface water quality in the San Lorenzo River watershed fluctuates seasonally in relation to streamflow. During periods of high runoff, sediment and organic debris, urban runoff, animal wastes and wastewater from septic systems enter the surface water system. High levels of turbidity and pollutants during these events can limit the source water available for treatment. During dry periods and droughts, groundwater sustains baseflow to the area streams. The groundwater quality varies widely because of both geologic and human influences. As groundwater contributes to streamflow, it may carry dissolved constituents from bedrock formations, discharges from septic systems, and other constituents that have percolated into the aquifer.

In general, water quality in the San Lorenzo River watershed is primarily influenced by the three geologic subareas bounded by the Zayante and Ben Lomond faults (c.f., Battleson, 1966; Ricker and others, 1977; Sylvester and Covay, 1978). North of the Zayante fault, streams draining the older sedimentary formations contain relatively high concentrations of dissolved solids (c.f., Philips and Rojstaczer, 2001). The upper watersheds of the San Lorenzo River, and Kings, Two Bar, Bear, Zayante and Newell Creeks are all underlain mainly by erosive sedimentary formations, principally the Butano sandstone, Two Bar shale, Rices mudstone, Vaqueros sandstone, and Lambert shale.

South of the Zayante Fault and east of the Ben Lomond fault, streams originate in the younger sedimentary formations and contain water of intermediate quality. Rainfall runoff tends to occur slowly because of the higher permeability soils that have developed on parts of the Santa Margarita sandstone, Lompico sandstone and Purisima formation (most commonly a water-bearing sandy shale, but locally quite sandy). These geologic formations are shown on Figure 2-5 and discussed further in Section 2.3. Less permeable geologic formations in these eastside streams include the Monterey formation and the Santa Cruz mudstone. The high rates of recharge and relatively large available groundwater volumes within the Santa Margarita sandstone have resulted in extensive development of its water resources. Use of wells has lowered groundwater levels and diminished streamflow, altered the direction of groundwater flow, and helped to induce increases in the dissolved solids ('salts') and nitrate levels in this aquifer, originating (respectively) from groundwater inflow from deeper aquifers and from partial recharge from leach fields or other sources that contribute human or livestock wastes. The larger streams with seasonal baseflows from these formations include Bean, Zayante, Lompico, and Love Creeks.

West of the Ben Lomond fault, San Lorenzo tributary streams drain the igneous and/or metamorphic rocks, have relatively lower concentrations of dissolved solids and tend to provide high quality water at reasonably constant rates. The weathered upper zone of the rocks (principally granodiorite, quartz diorite, schist, and limestone/marble karst) exposed on Ben Lomond Mountain serves to recharge precipitation and provide dry-season baseflow to the streams that drain the east side of Ben Lomond Mountain. These include Jamison, Peavine, Foreman, Malosky, Clear, Fall, and Shingle Mill Creeks, and Hubbard and Gold Gulches, as well as Bennett Corvin, and Pogonip Springs. Flows in Boulder Creek during dry seasons or drought years are also sustained primarily by flows emanating from these crystalline rocks. Hare Creek and upper Boulder Creek drain similar watersheds from Ben Lomond Mountain but are underlain by sedimentary rocks generally yielding much lower rates of summer baseflow (Hecht, 1977).

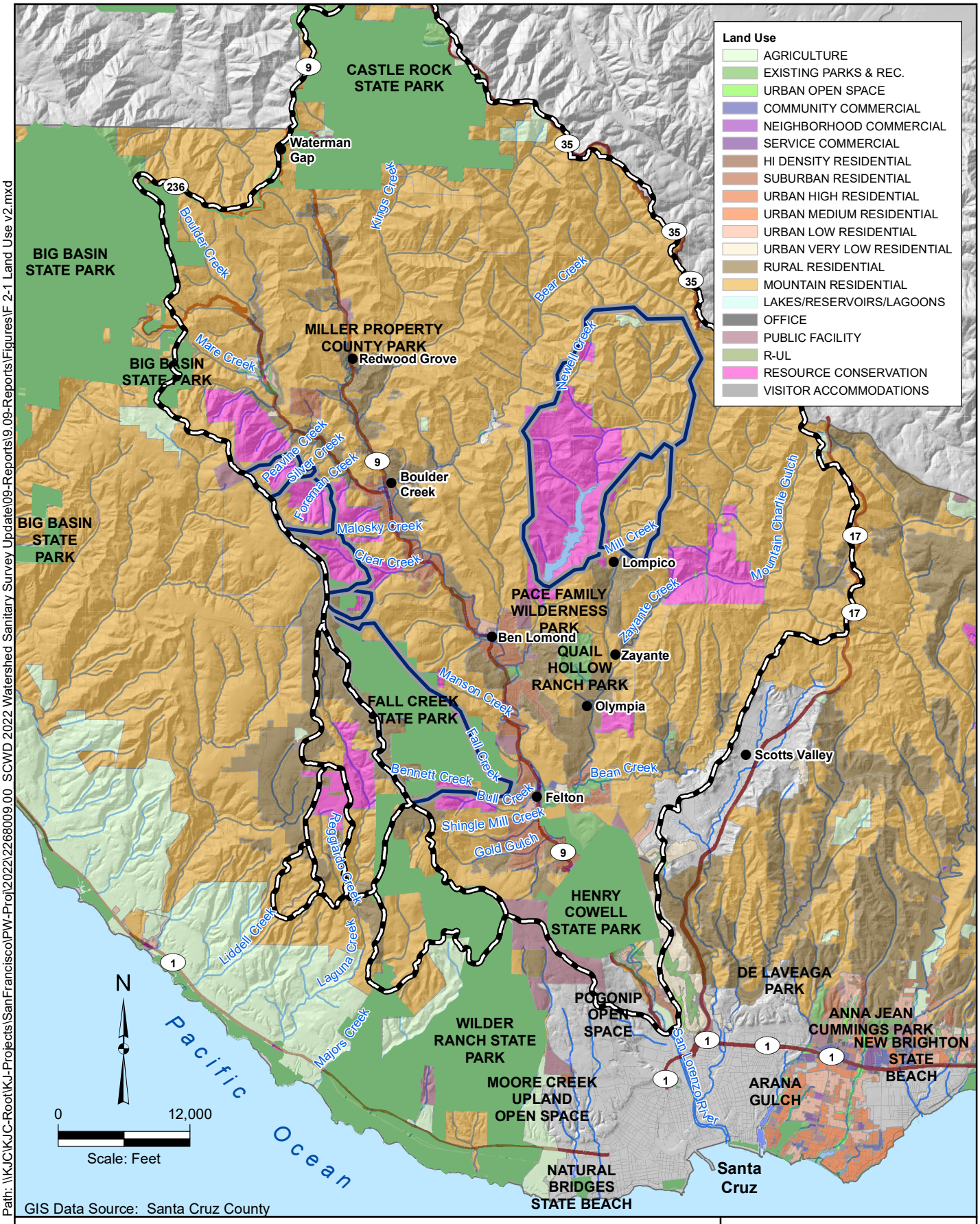
In the North Coast watersheds, surface water in the streams is also influenced by the same crystalline rocks of Ben Lomond Mountain. In addition, the Lompico sandstone, Monterey formation, and Santa Margarita sandstone overlay the crystalline rocks of Ben Lomond Mountain and provide groundwater storage and baseflow to the streams. Sinkholes and cavernous fractures (i.e. karst formations) occur throughout the County and also in several parts of the Laguna and Majors Creek watersheds and at Liddell Spring, which serves as the most distant and reliable North Coast source of water for the City. These karst formations provide subterranean connectivity between the Laguna and Liddell watersheds, essentially increasing the Liddell Spring drainage area by up to 2,000 acres (P.E. LaMoreaux & Associates Inc., 2005). The karst connectivity both increases drainage area and potentially supply at City diversions as well as rapidly transporting contaminants, if any were to occur. Upstream of the City's diversion, Majors Creek has been generally and actively incising into the underlying alluvium and weathered sedimentary rocks since at least the 1960s (Hecht and others, 1968; Hecht, 1978), contributing waters that are typically more turbid than in Laguna Creek or at Liddell Spring (Camp Dresser McKee, 1996). Water derived from Liddell Spring plays an important role in the City's water portfolio due to its relatively high alkalinity compared to other City source waters. The high alkalinity increases the ability to use alum in the treatment process and enhance clarification.

2.2 Land Use and Water Quality

This subsection describes land use and aspects of the natural setting that may affect potential contaminant sources. In general, there have been limited changes to land uses in the watershed since the 2018 Watershed Sanitary Survey.

2.2.1 Land Use

There are a variety of land uses in the watersheds including: timber production, quarrying, agriculture, ranching, rural residential and unincorporated communities with urban densities as found on Figure 2-1. Almost one-quarter of the San Lorenzo River watershed lands are in public or private ownership for natural resource conservation. In the 1960s and 1970s, Santa Cruz County experienced rapid growth in both population and development.


Land Use
AGRICULTURE
EXISTING PARKS & REC.
URBAN OPEN SPACE
COMMUNITY COMMERCIAL
NEIGHBORHOOD COMMERCIAL
SERVICE COMMERCIAL
HI DENSITY RESIDENTIAL
SUBURBAN RESIDENTIAL
URBAN HIGH RESIDENTIAL
URBAN MEDIUM RESIDENTIAL
URBAN LOW RESIDENTIAL
URBAN VERY LOW RESIDENTIAL
RURAL RESIDENTIAL
MOUNTAIN RESIDENTIAL
LAKES/RESERVOIRS/LAGOONS
OFFICE
PUBLIC FACILITY
R-UL
RESOURCE CONSERVATION
VISITOR ACCOMMODATIONS
CASTLE ROCK STATE PARK
Waterman Gap
BIG BASIN STATE PARK
MILLER PROPERTY COUNTY PARK
Redwood Grove
Boulder Creek
Lompico
PACE FAMILY WILDERNESS PARK
Ben Lomond
QUAIL HOLLOW RANCH PARK
Zayante
Olympia
FALL CREEK STATE PARK
Scotts Valley
Felton
HENRY COWELL STATE PARK
DE LAVEAGA PARK
POGONIP OPEN SPACE
ANNA JEAN CUMMINGS PARK
NEW BRIGHTON STATE BEACH
WILDER RANCH STATE PARK
MOORE CREEK UPLAND OPEN SPACE
ARANA GULCH
NATURAL BRIDGES STATE BEACH
Santa Cruz
Pacific Ocean
Boulder Creek
Kings Creek
Bear Creek
Mare Creek
Newell Creek
Peavine Creek
Silver Creek
Foreman Creek
Malosky Creek
Clear Creek
Mill Creek
Mountain Charlie Gulch
Zayante Creek
Manson Creek
Fall Creek
Bennett Creek
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Bean Creek
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San Lorenzo River
N
0
12,000
Scale: Feet
GIS Data Source: Santa Cruz County
Path: \\KJC\KJC-Root\KJ-Projects\SanFrancisco\PW-Proj\2022\2268009.00 SCWD 2022 Watershed Sanitary Survey Update\09-Reports\9.09-Reports\Figures\F 2-1 Land Use v2.mxd
Area Locations
Santa Cruz City Water Supply Watersheds
Sub-Watershed
Lakes
Stream
Streets
Santa Cruz Water Department
WSS Update
Figure 2-1: Land Use

The San Lorenzo Valley entered a period of transition from primarily seasonal vacation homes to full-time residences.

During the period of rapid growth, year-round residential occupancy of properties that were originally developed for summer use increased, which resulted in stress on onsite sewage disposal systems in the San Lorenzo River watershed that were inadequately sized, improperly maintained or poorly sited. Systems designed for seasonal use struggle with both the added load and the issue of higher groundwater during the winter months that has been found to communicate undesirably with the disposal systems. At the same time, new residential development occurred which added more onsite disposal systems at increased density.

Existing and new development activity occurring in steep and remote areas of the watersheds increases runoff and erosion, leading to increases in sedimentation and persistent turbidity in water supply streams. The resulting water quality issues also impact riparian corridors and can thus be attributed both to decisions made at the level of individual lots with respect to grading and land clearing as well as cumulative impacts of widespread development. Similarly, activities and development in the riparian areas can also impact water quality in a manner similar to those in steep and remote areas.

Furthermore, continuous use of unpaved roads to access residences, especially in wet periods, contributes both sediment and turbidity to receiving waters. Partially offsetting these trends is growing acreage of lands no longer open to logging, most significantly in the headwaters of the San Lorenzo River and on lands of the San Lorenzo Valley Water District and the City of Santa Cruz Water Department. In addition, additional effort related to riparian area enhancement is envisioned as discussed in Section 4.9.

Many of the same dynamics have affected land use in the North Coast watersheds, although the initial proportion of seasonal homes was much lower. Historically, this area has seen steady residential growth that has flattened out in recent years. As in the San Lorenzo River watershed, virtually all wastewater disposal is through leach fields, so the volume and areas of watershed affected are growing albeit at a lower rate than historically.

Figure 2-1 shows the general developed areas within the watersheds as well as the protected public park lands within the San Lorenzo River watershed. As detailed in the following sections, regulations related to Accessory Dwelling Units (2.3.2 Residential), the impacts of cannabis cultivation in the San Lorenzo River watershed (2.3.3 Agricultural), and potential public access of additional lands (2.3.6 Recreation) are land use changes with water quality impacts.

2.2.2 Residential

Within the survey area, the majority of the population is concentrated along Highway 9 on the floor of the San Lorenzo Valley. Steep slopes and rugged terrain have long been a significant constraint to commercial and residential development in all areas of Santa Cruz County. As a result, the county is rural in character, heavily forested, and visually dominated by open space.

The 2020 American Community Survey (ACS) estimated a population of 42,932 people in the San Lorenzo Valley (Census Tracts 1203.01 through 1209.02, shown on Figure 2-2). This is 2.6 percent higher than the estimated population of the San Lorenzo Valley in the 2010 ACS.

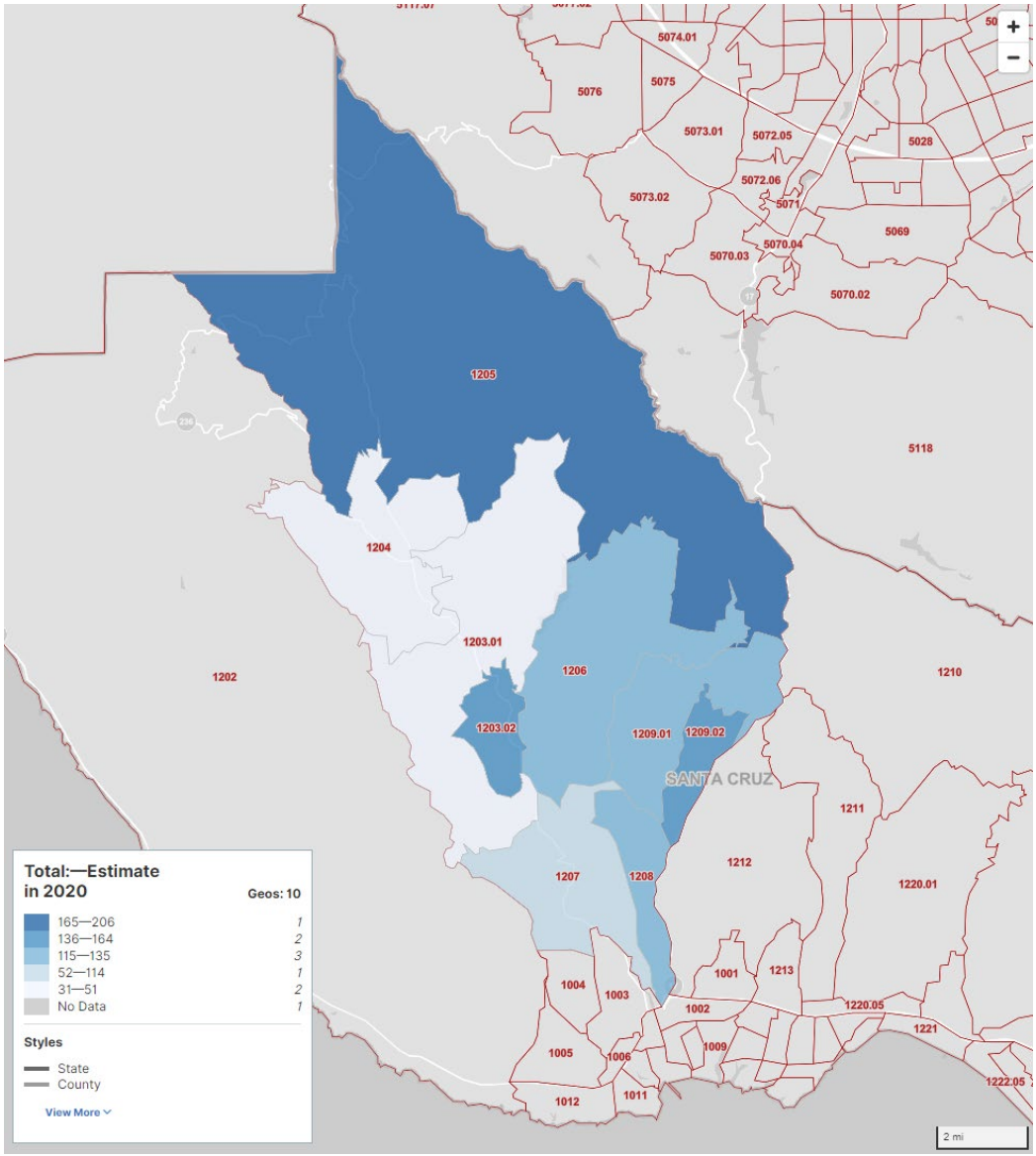


Figure 2-2: San Lorenzo Valley Census Tracts

The population of the North Coast watersheds lies in Census Tract 1202; however, population estimates for CT 1202 overestimate the population of the North Coast watersheds as they also include residents of Davenport, Swanton, and disperse residences along Highway 1 that are downstream of the City intakes. The 2020 ACS estimated population for the North Coast watershed to be approximately 2,630 people, which is a 2.7 percent decrease from the 2010 ACS estimate of 4,757.

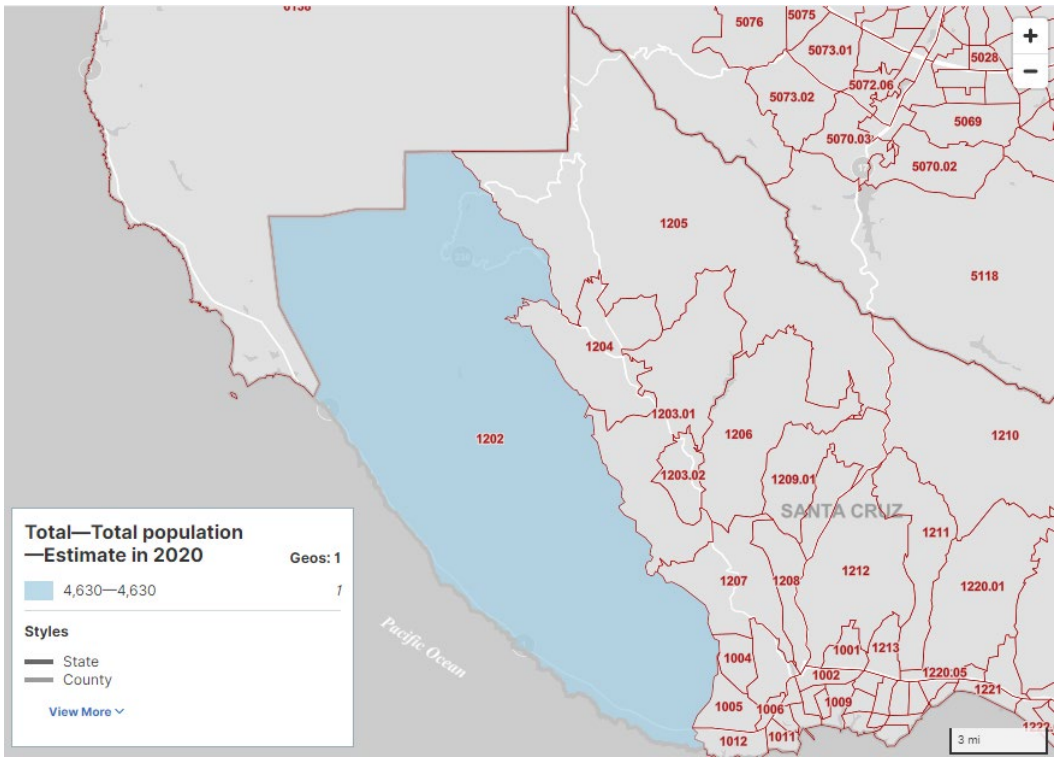


Figure 2-3: North Coast Watershed Census Tracts

Within the San Lorenzo Valley, the majority of the population lives in unincorporated communities located along the San Lorenzo River. Felton, Ben Lomond, Brookdale, and Boulder Creek stretch out along State Highway 9. Other communities have developed along major tributaries to the San Lorenzo, including the areas along Zayante Creek and Lompico Creek. Several closely-packed residential communities which originated as summer 'encampments' also exist in the area. These include the Paradise Park, Forest Lakes, Mount Hermon, Riverside Grove, and San Lorenzo Park subdivisions. Conventional 1960s and 1970s subdivision communities established throughout the Valley include: the Boulder Creek Golf and Country Club, Galleon Heights, Bear Creek Estates, Quail Hollow and Glen Arbor, and the portions of Rollingwood and Pasatiempo which lie within the San Lorenzo watershed. There are, in fact, relatively few valleys without a few clusters of homes, now typically occupied year-round. More recently, stand-alone mountain residences have been arrayed along most ridgelines.

The population in the North Coast drainages is far less than that of the San Lorenzo Valley. The largest area in the North Coast drainage with a concentrated population is known as Bonny Doon. Most of the population lives in rural and mountainous areas, mainly along the major roads: Empire Grade, Smith Grade, and Bonny Doon and Martin Roads.

The 2020 population of Scotts Valley was estimated at 10,582 people in its 2020 Urban Water Management Plan (UWMP). Scotts Valley is an incorporated city within the San Lorenzo watershed but most of the city lies beyond the eastern edge of the sanitary survey area, within the Carbonera Creek and Branciforte Creek subwatersheds. However, key commercial and industrial centers of Scotts Valley drain to Bean Creek, which is within the study area.

Individual onsite wastewater disposal systems are the primary means of wastewater treatment and disposal due to the remote nature and dispersed population of much of the watershed. Community onsite disposal systems serve Bear Creek Estates, Boulder Creek Golf and Country Club, the Mt. Hermon Association, and Big Basin State Park. Institutional disposal systems are in service at the San Lorenzo Valley Unified School District, Camp Harmon, Camp Campbell, and other camps and conference centers in the San Lorenzo Valley. Residential wastewater disposal is discussed in further detail in Section 3.2.

Zoning and land development standards for the unincorporated portions of the county reflect an area-wide awareness of the potential adverse effects of wastewater disposal and other development-related impacts on water supply. Within the area, mountain residential is the lowest density range, where minimal services are available. These areas include various open space and natural resource conservation areas unsuitable for more intense development. Rural residential areas are the next highest density range, requiring access from roads maintained to rural road standards. Suburban residential areas require service from a public water system to develop at the highest allowed density. The most densely populated areas along Highway 9 — Felton, Paradise Park, and Boulder Creek — have been developed at density levels typical of many urban areas despite their rural surroundings. County policies designate that these communities be limited to urban low density development unless community disposal systems are available. Santa Cruz County established CSA 12 in 1989 to promote better septic system management and maintenance and imposes an annual fee to fund the onsite wastewater management program.

In addition, regulation related to Accessory Dwelling Units (ADU) have undergone major updates at both the state and county level in an effort to address affordable housing challenges in the region. On January 1, 2020, new state ADU laws went into effect that required updates to the County's ADU ordinance. These laws include AB 68, AB 587, AB 881, and SB 13. Key provisions contained in these laws include streamlined ADU review, reduced or waived fees, more lenient development standards, lower parking requirements, Junior ADUs (JADUs), multifamily dwelling ADUs, owner occupancy requirements, short-term rentals, nonconformities, code enforcement, and separate sale of ADUs. In January 2020 and again in March 2022 the local Santa Cruz County Code was updated in alignment with state law requirements.

An increase in ADU development could pose future challenges especially in rural areas since the adequacy of aging, existing septic systems may be insufficient to meet both health and environmental needs. However, the County's Local Agency Management Program (LAMP), which was updated in November 2020 to stay consistent with evolving environmental health regulations, includes provisions for upgrade of existing Onsite Wastewater Treatment Systems (OWTS), or installation of an additional OWTS to serve an ADU on a developed parcel. In addition, rural unpaved roads continue to be a likely contributor of sediments and adding ADU can increase traffic and impacts of roads on water quality which should be addressed during the approval process.

2.2.3 Agricultural Uses and Animal Grazing

Agricultural acreage in the San Lorenzo River and North Coast watersheds is limited because of the steep topography and limited tillable land. Following the widespread initial logging of the late 1800s and early 1900s, apples and other orchard fruits were, however, planted on the flatter newly opened slopes throughout the subject watersheds. Much of this acreage has been

abandoned and now supports chaparral, second growth redwood forests, and residential development.

Vineyards and Christmas tree farms occupy the largest amount of agricultural acreage in the watersheds of interest tracked by the agricultural commissioner. There is one licensed commercial cannabis cultivation site in the watershed, and it is under strict regulation by Santa Cruz County. There are an unknown number of discretionary use permits for cultivation for personal use. Santa Cruz County is diligent about prohibiting unlicensed cannabis cultivation. Cannabis cultivation is subject to regulation from the US Fish and Wildlife Service, California Department of Fish and Wildlife, California Department of Cannabis Control, California Regional Water Quality Control Board, and Santa Cruz County. These regulations include limitations on impacts to water bodies, pesticide use, sedimentation and runoff, and water usage. Due to the strict regulations around cannabis cultivation, t future expansion of cannabis cultivation is not expected to have a substantial impact to water quality in the watersheds. Additional discussion regarding cannabis is in Section 3.4.2.

Majors Creek has the most significant agricultural land use of the tributary watersheds as shown on Figure 2-1. The lowest coastal terraces, downstream of the City supply intakes in the North Coast watersheds, are used for pasture or are cultivated for brussels sprouts and other row crops. Agricultural activity along the coast does not extend into the watersheds of the supply intakes. Agricultural or animal grazing is limited to that associated with residential uses in the SLVWD subwatersheds. Limited cattle grazing occurs in the North Coast drainages. Grazing leases are held on private lands and vary from year to year. Horses, on the other hand, are commonly kept by rural residents, and by several commercial stables. Confined animals are considered to be a potential source of nitrogen and pathogens (c.f., Hecht and others, 1991; White and Hecht, 1993, Ricker 1995, Ivanetich, 2006) and can also contribute to persistent turbidity in the area's streams.

2.2.4 Timber Harvests

Both City and SLVWD have ceased timber harvesting in their respective watershed lands. City manages timber on their watershed properties for fire resiliency except in the context of fire protection, restoration, and overall forest health needs, and prioritizes management of their watershed lands for source water protection and open-space uses. Given the increased awareness of redwood forest fire dynamics subsequent to the CZU Lightning Complex fire and ongoing drought, City is currently considering more active forest management on their watershed lands. City and SLVWD actively reviews timber harvests on private lands in their source watersheds to ensure source protection as well.

2.2.5 Mining

The survey area previously had many active mining operations. Currently, only Felton, Wilder, Quail Hollow, and Olive Springs Quarries are active.

Mining activities have been discontinued since 2004 at the Olympia and Hanson ('Kaiser') Quarries although reclamation and monitoring activities continue. A landslide in the vicinity of Conference Drive below the Hanson Quarry had significant movement in winter 2017 which resulted in sand erosion into Bean Creek and downstream. Most recently the CEMEX Bonny Doon marble (locally called 'limestone') and shale mine closed as discussed further in Section

3.9. There are no commercial or informal instream gravel mining operations in the subject watersheds.

Exploratory drilling for oil and gas has historically been conducted throughout the survey area, principally during the 1950s and 1960s. No current or shut-in (potentially re-activatable) production is reported. The principal water-effects of drilling have been unquantified increases in the salinity of the local stream system associated with deep, highly saline waters emanating from several abandoned boreholes (c.f., Hecht, 1975). Naturally-occurring asphaltum or bituminous sandstone outcrops at the edges of the Majors Creek watershed, where it was mined about 100 years ago. No effects on waters of Majors Creek have been reported.

2.2.6 Recreation

Santa Cruz and its surroundings have served as a center of recreation for more than 150 years. In the San Lorenzo River Valley, much of the recreation is focused on summer use of the streams and riparian corridors. Use of the San Lorenzo River and its tributaries includes swimming in natural pools, canoeing, fishing, hiking, and equestrian activities. Visitor use – especially the traditional river-based, water-contact recreation – is both a motivation for cleaner streams and a secondary contributor to bacteria, nitrate, and possibly turbidity levels.

The California Department of Parks and Recreation manages about 15 percent of the watershed, including Henry Cowell (including Fall Creek), Castle Rock and portion of Big Basin Redwood State Parks. See Figure 2-1 for locations of parks and open space within the Santa Cruz City water supply watersheds.

City-operated recreation facilities at Loch Lomond Recreation Area will continue to emphasize boating, picnicking, and trail uses. However, the high priority emphasis on source water protection and concerns by first responders at the city and state levels regarding fire risk and access for emergency response are likely to limit additional public access beyond that which is already available.

Recreational use of the Majors and Laguna Creek watersheds covered by the survey are diffuse and typical of rural residential areas, concentrated along the roads and trails. Significant portions of the southeastern side of the Majors Creek watershed are within the sectors of the Grey Whale Ranch and Wilder Ranch State Park which is now open to visitor use, with some restrictions. Public access and recreation are limited in the SLVWD watersheds. Hiking and equestrian trails can be found in Fall Creek State Park (within the Fall Creek watershed), and in some areas within the Olympia watershed. Additional discussion regarding the potential water quality threats from recreation occurs in Section 3.12.

Off road vehicles and mountain-bike use can be occur in localized areas common. Trail (bike, horse, and hiker) and off-road vehicle use can be sources of erosion, adding to background levels, and can contribute to increased risk of fire during the fire season. The Santa Cruz Mountains Trail Stewardship works closely with local land managers to incorporate new trails and mountain bike pump tracks into parks and open spaces throughout the Santa Cruz Mountains. Recently, their work includes the development of multi-use trails through the Cotoni-Coast Dairies and San Vincente Redwoods and fire relief efforts in response to the CZU Fire (including trail clearing and reconstruction, and bridge and culvert repairs and replacements).

In 2016, 5,800 acres of land surrounding the coastal City of Davenport were designated as the Cotoni-Coast Dairies National Monument. Relatively few people have seen this land since public access has been limited for more than a century. The Bureau of Land Management (BLM) has developed a public access plan and the National Monument is currently open for volunteer events. Although much of these lands are downstream of the City intake, concerns remain that public access can result in increased fire danger, and other risks that could impact water quality.

The SLVWD currently does not actively manage any of its lands for recreational purposes The SLVWD has had a written agreement with the Santa Cruz County Horseman's Association (SCCHA) for limited use of the District's Olympia watershed property, on marked trails.

2.2.7 Reservoir Sedimentation

Sedimentation rates in Loch Lomond Reservoir are small relative to its capacity, perhaps because the watershed of the reservoir is maintained primarily in open space, and are not expected to constrain the water supply functions of the reservoir for many years to come. The City has commissioned five separate sedimentation surveys of Loch Lomond by USGS in 1971 (Brown, 1973), 1982 (Fogelman and Johnson, 1986), 1998 (McPherson and Harmon, 2000), 2009 (McPherson et al, 2009), and most recently in 2019 (Whealdon-Haught et al, 2021).

The 2019 sedimentation survey by Whealdon-Haught et al. measured a storage capacity of Loch Lomond Reservoir of approximately 8,770 acre-feet. Whealdon-Haught et al. measured a loss of approximately 68 acre-feet since 2009 in shallow areas (such as the upstream end of the reservoir), suggesting sediment deposition. In areas deeper than 30 feet, small storage gains totaled 82 acre-feet since 2009. These changes in storage were consistent with loss patterns from past surveys. In total, it is estimated that Loch Lomond has lost about 500 acre-feet of total storage over its lifetime (on average, 8-9 acre-feet/year over its 60-year history).

2.3 Natural Conditions and Water Quality

The San Lorenzo River watershed and the North Coast water supply drainages are located in north central Santa Cruz County, California. These watersheds drain runoff from the Santa Cruz Mountains into the Pacific Ocean at or near the north end of Monterey Bay (see Figure 1-1).

The Santa Cruz Mountains extend south to southwest for about 100 miles from San Francisco to the Pajaro River. The ridge of the Santa Cruz Mountains rises between San Francisco Bay and the Santa Clara Valley on the east and the Pacific Ocean on the west. The topography of the area is moderately rugged, with elevations ranging from sea level to over 2,600 feet along the crest of Ben Lomond Mountain, and over 3,300 feet at several locations along the northeastern edge of the watershed. Steep slopes of over 30 percent are common, and most of the streams discussed in this report flow through deep canyons cut into bedrock. This is particularly true in the San Lorenzo River watershed, whose many streams are deeply shaded by a dense growth of redwood and Douglas fir trees.

The region has a Mediterranean climate with cool, dry summers and moderate-to-heavy rainfall in the winter months from November through March. Average annual rainfall ranges from about 30 inches along the coast to about 50 inches along the ridge of Ben Lomond Mountain. Coastal fog is common during the summer months and tends to spread inland at night.

The crest of Ben Lomond Mountain forms the topographic divide between the San Lorenzo River watershed to the east and the North Coast watersheds (Majors and Laguna Creeks) to the west. Coastal terraces, in the North Coast drainages, are a mosaic of grasslands, oak woodlands, steep forested canyons, and chaparral.

2.3.1 Soils and Geology

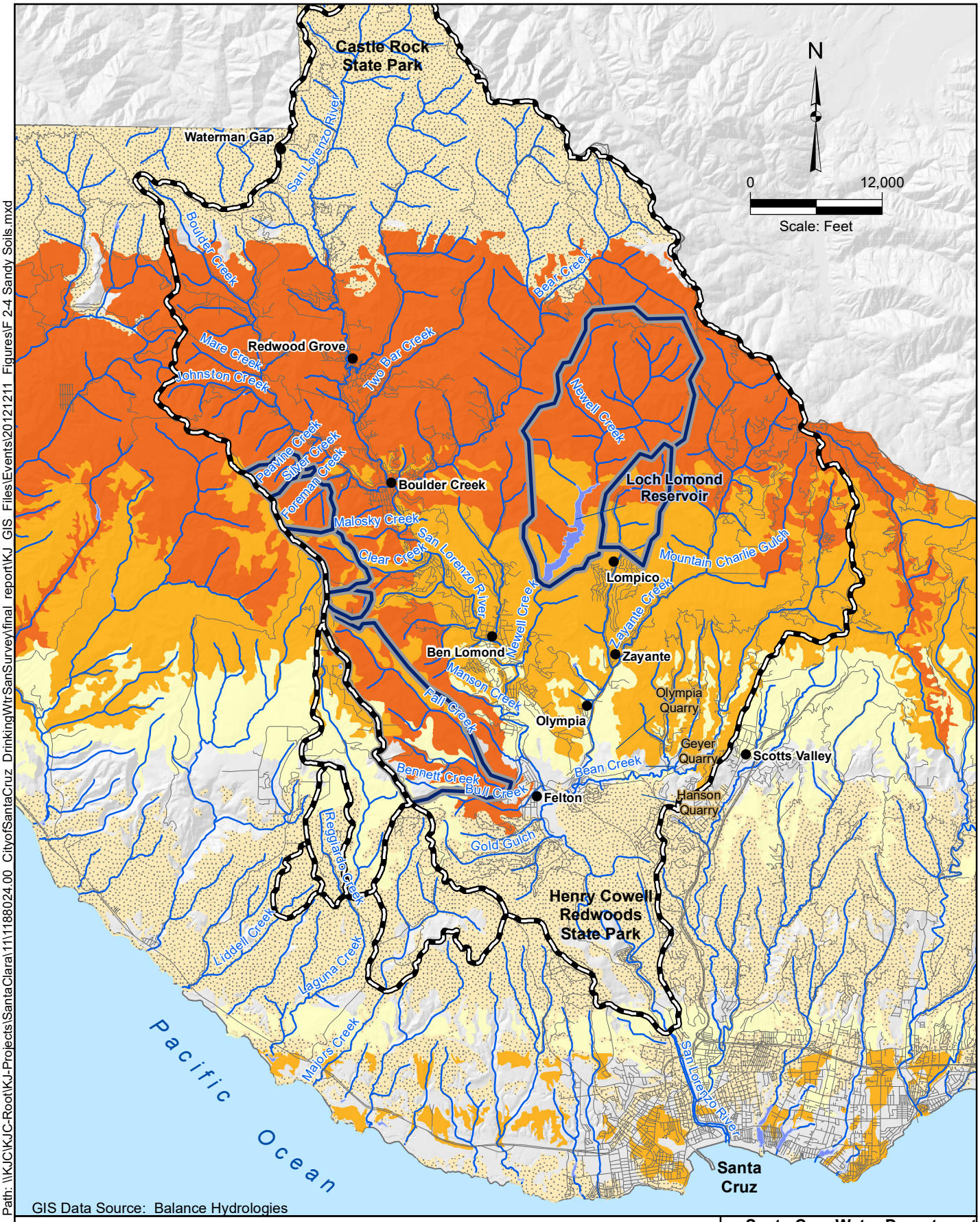
The area is underlain by a complex mosaic of alluvial and terrace deposits of Quaternary age; mudstone, shales, and sandstones of tertiary age; and fractured granitic rocks, schists, and metamorphosed limestones. Soils are highly variable, with a dense mosaic, depending on the underlying parent materials, and other factors such as climate, aspect, vegetation cover, and local relief. Alluvial and terrace soils of varying ages have formed on the alluvial and terrace deposits along nearly all of the major streams. Some of these soils have well-developed clay subsoils, inhibiting use of leach fields.

In the most general terms, soils underlain by permeable sandstones, as well as igneous and metamorphic rocks, are deep and well-drained. These loamy and sandy loam soils are found throughout the heavily forested reaches of the survey area. Soils formed from the Santa Margarita and several other sandstone formations are also sandy, deep, and well drained as shown on Figure 2-4. In the sandy soils, organic-matter content and cation exchange capacities are often about 15 to 25 percent of those found in many forest soils in coastal California. Sandy soils can infiltrate quickly which can pose a threat to groundwater and/or base flow if septic systems are located on sandy soils.

Santa Cruz County has been providing training and information on approaches and technologies to control erosion in these soils, and to improve nitrogen and pathogen removal in discharges from septic systems. In addition, the RCD has supported training to reduce road erosion as well as landowner support after the CZU fire to prevent fire-related runoff. Soils formed from mudstones and shales also tend to be deep, yet somewhat less well-drained. Overall, soil depth is often limited by shallow bedrock, steep slopes, and the gradual loss of topsoil to erosion.

In the alluvial areas of the San Lorenzo and North Coast watersheds, soils are also deep and well drained, although soil depth may be limited by low-permeability layers of fines. In the marine terraces of the North Coast, soils are characterized as deep to very deep and range from well-drained to somewhat poorly drained where claypans have developed. As in the San Lorenzo Valley, depths vary with slope and aspect.

Naturally-occurring cadmium occurs in portions of the Monterey shale and (to a much lesser extent) Santa Cruz mudstone geologic units. Because cadmium is tightly bound to minerals and clays in the local soils, elevated levels of cadmium are seldom if ever encountered in the water diverted from either the San Lorenzo River or North Coast watersheds. Higher levels are found in stream sediments and vegetation, and cadmium can be bioconcentrated by organisms living in the sediments and soils. The distribution of cadmium in western Santa Cruz County is explained in Golling (1983). Zinc and other trace elements often co-occurring with cadmium are not reported to be elevated in the local soils and sediment derived from the Monterey formation. The same formations tend to be rich in phosphorus, which is widespread in the streams of all surveyed watersheds. With organic carbon also abundant, the ecosystems of these streams are nearly always nitrogen-limited (Aston and Ricker, 1979 Butler, 1978).


Castle Rock State Park
Waterman Gap
San Lorenzo River
Boulder Creek
Bear Creek
Mare Creek
Redwood Grove
Johnston Creek
Two Bar Creek
Newell Creek
Peavine Creek
Silver Creek
Foreman Creek
Boulder Creek
Loch Lomond Reservoir
Malosky Creek
Clear Creek
San Lorenzo River
Mountain Charlie Gulch
Lompico
Zayante Creek
Newell Creek
Ben Lomond
Zayante
Manson Creek
Fall Creek
Olympia
Olympia Quarry
Geyer Quarry
Scotts Valley
Bean Creek
Bennett Creek
Bull Creek
Felton
Hanson Quarry
Redwood Creek
Gold Gulch
Henry Cowell Redwoods State Park
Liddell Creek
Laguna Creek
Majors Creek
Pacific Ocean
San Lorenzo River
Santa Cruz
N
0
12,000
Scale: Feet
GIS Data Source: Balance Hydrologies
Area Locations
Stream
Streets
Lakes
Santa Cruz City Water Supply Watersheds
Sub-Watershed
Sandy Soils
Hyper Sandy > 6"/hr
Very Sandy > 2"/hr
Sandy > 0.6"/hr
Sandy, shallow Limited Recharge
Santa Cruz Water Department
WSS Update
Figure 2-4: Sandy Soils
Path: \\KJC\KJC-Root\KJ-Projects\SantaClara\111188024.00 CityofSantaCruz DrinkingWtrSanSurvey\final report\KJ GIS Files\Events\20121211 Figures\F 2-4 Sandy Soils.mxd

Portions of the watershed areas are underlain by karst geology which poses a different type of risk to water quality because the large voids in karst allow for direct connection of contaminants to drinking water. Recent work by the City to map karst springs and marble outcrops associated with karst are overlain on Figure 2-4 which indicates that the Liddell Creek, Laguna Creek and portions of the Fall Creek, Bennett and Bull Springs watersheds exhibit these features. Karst geology, especially in the lower San Lorenzo River watershed, is an important means of providing base flow during the dry season which can reduce the need for Loch Lomond water in the summer and fall with resulting water quality benefits.

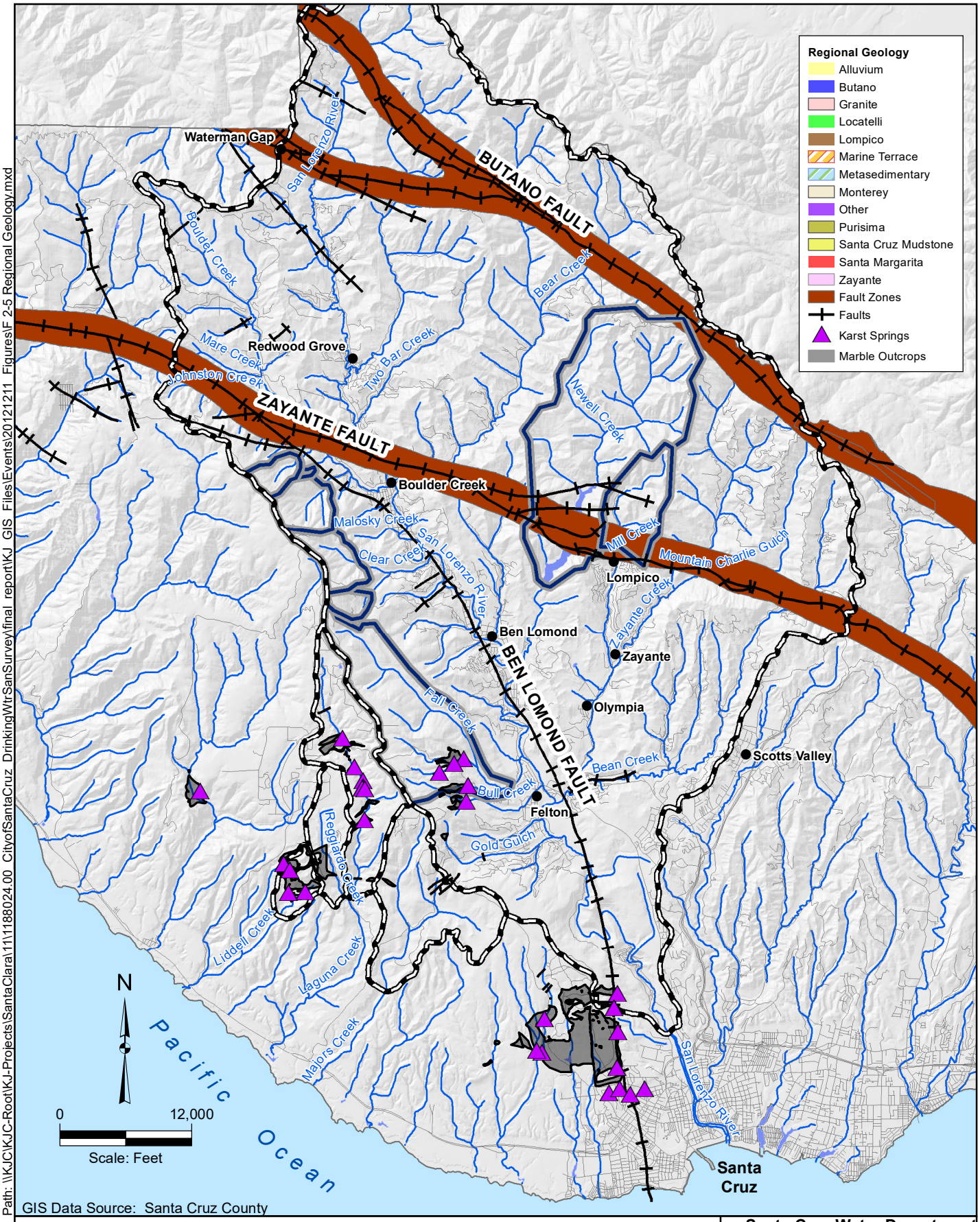
2.3.2 Faults and Seismic Activity

Faulting and seismicity pose a potential geologic hazard in the Santa Cruz Mountains. The San Andreas fault parallels the northern boundary of the project area approximately two miles to the north. Numerous faults cross the project area. In the San Lorenzo Valley, the most notable faults include: the Zayante fault, which runs primarily east-west, crossing Loch Lomond; Ben Lomond fault, with a trace roughly paralleling the San Lorenzo River from Santa Cruz to the Boulder Creek area; and the Butano fault, which crosses the northern, highest portions of the San Lorenzo watershed. No recent movement has been recorded on any of the three faults but these faults, as shown on Figure 2-5, control groundwater flow and quality in the region.

The principal fault in the North Coast area is the San Gregorio fault zone, which trends north-northwestward several miles offshore from the mouths of Laguna and Majors Creeks. It is active and has sustained recurrent activity for several million years.

Santa Cruz County experiences low-level seismic activity on a regular basis. The most significant recent event was the 1989 Loma Prieta earthquake. Significant damage to structures, roadways, and utilities occurred, including damage to water systems occurred following the magnitude 7.1 Loma Prieta earthquake. Landslides, debris flows, and the reconstruction of residences and infrastructure contributed to persistent turbidity in area streams and surface waters for a period thereafter. Future seismic activity should be anticipated, and this expectation should be a major factor in public policy and management of local water supplies.

In the past five years, the closest significant earthquake to the San Lorenzo Valley region occurred in east of Santa Cruz with a magnitude of 3.6. Even a moderate earthquake in this area could result in death, property damage, and economic upset as well as water quality upsets, particularly after a wet winter which resulted in landslides.



Santa Cruz Water Department
WSS Update

Figure 2-5: Regional Geology

2.3.3 Volcanic Activity

While known for their seismic activity, the Santa Cruz Mountains are highly unlikely to experience any volcanic activity in the foreseeable future.

2.3.4 Vegetation

The watershed lands evaluated in this survey area are dominated by dense forests consisting of a mix of deciduous and evergreen trees and hardy shrubs. Second growth coast redwood is the dominant forest species in the steep canyons, particularly where coastal fog can supply summer moisture. Several species of oak, as well as Douglas fir, tanoak, and madrone form mixed stands on drier slopes and aspects. Some ridges are covered by dense chaparral, composed mainly of manzanita and chamise. Ponderosa pine, a forest species not generally found in the Coast Range, forms a distinct community in the locations where the coarse sands of the Santa Margarita formation are exposed.

While scattered grasslands can still be seen in the San Lorenzo River watershed, most have been converted to residential uses or have reverted to chaparral and second growth forests. The coastal terraces, much of which is downstream of City intakes, support larger grasslands, but are also subject to the same sorts of residential development pressures and conversion to chaparral and coastal scrub. Within the area grasslands, few native bunchgrasses are found, having long ago been replaced by the exotic annual grasses introduced by early European settlers.

Riparian plant communities are established along all streams in the surveyed watersheds, although human activity or debris from unstable slopes often encroaches in these areas. Several species of willow and alder, as well as big leaf maple, box elder, sycamore, and cottonwood are the most common tree species. California blackberry, poison oak, stinging nettle, in addition to numerous species of sedge and rush, make up much of the understory streambank vegetation. In disturbed riparian areas, non-native vegetation such as French broom, English or cape ivy, poison hemlock, periwinkle, and acacia have become established and compete with native species. These riparian zones play vital roles in protecting and maintaining water quality in most of the water supply watersheds.

2.3.5 Wildlife

Numerous wildlife species inhabit the California Coastal Ranges. The steep topography, extensive open space, and vegetation communities that range from aquatic and riparian to woodland and chaparral, provide a wide range of habitats for terrestrial and avian species. The area supports such mammalian species as: black-tail deer, mountain lion, bobcat, gray fox, California ground squirrel and a variety of other small terrestrial mammals. A number of non-native species have become established in the Santa Cruz Mountains, including bullfrogs, New Zealand mudsnail, wild pig, Norway rat, common opossum, and feral domestic dogs and cats.

The number of bird species found in the Santa Cruz Mountains reflects the variety of habitats and the location along the Pacific Coast migratory route of waterfowl and songbirds. The riparian habitats fringing the San Lorenzo River and the smaller streams of the region have the highest breeding bird density of all habitat types in the area. Canada geese populations at Loch Lomond resulted in a 2019 study for more active population management to reduce potential

water quality impacts. Several species of wading birds live in the area, including great blue heron, green heron, and black crested night heron. Belted kingfishers, Stellar's jays, and wood ducks are also residents. Raptors are common throughout the area and include red-shouldered hawks, red-tailed hawks, and Coopers hawks, while occasionally golden eagles can also be encountered in the watershed. Wild turkey sightings have increased significantly in the last several years since the 2018 Watershed Sanitary Survey Update.

Reptile and amphibians can occur in local riparian habitats. Notable species in the County include the western pond turtle, California red-legged frog, legless lizard, and several species of salamander although specific presence in the watersheds varies.

The San Lorenzo River supports many species of fish. Steelhead trout and coho salmon are considered native to the coastal streams in Santa Cruz County and the San Lorenzo River supports the region's largest steelhead run. While data suggests historically large and viable populations, historical numbers are challenging to interpret due to significant hatchery operations. Since 1981, coho have been intermittently observed in the San Lorenzo River, though local populations are on the verge of extirpation. Both steelhead and coho are federally listed as threatened under the Endangered Species Act, while coho are listed by the State under the more-critical 'endangered' designation. Recent extended drought periods 2012-2015 and 2020-present have further stressed fish populations although fish stocking has somewhat reduced the impacts. The primary threats to these species include: loss of high-quality rearing and spawning habitats due to flow reductions and excessive fine sediment loads; and barriers to migration due to dams, culverts, and flow-depleted critical riffles (Alley and others, 2004; National Marine Fisheries Service. 2012; National Marine Fisheries Service. 2016)

2.4 Water Supply Systems Background

2.4.1 History

The San Lorenzo River and North Coast watersheds provide drinking water for numerous communities in the Santa Cruz area. Table 2-2 lists the water supply sources and general treatment processes used by the purveyors participating in this sanitary survey update (City and SLVWD). These purveyors use surface water and have over 200 total service connections. Table 2-3 lists the same information for non-participating purveyors part of the 1996 Watershed Sanitary Survey many of which have less than 200 service connections. All the purveyors listed in Tables 2-2 and 2-3 use surface water in the San Lorenzo River watershed. The following sections focus on the larger utilities, listed in Table 2-2, which include City and SLVWD. The watershed areas for each participating utility are shown on Figure 1-1.

Table 2-2: Summary of Drinking Water Purveyors Serving Surface Water with More Than 200 Service Connections in the Study Area

Santa Cruz Water Department (City of Santa Cruz)			
Number of Connections:		24,592	
Surface Water Sources:		San Lorenzo River/Loch Lomond Reservoir and North Coast Springs & Creeks	
Treatment Process	***Average Production***	***Primary Disinfectant***	***Last DDW Inspection Report***
Conventional Filtration (Graham Hill WTP)	2,606 MGY (from all sources)	Chlorine	Oct 2019
San Lorenzo Valley Water District			
Number of Connections:		6,523 Service Connections	
Surface Water Sources:		Clear Creek, Foreman Creek, Peavine Creek, and Sweetwater Creek	
Treatment Process	***Average Flow***	***Primary Disinfectant***	***Last DDW Inspection Report***
Trident Microfloc (Lyons WTP)	1.92 mgd, including use of groundwater sources	Chlorine	2021
San Lorenzo Valley Water District – Felton			
Number of Connections:		1,356 Service Connections	
Surface Water Sources:		Fall Creek, Bull Springs, and Bennett Spring	
Treatment Process	***Average Flow***	***Primary Disinfectant***	***Last DDW Inspection Report***
CPC Microfloc-Trimite TM-350 (Kirby WTP)	1.0 MGD (capacity)	Chlorine	2021

Notes:

Data from waterboards.ca.gov and the 2009 SLVWD Water Supply Master Plan.
Big Basin MWC Participated in the 1996 Watershed Sanitary Survey and is included in Table 2-3

Table 2-3: Summary of Small Non-Participating Drinking Water Purveyors in the San Lorenzo River Watershed

Big Basin Water Company		
Number of Connections:	482	
Watershed Location:	Four surface sources; Jamison Springs (No. 1 and 2), Corvin Springs, Well No. 5 (horizontal under the influence of surface water)	
Filtration System/Type	***Disinfection Strategy***	***Comments***
Jamison WTP Conventional Processes with Capacity to Treat 150 gpm (Neptune Microfloc/ Trimite)	Chlorine	--
Brackenbrae Mutual Water Company(1)		
Number of Connections:	24	
Watershed Location:	North of Boulder Creek	
Filtration System/Type	***Primary Disinfectant***	***Comments***
Package WTP (3M bag filter)	Chlorine	Protected streams and spring
Forest Springs Mutual Water Company(1)		
Number of Connections:	126	
Watershed Location:	North of Boulder Creek	
Filtration System/Type	***Primary Disinfectant***	***Comments***
Sedimentation only	Chlorine	Spring source
Bonnymede Mutual Water Company(1)		
Number of Connections:	10	
Watershed Location:	On Reggiardo Creek	
Filtration System/Type	***Primary Disinfectant***	***Comments***
--	Ozone	--
Quaker Center		
Number of Connections:	8	
Watershed Location:	Near Ben Lomond	
Filtration System/Type	***Primary Disinfectant***	***Comments***
Package WTP (3M bag filter)	Chlorine	--
River Grove Water System(1)		
Number of Connections:	25	
Watershed Location:	Near Felton	
Filtration System/Type	***Primary Disinfectant***	***Comments***
Slow sand filtration	Chlorine	--

Notes:

Data from the 1996 Watershed Sanitary Survey and waterboards.ca.gov

(1) Small water companies represented by Santa Cruz County

2.4.2 Santa Cruz Water Department

As described in greater detail in Section 2.6, generally, the private water companies that preceded the City of Santa Cruz began establishing pre-1914 water rights to area streams and underflow in the late 1800s. The riparian rights to the North Coast sources were purchased from landowners downstream of the City's diversions. The City has appropriative rights to San Lorenzo River and Newell Creek water via licenses and permits. These rights allow the withdrawal of water at the San Lorenzo River Intake at Tait Street (also known as the Tait Street Diversion) in Santa Cruz for delivery to the GHWTP and the Felton Diversion for storage at Loch Lomond Reservoir. In 1960, Newell Creek Dam was constructed to create Loch Lomond Reservoir, with a then-reported capacity of 8,500 of acre-feet.[4] Jointly, these surface water sources are the primary supply for the City.

Source water development and the supply history of the Santa Cruz Water Department through 1986 were described in detail in the 1996 Watershed Sanitary Survey. In 1986, the City upgraded the GHWTP to improve treatment performance. Improvements consisted of replacing the filter media; modifying the chemical feed systems, flocculators, monitoring and control system, and sludge collectors; and installing tube settlers in the sedimentation basins. In the 1990s the City began advanced filtration of its North Coast sources, which previously were simply chlorinated. An Additional changes in the City water supply and treatment system that have occurred since the 2018 Watershed Sanitary Survey update include replacement and rehabilitation of wells at the Tait wellfield and rehabilitation and upgrades at the Graham Hill WTP, which are discussed in Section 2.8.

2.4.3 San Lorenzo Valley Water District

The SLVWD, originally the San Lorenzo Valley County Water District, was formed by a special election of the residents of Santa Cruz County on April 3, 1941. At that time, the boundaries were established to include 58 square miles of the San Lorenzo Valley in the Santa Cruz Mountains. During the late 1940s, the SLVWD purchased large areas of land with an initial intent of potential reservoir development; as philosophies changed these lands were later preserved for watershed protection in the early 1980s. In 1958, the SLVWD sold 2,500 acres of land to the City of Santa Cruz for the placement of Loch Lomond Reservoir.

Major events in the development of the current SLVWD water supply system are described in detail in the 1996 sanitary survey. The District has not used springs as water sources since 1993 when the Lyons surface water treatment plant was constructed. More recent developments include the annexation of the Mañana Woods Mutual Water Company and the acquisition of protected lands in the Malosky Creek watershed both of which occurred in 2006 and are described in the 2006 Watershed Sanitary Survey.

In 2008, SLVWD acquired the Felton Water System from California-American Water Company. Felton is supplied water from two (2) spring sources and one (1) surface water diversion. The spring sources are Bennett Spring and Bull Spring. The surface water source is Fall Creek.

[4] Re-surveys indicate a current capacity of about 8,600 acre-feet above the spillway elevation (McPherson, 2011)

Supply water from the combined springs is routed through a raw water transmission line to the Kirby Street Water Treatment Plant. Supply water from Fall Creek is also routed through separate raw water transmission line to the Kirby Water Treatment Plant (Kirby WTP). The Kirby Street Water Treatment Plant was brought online in January 1997 to meet the requirements of the SWTR. The nominal capacity of the Kirby Street Water Treatment Plan is 1.0 mgd using two (2) 350 gpm rated, two stage filtration constant adsorption clarification/tri-media filtration units (CPC Microfloc-Trimite TM-350). Disinfection is provided at the Kirby Street Water Treatment Plant by contact mixing with sodium hypochlorite prior to introduction into the treated water distribution system.

The area formerly served by LCWD is now a part of the SLVWD North system and has approximately 500 service connections (which has not changed as of 1996), which generally surrounds the Lompico area. Lompico is shown just east of the Loch Lomond Reservoir in Figure 1-1.

As part of the LCWD/SLVWD merger process, ownership, and management of the 425-acre Lompico headwaters property that previously supplied water to the community of Lompico transitioned to the Sempervirens Fund.

2.5 Water Sources

2.5.1 Santa Cruz Water Department

The existing City water supply system is described in detail in the 2020 Urban Water Management Plan. The City supply system is comprised of four main production elements: (1) the North Coast streams and Liddell Spring; (2) the San Lorenzo River (San Lorenzo River Intake, Tait Wells and Felton Diversion); (3) Loch Lomond Reservoir on Newell Creek; and (4) the Live Oak wells. The following sections describe in greater detail City's surface water sources (sources 1 through 3). The Live Oak wells system is entirely a groundwater supply source and is not described further.

The main water supply facilities are shown on Figure 1-1.

2.5.2 North Coast

The North Coast sources consist of surface diversions from three coastal streams (Laguna Creek, Reggiardo Creek, and Majors Creek) and one natural spring (Liddell Spring) located approximately six to eight miles northwest of downtown Santa Cruz. City has used these sources since 1890. Reggiardo Creek has not been active in recent years.

A few changes to the facilities described in the 1996 Watershed Sanitary Survey have been made including repairs at the Majors Dam following a failure and sediment transport improvements including new drain valves and operational improvements required by CDFW at Laguna and Majors Creeks. A brief summary follows, for reference. More detailed descriptions are found in the 1996 Watershed Sanitary Survey.

Liddell Spring — Liddell Spring is a natural spring used for water supply. The spring box/diversion is located at elevation 584 feet. Water from the spring is directed through a 10-inch steel pipeline into the Coast Pipeline for transmission to the City service area.

Laguna Creek and a tributary, Reggiardo Creek — Flows from Reggiardo Creek, which are quite limited, were historically captured at a diversion dam located at elevation 630 feet. The diversion is currently out of service due to much needed repairs. When used, diversions are routed through about 850 feet of pipeline to Laguna Creek just upstream of the Laguna diversion and are not monitored separately from Laguna Creek. Diverted Laguna Creek flows, combined with any diverted Reggiardo Creek flows when in operation are captured at a concrete and limestone dam located at elevation 623 feet on Laguna Creek. The original dam constructed in 1890 is still in use today, though the intake structure was upgraded with a Coanda screen in 2021. These diversions are sent through 12,400 linear feet of 14-inch steel pipeline to the junction with the transmission pipeline from Liddell Spring. The junction is known as the Laguna-Liddell "Y". Diversions from Laguna Creek have been reduced to meet fish flows in recent years on accordance agreements proposed in the Santa Cruz Water Rights project, the Operations and Maintenance HCP, and the Anadromous Salmonid HCP, increasing reliance on Loch Lomond and other supplies.

Majors Creek — Flow from Majors Creek is diverted from a concrete dam located at elevation 352 feet. As noted earlier, a dam failure in the winter of 2011, was repaired to restore the original diversion in the summer of 2011. Diversions from Majors Creek are conveyed through 11,300 linear feet of pipeline varying between 10 and 16 inches in diameter before joining the main Coast Pipeline along Highway 1. Because the Majors Creek diversion is located at a much lower elevation than the other North Coast sources, use of the Majors Creek Diversion has historically been limited by the available supply from the other North Coast sources (i.e., the Majors Creek flows can enter the Coast Pipeline only when the head from the other sources is low). Reduced production at Laguna due to the need to provide improved flows for fish in Laguna Creek, allows more of Majors Creek flows to enter the Coast Pipeline but also increases reliance on Loch Lomond and other water sources.

Water from the North Coast diversions flows by gravity to the City system via the Coast Pipeline, which varies from 16 inches in diameter between the Laguna-Liddell "Y" and Majors Creek up to 24 inches in diameter near Bay Street Reservoir. Projects have been underway over the last 10 years to replace badly deteriorated sections of the Coast Pipeline with projects ongoing.

Water from the Coast Pipeline is boosted at the Coast Pump Station to the Graham Hill WTP for treatment.

2.5.3 San Lorenzo River – Intake in Santa Cruz and Tait Wells

San Lorenzo River flows are diverted at the Intake in Santa Cruz just north of Highway 1. Water is diverted at a concrete check dam into a screened intake sump where three vertical turbine pumps are used to pump the water to the Graham Hill WTP. Two of the pumps are converted to a variable frequency drive (VFD) to better match pump output to demand and available flow while one pump is set at a constant speed. These pumps are located in the same building as the pumps for the North Coast diversions. High flows during winter of 2017 have scoured the river bottom in the vicinity of the intake allowing for inspection which indicated that some damage has occurred. This downcutting may have had some water quality benefit as the river flow now has greater velocity in the vicinity of diversion. In addition, the lagoon at the mouth of the San Lorenzo River at the Pacific Ocean has backed up almost to the diversion, which could potentially bring more saline water at the diversion as sea levels rise.

The San Lorenzo River Intake in Santa Cruz also includes three production wells, located on the east side of the river. Two replacement wells, Tait Well No. 1B and Tait Well No. 3B were drilled in 2016 and are about 89 feet deep. One well, Tait Well No. 4, was rehabilitated in 2016, and is 71 feet deep. These wells are tied to the City's appropriative rights for San Lorenzo River flows as there is evidence that the Tait wells are hydraulically connected to the river. The DDW classifies water from the Tait wells as GWUDI (Groundwater Under Direct Influence of Surface Water).

Water produced by the Tait wells is also delivered to the San Lorenzo River intake sump at the Coast Pump Station. The groundwater is then pumped into a common transmission pipeline used to convey water from both the North Coast and San Lorenzo River sources to the Graham Hill WTP for treatment.

2.5.4 San Lorenzo River - Felton Diversion

There have been no major changes or modifications to this system since 2018 when the diversion dam was replaced. The Felton Diversion is located on the San Lorenzo River just downstream of the Zayante Creek confluence, which is approximately five river miles north of the Coast Pump Station and San Lorenzo River Intake. The diversion structure consists of an inflatable rubber dam to divert flows into a screened intake sump. Flows are then pumped through the Felton Booster Station into Loch Lomond for storage via the Newell Creek Pipeline. The desired diversion rate is regulated by using different combinations of the three pumps at the Felton Diversion and the five pumps at the Felton Booster Station.

2.5.5 Loch Lomond Reservoir on Newell Creek

The Loch Lomond Reservoir was created by the construction of Newell Creek Dam, located about ten miles north of Santa Cruz and northeast of the town of Ben Lomond. The reservoir was constructed in 1960, and currently has a maximum storage capacity of about 8,600 acre-feet.[5] Loch Lomond is the only major reservoir in the San Lorenzo River watershed. There have been no major changes in this system in the last five years.

Newell Creek Dam is an earthfill dam, 190 feet high and 750 feet long at the crest. The spillway crest is at elevation 577 feet. Releases from the reservoir are made through outlet works on the upstream face of the dam. Water released from Loch Lomond for use by City is conveyed to the Graham Hill WTP through the Newell Creek Pipeline. The water flows by gravity from the reservoir to the Felton Booster Station, approximately 4.3 miles downstream of the dam. The water is then pumped at Felton Booster Station to clear a ridge in Henry Cowell State Park at an elevation of about 580 feet. To meet fluctuating head and flow conditions, five pumps and alternative valving configurations that allow various pump combinations are available at the Felton Booster Station.

[5] Per a 2009 survey discussed in Section 2.2.7

2.5.6 SLVWD

Clear Creek, Foreman Creek, Peavine Creek, Silver Creek, and Sweetwater Creek are the primary surface water sources for the Lyons WTP which serves the northern portion of SLVWD's service area. The current average stream diversion yearly total is about 900 acre-feet from these sources. SLVWD has pre-1914 appropriative rights to these creeks. These sources are perennial creeks and are located west of Highway 9 along the Ben Lomond Mountain. The watersheds of the creeks are contiguous and rugged with extremely steep slopes. The watersheds above the creek intakes are largely uninhabited. In addition, the SLVWD's Felton system is served by Fall Creek and Bennett and Bull Springs. The approximate location of each creek intake and watershed area is illustrated in Figure 1-1.

The original surface water source for the Lompico portion of the SLVWD north system was Lompico Creek, downstream of the Mill Creek confluence which has a watershed area of about 1,470 acres. SLVWD now has the appropriative water rights for Lompico Creek, which dates to the mid-1940s. A 1707 petition was submitted in 2020 in order to dedicate the water for instream flows.

2.6 Water Rights

2.6.1 SCWD

Table 2-4 lists the City water rights, as listed in the 2020 Urban Water Management Plan. There have been no changes in the City water rights since the preparation of the 1996 Watershed Sanitary Survey although City is developing and submitting filings for a change to the water rights that would allow direct diversion at Felton for delivery to the Graham Hill WTP. The City's 2013 Anadromous Salmonid HCP, which identifies the bypass flows negotiated for the protection of anadromous salmonids as discussed earlier in combination with the Santa Cruz Water Rights Project (SCWRP), are to allow flexibility for diversions.

The SCWRP includes proposed modifications to the City's existing water rights as listed in Table 2-4 and includes associated infrastructure improvements to take advantage of the modifications. The City has petitioned the SWRCB to revise its decades-old permitted and licensed water rights in the San Lorenzo River watershed to allow more options for where and how those water rights can be used. In addition, minimum instream bypass flows (also called Conservation Flows or Agreed Flows) were included in the water rights petitions.

To provide for the needed flexibility in the operation of the City's water system, the SCWRP would add points of diversion and rediversion. Specifically, the SCWRP would add the City's existing Beltz system as points of rediversion into and out of groundwater storage to the City's Tait Licenses, Felton Permits and pre-1914 appropriative rights. These rediversion points would provide flexibility for utilizing the City's San Lorenzo River surface water supplies for the Beltz Aquifer Storage and Recovery subcomponent of the SCWRP. The SCWRP would also add the Tait Street Diversion as a new point of diversion on the Felton Permits, which would give the City the option of diverting water under the existing Felton Diversion water rights at either the Felton Diversion or downstream at the Tait Street Diversion. This change would provide the ability to divert water under the Felton Permits with or without activation of the Felton Diversion inflatable dam and improve operational flexibility. Additionally, when water under the Felton Permits would be diverted at the Tait Street Diversion, water would remain in the San Lorenzo

River longer, bypassing the Felton diversion before being diverted at the Tait Street Diversion, thus providing fisheries benefits. Some other changes from the SCWRP include diversion of water during the winter as well as source changes to accommodate fish flows both of which could result in source water quality impacts.

Table 2-4: Summary of City Water Rights

Source	Period	Maximum Diversion (cfs)	Fish Flow Requirement (cfs)	Annual Diversion Limit (MG/year)
Liddell Spring	Year-round	No Limit	None	None
Laguna Creek	Year-round	No Limit	None	None
Reggiardo Creek	Year-round	No Limit	None	None
Majors Creek	Year-round	No Limit	None	None
San Lorenzo River Tait Diversion	Year-round	12.2	None	Non
Felton Diversion to Loch Lomond Reservoir				
	September	7.8	10	977
	October	20	25	
	November-May	20	20	
	June-August	0	---	
Loch Lomond Reservoir on Newell Creek				
	September-June	No limit	1 (released from Newell Creek Dam)[1]	Max collection: 1,825 Max withdrawal: 1,042

Notes:

Water rights for the North Coast Sources are pre-1914 rights containing all downstream rights. Therefore, the City may divert up to the full natural flow of each stream. City owns all downstream riparian water rights on the North Coast sources.
[1]This requirement has been reduced further as a result of a Temporary Urgency Change Petition during droughts.

It should be noted that the drought emergency starting in 2014 and again in 2020—present, required City file for a Temporary Urgency Change Petition (TUCP) with the SWRCB, Division of Water Rights for relief from the bypass and release requirement at Loch Lomond Reservoir in order to maintain water in storage to meet the community's needs for water for essential health and safety needs. In addition, City is wrapping up the SCWRP to conform water rights that will change the place of use of the San Lorenzo River water and allow flexibility in the use of the various surface waters available to Santa Cruz. The diversion flexibility of the SCWRP also includes more winter diversions, when available, with associated potential water quality impacts that will need infrastructure improvements at GHWTP to provide an adequate level of treatment.

2.6.2 SLVWD

Table 2-5 summarizes the water rights for SLVWD. This table also lists the limiting flow rates or diverted flow rates from the different surface waters, if applicable.

Table 2-5: Summary of Surface Water Rights for San Lorenzo Valley Water District

Source	Right	Limitations
Clear Creek, Foreman Creek, Peavine Creek, Sweetwater Creek,	Fully appropriated rights	None
Fall Creek, Bennett, and Bull Springs	Fully appropriated rights Not to exceed 1.7 cfs and 345 mg/year	Required minimum bypass flows vary from 0.05 – 1.5 cfs, depending on the cumulative monthly runoff of the San Lorenzo River, as measured at the Big Trees gage; cannot divert once Big Trees drops below 20 cfs per seniority
Lompico Creek	Appropriative Rights	Diversion of up to 24,000 gallons per day of surface water and must have 0.1 cfs bypass

Notes:

Source: DDW Annual Inspection Reports and State Water Resources Control Board Water Rights Database

SLVWD has pre-1914 appropriative water rights to divert from the northern tributaries to the San Lorenzo River and appropriative water rights transferred during SLVWD's acquisition of the Felton System for Fall Creek and Bennett and Bull Springs.

The appropriative water right to divert up to 24,000 gallons of surface water at the Lompico Creek intake structure was originally owned by LCWD but has now been transferred to SLVWD since the 2016 merger.

2.6.3 Water Quantity

Table 2-6 summarizes the water sources and the quantity of water available for each large utility. This table lists the surface water sources for each utility, the approximate average surface water supply capacity for the source, the total supply capacity (including ground water), and the total average day use. Each of the large utilities has a limited supply of water for drinking water purposes. For example, City has about 7.5 mgd of combined ground and surface water available for drinking water purposes, of which about 77 percent comes from flowing surface diversions, about 6 percent from groundwater and the remaining 17 percent from water stored in Loch Lomond at the present time. However, the combination of sources used from day to day can vary with some days reliant on the San Lorenzo River and Liddell Springs sources with other days with much higher Loch Lomond usage than San Lorenzo River. The average day use from 2020 was about 7.1 mgd, with a potential average demand in 2045 of up to 7.59 mgd (2020 City UWMP). Although average water demand appears to be met with the available supply, during periods of drought, flows in the San Lorenzo River and coast sources run low and cannot support average dry-season demands. This situation can stress the system, especially given the unpredictable nature of climate conditions and due to system demand and the need to provide instream flows for fisheries.

Although efforts are made to maximize the volume of water available from surface water sources, especially the San Lorenzo River, after a storm event, the City operates under a

maximum turbidity level for withdrawal from the San Lorenzo River sump of 10 NTU at the Coast Pump Station; the sump is a blend of San Lorenzo River and Tait well water. During first flush storm events in the early season, turn outs are bypassed as soon as it starts raining. The City is considering a winter diversion program that could be used for in-lieu conjunctive use of groundwater to improve seawater intrusion conditions which may result in adjustments to the turbidity criteria. City is addressing the challenges to consistently provide and achieve the desired supply capacity, especially during extended drought periods, under the minimum instream flow targets for the HCP, and in the future with the current supply sources with continued water conservation, addition of recycled water, and study of groundwater replenishment with excess surface water and advanced purified water.

Table 2-6: Summary of Water Sources Available to City and SLVWD

Source	Average Surface Water Supply	Average Groundwater Supply	Average Supply Available	Average Demand
San Lorenzo River	4.2 MGD	N/A	2,561 MGY	7.1 MGD
Loch Lomond Reservoir	1.3 MGD	N/A		
Coast Sources including Liddell Spring, Laguna/Reggiardo Creeks, and Majors Creek	1.5 MGD			
Beltz Wells[2] (Active wells only)	N/A	0.14 MGD		
Clear Creek, Foreman Creek, Peavine Creek, Sweetwater Creek	1.2 MGD	N/A	5.1 MGD	1.91 MGD
Quail Hollow, Olympia, and Pasatiempo Wells	N/A	3.3 MGD		
Fall Creek, Bennett, and Bull Springs	0.5 MGD	N/A		
Lompico Creek[3]	0.06 MGD	N/A		
Former LCWD Wells[3]	N/A	0.06 MGD		

Notes:

Total supply available depends on annual rainfall
Most of the demand is in surface water service area (approximately 70 percent)
Sources from former Lompico County Water District, which merged with SLVWD in 2016.

2.6.4 Source Management

Each of the utilities in the area manages their sources in an attempt to satisfy the water demands for their specific systems. All utilities are dependent upon the surface flows from the various creeks, streams, and springs that make up their drinking water source. Factors such as highly turbid water caused by stormwater runoff make the water more difficult to treat, requiring

diversion of the source to be discontinued until the water quality returns to acceptable levels. For example, City does not use water from the San Lorenzo River Diversion during storm events when the sump turbidity which is blend of San Lorenzo River and Tait Wells exceeds about 10 NTU. When flows are diminishing towards the end of a storm and/or on the receding limb of the hydrograph, turbidity of about 25 NTU is diverted. Also, SLVWD does not use highly turbid water at their Lyon and Kirby WTPs during high-turbidity periods.

One of the major challenges for City is managing operations to accommodate the minimum flows in the Operations and Maintenance Habitat Conservation Plan, the conservation flows from the SCWRP petitions, and the proposed instream flow requirements for Endangered Species Act (ESA) requirements under the Anadromous Salmonid HCP on some of the North Coast streams, potentially reducing the volume of flow available from these sources. As discussed in Section 2.3.5, the consequence of reduced North Coast flows would be higher reliance on water from Loch Lomond Reservoir and winter flows from the San Lorenzo River both of which have a higher TOC concentration, and hence a higher potential for formation of disinfection byproducts (DBP). DBP formation can be managed/inhibited/ from both the treatment perspective by carefully selecting source water for lower TOC as well as in the distribution system where regular water sampling occurs for DBP compliance.

City staff has continued to discuss and manage the implications of the SCWRP and ESA instream flow requirements as well as potential future winter water production for regional water supply reliability, which include modifying the treatment process currently underway as part of the Facility Improvement Project and/or constructing horizontal wells at the San Lorenzo River diversion – both of which are activities that will require many years to plan and implement. In addition, Graham Hill WTP improvements to meet LT2 and Stage 2 rule requirements were evaluated in 2010. These improvements include alternatives that could be implemented to meet more stringent D/DBPR requirements and reduce the higher levels of DBP that are associated with elevated TOC concentrations.

Water utilities must therefore balance the need to satisfy their customer demand with the requirement to comply with drinking water regulations. Most utilities, large and small, experience difficulty in treating highly-turbid water, and therefore prepare and adjust for such operations before, during, and after storms events as does SLVWD.

2.7 Facilities

2.7.1 Raw Water Reservoirs

With the exception of small diversions in creeks and streams, the only large raw water reservoir in this study area is Loch Lomond, which is managed by City. This roughly 8,600 acre-foot capacity reservoir, located on Newell Creek northeast of Felton and east of Ben Lomond, also stores San Lorenzo River water diverted at the Felton Diversion structure. SLVWD holds entitlement to a portion of surface water storage in Loch Lomond Reservoir or an equivalent water transfer from the City Santa Cruz Water. SLVWD has not recently exercised its entitlement due mostly to the costly upgrade that would be needed to its Kirby water treatment plant to address the high concentrations of total organic carbon in Loch Lomond raw water.

City commenced construction in 2020 of a project to replace the inlet/outlet pipeline that serves the Loch Lomond Reservoir. A valve on this pipeline was inspected in 2012 and was found to be

stuck partially open and no longer operable. An interim plan was agreed to with Division of Safety of Dams in 2015 and the project is expected to complete construction in 2023.

2.7.2 Intakes/Conveyance Systems

The locations of major water intakes are shown in Figure 1-1. Table 2-7 describes the intake and conveyance systems for the large utilities. Note that the San Lorenzo Valley and North Coast watersheds have extensive intake and conveyance systems needed to efficiently use the readily available supply of water in this area. Many of the intake structures have been constructed to prevent contamination from outside sources. Some of the key intake and conveyance systems are discussed below.

Table 2-7: Summary of Conveyance/Intake Facilities for Utilities with More Than 200 Service Connections

Utility	Source	Intake Details	Pipeline Dimensions	Pump Station Capacity	Other
City of Santa Cruz Water Department	San Lorenzo River Intake	Combination concrete check dam and screened intake sump with vertical turbine pumps on wells	Varies	7.8 mgd	
	San Lorenzo River - Felton Diversion	Inflatable rubber dam, screened intake pump	N/A	Felton Diversion P.S. at 2,850 gpm	Diverts water to Loch Lomond
	Loch Lomond Reservoir	Large earthen dam with multi-stage outlet tower	44,000 lf pipeline; 18 to 27 inches diameter	Gravity flow to Felton with Felton Pump Station at 13.5 MGD	Used in specific months to augment supply or when other sources have high turbidity that is difficult to treat
	Coast sources	These sources have small diversion structures or a protected spring box	Diameter varies - total pipelines	Gravity flow	Gravity flow to the Coast pump station then; pumped to GHWTP
	Majors	Concrete full-span dam with wire screened intake	10”	Gravity flow	Gravity flow to the Coast pump station then; pumped to GHWTP
	Laguna	Concrete/stone full span dam with Coanda screen intake	14”	Gravity flow	Gravity flow to the Coast pump station then; pumped to GHWTP
	Reggiardo	Concrete/stone full span dam with wire screened intake	8”	Gravity flow	Gravity fed to Laguna impoundment
	Liddell	Concrete/Corrugated Aluminum spring box with wire screened intake	16”	Gravity Flow	Gravity flow to the Coast pump station then; pumped to GHWTP
San Lorenzo Valley Water District	Clear Creek	Protected spring box at elev 1250 ft,	8-inch pipe to Foreman Creek	N/A	Gravity flow to Lyon WTP
	Sweetwater Creek	Protected spring box at elev. 1230 ft.		N/A	Gravity flow to Lyon WTP
	Peavine Creek	Small diversion structure at elev 1264 ft.	8 in. pipeline to Foreman Creek	Gravity	Gravity flow to Lyon WTP, Christmas tree farm in watershed

Utility	Source	Intake Details	Pipeline Dimensions	Pump Station Capacity	Other
	Foreman Creek	Small diversion structure at elev 927 ft.	8 in. pipeline to WTP	Gravity	Gravity flow to Lyon WTP, small subdivision in headwaters
	Fall Creek	Small wire screen structures	8-inch	500 gpm	Gravity flow to Kirby WTP, Fall Creek St Park
	Bennett Spring	Protected spring box	4-inch	N/A	Gravity flow to Kirby WTP
	Bull Spring	Protected spring box for #1 and #2	4-inch	N/A	Gravity flow to Kirby WTP,
Lompico County Water District (merged with SLVWD in 2016)	Lompico Creek	Secured, screened structure adjacent to creek impoundment dam with concrete deep well and 1 HP pump	2" PVC Raw water line to holding tank 260-ft away	30 gpm Pump	N/A

N/A Not applicable or available.
Note to Reviewers: Info for Big Basin MWC is not included in this table but were included in 1996.

2.7.2.1 City

Figure 1-1 shows approximate intake locations for the City system. These include pipelines from the North Coast watershed and the San Lorenzo Valley. The details of these intakes and conveyance systems are described in Section 2.5 and in the 1996 Watershed Sanitary Survey.

2.7.2.2 SLVWD

Figure 1-1 shows the locations of the surface water sources used by the SLVWD. 4 of the 9 points of diversion are currently inactive due to damage sustained in the CZU Lightning Complex wildfire damage in the summer of 2020. It is anticipated that these will be repaired or replaced in 2023/2024.

SLVWD has an intake, currently unused, on Lompico Creek below the Mill Creek confluence. About 15-20 houses are located upstream of the intake structure. Originally, the LCWD obtained about 25 percent of its water from the Lompico Creek surface intake and the other approximately 75 percent is obtained from groundwater wells.

2.7.3 Treatment Plants/Processes

The water treatment plant facilities for the large utilities in the watershed study areas are summarized in Table 2-8 and are described in more detail below.

Table 2-8: Summary of Surface Water Treatment Facilities for Utilities with More Than 200 Service Connections

Utility/Treatment Plant (Capacity)	Subject Watershed Source(s)	Pretreatment Process	Coagulant/ Flocculation Process	Sedimentation	Filtration (Rate)	Disinfection
Santa Cruz Water Dept. Graham Hill WTP [(1)] (24 mgd)	San Lorenzo River, Loch Lomond, and North Coast sources	Potassium permanganate or chlorine for oxidation, powdered activated carbon and potassium permanganate for taste and odor removal	Alum and cationic polymer Horizontal paddle mixers	Conventional - enhanced using tube settlers	Dual media (6gpm/ft2)	liquid chlorine
San Lorenzo Valley Water District - Lyon WTP (1.0 mgd)	Clear Creek, Foreman Creek, Peavine Creek, Sweetwater Creek	Sodium Hypochlorite	Adsorption clarification/ filtration (Neptune Trident Microfloc)	Adsorption onto floating media which is equivalent to sedimentation	3 multi-media filters at 350 gpm rating each (6gpm/ft2)	Sodium Hypochlorite
San Lorenzo Valley Water District - Kirby WTP (0.5 mgd)	Fall Creek, Bennett, and Bull Springs	Sodium Hypochlorite	Adsorption clarification/ filtration (Neptune Trident Microfloc)	Adsorption onto floating media which is equivalent to sedimentation	2 – filters at 350 gpm rating	Sodium Hypochlorite
San Lorenzo Valley Water District – Mill Creek WTP (on standby)	Lompico Creeks	None	None	None	Microfiltration membrane 0.5 gpm/m2 of membrane area	Chlorine Post-treatment

Source: DDW Annual Inspection Reports

N/A = Not applicable, *Note to Reviewers*: Info for Big Basin MWC is not included in this table but was included in 1996.

[(1)] Beltz WTP is not included because it is a groundwater source and Loch Lomond Recreation Area WTP is not included because it is a transient non-community water system.

[(2)] Orthophosphate is added for corrosion control in the water distribution system to prevent leaching of lead and copper

2.7.3.1 SCWD

Figure 2-6 represents the approximate layout of the facilities at the GHWTP site. The GHWTP is a conventional treatment plant with key processes such as preoxidation, coagulation, carbon/potassium permanganate contactors (for taste and odor control), flocculation, sedimentation, filtration, and disinfection. These processes are fully described in the 2019 Inspection Report by DDW. In addition to upgrades at the Graham Hill WTP to the filters and replacement of tube settlers described in the 2018 Watershed Sanitary Survey update, other upgrades to allow treatment of higher turbidity source water are under design. City is in process of Facilities Improvements Program at GHWTP including to the flocculation, sedimentation and filtration basins, and replacement of three of the four concrete tanks at GHWTP. Following that, an upgrade of the overall GHWTP will commence, moving to the use of plate settlers, ozone, granular activated carbon filters for a more robust treatment process will help adapt to climate change and decreasing water quality. The updated GHWTP will better address total organic carbon and associated disinfection by products as well as Contaminants of Emergency Concern. The improvements allow use of high flows such as during and after storm events projects that otherwise would need to be bypassed. These investments are designed to address aging infrastructure and prevent noncompliance with drinking water standards under anticipated future conditions.

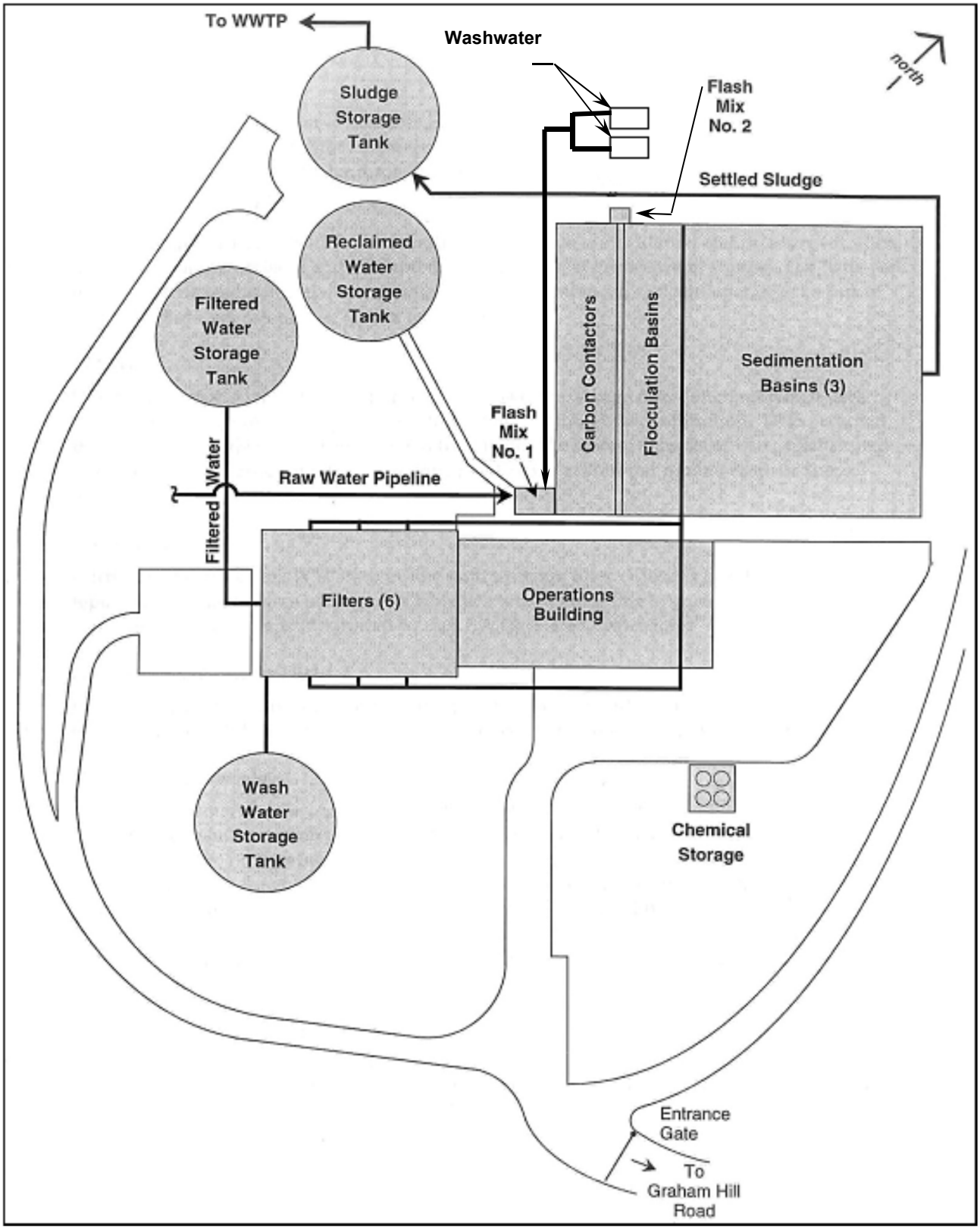
The Loch Lomond Reservoir Recreational Area (LLRRA) water system previously used a microfiltration system to provide water for park users and the caretakers of the reservoir watershed. The system is no longer used, and water is instead purchased from SLVWD.

City also operates two treatment facilities that serve the Live Oak (previously Beltz) Wells. These facilities are only used to treat groundwater and are not fully described in this update. Details on the Live Oak Wells Filtration Plant are provided in previous surveys.

2.7.3.2 SLVWD

SLVWD constructed the Lyon WTP in 1994, a two-stage package filtration plant which uses floating media to remove floc particles followed by a granular media filtration. DDW accepted this process as equivalent to conventional treatment. The system consists of three prefabricated adsorption, clarification, and filtration units each rated at 350 gpm. Due to piping system constraints, however, the maximum treated water production rate is 1,150 gpm.

In addition, SLVWD operates the Kirby WTP in Felton which is described in Section 2.4.3



Source: CDM - Camp Dresser & McKee Inc., 1996

Figure 2-6 Process Layout of the Graham Hill Water Treatment Plant, Santa Cruz Water Department.

2.7.4 Pipeline Data, Capacity

Table 2-9 summarizes the pipeline data for each of the large utilities. Table 2-10 lists the distribution system reservoirs for each of the large utilities. The distribution system storage capacity for these utilities appears sufficient to account for short-duration periods when the lower quality water is diverted, and water treatment facilities are not used. The maximum storage capacity for these utilities is about two to ten times more than the average daily use, with City typically at the lower end of that range. Therefore, each utility has enough storage to allow a short-term period when water treatment facilities are not operational.

Table 2-9: Summary of Distribution Systems for Utilities with More Than 200 Service Connections

Utility	*Number of Service Connections*	*Total Pipeline Length*	*Notes*
City of Santa Cruz Water Department	24,653 in 11 pressure zones	263 miles (1in. to 36 in.)	Satellite disinfection available at 4 locations
San Lorenzo Valley Water District	6,000 in 23 pressure zones 1,300 in 6 pressure zones for Felton System 484 in 3 pressure zones in Lompico System	155 miles (SLVWD 125 miles, Felton 30 miles, Lompico System 32 miles) (2 in. to 16 in.)	Satellite disinfection available at 2 locations

Note to Reviewers: Info for Big Basin MWC is not included in this table but was included in 1996.

Table 2-10: Summary of Distribution System Storage Reservoirs for Utilities with more than 200 Service Connections

Utility	*Reservoir Name*	*Capacity (Gallons)*
City of Santa Cruz Water Department (14 reservoirs total)	Carbonera	1,000,000
	University #5	2,000,000
	University #4	400,000
	University #2	1,000,000
	Bay St. (2 tanks)	12,000,000
	DeLaveaga 1	1,000,000
	DeLaveaga 2	1,000,000
	S.C Gardens 1	250,000
	S.C Gardens 2	250,000
	Rollingwoods	270,000
	Pasatiempo 1	750,000
	Pasatiempo 2	300,000
	Finished Water Tank @ GHWTP	1,000,000
San Lorenzo Valley Water District (46 reservoirs total)	Echo	75,000
	Reader	150,000
	Brookdale	721,000
	Big Steel	1,400,000
	Lyon	3,000,000
	Little Lyon	250,000
	Blue Ridge	40,000
	Huckleberry	125,000
	Bear Creek Estates	75,000
	Ralston	10,000
	Eckley	5,000
	Blackstone 1	12,000
	Blackstone 2	12,000
	Highland	60,000
	Nina 1	53,700
	Nina 2	53,700
	South 1	9,000
	South 2	9,000
	South 3	9,000
	South 4	9,000
	Spring	65,000
	Swim 1	10,000
	Swim 2	10,000
	Quail 1	211,000
	Quail 2	240,000
	University	51,000
	Ralston	20,000
	Reagon	500
	Riverside Grove	380,000
	Probation	100,000
	Lower Pasatiempo	100,000
	Upper Pasatiempo	100,000
	Blue Tank	65,000
	Charlie Tank	45,000
	Felton – Kirby	250,000
	Felton - Blair	255,000
	Felton - El Solyo	20,000
	Felton – McCloud	284,000
	Felton- Pine Tanks	20,000
	Felton Acres	100,000
Lompico County Water District (merged with SLVWD in 2016)	Kaski 1	42,400
	Kaski 2	42,400
	Lewis 1	114,400
	Lewis 2	114,400
	Madrone 1	75,500
	Madrone 2	75,500

2.7.5 Satellite treatment facilities

Besides small chlorination systems for numerous wells used throughout the area, the main satellite treatment facilities are chlorination facilities used by City at the University Reservoir. Satellite chlorination equipment is housed in a separate room from the source. SCADA systems are used to control and monitor these facilities. The targeted chlorine residual leaving these facilities to the appropriate pressure zones is about 0.5 mg/l of free chlorine. SLVWD has a similar facility at one of its reservoirs.

2.8 Emergency Plans

Most utilities experience periodic emergencies that disrupt water treatment or water supply. The SWTR requires utilities to develop standard and emergency response plans for specific types of emergency episodes. These include chemical spills, fires, equipment failure, serious power failure, and deliberate water fouling. Some emergency plans may include responses to seismic episodes, floods, and droughts. In addition, the Bioterrorism Act of 2002 requires that drinking water systems serving a population greater than 3,300 (or 1,000 service connections) complete a vulnerability assessment in regard to terrorist activity and modify their emergency plans to reduce the risk posed by terrorist attacks. More recently USEPA mandated water system risk and resiliency assessments and emergency response plans were required.

Most of the utilities in the study area have developed emergency response plans as part of the Operations Plans for each WTP. These emergency response plans were also updated to address vulnerabilities identified by the risk and resiliency assessments. Also, the County uses the emergency response dispatch, NETCOMM, to notify drinking water utilities of chemical spills, fires, and other emergencies in the watershed. The Emergency Plan includes a response when episodes are notified via the 911 emergency telephone number. However, City staff has indicated that notifications are not always made; therefore, a recommendation to have an annual discussion with emergency response dispatchers has been made. Specific emergency plans for each utility are discussed below.

2.8.1 SCWD

The City issued a revised *Emergency Operations Plan* in 2013, which addresses natural and man-made disasters such as earthquakes, tidal waves, flood, fire, vandal-caused disasters, and chemical spills. This *Emergency Operations Plan* would be used in the event of contamination of the water supply by acts of terrorism or vandalism. The response to equipment failures and serious power failures at the WTP is included in the September 2016 GHWTP Operations Manual.

City has conducted a seismic risk evaluation called the Earthquake Response Procedures for the Newell Creek Dam and Other Critical Structures. This information is available in the 2005 *General Emergency Plan* City also has a Water Shortage Contingency Plan which was adopted by resolution of the Santa Cruz City Council in 2021 and an Ordinance (Santa Cruz Municipal Code Chapter 16.01) that implements water shortage regulations and restrictions. Both of these documents are a part of the 2020 *Urban Water Management Plan* and call for an aggressive conservation effort and public relations program to reduce the drinking water demand of the customers during emergencies.

In addition, City conducted a comprehensive assessment of the Newell Creek Dam and spill way concurrent with an update to the dam Emergency Action Plan. During the winter of 2017, City increased dam inspections from monthly to daily during the heaviest rains. The dam was also inspected at a reconnaissance level by the Division of Safety of Dams in Spring 2017 as a precaution; the state inspection identified potential geologic, structural or performance issues that could pose a risk during a flood event. It is anticipated that these risks will be further studied, and remedies proposed during the comprehensive dam assessment currently underway.

The broader 2015 *Santa Cruz County Operational Area*[6] *Emergency Management Plan* addresses the consequences of any emergency or disaster which may occur within the County. The plan also provides a means by which State and Federal assistance is requested if necessary. Depending on the size and complexity of the incident, an emergency operations center (EOC) may be activated under the direction of the Santa Cruz County Office of Emergency Services. The Santa Cruz Operational Area transitioned to a Standardized Emergency Management System (SEMS) in 2007 that is compliant with the National Incident Management System (NIMS). NIMS was developed by the Department of Homeland Security to improve national readiness to respond to not only terrorist events but all types of disasters (Santa Cruz County Office of Emergency Services, 2005). The City has a water system risk and resilience plan and emergency response plans for the City prepared in 2021, as well as an emergency response plan specific to Loch Lomond and one for the City as a whole.

2.8.2 SLVWD

SLVWD recently updated their emergency response plans in 2021 which are contained in the *Lyon WTP Operations Plan*. This plan includes a response to most natural disasters and chemical spills in the watershed. For other emergencies, SLVWD can rely on the County EOC infrastructure. In addition, SLVWD is planning to complete an agency specific Local Hazard Mitigation Plan.

[6] The Santa Cruz Operational Area consists of the County and all political subdivisions within the County.

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Section 3 Potential Contaminant Sources in the Watersheds

3.1 Survey Methods

The survey consisted of a combination of discussions and meetings with several County staff and Water Department staff, update calls to selected agencies, and a review of several agency websites and files. Contacts are listed in Table 3.1. The survey work was also supplemented with additional data and report review and discussions with various agency staff. This section discusses the specific potential contaminant sources.

Table 3-1: Santa Cruz Watershed Sanitary Survey Contacts

Name	Agency/Title	Sections Contributed To	Contact
Chris Berry	City of Santa Cruz Watershed Compliance Manager	Overall Report	cberry@cityofsantacruz.com (831) 420-5483
Zeke Bean	City of Santa Cruz	Overall Report	ebean@cityofSantacruz.com
Carly Blanchard	SLVWD Environmental Programs Manager	• Recreation • Unauthorized Activity • Geologic Hazards • Wildfires	cblanchard@slvwd.com (831) 430-4639
Sierra Ryan	County of Santa Cruz Environmental Health/Health Services Agency Water Resources Manager	• Wastewater • Agricultural Land Use • Quarries and Mine Runoff	Sierra.Ryan@santacruzcounty.us (831) 345-5202
Gar Eidam	City of Santa Cruz	• Recreation	geidam@cityofsantacruz.com
Matt Johnston	County of Santa Cruz Environmental Coordinator/Principal Planner for Environmental Planning	• Wastewater • Quarries and Mine Runoff • Solid and Hazardous Waste Disposal Facilities	Matt.Johnston@santacruzcounty.us (831) 454-5357
Sam LoForti	County of Santa Cruz Cannabis Licensing Manager	• Agricultural Land Use • Unauthorized Activity • Wildfires	Sam.Loforti@santacruzcounty.us (831) 454-3426
Lisa Lurie	Resource Conservation District of Santa Cruz County Executive Director	▪ Grazing Livestock • Concentrated Animal Facilities	llurie@rcdsantacruz.org (831) 205-3397

Name	Agency/Title	Sections Contributed To	Contact
Erin McCarthy	County of Santa Cruz Environmental Health/Health Services Agency Water Resources Planner	• Grazing Livestock • Concentrated Animal Facilities	Erin.McCarthy@santacruzcounty.us (831) 454-2810
Heather Reynolds	County of Santa Cruz Environmental Health/Health Services Agency Land Use Program Manager	• Wastewater	Heather.Reynolds@santacruzcounty.us (831) 454-2022
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3.2 Wastewater

Onsite Wastewater Treatment Systems (OWTS), commonly known as septic systems, are a common method of treating and disposing sewage in rural areas where sewer systems are not available. OWTS are designed to treat wastewater using a combination of physical processes for solid-liquid separation coupled with biological processes for inactivating pathogens and stabilizing organic matter and nutrients. Conventional OWTS includes a septic tank to retain solids a grease and provide primary treatment of the wastewater, and a leaching trench disposal system such as a leach field that allows the wastewater to percolate into soil for further treatment.

A number of communities and organizations are served by package wastewater treatment systems that discharge to common leach fields as shown on Figure 3-1. These entities include: County Service Area No. 7 in the vicinity of the Boulder Creek Golf and Country Club, Bear Creek Estates, the Mt. Hermon Association, the San Lorenzo Valley Unified School District, Camp Harmon, Camp Campbell and several other camps and conference centers. County

Service Area No. 10 - Rollingwood Estates connects to the City of Santa Cruz wastewater treatment plant which discharges the wastewater through the City of Santa Cruz ocean outfall. Both Henry Cowell State Park and Castle Rock State Park have restrooms. The septic system for Henry Cowell State Park, located near the Felton Diversion, is being reconstructed.

However, the great majority of the residences and businesses in the San Lorenzo River watershed are on individual or community (e.g., trailer parks) septic systems. The dispersed rural population in the North Coast watersheds is served by individual septic tank and leach field systems that are regulated by the County; inspection of septic systems has declined in recent years. There are no direct discharges of municipal wastewater to surface waters regulated by National Pollutant Discharge Elimination System (NPDES) permits in the San Lorenzo Valley or North Coast watersheds.[7]

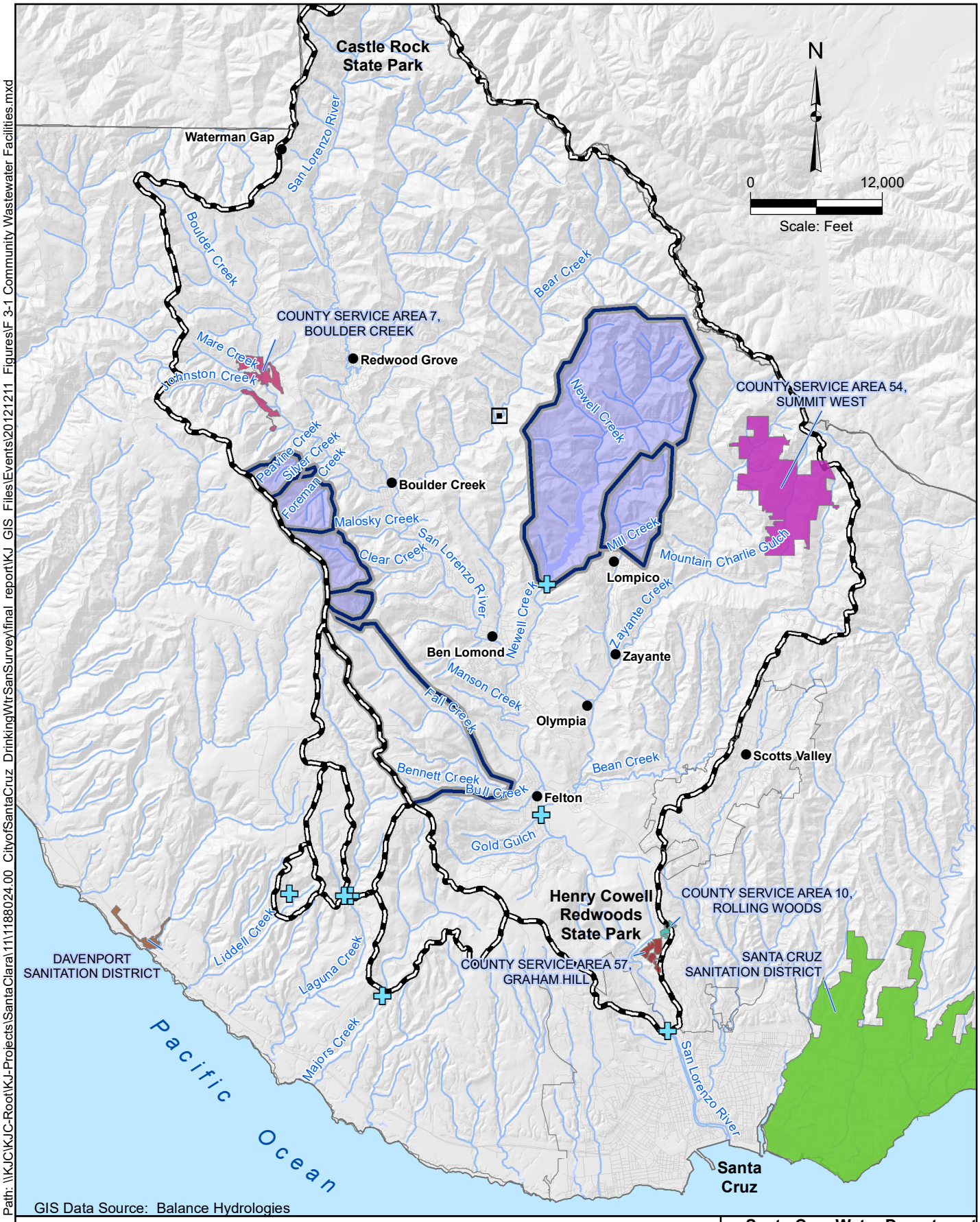
The types and number of OWTS in Santa Cruz County are shown in Table 3-2.

Table 3-2: Types of OWTS in Santa Cruz County

Type of System	Number
Conventional, meets standards	6,175
Conventional, does not meet all standards	209
Pressure Distribution	24
Mounded Bed	52
Sand Filter	22
At-Grade	5
Enhanced Treatment System (proprietary)	686
Haul away	21
Large Systems (>2,500 GPD)	12
Older system, performing satisfactorily	1,558
Older system, no information available (pre-1995)	18,983
Total	27,747

As shown on Figure 2-1, the majority of the land in the watershed areas is designated either as existing parks and recreation, resource conservation, or mountain residential by the Santa Cruz County General Plan. The state parks have hiking trails and limited wastewater facilities; Henry Cowell State Park facilities are undergoing upgrades. Only a small portion of the SLVWD watershed lands are designated rural residential with associated septic systems; these lands are near the upper watershed, quite a distance from the diversion locations.

[7] The Watkins Johnson site in Scotts Valley, has had declining levels of TCE and PCE that have been treated and released. The site owners are currently negotiating with the USEPA to formally close the site.



Path: \\KJC\KJC-Root\KJ-Projects\SantaClara\111\188024.00 CityofSantaCruz DrinkingWtrSanSurvey\final report\KJ GIS Files\Events\20121211 Figures\F 3-1 Community Wastewater Facilities.mxd

Santa Cruz Water Department
WSS Update

Figure 3-1: Community Wastewater Facilities

As reported in the Santa Cruz County LAMP for OWTS, a properly functioning OWTS returns a significant amount of water back to the groundwater basin. During the dry season, about 15 percent of the baseflow in the San Lorenzo River is estimated to be discharged from OWTS and has percolated through the soil to reach the San Lorenzo River as clean groundwater. If septic systems are improperly designed or installed in highly-permeable soils, such as sandy soils noted earlier, wastewater constituents can leach into groundwater and from there seep into nearby surface waters. Surface water contamination from septic systems can also occur by system 'failure,' or insufficient percolation rates leading to ponding and surfacing of effluent. A 'failing' septic system can allow large amounts of nutrients, viruses, and bacteria to contaminate nearby surface waters. The portions of the San Lorenzo Valley that overlie high permeability soils has a higher probability of nitrates entering groundwater from the individual septic systems through excessively rapid percolation to groundwater rather than by system failures as a result of the sandy soils discussed in Section 2.3.1. According to the LAMP, 0.1 percent of installed or proposed OWTS in Santa Cruz County are/will be fast permeability sandy soils (percolation rate faster than 5 minutes per inch (MPI), and 12.9 percent are/will be in moderate permeability loams (percolation rate between 5 and 30 MPI).

Surface water contamination by nutrients and coliform bacteria from septic systems in the San Lorenzo Valley has been extensively studied previously. The 1979 Watershed Management Plan identified improperly functioning septic systems as one of the major pollutants sources to the San Lorenzo River. In 1995, the County Board of Supervisors and the Regional Board adopted the Wastewater Management Plan for the San Lorenzo River watershed which has been considered a model for the onsite septic wastewater management standards in the State under AB 885 as discussed in Section 4.9. Septic system repairs and upgrades have occurred regularly since the 1995 adoption of the San Lorenzo River Watershed Management Plan.

The Wastewater Management Plan contains management practices to prevent further degradation of water quality from septic systems and corrective measures to improve existing systems and reduce the loading of pollutants to the San Lorenzo River. The County implements a series of activities including septic tank pumping reporting to manage onsite wastewater systems as discussed in Section 5. Many of these measures were emplaced after extended field trials at sites throughout the valley under a range of soil and slope conditions. Since 2018, the County has approved approximately 150 minor repairs, 22 re-pipes, 57 enhanced treatment repairs, 2 enhanced treatment repairs (tanks only), 189 upgrades to conventional systems, 50 new conventional systems, 48 new enhanced treatment systems, and 38 upgrades to enhanced treatment systems, for a total of about 550 septic repairs and modifications in the watershed (Heather Reynolds, personal communication 2022). Of these 550 repairs and modifications, approximately 206 were considered major repairs.

As of September 2022, about 24 complaints regarding septic systems have been recorded in the San Lorenzo River watershed. This is similar to the number of annual complaints reported in 2018, and significantly less than the 130-160 failures per year recorded in the 1990s. Most complaints are resolved fairly quickly (within a couple of weeks). A small number require longer enforcement times due to cost of repairs, complexity of repairs, and responsiveness of the property owner (Heather Reynolds, personal communication 2022).

In 2022, 27 applications for new development were received. Santa Cruz County can provide septic evaluation services to potential home buyers for a fee, including review of septic records and parcel research. Santa Cruz County is also in the process of developing a Point of Sale

program, which is planned for implementation in 2023 (Heather Reynolds, personal communications 2022). Additionally, if a new ADU is added, review of the existing septic system is triggered to confirm compliance with current sewage disposal code. If existing code standards are not met, the septic system must be upgraded. It is rare that existing septic systems can meet current standards for an ADU addition (Heather Reynolds, personal communications 2022).

3.2.1 Contaminants of Concern

Contaminants in wastewater can be divided into those that present an acute health risk and those that may pose a chronic, or long-term health risk. An acute health risk is posed by the presence of pathogenic microorganisms. A chronic health risk is posed by excessive concentrations of compounds present in the source water or formed in the water treatment process.

Wastewater contains a number of pathogenic microorganisms responsible for causing diseases, such as hepatitis, typhoid, cholera, dysentery, salmonella, giardiasis, and cryptosporidiosis. In a properly functioning septic system, the effluent is treated by the soil and the microorganisms are removed. If the system is not functioning properly, incompletely treated effluent may enter streams, or reach ground water.

Wastewater also contains high concentrations of nutrients and organic carbon. Most nitrogen in wastewater is converted to the nitrate form, which is highly soluble and readily transmitted through the soil to ground or surface waters. Nutrients can stimulate biological productivity in surface waters leading to high concentrations of organic carbon at downstream water intakes. Organic carbon combined with disinfectants used at water treatment plants produces trihalomethanes (THMs), five haloacetic acids (HAA5) and other disinfection byproducts (DBPs) which can have long-term health implications. Excessive algal growth, promoted by introducing additional nitrate into a natural system in which phosphorus is widely available, also causes taste and odor problems in drinking water systems.

Blooms of blue-green algae (cyanobacteria), which form in nutrient-rich, non-turbulent waters, could cause more serious problems as some of these organisms produce harmful toxins. In September 2009, the EPA finalized its Drinking Water Contaminant Candidate List to include cyanobacteria, which prioritizes this issue for further investigation. Usually, management practices to control taste and odor help to reduce the likelihood of toxic blue-green algal blooms also known as HAB; however, prevention is the preferred method because some types of treatment can rupture the cells and release the toxins.

County policy requires permitting of greywater sumps and includes connection of all greywater to an adequately sized septic system for the winter time when irrigation demands are low. SB 1258 passed in 2008 directs the California Department of Housing and Community Development to develop a more wide-ranging set of greywater standards for both indoor and outdoor uses than current law allows. These standards are expected to be incorporated in California Plumbing Code updates. Proposed standards include consideration of source water protection through containment on the site where generated and disposed of, prohibition on ponding and runoff, and prohibition of the use of greywater containing infectious (e.g. diapers)

or hazardous contaminants. Both the County and the City provide guidance for use of greywater systems.

A greywater system collects and disposes of wastewater from systems such as the washing machine, shower, and bathroom sink. Greywater sumps are used by some homeowners to reduce loadings on a septic system with inadequate leaching capacity and to be able to reuse greywater for landscape irrigation. Although greywater contains fewer pathogens, solids, and nutrients than toilet wastes, it can still present a significant health hazard.

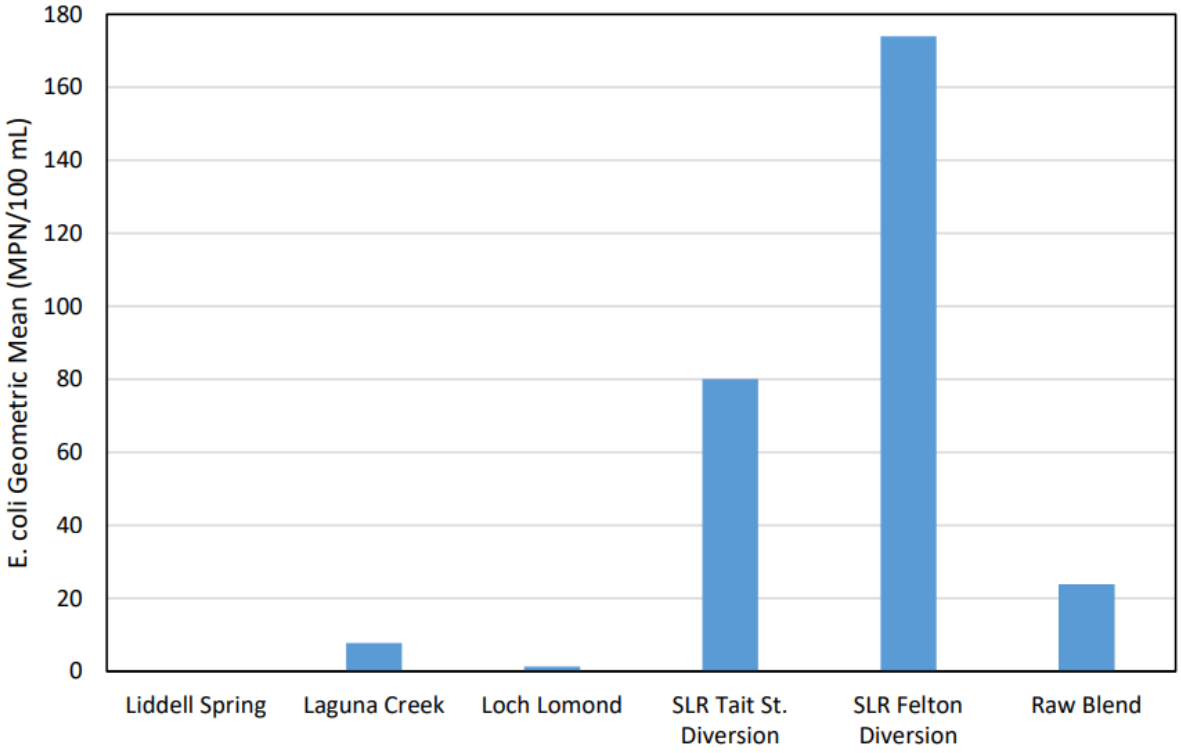
As noted earlier, the County requires building permits for installation of a greywater system. Very few greywater sump permits, and no greywater repair permits have been issued since 2018 (Heather Reynolds, personal communication 2022). The County Environmental Health Department only issues greywater sump permits for subsurface disposal only (not for greywater irrigation).

3.2.1.1 Bacteria

A number of studies have been conducted to evaluate the proportion of the bacterial contributions resulting from wastewater discharge versus the proportion resulting from other sources, including waterfowl, livestock, pet waste, failing septic systems, sewer system leaks, encampments, and urban runoff. Groundwater monitoring conducted in Boulder Creek in the early 1980s and as part of the County's historic monitoring program has shown that fecal coliform levels decrease to background levels more than 25 feet from septic systems. Beginning in 1981 the County has assessed fecal coliform concentration in shallow groundwater underlying developed areas. The absence of fecal coliforms indicates that incidents of bacterial contamination of surface waters do not result from cumulative contamination of groundwater but result from failures and discharges to the ground surface from individual systems.

More recently the City 2021 Source Water Monitoring Study Report reported that the San Lorenzo River watershed is densely populated with septic systems, and failing systems are considered a threat to water quality. Bacteria concentrations (specifically *E. coli* and Entercocci) are highly variable by water source and increase during the wet season due to storm events. The Felton Diversion and Tait Street Diversion are the most variable and susceptible to increases in microbial load, however, these sources are blended with Liddell Spring and Loch Lomond, which provide a buffer against the water quality fluctuations of the San Lorenzo River.

Figure 3-2: Summary of *E. coli* geometric mean of source waters from October 2020 through September 2021 (2021 Source Water Monitoring Report)



Per discussions in the 2021 Source Water Quality Monitoring Report, results of recent microbiological source tracking indicate human waste is the largest contributor to microbial load during the wet season. Animals such as birds and cattle contribute more to the overall microbial load during the dry season, when flows are low and animal activity is increased.

Blue-green algae (cyanobacteria) are closer to bacteria than algae and can release harmful toxins, resulting in HAB. HAB have been reported in Loch Lomond Reservoir several times during warm summer conditions in the last five years.

3.2.1.2 Nitrate

Although nitrate concentrations in the San Lorenzo River had increased five to seven times over background levels (Ricker, 1995), as discussed in Section 5, it was estimated that 50 to 80 percent of this increase is attributable to nitrate from wastewater (Ricker, 1989). This increase in nitrate is consistent with the high growth in Santa Cruz County with the population increasing 3.5 times from 66,534 in 1950 to 229, 734 in 1990. Approximately two thirds of the nitrate load in the river comes from the area of the watershed underlain by the highly permeable Santa Margarita sandstone. Unlike bacteria, there has been a significant cumulative release of nitrate from septic systems in the watershed, particularly in areas underlain by sandy soils.

A Nitrate Management Plan was first implemented in 1995 and was subsequently formalized as a TMDL for nitrate in 2000 as a result of the rising nitrate levels and is discussed in Section

4.9.1. The extensive effort in improving wastewater management since 1995 has likely moderated nitrate levels. As shown on Figure 5-10a-d, nitrate levels in the San Lorenzo River over the last forty years appear to show a gradual increasing trend; however, further reductions to nitrate concentrations will be challenging. Since San Lorenzo River water is pumped to Loch Lomond Reservoir, the linkage between nitrate, algae production, and the resulting odors and disinfection-by-product precursors will continue to be a challenge for City and SLVWD.

3.2.2 San Lorenzo River Watershed

The Regional Water Quality Control Board is responsible for permitting and management of wastewater systems that discharge greater than 20,000 gallons per day (gpd). As part of County Service Area No. 7, the County-operated Boulder Creek Wastewater Treatment Plant serves the neighboring country club, 18-hole golf course, tennis facilities, restaurant, and pro shop, as well as about 200 townhouses and residences built along the fairways. The collection system includes 24 miles of 6- and 8-inch gravity mains, a 4-inch PVC force main, and five lift stations. The plant was upgraded to tertiary treatment in 1996 and has a capacity of 104,000 gpd. The treated effluent is pumped to a leach field, where it is disposed of by subsurface discharge. In the past, tertiary treated water has also been delivered to the Boulder Creek Golf and Country Club, blended with raw water, and used for irrigation. Since 2010, process improvements to reduce the nitrate concentration, improved distribution of effluent to the leach field, as well as force main upgrades to reduce spills between the treatment plant and leach field have been implemented. (J. Ricker, Personal Communication, 2012). The force main and other improvements have particularly reduced spills to Boulder Creek. In addition, improvements to the wastewater treatment plant including upgrades to the blower line for aeration, replacement equalization tank, and sewer line improvements are planned and awaiting federal funding as of 2022.

The Bear Creek Estates Wastewater Treatment Plant, which is owned and operated by the SLVWD, serves approximately 56 homes. SLVWD has a waste discharge permit to treat up to 12,000 gallons per day of wastewater, then discharge it to a community leach field. In 2005, SLVWD installed improvements for nitrogen removal pursuant to the Regional Water Quality Control Board's minimum discharge requirement of 50 percent nitrogen removal, prior to subsurface disposal. Heavy winter rains in 2016-2017 resulted in groundwater infiltration resulting in overflows which have been reported to the RWQCB and County. SLVWD is considering a replacement of the WWTP to provide more reliable treatment. In addition, there are about 150 septic systems within 3 of the SLVWD source watersheds (SLVWD Watershed Management Plan, 2010).

The Mt. Hermon Association is another significant community wastewater disposal system in the watershed. The Mt. Hermon Association is served by a sequential batch reactor package plant that treats wastewater from a hotel, cabins, and homes. The plant has a permitted capacity of 63,000 gpd but operates at about 45,000 gpd. Treated effluent is pumped uphill and discharged to a community leach field above the plant. More recently, the Rollingwood subdivision of about 30 homes, near Scotts Valley has been connected to the City of Santa Cruz Wastewater Treatment Plant.

Significant institutional wastewater disposal systems in the San Lorenzo Valley include those serving Camp Harmon, Camp Campbell, and other organized camps, as well as the San

Lorenzo Valley Unified School District (high school, junior high school, elementary school) facility in Felton. The latter system is unique in that treated effluent is further polished in a constructed wetland prior to being discharged to a leach field. The Santa Cruz County 2021 LAMP estimates that there are over 27,700 OWTS in the County of which 18,983 were constructed before 1995 with limited available information. As of 2017, the County estimated that there are approximately 13,292 individual septic systems in the San Lorenzo watershed alone Including Carbonera and Branciforte Creeks (J. Ricker, 2017). The density of systems is higher than that of any other comparable area in California watershed. Overall, the density of development in the creek bottoms, both along the river itself and on the river's tributaries, is quite high. Many residences were originally used as summer homes and are now occupied year-round. Some homes were built with part of the building supported by stilts, over the floodplain. In many areas the density is akin to urban areas in California which are served by municipal sewer systems. Some of these homes may have been destroyed in the CZU fire and if rebuilt, will need to meet current standards.

During a more extensive previous study described in the 1995 *Wastewater Management Plan,* there are a number of limitations to onsite disposal systems in the San Lorenzo Valley watershed, such as*:*

- Approximately 55 percent of the developed parcels are less than 15,000 square feet and 11 percent are less than 6,000 square feet. This significantly limits the size of leach fields and the opportunity to install back-up/replacement leach fields.
- Two-thirds of the systems are substandard in size and did not meet the repair standards of 1995. Significant improvements have been made to at least 3,000 systems since 1986.
- About 40 percent of the systems were constructed before 1975 and have not experienced significant additions (i.e. remodels/expansions/subdivisions) or do not have second leach fields.
- About 14 percent of the systems are located less than 100 feet from a stream.
- Winter groundwater levels are less than 10 feet from the surface in 30 to 50 percent of the systems and less than 3 feet from the surface in 3 to 6 percent of the systems.

The County has conducted numerous surveys and evaluations of the septic systems in the watershed since 1986. The County has continued to have a low frequency of septic-system surveys since the late 1990s, as relatively few changes were reported and the value of continuing the surveys does not compete effectively with enforcement or other County Environmental Health Service priorities (John Ricker, personal communication, 2017). Implementation of the LAMP will require some point of sale inspections of septic-systems prior to property purchase. Because there is real value to neighborhood- or community-scale discussion, the community-scale results from the 1996 Watershed Sanitary Survey are included

and updated as appropriate[8]:

Kings Creek - The greater Kings Creek area includes 800 developed parcels in the neighborhoods of Wildwood, Redwood Grove, River Rights, Lower Kings Creek, Sunbeam Woods, Blue Ridge, Madrona and Sequoia Drives, Lower Two Bar Creek, and Juanita Woods. This area has soils with significant clay content, high winter groundwater levels, small lots, and steep slopes. Despite potential significant constraints to septic systems, over 80 percent of the systems were found to be performing without any signs of failure during the wet winter of 1986. Most of the failing systems could be adequately upgraded using conventional systems. The *Wastewater Management Plan* concludes that a community system is not feasible because it lacks a disposal site.

Boulder Creek - The Boulder Creek area includes the developed areas centered around downtown Boulder Creek and extending a short distance up the valleys along Bear Creek, Boulder Creek, and the San Lorenzo River. This area has relatively permeable alluvial soils with some localized areas of clay soils. Winter groundwater levels are less than 10 feet below the surface in most of the area. Groundwater underlying Boulder Creek probably contributes nitrate to the San Lorenzo River. There have been repeated instances of septic system failure, with discharge of untreated effluent to roadside areas and eventually to the San Lorenzo River. During the early period of the County's wastewater management program, the river downstream from Boulder Creek had the highest incidence of contamination by sewage of any area in the watershed. Conditions have improved significantly during recent years. During the winters of 1987 and 1988, 85 percent of the parcels surveyed were performing adequately and 4 percent were found to have surfacing sewage. In 1991, re-inspection of systems repaired as a result of the survey found that 90 percent were performing satisfactorily, and 95percent of the systems were performing adequately in 1999 and 2001 (John Ricker, personnel communication, 2007). A feasibility study conducted for a community sewage disposal system for the downtown area found it to be too costly at the time. This option is currently being reevaluated. A community service district provides a regular pumpout service for the downtown area, with disposal outside of the watersheds.

Ben Lomond - The Ben Lomond area includes 780 developed parcels. There are no constraints to septic system performance in most of the Ben Lomond area. Historically the water quality in Ben Lomond has been the best of any developed area in the watershed. The survey conducted from 1989 through 1991 showed a 1 percent failure rate. In 1993, the failure rate was down to 0.5 percent. A community sewage disposal system is not warranted because of the cost and the low incidence of problems in this area.

Glen Arbor - The Glen Arbor area includes 500 parcels south of Ben Lomond. The area consists of three distinct zones; an upland area underlain by the Santa Margarita sandstone, an area of relatively steep slopes, and a lower area on well drained soils of the river terrace. Although the upland systems perform well, the effluent discharged to the highly permeable sandy soils contributes to elevated nitrate levels in the river. The lower portions of Glen Arbor have contributed to bacterial contamination of the river caused by high groundwater and some

[8] Balance Hydrologics staff also reviewed the long-term data provided by the County and City for indications that the 1989 Loma Prieta earthquake or the storms of 1995 and 1998 may have damaged sufficient systems to make a difference in bacterial or nitrate loadings. Neither constituent appears to have been affected by the three events queried

pockets of clay soil. In recent years, a number of systems have been repaired. During the 1990 through 1993 surveys, a failure rate of 2 percent was found. A community disposal system was judged to be infeasible because of high cost and potential impacts on the Quail Hollow groundwater basin. Most homes in the Glen Arbor area were constructed during the late 1960s through late 1980s. Relatively few changes in the number of homes or of waste disposal systems since the early 1990s (White and Hecht, 1993) suggests that little if any change in effects on downstream community water supplies would be expected.

Felton - The Felton area includes 820 developed parcels. This area was surveyed in 1989 and 1991. Much of the Felton area is on a broad alluvial flat, with high groundwater and small lot sizes being the main constraints to proper septic system functioning. Failure rates in 1993 were 0.6 percent. El Solyo Heights is a separate neighborhood of 80 developed parcels at the north end of Felton. Failure rates in this area were 13 percent in 1989. Constraints to proper septic tank functioning include high ground water, clay soils, shallow depth to bedrock, moderate slopes, and presence of cuts and fills. Alternative systems are being required on a case-by-case basis. A community disposal system feasibility study concluded that there was not an adequate disposal site and that the project would be too costly to justify.

Brook Lomond - The Brook Lomond area consists of 120 developed parcels between Ben Lomond and Brookdale. This area has permeable alluvial soils with high groundwater and some areas of clay soil. In the 1987 survey, 6 percent of the parcels were found to have failing septic systems. The County recommends improved onsite disposal rather than a community disposal system.

Forest Lakes - The Forest Lakes area includes 970 developed parcels immediately south of Felton. This area has small lots, and localized pockets of high groundwater and dense clay soils. The 1990 and 1991 survey found a failure rate of 2 percent. There has been no indication of wastewater contamination in Gold Gulch, the stream that drains most of the area. Because of the scattered occurrence of problem parcels, community collection and disposal is not a feasible alternative to onsite treatment.

The two most significant potential impacts of wastewater disposal on the drinking water supplies in the San Lorenzo watershed are the release of pathogenic organisms and excessive nutrients. However, focus to wastewater management by the County in the late 1990s as well as connection of some onsite systems to community wastewater treatment with off-site disposal has reduced the risk of contamination by wastewater. Concerns remain though that some of the existing onsite systems, especially those near riparian areas, may not be functioning optimally after heavy rains. Other water quality concerns related to wastewater are recreation and homeless encampments that may not have proper sanitary facilities and could contribute contaminants of emergency concern like artificial sweeteners and pharmaceuticals in addition to pathogens and nutrients. Specific sources may be difficult to discern without additional sampling and monitoring.

Wastewater facilities in the SVLWD, are limited to residential septic systems, none of which are located near the diversion locations.

3.2.3 Loch Lomond Reservoir Subwatershed

About half of the watershed tributary to Loch Lomond Reservoir is owned by the City of Santa Cruz and the structures under the City's jurisdiction are park visitor facilities and the ranger's residence. Septic systems serve a handful of homes on parcels not held by the City and two wineries and several medical marijuana grow facilities that drain to Loch Lomond Reservoir. County staff has noted road development to these developed parcels in these headwater areas (see Section 3.15.3). Loch Lomond stores wastewater from its recreational areas in vaults, which are pumped periodically and transported to the City Wastewater Treatment Plant.

3.2.4 North Coast Watersheds

Most septic systems in the North Coast watersheds are not anticipated to be a significant source of contamination because of: (a) very low residential densities, (b) a highly-dispersed pattern of residential settlement, and (c) soils and underlying geologic units which are generally loamy or crystalline and favorable for the use of conventional onsite systems. Scattered areas in these watersheds have substrates with limited percolation rates, principally in some of the older soils along Empire Grade (including the Pineridge subdivision), some shallow soils along Ice Cream Grade, and small areas underlain by shales in the upper Majors watershed. Karst, which is associated with subsurface connectivity through the limestone, can occur in portions of the watersheds including the upper portions of the Liddell Spring and Laguna Creek drainages as shown on Figure 2-4. These areas are sparsely populated, and it is not known if wastewater sources directly overlie karst areas. The County is updating the septic ordinance to identify setbacks for systems in karst areas. The largest community in the area, Bonny Doon, does not drain to the watersheds of Laguna or Majors creeks.

The water quality data presented in Figure 5-2 in Section 5 indicate that the annual geometric mean of the total coliform bacteria concentrations in the Laguna and Majors Creek watersheds have varied from 146 MPN/100 mL up to 2261 MPN/100 mL over the past 5 years. Liddell Spring's total coliform data are consistently lower with a geometric mean of less than 5 MPN/100mL. The County's 2006 microbiological source tracking effort (Ricker and Peters, 2006) did not collect data for North Coast streams but instead focused on the San Lorenzo River watershed, where development is concentrated and is the subject of a pathogen TMDL. The County has also focused bacteriological testing on County beaches at the river mouth and to the south, which receive the greatest number of visitors. Failing septic systems are a potential source of increased coliforms in these streams, as are wildlife, waterfowl, and livestock.

A review of nitrate data from 2012 and 2018 compared to the data presented in Section 5 shows a decreasing trend in annual median nitrate concentrations in Laguna Creek and Majors Creek over the past 30 years, with no long-term trend distinguishable in Liddell Springs.

The previous hydrogeologic report on the Bonny Doon quarry (Watkins-Johnson, 1992) indicated that nitrate concentrations were high (over 6 mg/l as nitrogen) in monitoring wells upgradient of the quarry. Because very little development exists upstream of this facility, the report suggested without elaboration that septic systems or a former poultry operation along

Smith Grade as the sources of this nitrate.[9] Among other potential sources are explosives formerly in use at the quarry. While active quarrying has discontinued, the site is currently used for an aerospace research and development facility with employees that is regulated by the County. The likely sources of nitrate in the Laguna Creek and Majors Creek watersheds are the same as for microbial contamination.

3.2.5 Significance

After many years of study, the County and the Regional Board have concluded that the large majority of existing septic systems do not consistently contribute significantly to dry-season microbial concentrations measured in surface waters. Occasionally, failing septic systems are responsible for significant localized degradation of bacterial quality in surface waters during summer months. However, bacterial contributions from septic systems are probably greater during or following wet periods when runoff can convey surfacing sewage from failing systems to the San Lorenzo River. Efforts made since 1995 to improve septic system performance have reduced the septic failure rate and therefore the water quality degradation related to septic systems.

The San Lorenzo Nitrate Management Plan (Ricker, 1995) concluded that an estimated 84 percent of the nitrate load in the River resulted from human activities in the watershed. Two-thirds of the nitrate was attributed to wastewater discharges, particularly from septic systems in the highly-permeable Santa Margarita sandstone. An update to the nitrate load estimate maybe prudent to consider as almost forty years have passed since the 1995 study and changes in OWTS management and stormwater management have occurred in the intervening years.

3.3 Urban Runoff

Urban runoff is that portion of stream flow originating from urban or densely-suburbanized areas. Most urban runoff occurs during storms; however, inter-storm period nuisance flows from urbanized areas can account for significant components to flow during those times. Urban runoff flows and contaminant concentrations are highly variable. Some factors affecting this variability include duration and intensity of rain events, specific urban land use (residential, commercial, industrial), and the length of the preceding dry period during which pollutants build up on the land surface. In addition to specific land uses, the atmosphere and automobiles are significant contributors to the contaminant load in urban runoff.

In October 1990, the EPA issued final regulations requiring NPDES Municipal Stormwater permits for urban runoff from cities with a population of 100,000 or greater, from certain types of industries, and from construction sites which involve a land disturbance of greater than 5 acres (Phase I). Although there are no cities this large in Santa Cruz County, the Central Coast office of the Regional Board, which administers the NPDES stormwater permit program, worked with County and municipal staff in anticipation of future regulations. In 1999, EPA expanded the NPDES Municipal Stormwater permit program to require permits for urban runoff discharges from cities with a population of less than 100,000 and from industries or construction sites which

[9] The former poultry farm, in a highly karstic area locally known as the ‘sinkhole plain’, was discontinued at least 30 years ago, and should no longer seriously be considered as a discernible source of nitrogen in this sanitary survey.

result in a land disturbance of from 1 to 5 acres (Phase II). The City and County subsequently developed comprehensive Storm Water Management Plans (SWMPs) describing compliance with the new regulations. The plans were submitted and approved by the Regional Board with applications for coverage under the Phase II permit. The County of Santa Cruz also joined the Central Coast Regional effort to develop hydromodification criteria by October 2012. Additional details about urban runoff regulations are included in Section 5 of this sanitary survey.

Watersheds in the study area are relatively unindustrialized, so there are few facilities which must comply with the state's NPDES General Industrial Stormwater permit program. The state permit requires industrial facilities to implement pollution prevention measures and to collect monitoring data during rainfall events. Each industrial facility files a Notice of Intent (NOI) which certifies that it will comply with these permit requirements. There is currently little oversight and enforcement of the industrial stormwater permit program because most of the state's effort has been channeled into simply identifying facilities which should be under permit. Types of industrial facilities which must file a NOI to comply with the state permit include: manufacturers (food, textiles, lumber, paper, chemicals, petroleum, rubber, plastic, metals, stone, clay, glass, machinery, electric, electronic, equipment, instruments, cement, phosphate, asphalt, fertilizer); confined animal facilities with over 700 animals; printing operations; recyclers; landfills; mining operations; transportation businesses (such as bus and trucking companies and airports); petroleum bulk plants; all NPDES wastewater dischargers with a design flow greater than 1.0 million gallons per day; Superfund sites; and steam electric power generator facilities.

A list of active industrial stormwater permittees in Santa Cruz County was downloaded from the SWRCB database in September 2022. Of the 273 permittees listed in the SWRCB database, only 117 are active. Most are located in Watsonville (62) and the City of Santa Cruz (19), which are located outside of the sanitary survey area. The active industrial permittees within the study area are listed in Table 3-3.

Table 3-3: Active Stormwater Permittees in Study Area

Location	Permitee
Ben Lomond	San Lorenzo Valley School District
Ben Lomond	Santa Cruz County Department of Public Works
Bonny Doon	Beauregard Vineyards
Boulder Creek	Big Basin Vineyards
Felton	Granite Construction (Felton Quarry)
Felton	Granite Rock Company (Quail Hollow Quarry)
Felton	CEMEX Construction (Olympia Quarry)
Scotts Valley	Granite Creek LLC
Scotts Valley	Bay Photo LLC
Scotts Valley	Expertech
Scotts Valley	Fox Factory
Scotts Valley	Armitage Wines
Scotts Valley	IMG Larkin LLC
Scotts Valley	Thermo Fisher Scientific
Scotts Valley	Tony's Machine Shop

Since 2009, any construction activities greater than 1 acre requires permitting under the revised statewide Construction General Permit (CA 2009-0009-DWQ.) The local jurisdictions (City and County) have construction best management practices that are required for smaller projects to control erosion and sediments that could negatively impact water quality.

3.3.1 Contaminants of Concern

The urban runoff contaminants of most concern to drinking water are microbial organisms and suspended sediments. Sources of microbes in urban runoff include: animal wastes from pets, birds, and rodents; human waste from sewer system leaks and encampments; diffuse (nonpoint source) runoff, and decaying organic material in storm drains. Suspended sediment levels are often high in urban runoff because of the ease of mobilization and transport of small particles on impervious surfaces. In addition, suspended sediments are higher in runoff from erosion from newly-developed areas prior to establishment of vegetation. Suspended sediments in urban runoff contribute to high turbidities in the stream system during wet weather and also are significant because contaminants may be adsorbed to the sediment particles and transported into the streams. Note that construction of new impervious surfaces in urban areas can result in higher peak flows which, without mitigation, can lead to increased instream erosion and turbidity.

Other common contaminants of concern in urban runoff include: metals (notably copper, lead, and zinc), hydrocarbons, and pesticides. These contaminants can be significant to aquatic life in the receiving stream but at the levels found in the Santa Lorenzo River, have not been shown to be of exceptional significance to the drinking water quality.

3.3.2 San Lorenzo River Watershed

The urbanized population in the San Lorenzo River watershed centers on the communities of Boulder Creek, Ben Lomond, Brookdale, and Felton. There are also pockets of development in the Boulder Creek Golf and Country Club area, along Newell Creek (Rancho Rio), lower Bear Creek, Zayante Creek, Lompico Creek, and Paradise Park, and in numerous small valleys confluent with the San Lorenzo River. Rural residential areas along Bean Creek Road at the fringes of Scotts Valley are also experiencing growth. The rest of the watershed, as noted above, is sparsely populated.

Many houses and residential areas were built during several speculative vacation housing booms in the 1890s, 1900s and from 1920 to 1940. A large percentage of existing homes were built before 1960. More recent housing has been primarily for year-round residences. Many of the older vacation homes were built very close to the creeks. Further development within the riparian corridors is currently limited, requiring County exemptions. Riparian corridors now extend out to the edge of the riparian woodland if the woodland is extensive enough to have been mapped on County vegetation maps. Otherwise, they are defined to be 50 feet from the high water mark for a perennial stream, less for an intermittent stream, and more in the coastal zone area. As discussed in Section 3.13.2, violations of the County Riparian Corridor and Wetlands Protection ordinances occurs but limited enforcement resources are available to limit potential damage. Most new housing has been infill in more urbanized areas or on rural acreage, with few if any major subdivisions within County jurisdiction. Future residential growth is expected to be mostly accommodated with minor land divisions. Future residential

development will be permitted under current County regulation and is not expected to have major impacts to source water quality.

The San Lorenzo River watershed is in Zone 8 of the Santa Cruz Flood Control District. Drainage in the towns along Highway 9 consists of a combination of sheet flow, roadside swales and ditches, and some inlets and piping in low spots. In smaller population centers, the engineered drainage system consists mostly of cross culverts to move stormwater across roads. There is an urban runoff control structural feature, a detention basin, and several check dams downstream of the Rancho Rio subdivision. These facilities were installed by the County Planning Department after construction of the subdivision to minimize the considerable erosion resulting from disturbance of this sandy area. Maintenance of the facilities is unconfirmed.

The County's Water Resources Program has been sampling the San Lorenzo River since 1968 for chemical and microbial constituents. The program is being revisited to reflect changing priorities and requirements in the recently adopted Local Agency Management Program, and improved technology. The program currently samples up to 45 sites along beaches, creeks, and freshwater lakes.

Heavy metals (e.g., zinc, copper, cadmium, and lead) and toxic organic compounds, such as pesticides and PCBs, have often been detected at low levels in ambient receiving waters of the San Lorenzo River watershed and occasionally at higher levels in storm drain discharges. This was corroborated by the City 2021 Source Water Monitoring Study, which observed elevated color, turbidity, dissolved organic carbon, total organic carbon, total coliform, and metals in City's source water and upper watershed after storm events. Elevated constituents returned to normal baseline levels once precipitation and streamflow decreased a few days following a storm event.

Because these constituents can bioconcentrate in tissues, the County conducted a study focused on sampling sites in the lower River, including analysis of tissues from freshwater clams (Ricker and others, 2001). The results were generally consistent with previous monitoring studies in the watershed, the region, and the State (c.f. EPA Nationwide Urban Runoff Program): low levels of pesticides and PCBs (at 2 to 7 percent of hazardous thresholds), elevated concentrations of cadmium and zinc (both of geologic origin); and elevated levels of lead (potentially from prior use in gasoline or from the prior use of lead shot at a gun range near Castle Rock State Park). In all cases, concentrations were below levels of biotic or regulatory concern.

Bacteria levels in the San Lorenzo River have often exceeded County water quality objectives and on May 8, 2009, the San Lorenzo River Watershed Pathogen TMDL was approved by RWQCB Central Coast Region. The Pathogen TMDL was approved by the SWRCB, Office of Administrative Law, and USEPA in 2011. However, bacteria levels in the upper watershed are typically much lower than those at the mouth of the river, and recent monitoring data show considerable improvement in dry-season bacteria levels. The County focuses bacterial monitoring in locations with highest public uses like the beaches and has less monitoring in the watershed. Bacteria levels in the San Lorenzo River watershed are discussed in greater detail in Section 3.2.

As part of the 2021 Source Water Monitoring Study, City conducted Microbial Source Tracking (MST) to identify the particular sources of fecal contamination in water (i.e. human, cattle, and

bird). City monitored Universal Bacteroids, Human Bacteroids, MS2 Coliphage, and Somatic Colifage. Universal Bacteroids test for fecal contamination from all sources (animal and human), while Human Bacteroids, MS2 Coliphage, and Somatic Colifage are fecal indicators of human influence from wastewater. Human Bacteroids, MS2 Coliphage, and Somatic Coliphage concentrations are generally higher during winter storms (likely from septic systems in the San Lorenzo Valley), and Universal Bacteroids were high during the dry season where flow rates are low, animal activity is increased, and recreational usage is increased.

Work in coastal San Mateo County (Ivanetich and others, 2006) was also able to distinguish fecal bacteria originating from dog, deer, horse, seagull, and human sources. It is notable that the Santa Cruz County microbial source assessment study found that dogs alone accounted for about 7 percent of the dry-season bacteria in the upper watershed, and about 12 percent of wet-weather bacteria at Felton (Ricker and Peters, 2006). Waste from domestic animals such as cats, dogs, and chickens as well as from homeless encampments probably contribute greatly to the high fecal coliform counts in the first flush of stormwater through urbanized areas. The County has not conducted further ribotyping work since the 2006 Watershed Sanitary Survey. Further inquiries into sources and travel pathways of pathogens in the San Lorenzo Valley watershed, in particular, would be worthwhile, with special attention to streams reaches downstream of densely-urban communities and in areas receiving summer baseflow from sandy aquifers.

3.3.3 Loch Lomond Reservoir and the Upper Newell Creek Watershed

Urban runoff into Loch Lomond is effectively limited to contributions from Bear Creek Road, which are minor in magnitude. However, urban runoff constituents from the water pumped from the San Lorenzo River to Loch Lomond may be present in Loch Lomond.

3.3.4 North Coast Watersheds

There are no major towns in the North Coast watersheds. The Bonny Doon Airport is a small landing strip for private planes.

3.3.5 SLVWD

Based on conversations with staff from the SLVWD, there is no urban runoff that influences surface water in their watersheds. Most of the roads within the watershed of the SLVWD are district owned and maintained or are private access roads. Only the staff of the SLVWD has access to District roads.

3.3.6 Significance

Overall, urban runoff directly contributes a significant part of the total microbial load in the river system during summer and winter, it enriches summer baseflows with added nutrients, and it contributes some part of the sediment load entering the River during rain events.

Most development in the San Lorenzo Valley is residential. Many of the residents seek a rural lifestyle, and the contributed contaminants (microbes from both domestic and wild animals, nutrients, sediment) may best be seen in that light. There are homes in the four main communities that are very close to and positioned well above the stream system, such that contaminants can move rapidly from neighborhood areas in the main communities into the channels. In these areas, source control to reduce runoff as well as redirecting runoff to areas for infiltration has particular value as a way of reducing contaminants. In particular, the results of the microbial source tracking study show that efforts to minimize or prevent dry-season runoff from landscape irrigation and other human activities would reduce transport of bacteria and other contaminants to storm drains and the River during the summer months when dilution is minimal and recreational use is at its peak.

Development overlying sandy soils contribute a disproportionate volume of nutrients which enter the streams through the sandy aquifers. As discussed further in Sections 5 and 6 later, nutrient concentrations are elevated during summer months in the streams with appreciable sandy soil areas in their watersheds, offering different source-control opportunities in the sandy areas away from the streams. Because sandy soil areas occur in both the North Coast and San Lorenzo watersheds, efforts to address the particular issues of sandy soils can be especially effective over a period of decades. There are few industrial facilities or large expanses of paved areas.

3.4 Agricultural Land Use

Santa Cruz is a strongly agricultural county. However, the majority of the existing row-crop acreage is located along the coast, in the Pajaro Valley in South County and on the marine terraces of the North Coast, neither of which extend into the watersheds of this survey. Commercial cropping with the study area watersheds is presently limited to small areas of vineyards and Christmas tree farms. Both watershed areas once supported widespread cultivation of apples and other orchard fruits wherever suitable sites with deep soils and southern exposures were found, but most such areas had already gone out of commercial production before the onset of extensive pesticide use in orchards began during the early 1960s. In scattered locations throughout the study area, some row crops are grown on a commercial or horticultural basis but these operations are on limited acreage and typically use organic practices. As discussed in Section 2.3, regulation of cannabis cultivation is currently underway as cultivation potentially poses significant water quality, and other threats if not appropriately managed.

3.4.1 Contaminants of Concern

The primary contaminant of concern from these types of agricultural uses is sediment from erosion of fallow or improperly tilled land and from eroding drainages downstream from cultivated areas. Other potential contaminants include nutrients, pesticides, herbicides, and organic matter in stormwater runoff.

3.4.2 San Lorenzo River Watershed

In the San Lorenzo Valley, vineyards and Christmas tree farms occupy the largest agricultural acreage. Several established vineyards exist in the area; in Felton (Hallcrest Vineyard), next to

Bear Creek Road on the ridge above Loch Lomond (Byington and David Bruce Vineyards), and inside valleys near Boulder Creek (P & M Staiger), and along the top of the watershed divide at Skyline Boulevard (Zayante Vineyard). Some vineyards that historically had been in the area appear to have closed since 2018. Small personal vineyards are commonly seen on larger residential parcels with adequate sunlight. Land clearing for vineyards has the potential to be problematic, if not done correctly, e.g., poor drainage design, improper grading, and inadequate erosion control. Santa Cruz County regulates agricultural grading in an effort to protect water quality but has limited enforcement resources to monitor grading in general.

Unlike vineyards, Christmas tree farms are operated with little cultivation or disturbance to the soil surface. Field visits to several of these operations throughout the watershed showed that annual grasses, forbs, and bracken serve as a cover crop between rows of spruce and fir. The roads in the tree farms are intermittently used, with the greatest use generally during the two months prior to Christmas.

To a lesser extent, apples and other tree fruits are still grown in the old and declining orchards in the sunnier aspects of the Santa Cruz Mountains. According to County Agricultural Commission staff, little to no new commercial acreage has been developed during the last two decades. The existing orchards tend to be managed organically or with few applications of chemical pesticides or fertilizers, and minimal tillage.

Small commercial greenhouse operations and flower farms exist along Bean Creek and in the San Lorenzo Valley. Rhododendrons are no longer grown in the Bean Creek subwatershed, nor elsewhere in the San Lorenzo Valley (Roberta Haver, former owner, personal communication, 2006). Pesticide use is minor. University of California Agricultural Extension staff indicated that the primary potential contaminant in these container greenhouses is nitrogen, which is flushed through the containers , and which exceeds crop needs typically by 20 percent during each watering. These operations are located on the extremely permeable Santa Margarita sandstones, which provides the excellent drainage needed for these uses, but which may permit the greenhouses to become a source of nitrogen to both Bean Creek and the Santa Margarita aquifer.

Legal cannabis cultivation is highly regulated with a robust licensing program and ongoing check-ins with operators. There is currently one licensed cannabis cultivation site in the San Lorenzo River watershed. In addition, the County conducts fly-overs of the study area that search for illegal cannabis grows that exceed 500 square feet. Illegal grows are shut down upon discovery.

Cannabis cultivation is highly regulated by several agencies, including the California Department of Fish and Wildlife (which limits the impact to riparian bodies and surface water sources), California RWQCB (sedimentation and runoff regulations), and Santa Cruz County (limits usage and prohibits hydroponic cultivation). As a result of strict regulation, legal cannabis cultivation has a very light footprint compared to other agriculture in the watershed (Sam LoForti, Santa Cruz County, personal communications, 2022). Santa Cruz County plans to continue strict enforcement of cannabis regulations moving forward.

3.4.3 Loch Lomond Reservoir Subwatershed

In addition to the vineyards described above, there are also small medical cannabis operations in the Loch Lomond subwatershed. In the past, small-scale diversions associated with covert cannabis cultivation have been reported on tributaries that drain into Bear Creek and Loch Lomond.

3.4.4 North Coast Watersheds

The coastal terraces of northern Santa Cruz County are one of the classic agricultural areas of California, supporting far more cultivated acreage than the San Lorenzo Valley. The crops are grown mainly on the lowest two terraces along Hwy 1, *below the diversion points* on the North Coast streams. These areas are farmed primarily for brussels sprouts and (less frequently) artichokes. Both crops require the unique climate dominated by marine fog found on these lower terraces. Other crops include lettuce, strawberries, broccoli, and flowers.

Four vineyards operate in the North Coast, the Bonny Doon and McHenry Vineyards, and recently the Rancho Madera Roja[10] in the upper Liddell Creek watershed and Redwood Meadows Ranch Winery and Beauregard Vineyards in the upper Majors Creek watershed. Cattle are occasionally grazed on the mosaic of grasslands, oak/madrone woodland, and mixed evergreen forests which separate the belt of row crops along the coast from the residential areas and orchards of the Empire Grade portion of the Bonny Doon area. A small portion of this area drains to Majors Creek upstream of the intake. Some Christmas tree farms are also located in Bonny Doon, near the northern end of Empire Grade.

3.4.5 SLVWD

The only known commercial agriculture known to be present is a Christmas Tree farm along Upper Empire Grade Road within the Foreman Creek watershed. There has been no contamination observed due to this farm's operations. The 2020 CZU fire drastically impacted this operation.

There are no known commercial agricultural land uses within the Lompico Creek and Felton sub-watersheds.

3.4.6 Significance

As a minor land use in the water supply watersheds, agricultural production does not appear to be a major source of concern at present and in the foreseeable future. The two most visible crops in the watersheds, Christmas trees and grapes, tend to be grown at higher elevations, along ridges and in areas above the fog line, away from the major streams. Past observations at Christmas tree farms in the survey area suggest that these are unlikely to be major sources of contamination, or erosion. Vineyards, on the other hand, are typically located on slopes with loose, sandy soils, and controlling weeds by harrowing between rows leaves soils exposed to rainfall and rill erosion. Marginal to poor drainage design and inadequate erosion control can

10

result in vineyards being a source of sediment and persistent turbidity. Some vineyards use organic practices; others employ pesticides to a light or a moderate degree.

Cultivation of other crops is less likely to affect the quality of water supplies, because of the minimal acreage of land under cultivation and the generally low-level use of pesticides. Pesticide and herbicide use is discussed in Section 3.7.

3.5 Grazing Livestock

Watersheds in the study area are primarily forested or vegetated brushlands of various types, so the extent of grazed areas is also limited, particularly in the San Lorenzo watershed. The North Coast watersheds are better suited for livestock and have had several cattle and dairy operations working in the subject water supply drainages. Throughout the watersheds, impacts from grazing cattle are less than those of confined horses, except in areas where cattle are watered from streams. This section includes discussion of cattle and individual or small horse groupings; the main discussion of horses as they affect water quality is within Section 3.6.

3.5.1 Contaminants of Concern

Erosion and waste products are of primary concern. Where unfenced, destruction of streambanks and wetland vegetation by grazing animals causes an increase in erosion, indirect loss of channel stability (eventually generating pulses of sediment entering directly into the creeks), and persistent turbidity. Manure, urine, and pathogens such as cryptosporidium from young calves, may be introduced directly into streamflow year round, with elevated rates of transport into waterways during wet periods.

3.5.2 San Lorenzo Valley

Residential development of the valley bottoms, stream terraces, and sunny ridgelines in the survey area puts a premium on "buildable" land. This trend, combined with the gradual succession from grassland to chaparral, in the absence of wildfire, has gradually reduced cattle and sheep operations in the San Lorenzo Valley.

No active commercial cattle operations are known in the San Lorenzo Valley, other than occasional use of small acreages in the Bean Creek subwatershed. Equestrian use is widespread in the watershed and horses are kept on residential parcels and at commercial or boarding stables. The latter facilities typically have more horses but also have larger pastures for grazing (and dispersal of animal wastes). As a result of the low numbers, grazing animals pose a minor threat to the water quality of the San Lorenzo watershed. Concentrated animals such as horse stables upstream of water intakes pose a greater threat and are discussed in Section 3.6.2.

3.5.3 Loch Lomond Reservoir and upper Newell Creek watershed

No grazing animals were encountered in the Loch Lomond area during prior visits to the lake and upper watershed. The City does not allow riding animals in the watershed area.

3.5.4 North Coast Watersheds

As discussed above, a limited amount of rangeland drains to Majors Creek upstream of the City's diversion structure, including the northern parts of Grey Whale Ranch. These areas seem to be grazed intermittently, principally by individual horses or small groups of horses, with occasional cattle grazing (apparently) under lease arrangements. Most of these grasslands are located along ridgelines or on slopes distant from the streams, reducing but not eliminating the potential for contributing nutrients, pathogens, and sediment to the streams. Further downstream on Liddell Creek, beyond the boundaries of the survey area, issues of livestock management are being addressed by the County. Trails, and roads used as trails, do come close to the main stem and east fork of Majors Creek; these could prove to be a small, but perhaps growing, source of sediment and pathogens.

3.5.5 SLVWD

There is no commercial grazing livestock present within the SLVWD. Based on conversations with staff from the district, indicated that there may be a limited number of residences that may have goats and chickens, but these would be unlikely to impact the watershed.

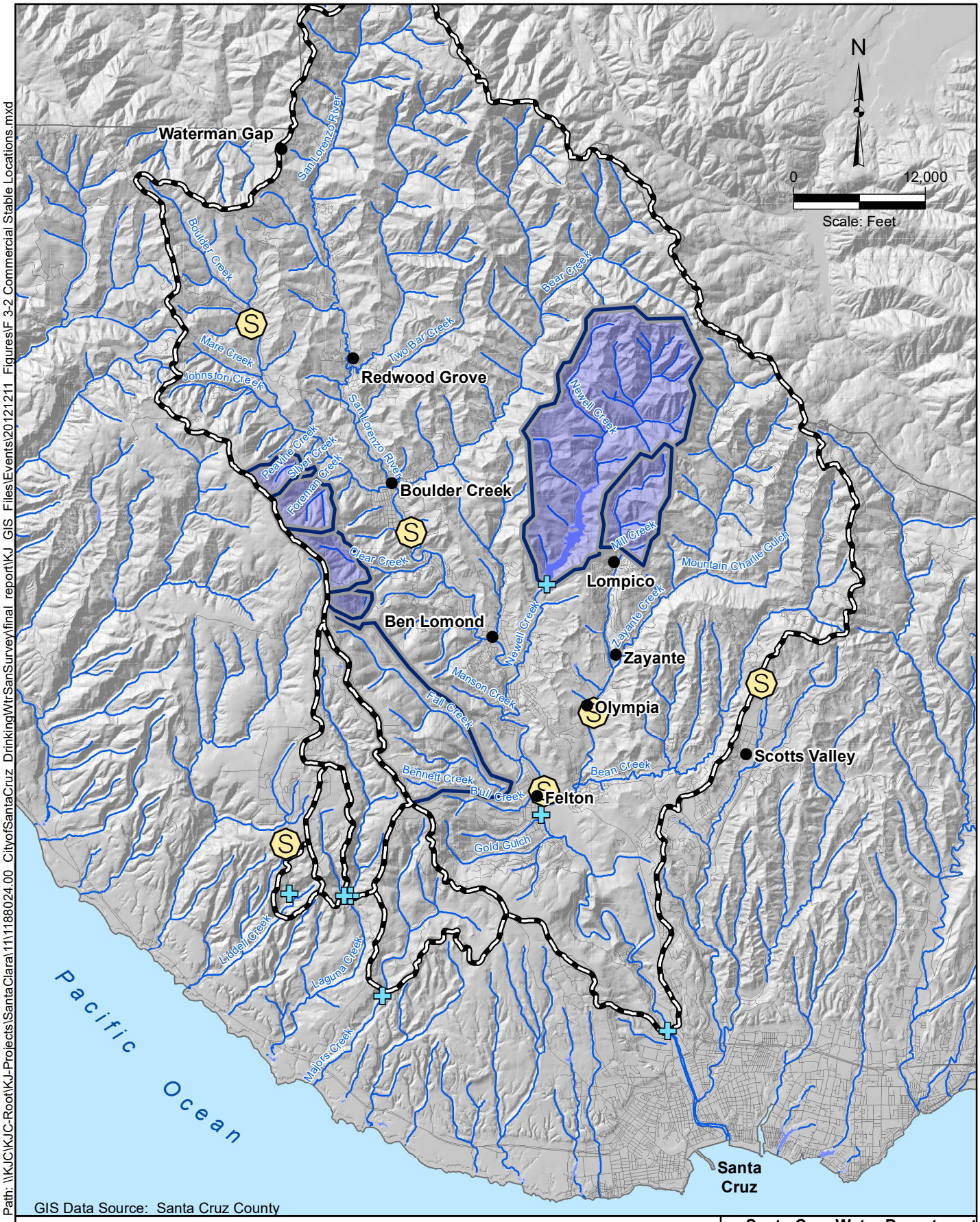
As in the SLVWD, there is no known commercial grazing livestock present within the Lompico Creek watershed although horses are known to be present at one residence within the watershed and there are some chickens and goats at other homes. It is believed that runoff from these residences would be highly unlikely to reach Lompico Creek.

3.5.6 Significance

The San Lorenzo River Pathogen and Nitrate TMDL list livestock as sources of the respective constituents. Pathogenic microorganisms are the major source of concern when contact between grazing animals and water supplies occurs. Hecht and others (1991) identified horses as a significant contributor to the San Lorenzo Valley nitrate budget and the County has taken measures to assess and control equine nitrate contributions to both surface and ground waters (c.f., the 1995 Wastewater Management Plan, and the 2001 Watershed Management Plan Update) to reduce costs of treatment for taste and odor problems. Where access to water is limited only to streams, degradation of habitat and bank stability is evident (see also Section 3.6). Development of improved water sources for grazing animals has played a significant part in limiting erosion impacts on water quality. Fencing, which is associated with water source improvements also reduce the impacts of manure and urine by creating buffer zones between grazing animals and waterways. That said, percolation of urine, especially in areas overlying sandy soils may be a source of nutrients from grazing livestock. Since 2005, the Santa Cruz County Resource Conservation District has partnered with a local NGO to provide resources in a Livestock and Land program, described in greater detail in Section 3.6.1 to assist homeowners in proper management measures to reduce water quality impacts of livestock and small agricultural activities.

3.6 Concentrated Animal Facilities

While traveling through the watershed it is apparent that although there are a number of commercial stables which house larger numbers of horses as found on Figure 3-2, there are also many residences that support one or two horses, despite small lot sizes and/or limited acreage suitable for pasturing horses or applying manure. While many of these small residential facilities are well-managed, it is also common to observe corral areas that are bare or partially denuded of vegetation from overgrazing, and manure management is often limited to stockpiling on site. Conditions contrast with the commercial facilities, which tend to have greater capacity to manage drainage and manure accumulations responsibly, in part because of their greater visibility and liability.



Path: \\KJC\KJC-Root\KJ-Projects\SantaClara\111\1188024.00 CityofSantaCruz DrinkingWtrSanSurvey\final report\KJ GIS Files\Events\20121211 Figures\F 3-2 Commercial Stable Locations.mxd

Santa Cruz Water Department
WSS Update

Figure 3-3: Commercial Stable Locations

3.6.1 Contaminants of Concern

Horses are considered a major source of pathogens and nitrogen and can also contribute to persistent turbidity in the water supply watersheds. While horses were a relatively newly-recognized concern during the 1996 Sanitary Survey, some important actions were taken to protect water quality and improve care of the animals.

One key step was publication of *Horsekeeping: A Guide to Land Management for Clean Water,* in 2001 (CBARCD, 2001). This manual for horse owners, developed by the Council of Bay Area Resource Conservation Districts and the USDA NRCS, explains water quality concerns, provides technical assistance with design and implementation of structural control measures, and includes a directory of conservation-related resources for further exploration. Based on use of this manual, and with funding from the SWRCB through Propositions 13 and 50 (Manure and Erosion Prevention), the Santa Cruz County RCD and Ecology Action developed a Livestock and Land Program to educate owners about best management practices for manure and drainage management, as a way to effect positive changes to mitigate water quality concerns from livestock facilities. As a part of this program, the RCD has previously worked with both commercial and residential facilities, and coordinated with the Santa Cruz County Horsemen's Association to provide technical assistance and cost-sharing to install filter strips, erosion control grids, and other practices at a number of demonstration sites. The program is not currently funded but RCD continues to take requests for assistance. Additional services provided through partnership with the Natural Resource Conservation Service (NRCS), include free onsite consultations and technical assistance.

Manure management plans are required in case of valid manure-related complaints. In addition, the County also requires best management practices (BMPs) to be implemented to address potential water quality impacts of manure. The County is currently working to update their process to require manure management plans for any new development that includes large animals. This update includes requirement of manure management plans as an addendum to erosion control plans for those new developments. The RCD continues to support manure management through its Livestock and Land Program.

It is estimated that the equine population in the survey area has not changed over the last five years based on permitting of facilities and review of commercial stable listings. While many more horses are now boarded in private paddocks or boarding facilities with control measures in place than was the case at the time of the 1996 Sanitary Survey, City and County staff still report problems, particularly with new and unpermitted facilities (Chris Berry, personal communication, 2022). Throughout the subject watersheds, stables or paddocks are sometimes located on the edges of properties, often in swales and along waterways. This bare ground can be a source of sediment and offers minimal breakdown of manure and nitrogen uptake by plants. The net result is often a rapid transport of these pollutants into surface and shallow ground waters during periods of rain.

3.6.2 San Lorenzo Watershed

The County is working to improve their inventory of stables but in prior WSS Updates staff estimate that there may be more than 300 horses in large stables within the San Lorenzo River watershed, and an equal number in smaller residential stables. While numbers of animals at

commercial stables vary from year to year, some of the largest stables are Covered Bridge, formerly Chaparral Stables (70 to 100 horses) in Felton, Eddy Ranch (40 to 50 horses) on Bear Creek, Zayante Equestrian Center, formerly Horse Haven (20 to 40 horses) on Zayante Creek, Glenwood Equestrian Center (20 to 25 horses) on Bean Creek, and Lichen Oaks (15 horses) in Quail Hollow. A search of commercial stables indicates that there do not appear to have been changes since 2012; however, a new operation Deerhorn Ranch in Felton appears to have recently been established. Additionally, the Santa Cruz County Horsemen's Association has resumed a regular calendar of events at the Graham Hill Showgrounds after shutting down in 2020 and 2021, including short-term stays for multiple animals.

Livestock in riparian areas also occurs. It has also been noted there is a flock of sheep grazing the riparian areas on private lands adjacent to the San Lorenzo River upstream of the City's Tait intake.

3.6.3 Loch Lomond Reservoir Subwatershed

No confined animal facilities are reported or were noted in this watershed.

3.6.4 North Coast Watersheds

The numbers of animals kept in the North Coast watersheds are not available. Some homes are on one-to-five-acre parcels, often with one or two horses, several chickens, and other domestic animals. Areas of bare soil are sometimes seen in the paddocks and associated areas. The Vigne Farms is a commercial stable located in Bonny Doon, which is temporarily closed, which is not in the surface drainage to Liddell Spring. However, the underlying karst in the area may provide a subsurface conduit to Liddell Spring. The County regulates the facility which has covered, concrete floored manure storage and surface water monitoring as a condition of approval. There is another large animal facility close to the Wilder Ranch State Park, but the livestock count is unavailable. Continued attention by regulatory and NGOs to manure management at confined animal facilities, especially those near surface waters upstream of diversions is an important element of pathogen and nitrate control.

3.6.5 SLVWD

There are no known concentrated animal facilities within the SLVWD.

3.6.6 Significance

The San Lorenzo River Pathogen and Nitrate TMDLs list domestic animals/stables as sources of the respective constituents. Wastes from horses have been estimated to contribute significantly to the pathogen and nitrogen load in the region's upper watersheds. One systematic study (Hecht and others, 1991) estimated that horses in the San Lorenzo Valley contributed nitrogen equal to one fifth or more of the amount released from septic systems. The San Lorenzo Nitrate Management Plan estimated that livestock and stables contributed about 6 percent of the nitrate load in the River (Ricker, 1995). The microbial source assessment found that horses were responsible for 10 percent of the wet weather *E. coli* samples at the Felton station but less than 2 percent of the wet weather *E. coli* load downstream (Ricker and Peters,

2006). No bacteria contributions from horses were noted in dry season samples. Most other types of confined animal facilities do not appear to be a major concern in the subject area except those located close to riparian areas such as the sheep upstream of the Tait diversion.

Both commercial stables and backyard paddocks can be found in almost all sub-watersheds of the San Lorenzo and North Coast water supply drainages, and animal wastes receive less treatment than human wastes and are more easily mobilized into streams. These facts suggest that effective manure management at all times of the year, but especially during winter and spring months, is critically important in reducing nitrogen and pathogen transport to ground and surface waters. Nitrate data, described in Section 5, indicate that nitrate concentrations have declined and stabilized in recent years suggesting that livestock management, as well as other management measures, has been successful in improving water quality.

3.7 Pesticide and Herbicide Use

Pesticides and herbicides are chemical compounds specifically formulated for their lethal effects on animal and plant life. Pesticides and herbicides are used in: (1) agriculture, (2) rights-of-way along roadsides, (3) landscaped areas such as parks and golf courses, (4) for structural pest control, and (5) by individuals. Volumes of specific chemicals used annually for the first four uses are represented in the reported use information collected by the County Agricultural Commissioner and reported to the State Department of Pesticide Regulation (DPR). The fifth use, by individuals in the home and garden, is unreported. Thus, a complete accounting of the chemicals used or the amounts applied is unavailable. The toxicity of compounds available to individuals – and generally to licensed professional applicators as well – has decreased markedly since the late 1980s.

All pesticides and herbicides used by licensed applicators (such as crop dusters, landscape maintenance professionals, and structural control businesses) are reported and sales of “restricted” chemicals are also reported by distributors. The Department of Pesticide Registration determines whether a pesticide/herbicide is classed as restricted based on its potential hazard to humans, animals, crops, or the environment in general. The County Agricultural Commissioner enforces related laws and regulations within the county, issues Restricted Materials Permits, and collects the use data which is then reported to the DPR. In addition, both City and SLVWD’s Integrated Pest Management (IPM) policies guide pesticide and herbicide use on their lands. Using a limited data set, the RWQCB has listed the San Lorenzo River under CWA Section 303d for a suite of pesticides and prepared a TMDL in 2014 for chlorpyrifos on Zayante Creek and the San Lorenzo River below Felton which attributed allocations of chlorpyrifos to urban stormwater and irrigated agriculture. However, given the banning of chlropyrifos and low concentrations in sampling results, it appears that use of chlropyrifos has diminished significantly and the TMDL is being met.

Comprehensive information on the specific types and locations of pesticide and herbicide use throughout the North Coast and San Lorenzo River watersheds was not developed for the original 1996 Sanitary Survey or any subsequent updates. Logically, such use will be a tiny fraction of the applications throughout Santa Cruz County. Most pesticides for which regional records are kept are used for agricultural activities in the Watsonville area and in the marine terrace agriculture downstream of the North Coast watersheds, rather than within the North Coast and San Lorenzo watersheds. Similarly, most of the reported structural pest control use

will be from the urban and industrial areas which are mostly outside the survey watersheds; i.e. the Cities of Santa Cruz, Watsonville, and Scotts Valley. However, per the latest list of impaired waters which was updated by the SWRCB in 2022, the San Lorenzo River continues to be 303d listed for chlordane and chlorpyrifos pesticides (source unknown), indicating that residues from commercial and/or residential applications are regularly reaching the river.

In 2012, the USDA conducted a water quality study in the San Lorenzo River for a range of insecticide, herbicide, fungicide, and metabolite compounds at the low parts per trillion detection levels. Out of over 4,000 treated water samples analyzed weekly over nine months, only two detectable results were found and at levels 1,000 times lower than the public health goal set for the compound. The diligence paid to pesticide/herbicide use in the watersheds indicate that the raw water remains at a low risk for contamination from these compounds.

3.7.1 Contaminants of Concern

While all pesticides and herbicides can be considered undesirable in a drinking water source, the legacy pesticide, chlordane, and the organophosphate pesticide, chlorpyrifos, are of greatest concern as shown by the 303d listing, and the TMDL prepared in 2014 is for these constituents recently established by the RWQCB. Other specific chemicals of concern are the synthetic organic chemicals (SOC) regulated under the Phase II/V Rules (see Section 5.4.5.1). The Phase II/V pesticides and herbicides are those which EPA has established requirements for drinking water (see Section 5.4.5.1).

3.7.2 San Lorenzo River Watershed

The most sensitive right-of-way in the watersheds, because of its proximity to the San Lorenzo River, is State Highway 9 maintained by the California Department of Transportation (Caltrans). Caltrans staff report that herbicide use along Highway 9 has been reduced 50 percent or more since the early 1990s under the agency's NPDES permit for roadside vegetation maintenance (Kris Griffin, personal communication, 2012). A revised NPDES permit adopted in 2022 for stormwater management requires Caltrans to prepare a vegetation control plan that minimizes use of herbicides. Previously, targeted applications of less-toxic materials occur at low rates immediately adjacent to fixed safety hardware (e.g., signposts, guardrails, reflectors), maintaining a minimum 20-foot buffer between the spray zone and the edge of live streams or the River. Caltrans staff previously applied two herbicides annually, both in late fall/early winter: a systemic pre-emergent, Goaltender 2 (oxyfluorfen), and a more typical pre-emergent, Oust (sulfometuron methyl), that also has some post-emergent properties. Oxyfluorfen disperses readily in water, is slightly mobile and is acutely toxic to aquatic organisms but practically non-toxic to terrestrial biota and birds. Sulfometuron methyl is also readily dispersible in water and moderately mobile, but practically non-toxic to both aquatic and terrestrial biota. Both materials are moderately persistent.

Caltrans has used spot treatments as needed with the broad spectrum (non-selective) systemic herbicide Roundup (glyphosate), and the selective (broadleaf) systemic herbicide Garlon 4 (triclopyr) for brush control in the highway right-of-way, to remove woody vegetation such as blackberries, poison oak and tree seedlings before they interfere with visibility or impinge on the roadway. Roundup has been considered to be one of the more benign herbicides from a drinking water point-of-view, because the active ingredient, glyphosate, is practically non-toxic

to aquatic and terrestrial biota and effectively immobile, being strongly adsorbed to soil. However, recent research suggests that at least one of the inert ingredients in Roundup has higher toxicity. Triclopyr is slightly soluble in water, moderately persistent, potentially mobile, and slightly toxic to mammals but highly toxic to aquatic biota.

Vegetation maintenance along County roads in the San Lorenzo River watershed has relied on targeted mowing since the Board of Supervisors passed a three-year moratorium on roadside herbicide spraying in May 2005. A 2015—2016 report identified the use of County Integrated Vegetation Management Program to minimize herbicide use, but herbicides are used along roads as needed. Similarly, Pacific Gas and Electric (PG&E) also implements an Integrated Vegetation Management approach to managing vegetation in their right of way.

Because mowing is far more labor intensive than spraying, mowing efforts concentrate on maintaining safe sight distance at critical intersections, road curves and other areas. While roadside maintenance in riparian areas involves herbicides to clear brush for flood control purposes, the County is exploring alternatives, such as organic substances, to reduce the environmental impact of conventional spraying. When used, herbicides are typically applied using a brush on the cut branch to minimize overuse.

The four State parks in this watershed are: Big Basin Redwoods State Park, Castle Rock State Park, Fall Creek State Park[11] and the Henry Cowell State Park. These parks use very little pesticides and herbicides as they are mostly preserved natural environments with very little landscaped area.

The four County parks in this watershed are: Felton Covered Bridge, Highlands Park, Ben Lomond Mill Street Park, and Quail Hollow Ranch. The County has limited use of pesticides and herbicides – a previous WSS update reported one application of Roundup along fence lines and on baseball fields at Pinto Lake and Polo Grounds Parks which are outside of the survey area.

The golf course at the Boulder Creek Golf and Country Club is managed based on IPM principles and use of least toxic materials at the lowest rates feasible. The course had previously employed two licensed pesticide applicators and primarily uses broadleaf weed control herbicides and fungicides.

In 2021, SLVWD prepared an Integrated Pest Management Policy, which aims to eliminate use of all pesticides on the District's properties, and to minimize the quantity and risk of pesticide use where complete elimination is not possible. City has a similar Integrated Pest Management program as discussed in Section 4.8

3.7.3 Loch Lomond Reservoir and upper Newell Creek watershed

The Loch Lomond Recreation Area is mostly non-landscaped and uses mechanical weed control for road right-of-way and other park maintenance. Although no pesticides, herbicides, or fertilizers are applied in these areas, consistent with the City of Santa Cruz policy, glyphosate is occasionally applied on the firebreaks/ridgetops as part of a multi-faceted strategy for fuel load

[11] More correctly, the Fall Creek unit of Henry Cowell State Park. Popular nomenclature use

reduction, access maintenance and invasive species management.; The need to reduce ladder fuels in an effort to reduce potential for crown fire and related impacts on the water resources at Loch Lomond is balanced with the potential water quality impacts of glyphosate use. Monitoring of Loch Lomond has shown that glyphosate has not impacted Loch Lomond. Other fuel management efforts include manual and mechanical French broom eradication efforts.

The City has attempted several methods to control algae (primarily blue-green algae or cyanobacteria) in the reservoir. Historically, pesticides containing copper as the active ingredient were successfully used. Since the 2018 WSS update, the City has moved away from PAK27 (a sodium bicarbonate and hydrogen peroxide mixture) and instead uses liquid GreenClean to control algae growth in the Loch Lomond Reservoir. GreenClean Safety Data Sheet identifies key ingredients as sodium carbonate peroxyhydrate and sodium carbonate (soda ash). The City has continued to also use copper-based algaecides under the terms of a permit with the State Water Resources Control Board on an as-needed basis. Algae growth is monitored year-round, and Loch Lomond Reservoir is aerated regularly to help limit growth. (Lindsay Neun, personal communications 2022).

3.7.4 North Coast Watersheds

Use of pesticides and herbicides in these watersheds is likely to be very small as landscaped areas are a very minor land use, and there are no large urban areas or major thoroughfares. There is limited agriculture, including some small vineyards that are potential source of pesticides and herbicides. Pesticides are not being used within the City managed watershed lands on the North Coast currently. However, they may be used as part of the City's multi-faceted IPM program if warranted.

3.7.5 SLVWD

SLVWD's watershed management plan, restricts, and where feasible, excludes the use of pesticide or herbicide within SLVWD lands. SLVWD also supports the minimal and restricted use of herbicides and pesticides in the District's service area as well as contributing to the control of herbicide and pesticide use in the greater San Lorenzo River watershed. The District has also imposed a complete ban on all glyphosate use on District properties.

3.7.6 Significance

The RWQCB's decision to place the San Lorenzo River on the 303d list for chlordane and the 2014 TMDL for chlorpyrifos suggest pesticides and herbicides as well as chemicals are a potential contaminant source of concern. However, City has provided written input to the RWQCB that these listings may be inappropriate in that the pesticides are no longer commercially available, the sources are unknown and the data that supports the listings is fairly limited. Additionally, these compounds have never shown up in the City's source monitoring. In the TMDL report, RWQCB acknowledged City's comment and noted that for chlorpyrifos, the detections are located downstream of the City intakes.

3.8 Wildlife

3.8.1 Contaminants of Concern

Wildlife may pose a threat of contamination to public water supplies under certain conditions. The likeliest condition is the contact between water supply sources and animal or waterfowl waste. The potential for transmission of waterborne pathogens such as Giardia cysts and Cryptosporidium oocysts varies with fluctuations in wildlife populations. While considered a potential problem, the relative importance is lessened when compared with the impacts of domestic and confined animals.

3.8.2 San Lorenzo Valley, North Coast Watersheds, and SLVWD

The wild animals that have the greatest potential impact in the San Lorenzo Valley and the North Coast watersheds are wild pig, black tailed deer, California ground squirrel, and the other local terrestrial mammals. Canada geese populations at Loch Lomond have been observed and maybe a contributor to HAB events during the summer. Terrestrial mammal populations fluctuate with changes in residential development, droughts, and other factors. Wild pigs specifically have historically been linked to erosion problems due to their foraging and wallowing habits – however, sightings of pigs by City staff have decreased over time, possibly due to changes in weather patterns associated with climate change or changes in residential development. Recent genetic studies of dogs may help to differentiate the presence of wild animals versus domesticated animals in the watershed.

California ground squirrels are a minor potential source of sediment and fecal coliform bacteria. Ground squirrels are a source of bank instability in grassland areas and along levees and earthen dam structures. This instability often necessitates eradication efforts that when done by rodenticides may be a source of chemical contamination to adjacent water sources. In small spring systems, it was noted that occasionally other rodents, like the dusky footed woodrat and deer mice, as well as a variety of lizards may foul water supplies when they die and decompose in water sources. This issue illustrates the need for vigilance on the part of the small-scale water suppliers and spring owners.

3.8.3 Significance

Pigs, Canada geese and other wild animal populations appear to have a moderate potential for contamination of surface waters at this time.

3.9 Quarries/Mine Runoff

There are currently four active quarries in the study area – Wilder, Quail Hollow, Felton, and Olive Springs, as described in Section 2.3.5.

The quarries are regulated under California's Surface Mining and Reclamation Act (SMARA) and by the County's Mining Ordinance. The County Mining Ordinance requires that the application package be submitted to the water purveyor in the drainage area of the quarry. The County inspects the quarries four times each year and the state inspects them annually. The

County conducts an extensive review each five years. At that time, the County Planning Commission can impose conditions on the quarry as part of the Certificate of Compliance. The Regional Board issues NPDES permits that set limits on contaminants that can be discharged to surface waters from quarries.

3.9.1 Contaminants of Concern

Sediment, nitrate, dissolved metals, and minerals are all contaminants of concern related to quarry operations. The Felton Quarry has historically been a source of dissolved minerals, sulfate, iron, and manganese in moderately elevated concentrations while the Bonny Doon Quarry for limestone, which recently closed, was associated with high sulfate, turbidity, sediment, and nitrate. The other quarries in the watersheds are closed but may be a source of sediment if not properly maintained. Each active quarry is discussed further in the following sections.

3.9.2 San Lorenzo River Watershed and SLVWD

This section presents existing conditions of the four active quarries in the San Lorenzo River watershed.

Felton Quarry - Felton Quarry, mined by Granite Construction Company, is a 262-acre granite quarry rising in elevation from 550 feet at the eastern edge to 1,550 feet at the northwest corner. The Felton Quarry mineral deposit, a spatially-limited unit of fractured and stained granitic rock (mapped as adamellite, also known as alaskite), is located on the southeastern side of Ben Lomond Mountain. The quarry consists of an active open pit, an asphalt plant, a washwater recirculation system, a polymer clarifier system, and settling ponds. It produces both decomposed granite used in construction and a stained aggregate marketed as a high-value landscaping rock under the 'California Gold' trademark.[12]

Mining occurs on approximately 85 acres of the site (Carlson, 2005). The quarry has been active since the early 1970s, and has been operated under the present permit for 31 years with an additional 19 years of feasible mining projected. Limestone Brook drains through the center of the site in a southerly direction forming the headwaters of Gold Gulch, which flows east to the San Lorenzo River. Washwater is recirculated and stored in three detention ponds. It is not discharged except during major storm events. Stormwater runoff from the site is also stored in the three onsite detention ponds. Prior to major storm events, water is pumped from the ponds and discharged to Gold Gulch to increase pond capacity for stormwater runoff. The ponds are designed to handle a 2-hour, 100-year storm, providing a median detention time of at least 20 to 40 minutes. During extreme storm events the capacity of the detention ponds is exceeded and stormwater flows out of the ponds to downstream receiving waters. Discharges to surface waters are regulated under an NPDES permit issued by the Regional Board. The quarry submits quarterly discharge reports to the Regional Board.

Granite monitors groundwater and surface-water quality twice each year at a number of monitoring locations. Groundwater levels are measured in nine wells and samples are collected

[12] See Hecht, 1978 for a discussion of the hydrogeologic and weathering conditions which have led to deep weathering and the lightly-stained rock mined at the site.

for pH and conductivity. Surface water samples are collected at 16 locations including the settling ponds, springs, Gold Gulch, and Limestone Brook. All samples are analyzed for pH and specific conductance. Selected samples are analyzed for general water quality parameters such as total dissolved solids, calcium, and sulfate. In April 1995, a sample was collected from the effluent of the clarifier and analyzed for the 13 priority pollutant metals. Most of the metals were not detected. Lead and nickel were detected at concentrations well below drinking water standards. High concentrations of sulfate, calcium, iron, and manganese have been detected in the groundwater basins of Limestone Brook and Gold Gulch. County requirements call for developing a set of protective measures should water quality change by more than 20 percent. The Felton Quarry has controlled erosion at the site by revegetation with native plants.

Historically there was concern that the quarry's operations might affect the water supply of the Forest Lakes Mutual Water Company, as the quarry's product of partly-weathered rock is part of the source aquifer for the Company's wells. A hydrogeologic assessment study (Hecht, 1978) showed that there was no impact on groundwater levels; however, the operator drilled a new well for Forest Lakes MWC that provides 18 acre-feet of water to the water district each year. Conditions of approval for the quarry require that if the water supply were to diminish, Granite would be required to provide a new water supply to this purveyor.

Quail Hollow - The Quail Hollow Quarry encompasses 240 acres and is located on Quail Hollow Road near the community of Ben Lomond (Carlson, 2005). Mining is estimated to continue for decades from the present and is permitted for a maximum production rate of 250,000 tons per year. The Santa Margarita Sandstone is mined for sand which is used in the construction industry; however, the Quail Hollow quarry is locally unique in that it also contains fine, industrial grade sand used by the glass industry (Carlson, 2005). The quarry consists of an open pit, a washwater recirculation system, and detention ponds. In 1998, the Planning Commission certified an EIR for the project and approved the Mining Approval and Certificate of Compliance.[13] In 2007, the first permit review since the 1998 approval was conducted and staff concluded that the quarry was in substantial compliance with the Conditions of Approval (Carlson, 2007). Additional best management practices were installed to better manage stormwater runoff. The capacity of the site to retain stormwater runoff has been exceeded under extreme conditions, such as occurred during the 2016—2017 wet season, and further improvements to the storm water pond system have been implemented and additional improvements are planned to better manage and treat stormwater runoff before it leaves the site (Carlson, 2018).

In 2008, Graniterock finalized the Long Term Management and Maintenance Plans (LTMMP), which was a stipulation of their 1998 Mining Approval and Certificate of Compliance. The purpose of the Plan is to implement the conservation goals of the Habitat Conservation Plan by describing the management and maintenance actions that will be undertaken to preserve conservation and reclaimed areas of the mine in perpetuity (Carlson, 2008). The LTMMP calls for a more comprehensive monitoring program to include, invasive species mapping, vegetation community mapping and plan plant species mapping, as well as an adaptive and research-

[13] There are actually two Approvals for the Quail Hollow Quarry and two corresponding sets of conditions of approval. The approval for the "Current Mining Area" was in 1994, and that for the "Future Mining Area" was in 1998.

oriented approach that will allow management to be refined and improved as new information is obtained.

3.9.3 Loch Lomond Reservoir and the upper Newell Creek watershed

There are no active quarries in this watershed.

3.9.4 North Coast Watersheds

There are no active quarries in this watershed.

3.9.5 Significance

Within the four quarries in the San Lorenzo River watershed, occasional heavy sedimentation can occur because of exceedance of settling pond capacities during major storms. This condition is not likely to change in the foreseeable future. The potential water quality impact is more significant with the operational quarries at Felton and Quail Hollow. Bonny Doon Quarry (in the North Coast watersheds) is no longer active, and thus Liddell Spring water quality will no longer be negatively impacted by blasting events. However, potential industrial land uses at the site by an aviation firm producing drones may pose some risks which should be monitored for regulatory oversight such as use permits by the County and evaluated in a future WSS update. The Peninsula Open Space Trust and Sempervirens Fund with other organizations acquired the San Vicente Redwoods from CEMEX in the winter of 2011. In 2014, these organizations joined with others to collaborate on the Living Landscape Initiative design for a plan that protects wildlife habitat, recreation, and sustainable timber harvesting for the 8,500-acre property. As noted earlier, allowing public access to these lands increases risk of wildfire with associated water quality risks

3.10 Solid and Hazardous Waste Disposal Facilities

In California, there are three main categories of waste disposal facilities: (1) solid waste disposal facilities, (2) hazardous waste treatment, storage, and disposal (TSD) facilities, and (3) illegal dump sites. Solid waste facilities are regulated by the California Department of Resources, Recycling and Recovery (CDRRR, formerly the State Integrated Waste Management Board), although pollution problems are handled by the Regional Boards. Hazardous waste facilities are overseen by the State Department of Toxic Substances Control (DTSC). The County removes trash and abandoned articles from illegal dump sites.

There is one closed solid waste facility in the San Lorenzo River watershed, discussed below. A review of Geotracker, the database of TSD facilities showed there are no new active TSD facilities in any of the watersheds and that the former Santa Cruz Lumber Company and Valeteria Dry Cleaners sites in Felton remain under state oversight.

3.10.1 Contaminants of Concern

Leachate from waste disposal facilities is a liquid formed as infiltrating rainwater seeps through the landfilled material mobilizing a variety of contaminants. Leachate is typically a highly mineralized liquid containing heavy metals, dissolved solids, nutrients, and organic chemicals. The composition of leachate from any particular landfill will depend on the nature of the decomposing landfilled materials. Although regulations aim to minimize or eliminate leachate from contaminating the underlying groundwater and nearby surface waters, complete leachate control is difficult to achieve.

3.10.2 San Lorenzo River Watershed

There are no active solid waste disposal facilities in the watershed. The County provides trash pick-up service in all the watersheds and transports the material to one of the two operating landfills, both of which are outside the watershed areas for this study.

There is one closed County landfill, the former Ben Lomond Landfill. This facility was in operation since the early 1950s and was classified first as a Class II Landfill, then later as a Class III Landfill. The landfill ceased acceptance of waste in July 1991 and it is now used as a transfer station and recycling center and is known as the Ben Lomond Transfer Station. It is located on the north side of Newell Creek, downstream of Loch Lomond, in the highly permeable Santa Margarita sandstone which is underlain in this area by the south-southeast dipping Monterey shale.

Requirements for management of active landfills, closure of landfills, and air and water quality testing are described under Subchapter 15 of the California Code of Regulations. The CDRRR implements source reduction and recycling requirements, waste handling and landfill design, and waste disposal standards. Landfills are to be designed and closed to permit no off-site movement of leachate. Both active and inactive solid waste disposal sites are required to conduct monitoring specifically to identify the content of any leachate leaving the site and whether there are water quality problems posed by the site. The monitoring results are reported to the Regional Board in Solid Waste Assessment Test (SWAT) reports.

The entire Ben Lomond Landfill is now under a clay cover. Regional Board staff report this cover has been effective in reducing the cadmium levels. Closure measures include gas extraction, installation of a sedimentation basin, and installation of a drainage system. The County submitted a closure plan to the Regional Board in 1996.

There is a groundwater plume beneath the Ben Lomond Landfill but concentrations of most monitored constituents are at low levels. A few VOCs are detected above MCLs in three of the wells close to the landfill perimeter. Downgradient groundwater monitoring wells, however, show no evidence of VOC contamination. Monitoring of Newell Creek shows some increases in mean constituent concentrations from upstream to downstream of the landfill, including an apparent increase in turbidity. Leachate inflow into Newell Creek would be unlikely to cause the turbidity increase; this apparent increase may have some other source, possibly erosion within the Rancho Rio subdivision on the opposite creek bank.

3.10.3 North Coast Watersheds and the Loch Lomond Reservoir

There are no identified and no permitted waste disposal facilities in any of the other watershed areas.

3.10.4 Significance

Waste disposal facilities most likely are not a significant threat to the water quality of the San Lorenzo River or the creeks in the North Coast watershed. There are no hazardous waste disposal facilities in any of the watersheds. The closed Ben Lomond Landfill in the Newell Creek watershed appears to have created a low-concentration groundwater plume with a few elevated VOCs but the plume does not appear to be migrating into the creek. There is an apparent turbidity increase in the creek from upstream to downstream of the landfill. The landfill leachate, however, is unlikely to be the source of this turbidity increase.

3.11 Timber Harvesting

Logging is part of the land-use mosaic and tradition in Santa Cruz Mountains. Most old-growth redwood had been cut by 1915. Douglas fir and hardwoods have also been extensively logged. Timber harvests were historically an integral part of the local economy. However, in recent decades, timber harvesting has been used primarily as a tool for forest management and fire resiliency as evidenced by limited timber harvest plan submittals to the RWQCB since 2004. Neither the City of Santa Cruz nor the San Lorenzo Valley Water District plan to continue timber harvesting outside of the context of forest management for fire resiliency and restoration purposes. Section 3.16 discusses wildfire forest management in more detail. If timber harvest activities occur after fire, they pose a risk to mobilize sediments and other pollutants which should be scrutinized. Other timber harvest objectives including forest management and land restoration.

3.12 Recreation

Principal recreational activities in the watersheds include swimming, fishing, hiking, and horseback riding. There has been a continued interest in mountain biking occurring on trails in the watersheds including development of illicit trails upstream of the City's water intakes on the North Coast. Water contact recreation (swimming) occurs primarily during fair weather and relatively warm temperature conditions, conditions typical of May through October on both the San Lorenzo River and some of the tributaries. The peak water-contact recreation season is traditionally from the Memorial Day through the Labor Day weekend and is limited to natural swimming holes as temporary dams are limited by CDFW; however, informal summer dams have been observed such as the one on Zayante Creek at Mount Hermon just upstream of the Bean Creek confluence. In addition, weekend use is generally more intensive than weekday use. Swimming and wading has been listed as the most popular recreational activity in the watersheds. Recent water quality sampling has found the insect repellent DEET in the San Lorenzo River at Felton in November and December 2020 as well as January, February and March 2021 which could potentially be associated with recreational and other human activity. Hiking, mountain biking, and horseback riding are more year-round activities (County General Plan).

Future trails are currently being developed by the Santa Cruz Mountains Trail Stewardship and Sempervirens Fund, as described In Section 2.3.6. Increased usage of the watershed for recreational purposes may result as more areas of the watershed open up for public access. Typical usage of the watershed for recreation is for walking and hiking, which has a fairly limited impact on source water quality. If mountain biking and motorized vehicles like electric bikes become more frequently used, the impact on watershed erosion may be greater.

On March 19, 2020, a shelter-in-place order was issued by the California Department of Public Health to limit the spread of COVID-19. Since this order allowed for outdoor recreational activities, the San Lorenzo River watershed saw an increase in visitation throughout the COVID-19 lockdown order. Recreational activities included increased hiking, mountain biking, and recreational fishing encouraged by stocking of fish at Loch Lomond. Increased recreational activity of this kind could potentially contribute to increased erosion in the watershed.

3.12.1 Contaminants of Concern

Water-contact recreation is a potential source of viruses, pathogens, and bacteria, principally from the introduction of human fecal matter (most likely from infants and children) directly into the stream. Hiking, mountain biking, and particularly horseback riding, can contribute to erosion and increased turbidity, especially when conducted off established trails and at stream crossings. Human access to watersheds also exacerbates fire hazard. Fishing activity is limited to catch-and-release steelhead, except at Loch Lomond where CDFW stocks fish, and is a potential source of contaminants including nutrients that could result in HAB, especially with the increased fishing activity during the COVID-19 pandemic. In addition, live bait at Loch Lomond is limited to night crawlers to prevent invasive species introduction.

3.12.2 San Lorenzo River Watershed

There are three state parks, four county parks, one City recreation area, one private country club, and several public and private swimming holes within the watersheds. Water contact recreation is prohibited in the City recreation area but is widespread elsewhere in the creek system. The state parks include Castle Rock State Park, the Henry Cowell State Park, and a small portion of the Big Basin Redwoods State Park. The state parks are essentially open spaces. Prior to the CZU fire in 2020, which burned 97 percent of Big Basin Redwoods (Big Basin) State Park's 18,000 acres, there were many miles of trails for hiking, biking, and horseback riding, 147 developed campsites, 6 trail camps, and 36 tent cabins. As of 2022, Big Basin is open for limited day use with about 20 miles of trails reopened. Castle Rock State Park has more than 5,000 acres and 34 miles of trails for hikers and equestrians. Camping is for backpackers only at two primitive sites with pit toilets. Henry Cowell State Park consists of two units; a main park area of about 1,800 acres and the Fall Creek Unit which has about 2,500 acres and has about 20 miles of trails. Some trail sections are designated for horses, leashed dogs, or bicycles, but most trails are for hiking. There is also a 112-unit campground. Illicit recreational uses in Henry Cowell State Park and adjacent lands have recently increased, particularly mountain biking off the designated trails. Passage of Proposition 68 in 2018 has made more state funding available for parks and it is hoped that enforcement of park regulations will return. There is continued concern that additional demands for access for recreation including mountain biking will exacerbate erosion and other water quality concerns.

The County parks include the Felton Covered Bridge County Park (playground, covered bridge, horse trail access, volleyball); Highlands County Park (senior center, swimming pool, picnicking, playing fields, nature trail); Ben Lomond Mill Street Park (picnicking, small playing field); and Quail Hollow Ranch County Park (equestrian facility).

The Boulder Creek Golf and Country Club is a private facility which provides an 18-hole golf course as well as other recreational facilities, such as tennis courts and a swimming pool.

Historically, there were several small dams constructed across creeks to afford summer swimming holes at locations that included, San Lorenzo Woods, Bear Creek Scout Camp, Gold Gulch in Forest Lakes, and Zayante Creek in Mt. Hermon. Swimming holes are now limited to natural swimming holes which are located in less accessible portions of the watershed although illegal dams constructed of cobbles and plastic are frequently constructed. The County Health Services Agency continues to monitor coliform bacteria at two locations on the San Lorenzo River. The coliform data can indicate sewage contamination from failing septic systems, urban runoff, domestic animal wastes, wildlife, birds, and/or water contact recreation itself. In addition, the County monitors for mycrocystin which is the toxin associated with cyanobacteria at two locations on the San Lorenzo River downstream of City diversions.

3.12.3 Loch Lomond Reservoir and the upper Newell Creek watershed

Loch Lomond Recreation Area occupies the east side of the reservoir and is owned and operated by the City. Recreational use averages around 55,000 visitors per year. There is day use only, with hiking, dog walking, picnicking, fishing, and boating as the primary activities. Only electric powered boats and manually paddled boats such as rowboats are allowed. There is no water-contact recreation allowed. Recreational fishing is augmented with CDFW stocking of fish at Loch Lomond; there is a concern that wastes associated with an increased fish population, as well as increased geese population may be linked to the increased HAB events.

Wastewater is trucked out of the recreation area and virtually no pesticides or herbicides are currently used in the area. The park is open from March 1 to September 15 and on weekends after Sept 15 until the second weekend in October from 6 AM roughly to sunset (varying times). On private lands of the upper Newell Creek watershed, there are a few septic systems to serve homes and wineries.

3.12.4 North Coast Watersheds

There are several recreation areas or regional parks in the North Coast watersheds such as the recently formed San Vicente Redwoods, some of which drains into the Laguna and Liddell watersheds, CDFW's Bonny Doon Ecological Reserve which drains into the Reggiardo Laguna, and Liddell Creeks; the Wilder Ranch State Park, some of which drains Majors Creek and the Coast Dairies State Park which is located on the lower portions of Laguna Creek. In addition. there are informally established horse and mountain bike trails in these watersheds.

3.12.5 SLVWD

The Fall Creek State Park is available for day use, and is located just upstream of the Fall Creek intake. Since this area is only available for day use, there is a limited chance of contamination occurring. Recreation activities consist mainly of family picnics and hiking. The road along fall creek is gated just past the campground, so vehicles other than SLVWD vehicles, do not have access beyond Fall Creek State Park.

The Olympia Wellfield is open to hiking and equestrian use. There are no surface water diversions on site.

Recreational use is restricted within other areas of the SLVWD lands but are occasionally subject to illicit use by hikers and mountain biking to which the District responds by deterring trespass through various methods.

Lompico Creek has limited recreation activities within its watershed. There is a small pool below the former Lompico Creek intake which is used for recreation and swimming. Other activities that may exist in the watershed are limited to hiking and possibly some mountain biking.

3.12.6 Significance

Many recreational activities are relatively benign and non-polluting. Large recreational areas, especially those which are mostly open space like Henry Cowell State Park or are managed specifically for water quality such as the Loch Lomond Recreation Area, appear to enhance water quality. As discussed above, bacterial water quality appears to improve as the water passes through large open space parks (Henry Cowell State Park) or resides in a reservoir for extended periods (Loch Lomond Reservoir).

Recreational activities generally considered of most significance involve water-contact recreation. However, an evaluation of the County fecal coliform bacteria data conducted during prior watershed sanitary surveys, conducted by the County Health Services Agency, found no significant increase in bacteria in the swimming areas of the San Lorenzo River system. It has been observed, however, that the dammed swimming areas do grow algae later in the summer as water temperatures warm and there is concern that these conditions could contribute to HAB. The first winter rains can carry the algae mats as well as first flush stormwater that should be monitored for and managed as a source water constraint.

An examination of the geographical distribution of the County fecal coliform data from 2012—present continues to show that the urbanized portions of the river system, generally between Boulder Creek and Felton, have fairly similar average and median values. Historically, there has been an apparent trend of decreasing coliform counts through reaches that pass through the State Parks, which are mostly open space.OBJOBJ data indicate that total coliform counts at Loch Lomond are lower than the counts at the Tait Street and Felton Diversions as shown in Section 5. The County's wastewater management program evaluation found no significant increases of fecal coliform bacteria in the swimming areas of the San Lorenzo River system, indicating that water contact recreation at parks and designated recreation areas is not a significant source of the bacterial load in the river (John Ricker, personal communication, 2017).The potential for erosion from hiking, horseback riding, and mountain biking may also be significant and has

been observed in locations such as Henry Cowell State Park and upstream of the Tait diversion on the San Lorenzo River. [14] Downhill biking continues to be increasingly popular biking-induced damage (including the building of illegal jumps) has stirred controversy in the San Lorenzo River watershed (Betsy Herbert, personal communication, 2012). There are few signs to alert bikers coming from legal trails on UCSC's upper campus that they are entering closed trails under state park control, and law enforcement has issued tickets to riders exiting Henry Cowell State Park onto Highway 9. Signage has been vandalized and/or removed in Henry Cowell State Park which requires monitoring and replacement.

There are a limited number of formal trails in the county for downhill bikers such as in the Soquel Demonstration Forest and a few other locations which cannot meet demand, Officials and bikers represented by the Mountain Bikers of Santa Cruz have collaborated to start building a park on federal land maintained by the Bureau of Land Management near Davenport at the Cotoni Coast Dairies National Monument. About 3 miles of a planned 19 mile trail system have been completed to date.

3.13 Unauthorized Activity

Unauthorized activities are found at varying levels throughout the San Lorenzo Valley and North Coast watersheds and include unpermitted grading, illegal timber harvests, and unauthorized dumping of solid and liquid wastes, often associated with homeless encampments. Area resource managers find that land clearing, road construction, and maintenance by individual landowners are the primary sources of avoidable erosion. Cannabis cultivation, which has occurred illegally, is now regulated as discussed in Section 2.

Homeless encampments can also be a source of human waste and are the subject of targeted enforcement. The City of Santa Cruz passed Ordinance No. 2021-12 (Camping Services and Standards Ordinance), which aims to provide regulation for the time, place, and manner for sleeping outside in the City of Santa Cruz. This ordinance intends to allow the City to better balance health, safety, and environmental concerns through a combination of prohibitions on camping, increased outreach and education, and connections to available services and safe sleeping sights. The camping ordinance is still pending implementation, as it requires that adequate shelter space be developed before prohibitions on camping in the watershed can be enforced. Additionally, staff bandwidth to implement the ordinance will be an ongoing challenge regardless of shelter space conditions.

3.13.1 Contaminants of Concern

Generally, sediment caused by eroding land is a primary contaminant of concern. In addition to the erosion risk, chemical spills including pesticides, herbicides, and fuels, and accumulation of debris pose additional water quality threats. There is also concern regarding increases to coliform and bacteria levels in source water due to increased homeless encampments in the

[14] SLVWD does not actively manage much of its land for recreational purposes; however, in 2011, SLVWD approved limited recreational use (equestrian, walking, and dog walking) on the Olympia watershed property.

watershed – many of which are located immediately adjacent to the water in local riparian areas.

3.13.2 San Lorenzo River Watershed

Numerous violations of the Santa Cruz County Erosion Control Ordinance can be seen throughout the subject watersheds, primarily in connection with roads. County staff estimate that in the project area, there are scores of "active" violations of the County Grading and Erosion Control, the Riparian Habitat Protection, and the Sensitive Habitats Protection Ordinances. In addition, several large illegal roads in the Bear Creek and King Creek watersheds remain open and are a significant source of sediment and persistent turbidity. County enforcement staff do their best to obtain compliance for these situations, however with limited resources, violations are prioritized based upon severity and overall threat to life and safety. For larger land clearing or grading violations, it may take years to ultimately resolve the violation due to many factors including the magnitude of the violation as well as the property owner's willingness and financial ability to comply.

Besides grading and brush clearing by individual landowners, unpermitted timber harvests for firewood occasionally occur in the watersheds. Illegal timber harvests are seen by resource managers as causing more aesthetic damage than water supply damage.

Other unauthorized activities that may have an adverse impact on water quality are associated with homeless encampments in and around the San Lorenzo River from the Highway 1 bridge to Paradise Park as well as other bridges on the San Lorenzo River. Reports on homelessness in Santa Cruz County indicate that the homeless population has likely increased by about 6 percent since 2019 to an estimated homeless population of 2,299 in 2022 (Santa Cruz County Housing for Health Partnership, 2022). It should be noted that this is a reduction since 2011 when the homeless population was estimated to be 2,771 (Applied Survey, 2017).

The upper portion of this corridor is upstream of the Tait Street Diversion, the downstream limit of the survey area. The wooded riparian area just upstream of the Tait Street Diversion has historically been used as an informal settlement with efforts made by the City to resolve homeless issues with multiple approaches including providing social services. Because there is a lack of sanitary facilities in the vicinity of the encampments, these sites may be a source of human waste. The City has increased patrols in the area, and has continued to negotiate with riparian landowners upstream of the Tait Street Diversion for the right to conduct maintenance and restoration along the river (Chris Berry, personal communication, 2022). Homelessness is a complex issue, and while cleaning up one site does not solve the underlying problem, it is significant that the City has been working to keep riparian areas clean. Encampments in the Pogonip remain an issue and have been addressed with increased patrols; they likely have less of an adverse impact on San Lorenzo River water quality than those along the river because of the greater distance. In November 2020, the County established a Housing for Health Division within the County Human Services Department to collaborate with other partners to create a Santa Cruz County Housing for Health Partnership to reduce homeless households by 25 percent by 2024.

3.13.3 Loch Lomond Reservoir Subwatershed

While the upper Newell Creek watershed is sparsely populated, a number of rural residential parcels have been developed. Formerly almost inaccessible, this area was cited by County resource planners as an area to watch. Old roads have been regraded to provide better access for the few households that have developed. Because of this new increased intensity of use, including year-round use, City staff has seen increased damage from vehicles to roadways in the last several years.

3.13.4 North Coast Watersheds

Previously, County enforcement staff indicated that numerous violations of the grading and erosion control ordinances, sensitive habitat protection ordinance, and timber harvest plans have occurred in the North Coast area. More recently, post-CZU fire, timber salvage and tree removal by PG&E have required enforcement action by CDFW. Sedimentation of Majors Creek has been cited as evidence of a general trend towards erosion and illegal grading and a potential TMDL is discussed further in Section 4.9. Although the general consensus was that violations are widespread throughout the subject watersheds and will continue, legacy logging roads are still considered the primary sediment source.

3.13.5 SLVWD

There has been some evidence of unauthorized activity within the SLVWD including use of trails by motorcycles. There are no regular or recurring inspections of the entire SLVWD lands because much of the watersheds are inaccessible to SLVWD staff, however, the staff do make visits to diversions sights and intakes approximately once per week when intakes are in service and prior to placing an out of service intake into service. Signs are posted throughout the watersheds that notify the public that the streams and surrounding areas are used for public water supply. Signs of vandalism have been rare, and most intakes are accessed by roads that are gated to control access by the public. With the exception of the Fall Creek intake and the Bennett Spring intake, intakes are not fenced but are behind gated roads. A few intakes are only accessed by roads that cross private lands, for which the District has easements in order to cross. Per conversations with SLVWD staff, no signs of dumping or illegal activity have been witnessed by the staff or have been reported to the District.

3.13.6 Significance

Unauthorized activities can be significant sources of sediment from eroding property in the watersheds. Small-scale grading for roads frequently use poor practices which lead to barren, unprotected roads, yards, etc. Finally, homeless encampments can increase the concentration of microbial and particulate contaminants in streams, as well as damage to riparian vegetation and are identified as a source contributing to water quality objective violations in the San Lorenzo River Pathogen TMDL.

3.14 Vehicle Upsets and Spills

Vehicle upsets are potential sources of contamination of hazardous materials into surface waters through the spilling or rupturing and subsequent discharge of the materials being transported. In addition to spilling of any cargo being carried, collisions can release petroleum products from the vehicles themselves. Factors that affect the level of risk for vehicle spills include overall traffic volume, amount of hazardous materials being transported, highway characteristics, and road conditions. There are no prohibitions on the transport of hazardous materials within the study area watershed.

There are two major transportation routes suited for heavy vehicles, both in the San Lorenzo River watershed. State Highway 9 is the major traffic route through the San Lorenzo Valley, while State Highway 17 skirts the eastern edge of the San Lorenzo watershed (see Figure 1-1). There are no major transportation routes in the North Coast watersheds. Empire Grade Road skirts the east boundary – and the west boundary of the San Lorenzo River watershed – but is not as heavily traveled as Highways 9 and 17. The risk for spills is generally present, and historically several spills were noted by City staff including an event that resulted in a fish kill in Brookdale, cars that had entered the creek near Lompico, and the application of fire-fighting foam some of which entered the creek during the previous wildfires. Specific spill events were not noted since 2018.

The Santa Cruz County Hazardous Materials Area Plan was updated in January 2017 and summarizes how local agencies have planned, prepared, and will respond to such an event in Santa Cruz County. The document is an annex to the County Operational Area Plan describing how county resources will be utilized to deal with many different kinds of emergencies affecting the county. Any public safety official on scene can declare a hazardous materials incident, and should immediately call 911. The dispatchers at 911/NetCom (Santa Cruz Consolidated Emergency Communications Center) will route the call to the appropriate local agency. Depending on its size and significance, the incident could be handled by local fire departments, by specialized hazmat teams, or coordinated by an operational area Emergency Operations Center. County staff then preliminarily assess the nature of the contamination, how far it has gone, and whether it has entered a waterway. County staff will then request assistance from the CDFW if a waterway is affected and will directly notify the downstream water user if appropriate. City staff routinely coordinate with County staff, NetCom and relevant first responders to ensure adequate communication regarding these incidents.

3.14.1 San Lorenzo River Watershed

Within the town of Felton, there are three known groundwater contamination plumes which are seeping into the San Lorenzo River. These are the only sites known to be impacting stream water quality. They are under the jurisdiction of the Regional Board.

3.14.1.1 Valeteria Dry Cleaners (6539 Highway 9)

This site was identified when perchloroethylene or tetrachloroethylene (PCE) was detected in the San Lorenzo River in 1985 (0.5 µg/l). Further monitoring tracked the PCE, in 1988, to a spring near this dry cleaner shop which continues to show evidence of PCE in the 2017 Annual Report. The source was determined to be contamination of soils in the dry cleaner's septic

system and leach field originating during the 1960s. The owner conducted a remediation that included removal of sludge within the onsite waste disposal system, steam-cleaning the redwood septic tank, and backfilling with sand. The remediation proved insufficient, and the site was re-excavated in 2002 (U.S. EPA, 2002). The leach field was then relocated and contaminated soil was exported. Groundwater monitoring results continue to show elevated PCE and TCE concentrations at a location approximately 20 feet upgradient of the San Lorenzo River, and downstream San Lorenzo River monitoring results also show low PCE concentrations. This suggests that the wastes released at the site have migrated, and may continue migrating downgradient. The responsible party is now required to submit a Corrective Action Plan to evaluate and select remedial alternatives for controlling groundwater contamination plume from further migration and impacting the river and for complete cleanup of the groundwater contaminations (Briggs, 2011). The Felton Diversion, which is about 1 mile downstream of the dry cleaner's, has had historical detections of PCE as high as 1.7 µg/L on November 1, 2011 relative to an at-the-tap maximum contaminant level of 5.0 µg/L but no detections were reported in the 2021 Source Water Quality Monitoring Report. According to the State of California Geotracker web site, this site continues to be open as remediation continues and was awarded funding in 2017 to continue investigation and remediation.

3.14.1.2 Chevron Underground Storage Tank Leak (6325 Highway 9)

A groundwater plume beneath this site caused by a leaking underground storage tank is contaminating a nearby seep to the river. Chevron has installed an interception sump which collects the seepage. In the seep, recent levels of total purgeable hydrocarbons have been measured at 67 to 7,400 µg/L and benzene has been measured at 2 to 1,700 µg/L, which were consistent with historical concentrations (Stantec Consulting Corporation, 2011). During dry weather, this system appears to be effective in intercepting much of the gasoline-contaminated ground water. During long wet periods, however, the effectiveness is limited. Monitoring occurs quarterly. Currently, Chevron is doing bi-weekly free product pump outs and high-vacuum groundwater extractions on a regular basis and is in the process of getting a commingled plume agreement with the Cornerstone property at 6320 Hwy 9, Felton. According to the State of California Geotracker web site, cleanup has been completed and the site has been closed as of 27 December 2021.

3.14.1.3 Sturdy Oil (former Exxon Station) Storage Tank Leak(s) (6225 Graham Hill Road)

The former Exxon Station near the Covered Bridge in Felton reported leaking conditions in 2000. A groundwater cleanup program was initiated, and, following a brief uptick in gasoline and MTBE concentrations in early 2005, this site is now deemed currently in compliance, with ongoing quarterly monitoring. The on site concentrations of MTBE has dissipated over time, due to the high solubility of MTBE in water, to non-detect concentrations. According to the State of California Geotracker web site, cleanup has been completed and the site has been closed as of February 5, 2013.

3.14.2 Other Sites with Potential Plumes

3.14.2.1 Watkins-Johnson Superfund Site (440 Kings Village Road)

Watkins-Johnson operates an extraction and remediation program at its manufacturing facility next to Bean Creek in western Scotts Valley. Watkins-Johnson used a variety of chemicals in the manufacture of industrial furnaces and electronic parts. Past operations resulted in contamination of the underlying Santa Margarita sandstone with methylene chloride, chloroform, and TCE. The plume contributed TCE to Bean Creek. The site is overseen by the EPA and has an ongoing remediation system which consists of several pumping wells and treatment by granular activated carbon adsorption. The treated water is considered contaminant-free and is either recharged to the aquifer through a leach field, re-used onsite as non-process cooling water, or discharged to Bean Creek. In addition to monitoring the treated discharge, Bean Creek is monitored at one upstream and two downstream sites. Contaminants are now non-detectable in Bean Creek. According to the State of California Geotracker web site, this site continues to be open with remediation and monitoring continuing.

3.14.3 Significance

The existing County system is used to report and clean-up traffic accident and other surface spills. Notification of the downstream water user is part of the response process although it is inconsistent and City staff made efforts to improve notification. Remediation occurred at all four groundwater contamination sites and resulted in a lessening of the contaminant levels seeped to the river at three sites, and possibly at the fourth.

3.15 Geologic Hazards

The two main geologic hazards affecting the quality of drinking water in the study area are earthquakes and landslides. These, along with other infrequent or less challenging geologic hazards, are discussed in this section.

3.15.1 Seismic Events

Few areas of the state are as familiar with the effects of an earthquake on public water supply systems as Santa Cruz County. Santa Cruz County purveyors had to repair a substantial number of emergency main breaks and re-sanitize their distribution systems in the days immediately following the 1989 Loma Prieta event. Observed or potential effects on water supply sources include:

Significant changes in the flow of springs — While springflows have been stable in recent years, the yield of Liddell Spring reportedly increased to about 8 to 10 mgd for two months following the October 17, 1989 earthquake and returned to normal, less than 2 mgd, in March 1990. The yield of the nearby quarry spring is reported to have doubled. Many other streams and springs in the region reported similar responses.

Source water quality may change — The mineral quality of most of the northern San Lorenzo tributaries changed noticeably following the 1989 event, and seem to be gradually returning to

pre-event conditions. The bacterial pathogen levels of any of the surface sources can potentially change as surface soils and debris are dislodged and enter the stream system. This is particularly a risk with the sources emanating from karstic watersheds. Also, soils and surficial debris can be dislodged by seiches (waves in lakes generated by earthquakes or landslides) and enter Loch Lomond.

Constituent release from reservoir-bottom sediments — While not reported after the 1989 earthquake, other earthquakes could potentially cause the release of gases, pathogens, and oily substances, all of which were observed in Searsville Lake near Palo Alto following the 1906 earthquake (Lawson and others, 1908).

3.15.2 Significance

Seismic events are a significant potential source of contamination and structural damage to existing water supply systems throughout the project area. The ability of treatment plants to anticipate and respond to damage to their own facilities, while also responding to fluctuating water quality and quantity, is a critical factor in the overall management of drinking water in the project area.

3.15.3 Landslides and Other Major Slope Instabilities

Landslides are prevalent throughout the Santa Cruz Mountains, and particularly in the San Lorenzo Valley. Nonetheless, the City and other purveyors have been quite successful in maintaining continuity of service and in avoiding the elevated turbidity and other water quality problems associated with landslides upstream of water intakes. This record reflects, in part, an awareness of the chronic landslide hazard which prevails throughout the subject watershed, and the judgment of senior staff of the purveyors in avoiding water sources which are especially prone to landslides. Large slope instabilities, including landslides, do occur periodically within the subject watersheds, and are expected to keep recurring. Landslides constrain local water systems well beyond concerns over turbidity. Sediment entering the channels limits habitat values that can result in regulatory burdens including need for greater in-stream flow, change in release timing, and other water agency action that can limit water availability in the long-term.

For example, the sandy material which has been entering Bean Creek since the 1960s from the Mount Hermon slide does not appear to elevate turbidities either at the Felton Diversion or at San Lorenzo River Intake at low flows, although the sandy sediment does complicate and add to the cost of diversions and causes other critical environmental damage. The Newell Creek Pipeline, which crosses a landslide at Brackney is slated for rehabilitation as loss of the pipeline could limit use of Loch Lomond water which would result in reliance on lower quality water from Tait Street Diversion. Hence, landslides might be seen as constraining water supplies both when (and just after) they occur as well as during the subsequent period when habitat is impaired downstream – generally the following spring and summer, when water may not be divertible because it is needed to sustain sufficient habitat.

During the past several decades, there have been a number of very large landslides along nearby streams in settings similar to those which prevail near certain intakes. In addition to the Mount Hermon slide, and Bean Creek slides in general, two examples are:

Baldwin Creek — A very large rock fall completely dammed and impounded Baldwin Creek. Based on observations made by project staff in 1968, the rockfall may have occurred during the prior 10 or 20 years. The setting in which this rockfall occurred is very similar geologically to those found near the Majors Creek intake and along Laguna Creek downstream of the intake.

Love Creek Landslide — In January 1982, a landslide occurred in moderately dipping fractured Monterey shales, such as occur upstream of a number of other areas west of Highway 9 between San Lorenzo Valley High School and Boulder Creek.

While no major landslides have occurred in the watershed since the 2018 Sanitary Survey, landslides remain a concern after wildfire events like the CZU fire especially if they are followed by significant winter rainfall events.

3.15.4 Weather-related Events

Occasional major windstorms or snow falls can introduce a very large amount of organic debris to the watersheds upstream of the intakes. For example, a snowstorm during the first week of January 1974 broke off an astounding number of branches, mainly of oaks and other hardwoods, many of which fell directly into the stream system and decomposed in place. Access to intakes was greatly inhibited for a period of several days to a week or longer.

A series of small to moderate landslides occurred during the winter storms of 2017, greatly impacting the watershed lands and facilities of City and SLVWD. The combination of several years of drought followed by extremely wet conditions with many severe storms with heavy rainfall seemed to produce optimum conditions for landslides and slope failures that significantly impacted diversions, pipelines, and treatment facilities. With the region experiencing longer and more intense wildfires, potential for debris slides due to the fires is now a bigger concern for the agencies. For example, a debris flow occurred at SLVWD's Foreman Creek diversion that required almost two weeks to clear to return to service.

3.15.5 Significance

Landslide and slope failures are common occurrences in the Santa Cruz Mountains. The greatest potential impact is at points of diversion and immediately upstream. Major landslides may occur as a result of seismic activity and/or rainfall throughout the subject watersheds and it can be difficult to differentiate weather related impacts from landslides as they often occur in similar time periods. Damage to intakes, pipelines and stream channels in their vicinities may render such facilities inoperable from a period of days to several weeks. In the case of several smaller purveyors, such an occurrence could prevent the delivery of treated surface water to their service areas.

3.16 Wildfires

CalFire is responsible for fire suppression and management in State Responsibility Areas (SRAs) and the Santa Cruz County Fire jurisdiction. Outside of SRAs, local governments typically have jurisdiction, e.g., fire districts in Boulder Creek, Felton, Ben Lomond, Zayante, and Scotts Valley. Since the last watershed survey, there has one been major wildfire, the CZU Lightning Complex Fire (86,509 acres). In August 2020, the CZU Fire burned almost 20 percent

of the San Lorenzo River watershed including over 75% of the SLVWD owned watersheds. The fire also burned the headwaters and upper reaches of the North Coast watersheds with the majority of impact to the Laguna watershed and recharge area of the Liddell watershed with some fire activity in the Majors Creek headwaters. The fire resulted in damage to vegetation, structures, vehicles, and infrastructure.

As discussed in the 2013 and 2018 surveys, the CalFire San Mateo-Santa Cruz Unit, RCD for San Mateo County, and Santa Cruz County developed the Community Wildfire Protection Plan (CWPP), a strategic plan identifying risks and hazards associated with wildland fires in the wildland urban interface (WUI) based on input from local stakeholders and the general public and adopted by the Board of Supervisors for both counties (CALFIRE and others, 2021). The plan identifies some critical resources such as Lexington Reservoir but omits Loch Lomond, while identifying the firebreak at Loch Lomond, and makes recommendations aimed at preventing and reducing both infrastructure and ecosystem damage associated with wildland fires. It was updated in 2021.

Fuel reduction projects identified in the CWPP receive priority for federal funds. The funding is made available primarily through the California Fire Safe Council's grant clearinghouse. The Fire Safe Council (FSC) provides resources for local communities to form their own FSC. Since 2008, the Soquel, South Skyline, and Bonny Doon FSCs have formed, each of which has submitted roadside and neighborhood shaded fuel breaks project proposals to the CWPP. In addition, a county-wide FSC was formed in 2017 in order to ensure that prevention services can be provided county-wide. Fire management in the region is primarily done on a small-scale, working with FSCs and landowners on projects to reduce fuels and create defensible space. The City is developing a wildfire resiliency plan for the water infrastructure that includes consideration of vegetation management, facility hardening, access and emergency response. In addition, the City is actively creating/maintaining fuel breaks and coordinating with fire agency's regarding City properties as well as with neighboring property owners.

3.16.1 San Lorenzo River Watershed

The San Lorenzo watershed contains substantial areas of fire-adapted vegetation, reported to burn at historical intervals of typically 40 to 80 years (Hecht and Kittleson, 1998). Several fires occurred in the 1930s and 1940s, with a large fire known as the Sawmill Fire in the 1950s. One other fire of note was the Love Creek fire in 1970. Numerous small fires occur every year, including the Bear Fire near Boulder Creek in October 2017 yet in total, they have not had much impact on reducing total fuel load. The approximately 400-acre Bear Fire is suspected to be a consequence of a lack of code enforcement creating an environment where fire could easily spread in a rural area. City fire was part of mutual aid for the Bear Fire and specifically asked for a fire line to be developed to keep it away from Loch Lomond Reservoir. As experienced in 2020 with the CZU fire, the potential for other large-scale fires with multi-year consequences for water supply remains which could be exacerbated by sudden oak death syndrome as well as vegetation stressed by drought and historic forest management that has resulted in overstocked, second-growth forest stands.

Communities in the San Lorenzo River watershed are impacted by wildfires, which results in incinerated cars, homes, and industrial buildings that contain chemicals, computers, electronics, plastics, paint, and other items that leave behind chemicals and heavy metals. Additionally, the

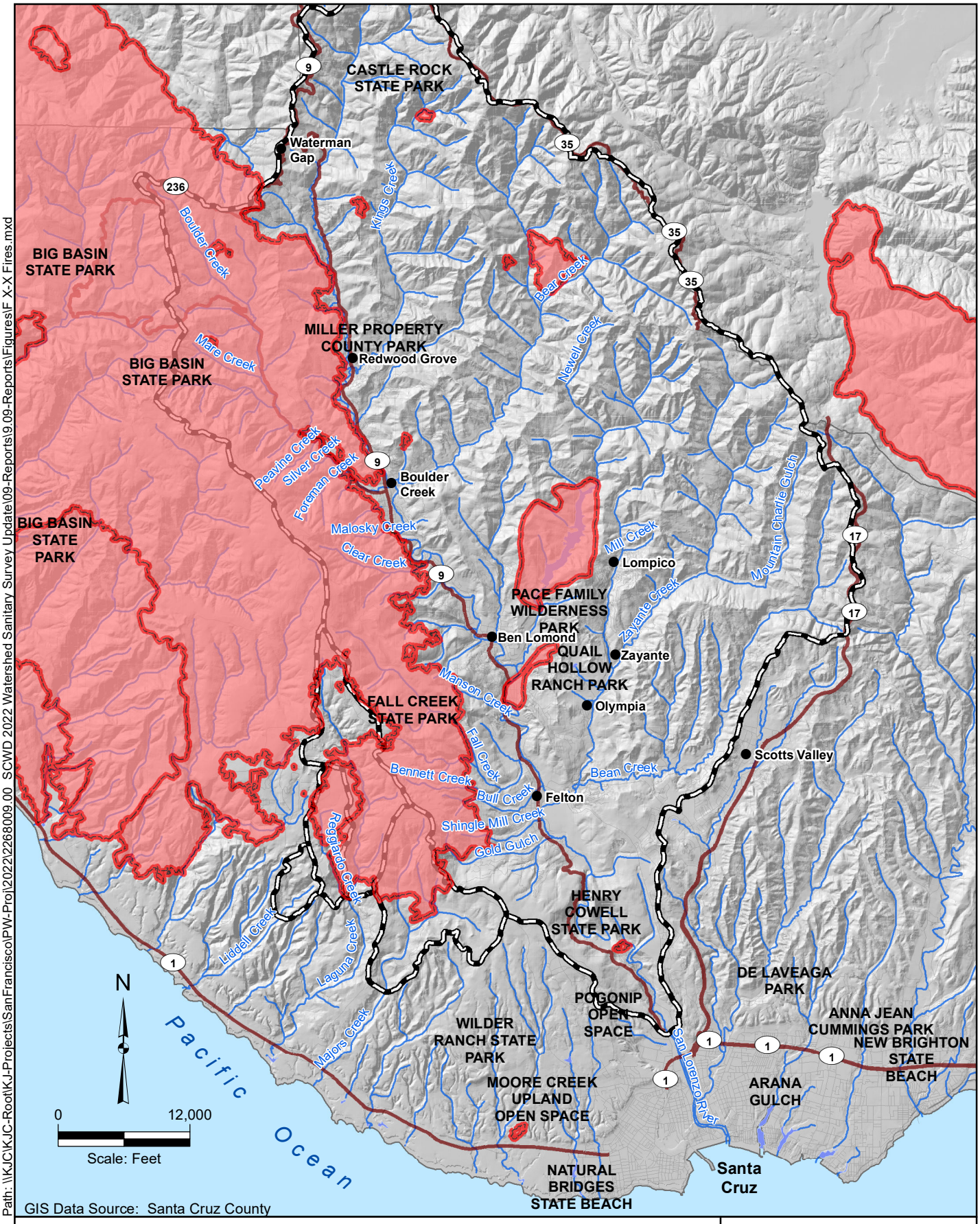
San Lorenzo River watershed has septic systems that, if damaged by fires, may increase the microbial load in the San Lorenzo River. Runoff from burned areas and may contain ash, nitrates, phosphate, chemicals, organic carbon, sediment, metals, and suspended solids that may enter source water during winter storms.

Potential increases in nutrient levels downstream of the City's intake following a fire may also lead to increased algae growth. During the summer, water levels in the San Lorenzo Lagoon have been observed to occasionally back up to the Tait Street Diversion which is currently being evaluated with respect to sea level rise and the need for a lagoon control structure. Thus, algae growth downstream of the Tait Street Diversion should be monitored during the summer and especially following a fire event.

3.16.2 Loch Lomond Reservoir and the Upper Newell Creek watershed

The City has taken several steps to address fire hazards within Loch Lomond and other watersheds that may fill gaps in the CWPP. The City has a draft fire plan for watershed properties and routinely meets with fire chiefs to review maps, keys, gates, and field conditions, ensuring access to City watershed property for fire suppression and minimizing wildfire hazards. Additionally, the Ben Lomond/Lompico fuel break was expanded in 2016 and plans made to improve the Loch Lomond/Love Creek fuel break in 2018. Maintenance of fuel breaks including cutting brush and removing dead trees occurs as needed in the winter; with periodically more intensive fuel management efforts also occurring. (G. Eidam, personal communication, 2022) Most recently, City partnered with local fire agencies to pilot the use of a remote-controlled masticator – which has vastly improved the ability to maintain fuel breaks around Loch Lomond. Additionally, City renewed use of glyphosate on a limited basis to facilitate ladder fuel reduction. Finally, City is currently considering more active forest management relative to fire resiliency and overall restoration goals.

The upper watershed of Newell Creek was not directly impacted by the CZU Lightning Complex fire, however, any large fire event in the vicinity may have significant effects due to ash and smoke particles settling on the reservoir surface and into surrounding soils. These particles may contain nutrients and organic carbon that may contribute to increased algae blooms during the summer months, or flow into Loch Lomond Reservoir during high flow winter storms.



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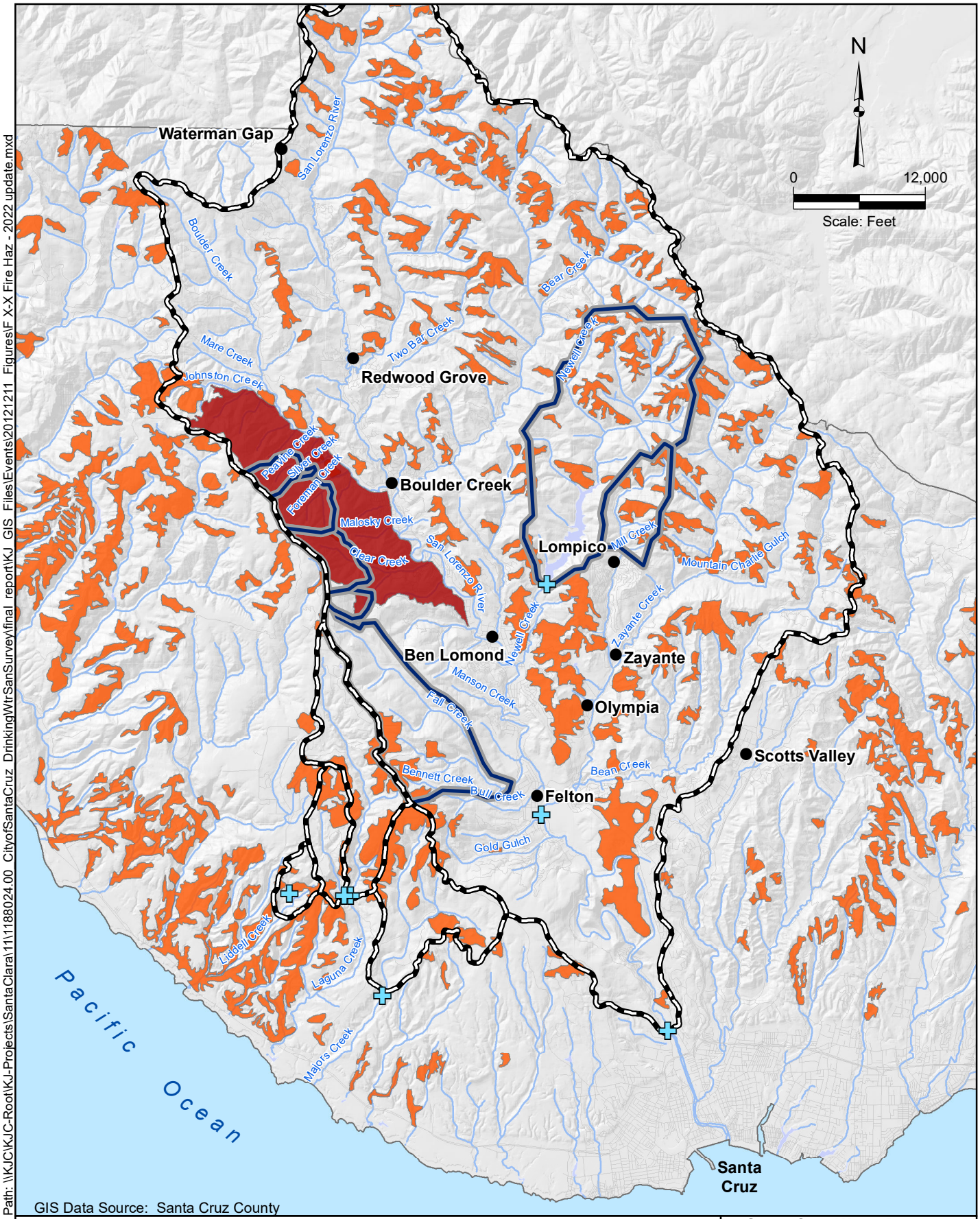
Santa Cruz Water Department
WSS Update

Figure 3-4:
Historic Fire Perimeters



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Santa Cruz Water Department
WSS Update

Figure 3-5: Fire Hazard Areas

3.16.3 North Coast Watersheds

Brushfires in the North Coast watersheds have occurred periodically, both by human sources (i.e., arson, prescribed burns) and lightning fires. The 2008 Martin Fire was predominantly fuel-driven, and March through June rainfall amounts were the lowest ever recorded for the area, about eight percent of normal (Gordon and Ferreira, 2009). Since the fire, the Reggiardo Creek crossing has been completed, a new fuel break in Bonny Doon was completed in cooperation with CalFire in 2016.

The primary potential effects to North Coast watershed sources from the CZU Lightning Complex Fire include runoff from burned areas that contains ash, chemicals, organic carbon, sediment, metals, and suspended solids. These contaminants accumulate on the ground and in soils following fire events, and can get washed into source water during winter storm events. The Majors and Laguna Creek watersheds were particularly vulnerable to runoff from the CZU Lightning Complex Fire, as there were multiple residential structures burned in the Majors Creek watershed, and fire lines were immediately adjacent and upstream of the City's Laguna Creek intake. While there are potential impacts to water quality in Majors and Laguna Creek, given the land use in these areas combined with cleanup efforts by the EPA and land management assistance to private owners by the Santa Cruz County Resource Conservation District, it is not expected that post-fire residential and industrial runoff will be as much a concern as in the Laguna Creek watershed.

3.16.4 SLVWD

The CZU Lightning Complex Fire of 2020 followed major wildfires in 2008, 2009, 2016 and 2017 which resulted in large areas of fire-adapted vegetation that typically would burn every 40-80 years. The CZU Lightning Complex Fire directly impacted over 75% the SLVWD-owned lands including sub-watershed lands of Foreman, Peavine, Sweetwater and Clear Creeks damaging 7.5 miles of raw water supply lines from those creeks as well as other water distribution infrastructure. Private and SCWD-owned watershed lands and residential neighborhoods upstream of SCWD diversions on Majors and Laguna creeks were also impacted. The CZU Lightning Complex Fire resulted in the evacuation of the entire SLVWD service area and resulted in immediate and potential delayed vegetation mortality, hazard trees, and created potential erosion issues upstream of SLVWD and SCWD diversions and infrastructure.

Higher fuel loads along with the impacts of climate change increase the likelihood of catastrophic fire in the future. While the CZU Lightning Complex Fire reduced some of these fuel loads there are still many areas on SLVWD, SCWD, and private watershed lands that are susceptible. The CZU fire also caused canopy loss and decreased competition in the watershed allowing invasive vegetation species to establish in previously undisturbed areas. A lack of native vegetation on hillsides can lead to increased erosion and sediment loads in local waterways. Although water sampling has not found contamination in SLVWD and SCWD water supply, the threat of contamination from burned homes, cars, and other infrastructure exist. The Foreman Creek & Peavine Creek sub-watersheds were particularly vulnerable to runoff after the CZU Lightning Complex Fire, as residential homes lost in the fire were directly upstream of both diversion structures. However, as mentioned in section 3.16.3, cleanup efforts by the EPA and land management assistance to private owners by the Santa Cruz County Resource

Conservation District, in coordination with SLVWD and SCWD, risk of post-fire residential and industrial runoff was significantly decreased.

The SLVWD and SCWD are taking steps to mitigate the impacts of fire on their respective watershed lands, the SCWD district service area, and their source water watersheds as a whole. The District's Watershed Management Plan Part II outlines various objectives aimed at gaining a better understanding of the future threat of wildfire while minimizing impacts from past burns. These objectives include reducing the risk of wildfire, managing fire fuels, reducing the potential of infrastructure fire ignitions, coordinating and monitoring fire management, and reducing the risk of post-fire impacts. The SLVWD is already taking steps to implement these objectives by adopting a Post-fire Recovery, Critical Asset Hardening, Vegetation, and Fuels Management Plan (2021). This plan has led to fuel reduction grants and the SLVWD securing contracted bi-annual vegetation management work in and around critical infrastructure on its lands.

3.16.5 Significance

There are three issues related to fire in the subject watershed.

First and foremost, the absence of wildfire increases the chance of a major event which could seriously alter surface hydrology and sedimentation in any or all subject water supply streams. Elevated levels of turbidity are likely to persist from several months to several years following an extensive fire. Because turbidities persist much longer in reservoirs than in springs or run-of-the-stream diversions, post-fire turbidity persistence may prove to be more challenging for the City, which draws heavily upon Loch Lomond Reservoir during the summer and occasionally during the winter. Experience with major floods or fires has shown that reservoirs of similar size can remain turbid throughout the summer (or two) following an extensive burn or other disruptive event. Wildfires can also result in increased Total Organic Carbon which contribute to disinfection by product issues.

Second, fire suppression activities include creation of temporary roads and firebreaks that can be a source of persistent sedimentation and turbidity if not properly managed following fire events. Following the CZU Fire, the City commissioned the RCD to assist in implementing measures to prevent runoff from burned houses, especially in the karst areas. Recent philosophies with post fire restoration has avoided traditional reseeding of burned slopes and mulching exposed soils because of changes to the vegetation community that result in reduced biodiversity and potential for a more fire prone landscape in the future. Therefore, the use of erosion control techniques is balanced against the potential for significant erosion to occur following a wildfire.

Third, fire retardants can have adverse effects on water quality. Historically, retardants used by Cal Fire have included borate salts and bentonite clay in water. Borate salts are long lasting, but they are also phytotoxic and soil sterilants. Bentonite clay is less persistent. Use then shifted to ammonium-based fire retardants, which as a group accounted for nearly all chemical retardants used to control wildland fires. The retardant now used by CalFire is Phos-Chek, which is a dry powder made of diammonium sulfate and ammonium phosphate that gets mixed with non-potable water at the air attack base (Hollister, San Andreas, or Sonoma) and then dropped by fixed-wing airplanes along ridgelines or other control points to retard the fire from spreading. If the retardant is applied directly to stream surfaces, it may cause fish mortalities (Buhl and

Hamilton, 1998) by depleting oxygen and alter aquatic conditions by elevating phosphorus and causing eutrophication downstream (Camp and others, 1996). However, CalFire avoids drops along water courses. Phos-Check retardant was not used in response to the CZU Lightning Complex Fire in the San Lorenzo River watershed.

Fire suppressant foams applied by fire trucks and helicopters may have adverse impacts on water quality, and are more toxic to aquatic biota than the ammonium-based fire retardants (Gaikowski and others, 1996). Application requires leaving a buffer between the spray zone and live streams. Studies by the US Forest Service have shown that the water quality impacts of these materials vary with three elements: the characteristics of the application (i.e., how much dropped and where), the characteristics of the site (steepness, vegetation types, extent of riparian stream cover), and the characteristics of streamflow (higher, turbulent flows result in better mixing, dilution, and reduced toxicity to aquatic life). In general, adverse water quality impacts decrease as the distance of application from a stream increases. In response to the changing fire climate, there has been an emerging push by companies to sell rooftop and other retardant-based home defense systems. These retardants typically use the same foam to put out fires, with a similar chemical makeup as commercial retardants. The City is actively monitoring these trends and working closely with the County and State to ensure adequate reporting and to keep up with updated regulations to protect source water quality.

The inevitability of a major wildfire has been echoed by state, county, and local natural resource managers. When a major fire does occur, water resources may suffer immediately and significantly as homes, roads and infrastructure are rebuilt. In subsequent years, the water utilities will likely see a decrease in turbidity and sedimentation, as vegetation becomes re-established and reconstruction activity decreases. Hulda McLean, a former County supervisor and owner of Rancho Los Osos in lower Waddell Creek, emphasized the importance of turbidity persistence after the 1948 Pine Mountain fire by noting that it took five years before Waddell Creek ran clear at any time during the winter months – a lesson on the effects of a watershed-scale fire (Hecht and others, 2010).

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Section 4 Watershed Management and Control Practices

4.1 Introduction

This section summarizes existing policies and control measures of the various entities which manage, control or influence land and resource use in the San Lorenzo and North Coast watersheds. The control measures discussed in this section are those watershed management practices that may impact water quality of the San Lorenzo River and its tributaries, as well as the City's water supply on the North Coast.

The following sub-sections, which in large part follow the structure of the AWWA *Watershed Sanitary Survey Guidance Manual*, are included in Section 4:

- Water Utility Management Practices
- Inspection and Surveillance of the Watersheds
- Key County Watershed Management Activities
- Watershed Control Authority
- Open Space Policies
- Erosion Control/Soil Management Policies
- Fire Management
- Santa Cruz County Riparian Corridor and Wetlands Protection Ordinance
- Pertinent State and Federal Legislation

Sub-sections of this chapter continue to evolve with the completion of each survey update but the chapter generally maintains the organization dictated by the AWWA manual referenced above. The details of several sub-sections have not changed since the previous reports and are thus only summarized in the present sanitary survey. Table 4-1 lists the general policies and practices that impact water quality in the project study area and summarizes their effectiveness. Generally, while there appears to be a comprehensive group of regulations, policies, and practices in place that can be used to manage watershed activities, more active input by the City as proposed in Section 6 could improve the effectiveness of these activities, especially in light of legalization of cannabis cultivation activities and associated state and local regulations.

Table 4-1: Updated Summary of Policies and Practices Which Impact Water Quality

Agency/Utility	Primary Watershed Objective	Policies or Controls Which Impact Water Quality	Effectiveness of Policies and Practices
Water Utilities – notably City of Santa Cruz Water Department and San Lorenzo Valley Water District	Protect drinking water supply. Protect water quality of drinking water sources and manage to minimize quality change. Manage to avoid microbiological and chemical contamination. Manage drinking water source areas for environmental quality.	Control or disallow public access to watershed lands. Manage secure intake structures. Implementation and growth of the City Watershed program. Advocacy and environmental review of proposed projects in. source watersheds. Conservation easements or licenses on private lands.	City Watershed program is resulting in the collection of valuable data which are used to plan for more effective lands management. Continued success in working with other agencies/groups on projects which enhance water quality protection measures including the multiagency efforts to improve the river and includes the Riparian Conservation Program to improve stream conditions in the County jurisdiction. Increased patrolling of source facilities is helping to minimize impacts associated with trespassing and illicit land use.
Santa Cruz County (e.g., Parks, Health Services Agency, Planning Department)	General Plan established a regulatory approach to plan future development. Regulate septic systems through LAMP. Protect riparian and wetland systems. Regulate erosion control practices. Regulate small water systems. Regulate cannabis cultivation Provides for open space access.	County General Plan. Ordinances for cannabis cultivation, erosion control, water quality control, riparian corridor/wetlands protection, sensitive habitat Surveillance of parks. Control illegal or mis-implemented grading, development and dumping. Reduce nitrates, pathogens, and sediment in streams. San Lorenzo River Watershed management plan. County Forest Practice Rules. Wastewater/Nitrate management plan.	Cannabis cultivation regulations Grading/erosion control ordinance can be too cumbersome to small homeowners or small projects. Exceptions to ordinances often granted and enforcement is limited. San Lorenzo River Watershed Management Plan was well thought out and presents tangible recommendations for betterment of water quality that could be revisited. Turbidity, nitrate, and pathogen monitoring in support of the 303(d) impairment listing is providing needed data to track trends and responses to implemented projects. Insufficient staffing has been exacerbated by budget cuts.
California Dept. of Forestry and Fire Protection (Cal Fire)	Suppress wildland fires (fire protection division). Control logging (resource management division). Fire preparedness	Prescribed burning to minimize impact of larger fires. Require Timber Harvest Plans for logging of more than 3 acres. Fuel management Monitor and enforce forest practice rules. Coordinate fire-fighting efforts.	Several wildfires have occurred in the area in 2008, 2009, 2017, and 2020 as discussed in Section 3.16. Excessive fuel levels and substantial urban/rural interface area could result in severe wildfire. Harvest Plans are comprehensive, though follow through, especially in critical years after the plan period to confirm that measures are maintained is often not sufficient. Some harvests cause roadway erosion. Timber harvest plan rules provide provisions for water quality protection.
California State Water	Adopt area-wide water quality	Enforcement power to issue	Regional Board is coordinating with County's efforts to reduce

Agency/Utility	Primary Watershed Objective	Policies or Controls Which Impact Water Quality	Effectiveness of Policies and Practices
Resources Control Board and the Regional Water Quality Control Board - Central Coast Region (SWRCB and RWQCB)	control plans (Basin Plans). Control/coordinate water quality issues. Control quality and quantity of discharges from wastewater treatment facilities, stormwater, and construction activities.	permits with specific water quality requirements. Enforcement power of State Water Code. Issue NPDES permits to specific entities for waters-of-the-state discharges. Establish water quality objectives. Impaired Water Body listings and Pathogen, Nitrate and Sediment TMDL for San Lorenzo River. Provide some funding for septic tank system improvements. Administering Phase II NPDES and Construction Stormwater regulations.	nitrates. Approved nitrate TMDL and Sediment TMDL in 2000 and 2003, respectively. Pathogen TMDL approved in 2009 and chlorpyrifos TMDL in 2014. Implementing programs to emphasize watershed protection from both point and non-point discharges. Regional Board was more active in the review of Timber Harvest Plans and attendance pre harvest inspections from a water quality perspective in the years prior to 2007 but activity appears to have declined in recent years. Implementation of Stormwater Management Plan by RWQCB for county and cities under Phase II NPDES permit
California Department of Fish and Wildlife (CDFW)	Protect fish and wildlife. Permit diversions from waterways.	Enforcement power of state code. Limit diversions from waterways. 1600 permits require CEQA review. Fisheries Restoration Grants Program is viable mechanism for drinking water source protection.	CDFW has specific regulations to control water quality that have been applied to homeless encampments along the riparian corridor. CDFW requires issuance of Section 1600 lake and streambed alteration agreement (LSA) or verification that LSA is not needed prior to the Department of Cannabis Cultivation issues an annual permit.;
Caltrans and County Public Works	Construct and maintain primary and secondary roadways. Respond to accidents and landslides. Design of drainage systems and in-stream habitat improvements	Minimize herbicide use. Avoid dumping debris into streams from roads projects. Quick response to chemical spills.	Storage, sidecast, and transfer of roadway debris can lead to increased sediment in streams. Endangered Species Act requirements may improve road practices. Implementing projects which improve in-stream salmonid habitat and riparian habitat in conjunction with roads projects.
National Marine Fisheries Services (NMFS or NOAA Fisheries) under US Department of Commerce	Protection-restoration of special status species (Coho Salmon and Steelhead Trout) in the San Lorenzo and North Coast watersheds.	Implement and enforce the Endangered Species Act (ESA).	City of Santa Cruz issued a final Operations and Maintenance HCP in 2021 for steelhead and coho to address ESA related issues related to operations of the City's water facilities. An Anadromous Salmond HCP is under preparation Sediment reduction which benefits listed salmonids will improve turbidity in raw water. Potential source loss from the North Coast surface sources through ESA compliance will result in a degradation of the City's raw water supply quality and limit production flexibility.

Agency/Utility	Primary Watershed Objective	Policies or Controls Which Impact Water Quality	Effectiveness of Policies and Practices
United States Fish and Wildlife Service (USFWS) under US Department of the Interior	Protection-restoration of special status species (Red-legged Frog, etc.) in the San Lorenzo and North Coast watersheds.	Implement and enforce the Endangered Species Act.	City of Santa Cruz is completed ESA related negotiations as a part of the City's 2021 Operations and Maintenance HCP

4.2 Water Utility Management Practices

The City, the SLVWD, the California Department of State Parks, Santa Cruz County Parks, and some private landowners of camps and timber properties are the largest watershed property managers in the project area as shown on Figure 2-1; however, several of the smaller water purveyors own and/or manage land adjacent to their wells, springs and surface water intakes. Watershed management practices vary for each utility agency. The City, for example, manages its lands to maintain optimal water quality and to limit recreation at the Loch Lomond Reservoir. SLVWD also manages its watershed lands, through administration of their Watershed Management Plan, to maintain optimal water quality, limit access, and minimize potential land disturbances.

4.2.1 Jurisdiction

The jurisdictional area of this sanitary survey is within Santa Cruz County. Within the sanitary survey watersheds, the City of Santa Cruz serves the Pasatiempo area with the majority of the City service area lying downstream of the Tait Street Diversion. The other water utilities participating in the Sanitary Survey are located in the San Lorenzo River watershed and are in unincorporated portions of Santa Cruz County, except for a portion of the middle Bean Creek watershed within the City of Scotts Valley. Most of the City of Scotts Valley drains to the San Lorenzo River via Carbonera Creek and Branciforte Creek, which flow into the San Lorenzo River below the City Tait Street Diversion. This portion of Scotts Valley shares most watershed management issues with the San Lorenzo Valley but was not part of the 2012 Watershed Sanitary Survey.

4.2.2 Watershed and Reservoir Management Practices

4.2.2.1 City of Santa Cruz Water Department

The City owns watershed land in the Newell Creek (2,880 acres), Zayante Creek (880 acres), and Laguna Creek (240 acres) watersheds.

The City has a Watershed Section comprised of the Water Resources Management and Recreation workgroups. The Section is responsible for the drinking water source protection, environmental regulatory compliance with applicable local, State and Federal regulations related to the source water watersheds, recreation area management and general natural resource management work that is an important part of drinking water source protection. While the City of Santa Cruz has a long history of proactive natural resource stewardship, watershed protection became an increasingly important part of the City's operations in the late 90s with the 1996 amendments to the Safe Drinking Water Act and the Endangered Species Act listings of several local species such as steelhead, coho and the California red-legged frog. Supporting what is primarily a surface water drinking water agency, the Watershed Section not only oversees operations of the City's nearly 4,000 acres of watershed lands, but also is an active stakeholder in management of the San Lorenzo, Laguna, Liddell and Majors watersheds – which comprise over 150 square miles of northern Santa Cruz County. The Section also occasionally engages in natural resource management planning beyond these limits to the extent that it supports the Department's mission. The Watershed Section coordinates the activities at Loch Lomond with the Water Resources Management staff focusing on outreach and the Recreation staff assisting

with interpretive events, watershed land patrols and watershed/creek sign programs. The City also retains a contract forester who is extensively involved in managing watershed lands.

The City of Santa Cruz has an existing Operations and Maintenance HCP finalized in January 2021 that permits covered activities (including but not limited to maintenance and rehabilitation of water supply and system facilities, operation and maintenance of municipal facilities, and management of City lands) provided that measures are taken for minimizing and mitigating adverse effects on covered species. The HCP lists the Ohlone tiger beetle, Mount Hermon June beetle, tidewater goby, Pacific lamprey, California red-legged frog, western pond turtle, Ben Lomond spineflower, Robust spineflower, Santa Cruz tarplant, and San Francisco popcornflower as covered species. This HCP includes minimum flow standards that have resulted in increased City reliance on Loch Lomond during the dry season and other times of the year when flows are reduced due to drought. City diversions are also currently conducted in alignment with a "Tolling Agreement" between City and the California of Department of Fish and Wildlife. Over the longer term, City diversions will be conducted in alignment with a more complex suite of conservation flows under the Anadromous Salmonid HCP that will result in additional reliance on Loch Lomond and groundwater, and overall increased use of winter water from the San Lorenzo River. This change in City operations will increase supply reliability and enable provision of conservation flows for special-status species in its source watersheds.

In 2012, a recreation area study to expand recreation at Loch Lomond was conducted; however, CalFire indicated that additional recreation is not advised because of the increased risk of fire and the inability to respond quickly. The City has conducted a watershed lands assessment of natural resources in order to make more informed decisions regarding management of watershed lands for water quality and quantity protection and protection of special status species and their habitats. Recreation activities include Loch Walks and Newell Jewell boat tours to increase watershed-related environmental literacy of local stakeholders and park visitors while educational outreach programs are presented to the San Lorenzo Valley, Bonny Doon and City schools. In addition, the City partnered with the Santa Cruz RCD in a program for watershed identification and signage at creek crossings.

The LLRRA is managed for water quality as well as recreational benefits. One of the most significant reservoir practices is management of blue-green algae (cyanobacteria) blooms at Loch Lomond Reservoir through the use of GreenClean a non-copper-based algaecide as discussed in Section 3.7.3. However, under Water Quality Order No. 2013-002-DWQ, General Permit No. CAG990005, the State Water Resources Control Board grants agencies like the City of Santa Cruz an exception for the use of copper-based algaecides, if the need arises. In addition to blue-green algae management which is important to minimizing HAB, wastewater is trucked out of the recreation area, human body contact recreation is not allowed at the reservoir, and no cattle or horses are permitted in the watershed.

4.2.2.2 San Lorenzo Valley Water District

The SLVWD service boundaries encompass 37,120 acres in the San Lorenzo Valley watershed, including a small portion of the Pescadero drainage which is northwest of the San Lorenzo River watershed. Watershed lands owned by the SLVWD include approximately 1,623 acres in one continuous piece on Ben Lomond Mountain, around the tributaries of the San Lorenzo River that supply the SLVWD's surface water (Clear Creek, Sweetwater Creek, Peavine Creek, Foreman Creek, and Silver Creek), and in the Malosky Creek and Harmon Creek drainages. The SLVWD

also owns approximately 163 acres in the recharge area of its Olympia wellfield. Marked trails on these watershed areas are used by horse riders. SLVWD now has some deeded riparian lands from nearby private land owners on Lompico Creek that will not be developable and could protect Lompico Creek if it is used as a source in the future. In early 2012, SLVWD initiated a formal agreement with the Santa Cruz Land Trust to provide patrol service. The primary concerns continue to focus on trespassers and off-road vehicles. Public access is limited.

Timber harvesting continues to not be permitted on SLVWD watershed lands. No pesticide/herbicide use is permitted on SLVWD lands.

Watershed Lands Acquisition

The SLVWD purchased the 188-acre Malosky Creek property from Sempervirens Fund in 2006. This property had been on the District's list of most wanted watershed acquisitions for years. The District's 5-mile long pipeline crosses the property. As part of the transaction, the SLVWD agreed to retire the timber rights on the property. The SLVWD has had a no-commercial logging policy on its watershed lands since the 1980s, which is still in effect.

SLVWD acquired the Felton Water System from California-American Water Company in 2008 which also included about 252 acres in the Fall Creek watershed that supply the Felton water system. The 2016 acquisition of LCWD included about 500 acres of Lompico Creek watershed lands.

In addition, as discussed in the Executive Summary, the acquisition of the 8,532 acres of CEMEX lands on the North Coast watersheds by a number of land preservation organization has resulted in the potential for protection of habitat and water quality, particularly for the community of Davenport but, with additional public access, could increase the risk of fire and resulting water quality challenges. Future activities to acquire lands and easements to protect water quality are discussed in Section 6.

4.3 Inspection and Surveillance of the Watersheds

Inspection and surveillance of watershed lands in the project area are performed by numerous agencies, depending on ownership and type of use. For example, State Parks regulations are enforced by Parks staff. County Parks, like Quail Hollow County Park (about 300 acres), are managed by County Parks personnel. The water purveyors themselves conduct surveillance of the purveyor-owned watershed lands. In addition, the City staff has advocated for increased patrols in the areas adjacent to San Lorenzo River with no granted public access. Camping is not permitted in these areas, and patrols are conducted to remove any unauthorized campers, especially during the fire season. The City has also entered into agreements with private landowners in riparian areas to allow patrolling, which has expanded the ability to monitor and control activities on private lands upstream of the City's Tait Street Diversion. Efforts to prioritize limited patrol resources towards water quality remain a challenge. The remainder of the project area not under City, SLVWD, or State parks jurisdiction is regulated by Santa Cruz County and/or state agencies, but does not involve regular monitoring. All monitoring by the County is subject to provisions in the County Code.

Within the Loch Lomond subwatershed, the City has instituted a comprehensive security program that includes installing cameras with motion sensors and infrared capability, with photos downloaded on a regular basis. There are fences and gates installed at the Newell Creek Dam, and a majority of the City's land ownership has limited access. As of 2022, there are 5 full-time Rangers, one of whom lives at Loch Lomond, along with 2 full time Ranger Assistants, and 2 seasonal Ranger Assistants. The Ranger and Ranger Assistants conduct patrols by truck, all-terrain vehicle or on foot with a focus on high use and critical infrastructure areas.

The County of Santa Cruz's Planning Department, Health Services Agency, and Department of Public Works develop and enforce water-quality related county ordinances and provide review of development plans, timber harvest plans, erosion control plans, quarry plans, and maintenance of county roads. The Santa Cruz County Fire Department, CalFire and other local fire agencies participate in the development of fire-related development standards and post-fire restorations efforts, in addition to the review and updating of the countywide Disaster Contingency Plan and Critical Fire Hazard Maps, which is typically handled by the Office of Emergency Services (OES). Inspection and enforcement of codes and regulations is hampered by a lack of resources and prioritization at the local, state and federal level.

4.4 Key County Watershed Management Activities

As previously mentioned, Santa Cruz County developed a comprehensive management plan for the San Lorenzo River watershed in 1979. The San Lorenzo River Watershed Management Plan was updated in 2001 through a collaborative process with the Regional Board, a citizen and landowner group, and other agencies. The ongoing efforts by the County and the completed update to the watershed management plan underscore the continued efforts of the County to implement practices, programs and ordinances which aim to improve water quality in the San Lorenzo River watershed. Pertinent efforts and data from those efforts will be used for the purposes of this report to summarize water quality and watershed management activities in the San Lorenzo River watershed.

4.5 Watershed Control Authority

Policies and control measures adopted by governmental agencies are described in this subsection. All the watersheds in this area are located in Santa Cruz County, and are therefore subject to the policies adopted by the County *General Plan*. Key goals and policies outlined in the *General Plan* are described below.

4.5.1 The County General Plan and the Local Coastal Program

The *1994 Santa Cruz County General Plan* and the *Local Coastal Program (LCP)* is a combined planning document that serves two primary purposes. First, it establishes a regulatory framework against which all proposed development is measured. Second, it serves as a vision statement for the desired future of the county. The *General Plan* was prepared to meet the requirements of both the State Planning Laws and the Coastal Act and some sections have been updated as described below.

The *General Plan* sets up numerous goals, objectives, policies, and programs related to the protection of water resources and sensitive habitats. The County adopted an *ecosystem* approach while drafting ordinances pertinent to water quality concerns. In other words, there is a clear understanding that by preserving and enhancing the natural systems of the county, a secure and safe drinking water supply will most likely be obtained. *General Plan* elements that contain goals most pertinent to the protection of water resources are as follows: Chapter 5 – Conservation and Open Space, Chapter 6 – Public Safety and Noise, and Chapter 7 – Parks Recreation and Public Facilities. The *General Plan* Conservation and Open Space, Public Safety, and Parks and Recreation and Public Facilities elements have not been updated since 1994. The Housing element was updated in 2015, and the Noise, Land Use, and Circulation elements were updated in 2020.

As part of the Sustainability Policy and Regulatory Update of the County's General Plan/ LCP, the County published a draft Environmental Impact Report (EIR) in April 2022. The broad sustainability goals of this update include incorporating a new planning horizon for population, housing, and employment growth; ensuring compatibility with land use and transportation planning principles that support reduction of greenhouse gas emissions, updating County Code permit procedures and so on. The City continues to advocate for more focus on karst protection, riparian incentive programs, and coordination to develop riparian mitigation banks through the County's planning processes.

4.5.2 Wastewater Discharge

Wastewater discharge requirements for point source discharges from wastewater treatment plants or from industrial facility plants directly to receiving streams are established through NPDES permits administered by the Regional Board under the federal Clean Water Act. These NPDES permits control the discharge by establishing numerical effluent limitations for specific constituents and parameters which the treatment plant or industrial facility must meet. The constituents for which effluent limitations are established are specific to the type of discharge. Suspended solids and coliform bacteria may be regulated, depending on the type of plant or facility. Each NPDES permittee collects data which it reports to the Regional Board on a regular basis. This self-monitoring data demonstrates compliance status with the specific effluent limitations.

Wastewater discharges to septic systems are regulated by the County within guidelines established by the Regional Board. Although no changes have been made to the County Sewage Disposal Ordinance, policies have been adopted to provide for tighter oversight and maintenance of alternative technology systems. In addition, a State-revolving fund was historically used to promote the use of such systems through a low-interest loan program. However, while this specific loan program is no longer available, funding for wastewater projects are often available from the State of California.

The SWRCB adopted state-wide Onsite Wastewater Treatment (septic) policy in 2012 and renewed it in 2018, as required under AB 885, detailed in Section 4.9.2.4, will provide some strengthening of local septic regulations, particularly within the area 2,500 ft upstream from a surface water intake. The County currently has about 27,747 active OWTS systems and prepared a LAMP that was accepted by the RWQCB in October 2021; the LAMP is undergoing some revisions related to Point of Sale requirements prior to acceptance by the County. As a

result of housing pressures, the City has concerns that the septic systems are not properly inspected and repaired prior to construction of ADUs or use by new owners.

4.5.3 Stormwater Regulations

Municipalities with populations greater than 100,000 and certain classes of industries (including construction sites which involve a land disturbance of more than 1 acre) are regulated under the NPDES Phase I permit program administered by the Regional Board. Municipal permits are specific and individual to the municipality in question, but all contain provisions for management of specific activities (e.g., construction, new development planning, industries, illicit discharges, public agency activities such as street sweeping and public education) and for monitoring. Certain classes of industries are required to file a NOI to comply with the provisions of the State General Industrial Stormwater NPDES Phase I Permit. The industry makes this notification to the SWRCB and, thereafter, is expected to comply with the general permit provisions which focus on pollution prevention and good housekeeping measures. Construction sites with a land disturbance greater than 1 acre must file a NOI with the SWRCB to comply with provisions of the state General Construction Activities Stormwater NPDES (Order No. 2009-0009 DWQ). This permit focuses on sediment control and waste management. The SWRCB maintains a database of industries and construction sites which have filed NOIs.

The County of Santa Cruz and the City of Santa Cruz have each completed and submitted a complete Phase II NPDES application to the Regional Board, and the Regional Board approved the County's 2010 SWMP and the City's 2013 SWMP. The County is currently in the eighth year of a 5-year NPDES permit, and is awaiting renewal of permits by the SWRCB. The County and City both require construction phase and post-construction phase erosion control plans for construction projects encompassing an area of less than 1 acre and for which grading is part of the construction plan. The plans typically must include BMPs which protect against illegal discharge of pollutants to the creeks and streams in the project area. The Phase II regulations provide support for existing County and City ordinances which establish the criteria for protection of water quality and natural resources.

The County adopted its current Stormwater Management Program in 2010 that meets the established requirements of the statewide NPDES Permit and serves as the Stormwater Pollution Prevention Plan for the County and the City of Capitola. Related to the Stormwater Management Program, County Ordinance No. 5117 added Chapter 7.79 Runoff and Pollution Control to the Santa Cruz County Code in 2012. The City completed a Stormwater Management Plan Guidance Document in July 2013 and has included an Ordinance for Stormwater and Urban Runoff Pollution Control as part of the municipal code since 2003 with updates through 2012.

4.5.4 Mines and Quarries

Surface discharges from both active and inactive mines to receiving streams are regulated by the Regional Board under the Waste Discharge Requirement permit program. Permit conditions for discharges from active mines usually allow only inert or non-hazardous waste releases. Mines typically meet these requirements by implementing various best management practices.

Regulation of mine and quarry operations in the watershed study area is covered under the County Mining ordinance. Mineral Resource Areas are designated by the State Geologist and State Mining and Geology Board. The County classifies these areas as within the County Mineral Zone Extraction District (M-3) and requires environmentally sound quarry operations and reclamation practices in accordance with the state SMARA, which emphasizes the primacy of post-reclamation uses and the need to plan and limit mining to be compatible with such uses. Development on M-3 lands is restricted to mining and other compatible uses. Compliance with the California Environmental Quality Act (CEQA) for mining operations is required. Mining operations adjacent to riparian corridors must be conducted in accordance with the Riparian Corridor and Wetlands Protection ordinance. Quarry operations are overseen by the County Planning Department Quarry Coordinator. There have been no changes made to the County Mining Ordinance since completion of the 2018 Sanitary Survey.

4.5.5 Animal Keeping Regulations in Santa Cruz County

The County of Santa Cruz does not currently have a specific ordinance regulating domestic and confined animals in residential and rural areas. General animal keeping and breeding regulations, however, are outlined in the County Code under Chapter 6.10 (Regulation of Animal Breeding). The Article provides regulations for animal enclosures (stables and paddocks), care of animals (animal hospitals and kennels), animal keeping (horses, cows, sheep, etc.) different types of animal raising (family raising, poultry, bird, turkeys, etc.) and biomedical animal treatment standards.

4.5.6 Recreational Activities and Policies

Agencies which administer the recreational and open space areas in the watershed study area include the County Parks Department, the Boulder Creek Recreation and Park Department, the California Department of Parks and Recreation, and the City. Management policies in the City's Loch Lomond Recreation Area were previously described in Section 4.2.2. In addition, the City prepared a draft Parks Master Plan 2030 in September 2017, which was approved in 2020. The Parks Master Plan focuses on recreation opportunities inside the City limits while acknowledging opportunities within the County. One element of the Parks Master Plan is creation of a legal, supervised campground for homeless to deter sleeping in parks and along the San Lorenzo River. Other measures include increasing ranger patrols to help address safety issues, and adding new restrooms to the parks.

Overall, recreational policies and open space policies in the watershed are described in the County's *General Plan*. Since the *General Plan* has not been updated since 1994, recreational policies and open space policies have not changed since completion of the 1996 Sanitary Survey. It should be noted that County Parks Department initiated a Strategic Planning process in 2017.

The County Health Services Agency continues to routinely monitor creek and river swimming areas in the San Lorenzo Valley for fecal coliform bacteria. This monitoring is conducted to obtain information on when to issue advisories avoiding swimming areas, and is part of larger County-wide program. The State parks in the watershed study area are essentially open spaces. The County *General Plan* promotes cooperation with state activities and specifically encourages expansion of state ownership at the Fall Creek and Henry Cowell park units.

4.6 Open Space Policies

The Santa Cruz County *General Plan* goals for open space protection are as follows:

"To retain the scenic wooded, open space and rural character of Santa Cruz County; to provide a natural buffer between communities; to prevent development in naturally hazardous areas; and to protect wildlife habitat and other resources."

Within the project watersheds, the majority of the population is concentrated along Highway 9 on the floor of the San Lorenzo Valley. Steep slopes and rugged terrain have long been a significant constraint to commercial and residential development in all areas of Santa Cruz County. As a result, the area is rural in general character, heavily forested, and visually dominated by open and undeveloped space.

Henry Cowell Redwoods State Park, the Fall Creek unit of Henry Cowell, Castle Rock State Park, and Big Basin Redwood State Park are all managed as public open space. The water purveyors' watershed lands are managed for water resource protection, and to a limited extent, for recreation. Several land trusts, including the Santa Cruz County Land Trust and the Sempervirens Fund own and/or manage open spaces in the project area.

A portion of the University of California Santa Cruz - Upper Campus and the Pogonip Open Space are adjacent to Henry Cowell Redwoods State Park in the San Lorenzo Valley. Several summer camps, conference centers, and retreats operate small water systems and own watershed lands. Private owners hold the remainder of lands in the project area.

4.7 Erosion Control/Soil Management Policies

The County has an Erosion Control Ordinance with the purpose of eliminating and preventing conditions of accelerated erosion that may lead to degradation of water quality, loss of fish habitat, damage to property, loss of topsoil and vegetative cover, disruption of water supply, and increased danger from flooding. The policies in the ordinance that are intended to protect water supply are as follows:

- Streams or drainage courses shall not be obstructed or disturbed except for approved road crossings unless disturbance of a drainage course will improve overall site design and be consistent with the purpose of the ordinance.
- Erosion control measures specified in, or pursuant to, this ordinance, shall be in place and maintained at all times between October 15 and April 15.
- Runoff from activities subject to a building permit, land division permit, or development permit shall be properly controlled to prevent erosion and adequate for runoff from a ten-year storm.
- Prior to issuance of a building permit, development permit or land division permit (or for other types of applications where erosion is expected to occur), an erosion control plan indicating proposed methods for the control of runoff, erosion, and sediment movement shall be submitted and approved

- Land clearing shall be kept to a minimum and vegetation removal shall be limited to that amount necessary for building, access, and construction.

When no land development permit has been issued, the following types of land clearing require an erosion control plan:

- Any amount of clearing in a sensitive habitat.
- One-quarter acre or more of clearing in the Coastal Zone if also in a least disturbed watershed, a water supply watershed, or an area of high erosion hazard.
- One acre or more of clearing in all areas not included in the above items.

When a land development permit has been issued, land clearing may be done in accordance with the approved development plan; however, approval of land clearing requires that "all disturbed surfaces shall be prepared and maintained to control erosion and to establish native or naturalized vegetative growth compatible with the area."

The Erosion Control Ordinance was updated in 2020 and currently includes project plans that incorporate erosion and sediment control prior to approval and issuance of a building or grading permit for a project. In addition, new stormwater discharge regulations under Phase II of the NPDES permitting system administered by the Regional Board are followed by both the City and the County through administration of various permits, including most notably construction permits. Both entities require erosion control plans covering the construction and post-construction phases of projects that are less than one acre in size. The erosion control plans are developed to protect against illegal discharge of sediment and other contaminants to creeks, streams, and other water bodies. Projects larger than one acre in size are regulated by the SWRCB, while the Region Boards and the local storm water jurisdictions (County or City) that issue development/building, grading and other permits implement sediment and erosion controls on projects less than an acre. Enforcement efforts remain limited by staff availability at all levels.

4.7.1 Roads

Caltrans and the County Department of Public Works are responsible for roadway maintenance on specific corridors. Both agencies have policies to truck roadway debris to designated dump sites. For example, they should not "broad-cast" or "side-cast" debris to the side of any road, especially roads near streams. However, significant winter storms such as occurred in 2017 can generate significant land slide material which can be difficult to move in a timely manner and can pose a water quality risk as a new storm comes into the area. Also, some county roads are owned jointly and shared among residents in rural areas. The County has established numerous roadway associations to tax residents and fund maintenance, culvert design and construction for these roads. This keeps the County in control of the maintenance activities and proper techniques are typically followed to mitigate erosion. Previously, the County used the 2004 "*FishNet 4C Roads Manual: Guidelines for Protecting Aquatic Habitat and Salmon Fisheries for County Road Maintenance"* published by the Fishery Network of the Central California Coastal Counties as a Road Maintenance Manual which indicates the sensitivity to proper road maintenance activities to minimize water quality impacts.

In addition, when funding has been available, the SCCRCD has historically undertaken a private roads rehabilitation program aimed at identifying those private road segments (after being approached by private landowners or roads associations) which contribute sediment to creeks and streams and further identifying repair schemes for the sediment contributing road segments. RCD developed a Central Coast Private Road Maintenance Guide in 2013 to assist property owners. In addition, the SCCRCD applied for and obtained funding that allowed rural road erosion control projects from around 2008 through 2016. As of 2022, funding for rural roads is not available; however, SCCRCD maintains a web page for their Rural Roads Program with resources for private road owners including onsite technical assistance.

4.8 Fire Management

The *General Plan* fire management objective is "to protect the public from the hazards of fire through citizen awareness, mitigating the risks of fire, responsible fire protection planning, and built-in systems for fire protection and suppression."

The San Lorenzo Valley and North Coast watersheds are within the jurisdiction of Cal Fire, locally headquartered on Highway 9 in Felton. Cal Fire is equipped to suppress wildland fires throughout the project area. Local fire districts take primary responsibility for fighting domestic and commercial fires in their specific areas of jurisdiction. At the county level, the Santa Cruz County Fire Marshall is responsible for the coordination between neighboring fire districts, particularly during first alarm response. The Santa Cruz County Office of Emergency Services provides communication and warning services to area residents and fire districts.

In March 2021, the City prepared an *Opportunities and Constraints Report* for the evaluation of its forest management options. The overall management goals of the report include reducing the potential for catastrophic wildfire and protecting water quality, increasing resilience to climate change, contributing to the City's actions to address the climate crisis as well as providing limited recreational opportunities. The report addresses fire hazard mitigation planning through actions that reduce fuel loading, break up horizontal and vertical continuity of fuels and extend infrastructure to facilitate fire suppression. In addition, the City actively patrols open space areas during the fire season as well as conducting outreach to homeless encampments regarding ignition risk. Finally, the City is working on a Wildfire Resiliency Plan which will also address water supply reliability during a fire.

In 2021 the SLVWD developed the Post-Fire Recovery, Critical Asset Hardening, Vegetation, and Fuels Management Plan (plan) which is intended to address the need for vegetation and fuels management to lessen the presence of unnaturally high fuel loads on District-owned lands and around District-owned assets to reduce the intensity and harmful impacts of wildfires. The plan identifies a suite of recommended projects designed to reduce or maintain the lowered fuel loads, increase fire resiliency, and help reduce wildfire impacts to critical water infrastructure.

Prescribed burning by the California Department of Parks and Recreation at the perimeters of Henry Cowell Redwoods State Park and Big Basin State Park were conducted recently in 2022, to minimize the potential spread of a major conflagration either into or out of the parks. Prescribed burns are also used to promote fire-tolerant native vegetation threatened by invasive non-natives.

In addition, the City recommends maintaining fuel breaks and roads in the watershed, as well as mechanical treatment and hand work as potential fire hazard mitigation options. Maintenance has included the use of herbicides at the ridge top firebreaks as part of an IPM approach to fire preparedness. On a broader planning level, it is recommended that the City and SLVWD increase fire management involvement beyond vegetation management and fire response and into land use planning. Development within the WUI of the City's watersheds should also incorporate appropriate building standards for wildfire resiliency that considers post-fire water quality. If structures are constructed to be more resilient to wildfire, combustion of building materials may result in toxic runoff.

4.9 Other Local, State and Federal Regulations

In addition to the topic-specific watershed management practices, activities, and controls described in previous sections, other surface water quality environmental regulations exist that affect how water purveyors can meet drinking water quality regulations within the San Lorenzo River and North Coast watersheds.

4.9.1 Local Regulations

4.9.1.1 Santa Cruz County Water Quality Control Ordinance [1974]

Santa Cruz County developed a water quality ordinance in 1974 to manage the turbidity level of natural waters in relation to projects which may impact these turbidity levels. Numerical criteria were established in relation to the impact on natural water turbidity levels from the implementation of any project. If the criteria are exceeded due to activity of any permitted project, then the project is deemed to be in violation of the permit. The County criteria are valid unless more stringent permit criteria are established by the California Department of Fish and Wildlife or the Regional Water Quality Control Board.

4.9.1.2 Santa Cruz County Riparian Corridor and Wetlands Protection Ordinance

The purpose of this ordinance Chapter 16.30 is to eliminate or minimize encroachment into the riparian corridors of Santa Cruz County to preserve, protect, and restore riparian corridors. No development activities are allowed within the riparian corridor other than those allowed through the following key exemptions and exceptions:

<u>Exemptions</u>

- The continuance of any pre-existing nonagricultural use, provided such use has not lapsed for a period of one year or more. This includes changes of uses which do not significantly increase the degree of encroachment into or impact on the riparian corridor as determined by the Planning Director.
- The continuance of any pre-existing agricultural use, provided such use has been exercised within the last five years.
- Control or eradication of a pest as defined in Section 5006, Food and Agriculture Code, as required or authorized by the County Agricultural Commissioner.

- Drainage, erosion control, or habitat restoration measure required as a condition of County approval of a permitted project.

Exceptions are granted on a case-by-case basis after a filing with the County and based on findings by the Zoning Administrator that include that there are special circumstances affecting the property; that the exception will not be detrimental to the public or injurious to other downstream properties and is in accordance with ordinance. Conditions may be imposed that include maintenance of a protective vegetated strip between the activity and the water body; installation and maintenance of water breaks, sediment and erosion control including reseeding and other surface treatments and sediment catch basins.

The ordinance has not been updated since the 2018 Sanitary Survey. The Santa Cruz County Fish and Wildlife Commission and NMFS have previously recommended to the Board of Supervisors that the County code regarding protection of riparian corridors be strengthened with new standards for streamside development and with targeted implementation and enforcement in water supply and coho salmon recovery watersheds and to receive periodic updates on environmental compliance topics at their meetings. The County Fish and Wildlife Commission also administers a Public Grants Program to support local conservation organizations to conduct small projects and outreach.

In addition, since 2003, a Stream Care Guide, which is in its third edition as of 2013, has been available by Santa Cruz County Planning Department that provides information for homeowners on maintaining and improving the riparian corridors.

4.9.1.3 Santa Cruz County Sensitive Habitat Protection Ordinance

The purpose of the Sensitive Habitat Protection Ordinance is to minimize the disturbance of biotic communities which are rare or especially valuable because of their special nature or role in an ecosystem. Lakes, wetlands, estuaries, lagoons, streams, rivers, and riparian corridors are among the habitats considered sensitive.

Sensitive habitat policies of interest to this survey include:

- No toxic chemical substance shall be used in such a way as to have deleterious effects on the habitat unless an emergency has been declared, or such use has been deemed necessary by the California Department of Fish and Wildlife to eliminate or reduce a threat to the habitat itself, or a substantial risk to public health will exist if the toxic chemical substance is not used.
- The Agricultural Commissioner, when reviewing an application to use a restricted material, shall consider the potential effects of the material on a sensitive habitat, and mitigation measures shall be required as necessary to protect the habitat. No approval shall be issued if adverse impacts cannot be mitigated.
- A biotic assessment shall be required for all development activities and applications in areas of biotic concern.
- No development activity shall commence until approved, unless such activity has been reviewed concurrently with the review of a development or land division permit.

Any development within any sensitive habitat area shall be subject to the following conditions:

- All development shall mitigate significant environmental impacts.
- Dedication of an open space, conservation easement, or equivalent measure shall be required as necessary to protect the portion of a sensitive habitat which is undisturbed by the proposed activity or to protect a sensitive habitat on an adjacent parcel.
- Restoration of any area which is a degraded sensitive habitat or has caused or is causing the degradation of a sensitive habitat shall be required, provided that any restoration required shall be commensurate with the scale of the proposed development.

No new development shall be allowed adjacent to marshes, streams, and bodies of water if such development would cause adverse impacts on water quality which cannot be mitigated or will not be fully mitigated by the project proponent. Development that has received a riparian exception according to the provision of the Riparian Corridor and Wetlands Protection Ordinance may be exempted from the provisions of this ordinance if the Planning Director has determined that the activity has received a review that is equivalent to the review required by the Sensitive Habitat Protection Ordinance.

Finally, the City and County has been working since 2010 to develop a Karst Protection Zone Policy with a formal request from the City to the County in late 2016. Karst is known to occur in several areas of Santa Cruz County, primarily in Bonny Doon, Felton, and the southeastern end of Ben Lomond Mountain in the vicinity of Pogonip and UCSC as shown on Figure 2-4. Since karst aquifers have unique recharge properties, current regulations designed for non-karst aquifers having fairly regular porosity, transmissivity, and hydraulic conductivity provide inadequate protection. Consideration of karst is included in recent updates to the Septic Ordinance as well as the County's Sustainability Update that incorporates changes to the County's land use rules and regulations and creation of design guidelines to support sustainable development.

4.9.1.4 Santa Cruz County Cannabis Cultivation Ordinance

Santa Cruz County has adopted a Cannabis cultivation ordinance to provide specific, local regulation resulting from the statewide legalization of cannabis. Implementation of the ordinance in the watershed is discussed in Section 3.4. During the ordinance development, the City provided numerous comments and suggestion to the ordinance including support for requirement of metering and reporting of onsite water sources and/or valid water rights associated with surface water diversion; prohibitions on use of generators, licensing parcels with outstanding code violations, and manufacturing of concentrates on cultivation sites; adding grounds for revocation of licensing; and alignment with state requirements for water resource protection plans and/or adherence to site-specific environmental protection standards (especially with regard to activities in water bodies critical to anadromous fish) including adherence to existing County environmental codes.

4.9.2 California State Regulations

4.9.2.1 California Porter-Cologne Water Quality Act [1969]

The SWCRB and the nine California RWQCB have the authority in California to protect and enhance water quality, both through their designation as the lead agencies in implementing the Section 319 nonpoint source program of the federal Clean Water Act (CWA), and from the state's primary water-pollution control legislation, the Porter-Cologne Water Quality Control Act. The Porter-Cologne Water Quality Act is the state law governing nonpoint-source water quality regulation. The SWRCB has responsibility for the State's water quality and water rights programs. State policies set forth by the SWRCB are administered by nine RWQCB. The Porter-Cologne Act refers to the RWQCB as "principal state agencies with the primary responsibility for the coordination and control of water quality" (Section 13001). The RWQCB are also directed to adopt water quality control plans (Basin Plans) for all regions within the State. Santa Cruz County is within the Central Coast Region, which includes San Luis Obispo, Monterey, Santa Barbara, and San Benito Counties, along with small portions of Santa Clara, San Mateo, Kern and Ventura Counties.

CWA Section 303, discussed in Section 4.9.3 that follows, and the Porter-Cologne Water Quality Control Act establish water quality objectives for all waters in the State. These objectives are implemented locally through Water Quality Control Plans, the NPDES permits for discharges to receiving waters, and waste discharge requirements (WDRs) for discharges to land.

In addition to obtaining WDRs for wastewater treatment plant discharges, individual or NPDES permits must be obtained for stormwater discharges. The NPDES Municipal Stormwater Permit program is divided into Phase 1 regional permits for municipal separate storm sewer systems (MS4's) servicing populations greater than 100,000, and a statewide Phase 2 (Small MS4) program covering populations less than 100,000. Industrial dischargers in specific industries are required to obtain coverage under site-specific NPDES Industrial Stormwater Permits. Construction sites where disturbance to more than 1 acre is proposed must obtain coverage under the NPDES Construction General Permit.

Land management activities that have the potential to affect water quality and are not covered under the NPDES program are regulated by the Regional Boards under the authority of the Porter-Cologne Act. The Regional Board issued a general conditional waiver of WDRs for timber harvest activities that are not subject to individual conditional waivers or WDRs. The conditional waiver was renewed in 2012 under Order No. R3-2012-0008. The general conditional waiver boosts the role of the Regional Board in review of THPs during the Cal Fire approval process and requires notification by timber harvesters once the THP has been approved. In addition, the waiver's Monitoring and Reporting Program results in post-harvest inspections by Regional Board staff. The level of activity of Regional Board staff is limited by budget priorities.

Water quality impacts of cannabis cultivation has also become a focus of the Regional Board as a result of recent Cannabis legalization in California and a permitting process for commercial cannabis cultivators has been in place since about 2018.

4.9.2.2 California Environmental Quality Act (CEQA) [1970]

CEQA was modeled after the National Environmental Policy Act (NEPA) and establishes the state's basic framework for the environmental review of new development projects. CEQA provides the effected agencies and the public with a role in the review of proposed development and sets forth standards of significance when evaluating the potential effects of projects. CEQA requires that potential significant impacts be identified and mitigated

4.9.2.3 California Department of Fish and Wildlife

The California Department of Fish and Wildlife is responsible for the regulation of impacts to wetlands, rivers, and lakes through the mandate of Sections 1601-1603 of State Fish and Wildlife Code. The department is required to review projects with the potential to divert or obstruct natural flows of waters in streambeds and wetlands. Alteration of wetlands, rivers, streams and lakes must be done with the permission of the Department of Fish and Wildlife, which places conditions of approval on the proposed action to mitigate any adverse effects to the habitat to be altered. In addition, Section 5650 of California's Fish and Game Code states that it is unlawful to deposit, dispose of or permit the dumping of solids, liquids, or carcasses into state waters; this code section has been used to mitigate the effects of homeless encampments in riparian areas.

The Department of Fish and Wildlife also regulates the hunting and trapping of wild and feral pigs and geese on public and private lands. The Department of Fish and Wildlife developed a Memorandum of Understanding to control the pig population. The memorandum includes requirements for disposal of pig carcasses, reporting program results, and maintenance of specific records. DFW has also offered to oversee a managed hunt of Canada geese at Loch Lomond should the population there continue to expand.

4.9.2.4 Statewide Onsite Wastewater Treatment Policy Assembly Bill (AB) 885

In 2000, the California Legislature passed AB 885, which requires the State Water Quality Control Board to adopt regulations for the operation of OWTS. The policy took effect in May 2013 and was updated in 2018. Designed to ensure that surface waters and groundwater are not contaminated by septic systems, the policy provides minimum OWTS standards for local agency OWTS management programs and indicates that permits for OWTS in the same drainage as and within 1,200 feet of surface water intake be reviewed by the public water system owner. and the permit application also be provided to the CDDW Drinking Water Program. The policy indicates that these agencies shall have 5 days from receipt of the permit application to provide recommendations and comments to the permitting agency. As described in Section 4.5.2, the County prepared a LAMP that was accepted by the RWQCB in October 2021, and is currently being finalized for local implementation.

Several other key state acts affect the management of pollutants and the potential impacts to water quality that may result from their use:

- Pesticide Contamination Act [1967]
- Forest Practice Act [1973]
- Subdivision Map Act [1974]

- Hazardous Waste Control Act [1982]
- Underground Storage and Hazardous Waste Substances Act [1983]
- Safe Drinking Water and Toxic Enforcement Act [1986]
- Integrated Waste Management Act [1989]

4.9.3 Federal Regulation

Federal provisions pertinent to the sanitary survey are described below. Drinking water regulations are discussed in Section 5.

4.9.3.1 Clean Water Act – NPDES and TMDL

The Federal Water Pollution Control Act of 1972, also known as the CWA, was enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's water." Some concerns exist that enforcement of the CWA could weaken under the 2017 presidential administration. The CWA established the NPDES permit program described above under California regulations; California's typically more stringent regulation may mitigate changes at the federal level.

The CWA also includes Section 303(d), which specifically requires states to identify those water bodies not meeting established water quality goals relative to a pollutant or a suite of pollutants. Once a water body is found to not meet applicable water quality goals, it must be added to the 303(d) list as an impaired water body and a TMDL must be developed for the specified pollutants. 303(d) listing recommendations are made by the Regional Board and approved by the State Board. The San Lorenzo River is 303(d) listed for nutrients (1996), pathogens (1998), sediment (1998), chlordane (2010), chlorpyrifos (2010), PCBs (2010) and fecal coliform (2011), and the Lower Newell Creek is listed for pH (2010). Based on the 303(d) listing for nutrients, pathogens, and sediment in the San Lorenzo River, TMDLs have been adopted for nitrate (2000), pathogens (2009), sediment (2003) and chlorpyrifos (2014); while the *E. Coli* listing was removed in 2019. The sources contributing chlordane, chlorpyrifos and PCBs to the San Lorenzo River and sources contributing pH to Lower Newell Creek have not been identified and adoption of TMDLs for these constituents is not anticipated until 2023 or later.

4.9.3.2 CWA 303d list and Total Mass Daily Loads

Table 4-2 that follows provides a summary of the Total Mass Daily Loads that have been approved or are in process through 303d impaired water body listing for the waterways in the watershed.

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Table 4-2: 303d List/TMDLs Summary Status and Drinking Water Relationship

TMDL	Status of Regulation	Relation to Drinking Water	Impact/Benefit to Water Treatment	Regional Implications
San Lorenzo River Pathogen TMDL	A pathogen TMDL was approved for the San Lorenzo River in May 2009 due to impairment of water contact recreation beneficial use. 2016 303d list added specific pathogens of Enteroccocus and *E. Coli* with TMDL target date of 2027, Fecal coliform TMDL was approved 2011	Implementation of the TMDL will improve City's source water quality.	Improved water quality potentially reduces water treatment costs.	Implementation of the TMDL requires the County, City of Santa Cruz, and City of Scotts Valley to potentially invest additional resources in management of wastewater (especially for onsite systems), stormwater, and riparian-area homeless encampments.
San Lorenzo River Sediment TMDL	A sediment TMDL was approved for the San Lorenzo River in May 2003 due to impairment of fish and wildlife beneficial use. RWQCB staff recommend revision of the existing numeric targets to sediment and biological indicators.	Implementation of the TMDL will improve TSS and turbidity, which will improve City's source water quality.	Improved water quality potentially reduces water treatment costs.	Implementation of the TMDL requires the County, City of Santa Cruz, and City of Scotts Valley to invest additional resources in stormwater management improvements especially as they relate to upstream sediment discharge and hydromodification.
San Lorenzo River Nitrate TMDL	A nitrate TMDL was approved for the San Lorenzo River in September 2000 due to potential to adversely affect municipal and domestic water supply beneficial use and water contact and non-contact water recreation beneficial uses.	While nitrate is not violating the drinking water standard for nitrate, implementation of the TMDL will improve City's source water quality. Nitrate can create taste and odor problems through the promotion of biological growth. Biological growth is also a concern as it can lead to higher TOC concentrations and higher potential for DBP formation as well as increased growth downstream that results in a higher upstream regulatory burden for the City with respect to threatened and endangered species.	When taste and odor often associated with algae blooms, were a problem, City had to spend $60,000/year on treatment of the problem. Additional studies would be necessary to assess the connection between nitrate/biological growth and water treatment	There are likely secondary impacts (i.e. biological growth formation at the Lagoon) from nitrate concentrations; therefore, the river is still considered impaired for nitrate. Nitrate levels continue to vary year to year. To decrease nitrate levels will require additional investment in nitrate reduction measures.
San Lorenzo River Chlorpyrifos TMDL	TMDL adopted May 29, 2014 with impairments in San Lorenzo River (below Zayante Creek confluence near Felton), Branciforte and Zayante Creek and Arana Gulch.	Chlorpyrifos, if present, may not be removed by current treatment and may require additional treatment	Chlorpyrifos removal may be accomplished by adsorption onto activated carbon and potentially breakdown with strong oxidants like free chlorine and peroxide.	Chlorpyrifos may be detrimental to aquatic life.
San Lorenzo River 303d listings for Chlordane, Chloride, PCBs, Sodium	Regional Board 2016 303d list revisions include maintaining chlordane and PCBs on list, and addition of chloride and sodium based on sample of SLR at Laurel St downstream of Tait to 303d list; TMDL target date is 2027.	Like chlorpyrifos, chlordane, if present, may not be removed with current treatment and may require additional treatment; Chloride/sodium likely not a raw water issue	Chlordane removal may be accomplished by adsorption onto activated carbon and potentially breakdown with strong oxidants like free chlorine and peroxide.	Chlordane may be detrimental to aquatic life.
Proposed San Lorenzo River 303d Listing for Temperature	Regional Board 2016 response to comments indicated that temperature is a medium priority with a 2023 target TMDL Completion date	Temperatures are already elevated in some locations beyond tolerance for some salmonids, and can contribute to algae blooms	Increased temperature when combined with available nutrients can result in algae blooms with associated increases in TOC and result in DBP formation	Elevated temperatures will be exacerbated as effects of climate change are manifested with longer, hotter, dry seasons.
Proposed Newell Creek (Lower) 303d listing for pH	Regional Board 2016 Fact sheet indicate that a 2027 target TMDL completion date, based on 1971-2006 SC County data (although some elevated pH levels are noted; it is not clear if the data set is sufficient for the listing)	Nominal changes for pH adjustment may be required	Nominal impact	Potential impacts to cold freshwater habitat
Proposed Loch Lomond 303d List for Mercury	Regional Board Decision 51458 indicates that no listing is indicated at this time	Mercury could be associated with sediments that would likely be removed with current treatment	Limited water treatment impact anticipated	Mercury could bioaccumulate in downstream aquatic life

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4.9.3.3 Section 404 Wetland Filling and/or Dredging Permit Program

Section 404 of the CWA regulates the discharge of dredged and fill material into wetlands and water of the United States and establishes a permit program to ensure that such discharge complies with environmental requirements. The 404 permit process is administered by the U.S. Army Corps of Engineers and the U.S. EPA.

The activities regulated by Section 404 include channel construction and maintenance, filling wetlands to create development sites, transportation improvements, and water resource projects. Some activities that may adversely impact wetlands and rivers, such as drainage or groundwater pumping, are often conducted without discharging dredged or fill material and are not regulated under Section 404. The exemptions to Section 404 that are pertinent to the sanitary survey study area include: normal farming, ranching and silvicultural practices; maintenance and emergency repair of levees and bridges; construction or maintenance of farm or stock ponds; construction of temporary sedimentation basins; and construction or maintenance of farm and forest roads, if best management practices are followed.

4.9.3.4 Endangered Species Act Section 7 and Section 10

Compliance with the federal Endangered Species Act is required for all activities that have the potential to impact special status species identified as threatened or endangered and are a significant driver for local water purveyor diversions and maintenance activities. The Act provides for the conservation of species that are threatened or endangered throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. Section 7 of the Act requires consultation by any federal regulator with the USFWS and NOAA fisheries prior to the approval of an authorization or permit. Section 10 of the Act allows for consultation to occur between non-federal entities and the federal regulators USFWS and NOAA fisheries without a nexus to a federal authorization or permit.

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Section 5 Water Quality Regulations and Evaluation

5.1 Water Quality Regulations

The U.S. EPA and/or state agencies regulate the water quality of drinking water systems. EPA delegates primary enforcement responsibility for drinking water program implementation and enforcement to the State. In California, the SWRCB, DDW (formerly Department of Public Health) is the primacy agency for drinking water regulations. To maintain primacy, the authority to enforce drinking water regulations, under the Safe Drinking Water Act (SDWA), DDW must adopt drinking water regulations at least as stringent as the Federal regulations and meet other relevant criteria. State drinking water regulations may be more stringent than the federal regulations, but not less stringent.

The City of Santa Cruz 1996 Watershed Sanitary Survey provides a detailed account of the development of water quality regulations in the United States. Subsequent updates to the 1996 Watershed Sanitary Survey in 2001, 2006, 2013, 2018 describe a number of regulations that were the most current at the time those documents were written. These regulations still apply. The paragraphs below provide a brief summary of the main surface water quality regulations. EPA and DDW 2022 regulations were reviewed, and no new regulations have been promulgated.

Table 5-1: Regulatory Schedule

	FEDERAL		STATE	
Rules	**Promulgation Date**	**Compliance Date**	**Promulgation Date**	**Compliance Date**
Revised Total Coliform Rule	February 2013	April 2016	February 2017	July 2021
Federal Groundwater Rule	November 2006	December 2009	April 2011	August 2011
Federal Long Term 2 Enhanced Surface Water Treatment Rule[(1)]	January 2006	October 2013	February 2013	July 2013
Stage 2 Disinfectants and Disinfection Byproducts Rule[(1)]	January 2006	October 2012	December 2011	June 2012
Drinking Water Arsenic Rule	January 2001	January 2006		November 2008
Radionuclides Rule	December 2000	December 2003		June 2006
Interim Enhanced Surface Water Treatment Rule	December 1998	January 2002		January 2008
Stage 1 Disinfectants and Disinfection Byproducts Rule	December 1998	January 2004	June 2006	June 2006
Surface Water Treatment Rule	June 1989	December 1990		

[(1)] Each of these two rules include data collection tasks with "early compliance dates" six months after the publication date for sampling plans, and 24 months after rule promulgation for both data collection and report submission.

5.1.1 Surface Water Treatment Rule

The SWTR was implemented to provide protection against Giardia cysts and pathogenic enteric viruses. The federal SWTR requires that the water treatment process achieve a minimum of 99.9 percent (3-log) removal and/or inactivation of Giardia cysts and 99.99 percent (4-log) removal and/or inactivation of enteric viruses. This must be accomplished through a combination of physical removal and disinfection. The DDW generally requires that the water treatment process provide the minimum removal and/or inactivation requirements for Giardia and viruses in the federal SWTR (99.9 percent [3-log] for Giardia cysts and 99.99 percent [4-log] for viruses).

The Department of Public Health, the agency name prior to becoming DDW, published a guidance document, “Surface Water Treatment Staff Guidance Manual” in May 1991 that summarizes the treatment requirements in the SWTR as adopted by the State in the California Code of Regulations (CCR). Appendix B of the DPH guidance manual establishes guidelines for determining when source waters will require more than the minimum levels of 3-log Giardia and 4-log virus removal. The guidance indicates that treatment can be based on total coliform levels and that for water sources with significant sewage, recreation, or agricultural hazards where median monthly total coliform concentration exceeds 1,000 MPN/100 mL, treatment must provide 4-log Giardia removal and 5-log virus removal.

Based on sampling performed during August 1996 through March 1998, DDW concluded that City should be required to meet the higher level of treatment of 4-log Giardia removal and 5-log virus removal as described in the July 13, 1998 letter to City. This requirement would be in effect at GHWTP until a watershed sanitary survey or continued monitoring could demonstrate that lesser levels of treatment should be required. A report was completed in 2013 documenting additional analysis conducted for the City found in Appendix A of the 2018 WSS Update, and DDW has accepted that the 4-log Giardia removal can be reduced to 3.0-log removal since the GHWTP filters were demonstrated to provide 1-log removal for Giardia through a combination of reducing the inactivation requirement and increasing the removal credits. The 5-log virus removal is not proposed to be changed. If necessary, additional chlorine contact time could be implemented at the risk of increased DBP formation with an associated expense on the order of $25—40 million to comply with BMP limits. Historic high raw water pathogen levels on Lompico Creek resulted in 4-log Giardia and 5-log virus removal requirements; this water source is not currently in use. In addition to further protect public health, significant effort has been made in identifying and managing pathogen sources.

As indicated in previous sections, a pathogen TMDL was established for the San Lorenzo River in 2009 and progress has been made in reduced pathogen levels. However, City recognizes that median monthly total coliform levels still exceed 1,000 MPN/100 mL at times as shown in Section 5.4.1. City is in the process of reviewing source water quality data to evaluate how often the median monthly total coliform level is consistently less than 1,000 MPN/100 mL; this information will enhance City’s Source Selection Procedure as another level of protection. The goal of the Source Selection Procedure is to guide when each of the source waters would be suitable for treatment to ensure that the total coliform MPN would be less than 1,000 MPN/100 mL (for each of the source waters and hence also for the blend). The City should be able to reliably select source water that only require 3-log Giardia and 5-log virus reduction.

5.1.2 Interim Enhanced Surface Water Treatment Rule

The final federal Interim Enhanced Surface Water Treatment Rule (IESWTR) was published in the Federal Register on December 16, 1998 and became effective in January 2002. California adopted the IESWTR in January 2008. The California IESWTR includes several additional monitoring requirements that create a more stringent filtered water performance standard. The IESWTR includes a 2-log *Cryptosporidium* oocyst removal requirement which can be achieved by maintaining filtered water turbidity less than or equal to 0.3 NTU in at least 95 percent of the filtered water samples collected during each month. As discussed in the 2016 filter performance study conducted (found in Appendix A of the 2018 WSS Update), 95th percentile filter turbidity data are consistently less than 0.3 NTU which meets the IESWTR requirements.

5.1.3 Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)

The LT2ESWTR was published in the Federal Register on January 5, 2006. The draft State LT2ESWTR was last revised on March 22, 2013. The State adopted the LT2ESWTR on July 1, 2013. Prior to State adoption of the LT2ESWTR, DDW was responsible for monitoring water suppliers for compliance with the rule, and the EPA was responsible for enforcement of the rule.

The LT2ESWTR requires that all water supplies collect source water data on Cryptosporidium, and it sets new treatment requirements that include treatment plant performance standards for each water supply based on the relative risk due to presence of Cryptosporidium in the source water.

5.1.4 Stage 1 and Stage 2 Disinfectants/Disinfection Byproducts Rule

In conjunction with the federal IESWTR, the USEPA promulgated another new drinking water regulation on December 16, 1998: the Stage 1 Disinfectants/Disinfection Byproducts Rule (Stage 1 D/DBPR). The State of California adopted the Stage 1 D/DBPR in June 2006. The Stage 1 D/DBPR focuses on controlling production of DBPs, while also meeting disinfection requirements. It revised the THM maximum contaminant level (MCL), created a new MCL for HAA5, and also included MCLs for bromate and chlorite as part of the new regulations. The Total THM (TTHM) MCL was reduced from 0.1 mg/l (100 µg/l) to 0.080 mg/l (80 µg/l). The HAA5 MCL was set at 0.060 mg/l (60 µg/l). The bromate MCL was set at 0.010 mg/l (10 µg/l) and the chlorite MCL was set at 1.0 mg/l. In addition, the Stage 1 DBPR included maximum residual disinfectant levels (MRDLs) for chlorine at 4.0 mg/L (as Cl_2), chloramine at 4.0 mg/L (as Cl_2), and chlorine dioxide at 0.80 mg/L (as ClO_2). For City, D/DBPR1 requires that the system-wide running annual average (RAA) concentration based on the quarterly samples for TTHM be less than 80 µg/L and for HAA5 be less than 60 µg/L.

The Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 D/DBPR) was published in the Federal Register on January 4, 2006. The THM and HAA5 MCLs remain at 80 µg/l and 60 µg/l, respectively, but the new Stage 2 D/DBP Rule differs from the Stage 1 Rule by requiring that each of the locations monitored meet the TTHM and HAA5 concentration limits based on its individual locational RAA. This approach, referred to as the locational running annual average

(LRAA), differs from current requirements, which determine compliance by calculating the running annual average of samples from all monitoring locations across the system. Given City's more stringent Giardia and virus reduction requirements, which are discussed in Section 5.1.1, it may be difficult to meet the LRAA DBP requirements in the Stage 2 D/DBPR. Moreover, the Stage 2 D/DBPR may be even more difficult to meet in the future if the City has to use a source water that is higher in DBP precursors because the other North Coast water sources are not available for environmental reasons; other regulatory forces that affect treatment are summarized in Table 4-2.

The State of California adopted the D/DBPR1 two and one-half years after the rule's compliance date (January 1, 2004), and 8 years after the rule was published in the Federal Register. During this two and one-half year period, the DDW was responsible for monitoring water suppliers for compliance with this rule, and the EPA was responsible for enforcement of the rule. The D/DBPR2 was adopted to be effective in June 2012.

5.1.5 Revised Total Coliform Rule

The Revised Total Coliform Rule (RTCR) was published by US EPA on 13 February 2013 as a revision to the 1989 Total Coliform Rule (TCR). Minor corrections were published on 26 February 2014. All public water systems must comply with the RTCR starting 1 April 2016. The State adopted the RTCR on July 1, 2021.

One of the main provisions of the RTCR is the setting of a treatment technique based on total coliforms and E. coli, and an MCL for *E. coli*. The RTCR also includes requirements for monitoring total coliforms and *E. coli*, provisions for allowing transition from the existing TCR to RTCR, requirements for seasonal systems, requirements for assessments and corrective actions, public notification requirements for violations and specific language to be included in Consumer Confidence Reports should a *E. coli* MCL violation occurs.

5.2 Water Quality Constituents of Concern

EPA, as well as DDW, has developed MCLs for over 100 organic and inorganic compounds, some occurring naturally in water supplies but many occurring as a result of contamination. Major sources of contamination include discharges from manufacturing processes, leaks from storage or disposal containers, and runoff from areas treated with pesticides. Treatment techniques are available for removing these contaminants from water supplies. Protecting source waters from contamination, however, is often more effective than treatment at eliminating contaminants. A list of MCLs for compounds regulated by EPA and DDW is included in Appendix A.

MCLs are developed based upon a number of factors including health risk, analytical detection limits, effectiveness of the best available treatment, and economic considerations. Federal maximum contaminant level goals (MCLG) are set at the level in which no adverse health effects are seen; in many cases, this is zero. In addition, California sets public health goals (PHG), which for carcinogens represents a 1 in 1,000,000 lifetime risk. Both MCLG and PHG are found in Appendix A. The City prepared a 2020 Public Health Goals Report that assessed City water quality relative to the 2019-2021 public health goals which can be found at: https://www.cityofsantacruz.com/home/showpublisheddocument/89495/637901296976770000.

5.2.1 Turbidity

The IESWTR strengthened previous turbidity performance regulatory requirements. The following are current regulatory standards for turbidity, which serve to demonstrate compliance with pathogen log removal requirements.

Individual Filter Effluent (IFE): Facilities are required to conduct continuous turbidity monitoring for each individual filter and submit an exceptions report to DDW if:

- IFE has a turbidity level greater than 1.0 NTU based on two consecutive measurements taken 15 minutes apart
- IFE turbidity is greater than 0.5 NTU at the end of the first 4 hours of filter operation, based on two consecutive measurements taken 15 minutes apart.
- Combined Filter Effluent (CFE): The turbidity level of the filtered water is required to be less than or equal to 0.3 NTU in at least 95 percent of the measurements taken each month and not to exceed 1.0 NTU at any time. Compliance is based on measurements taken at four-hour intervals.

5.2.2 Disinfection and Disinfection Byproducts

The current Stage 1 Disinfectants and Disinfection Byproducts Rule (D/DBPR) for TTHMs and the HAA5 MCLs are 80 μg/L and 60 μg/L, respectively. The Stage 1 D/DBPR compliance is based on a system-wide RAA. The Stage 2 D/DBPR includes more stringent regulatory requirements for TTHM and HAA5. The Stage 2 D/DBPR requires that each water purveyor perform an Initial Distribution System Evaluation (IDSE) to identify locations in their distribution system that are most vulnerable to DBP formation. The RAA MCLs will remain in effect and an additional limit of 80 μg/L of TTHMs and 60 μg/L of HAA5, based on a (LRAA at sites identified in the IDSE, will be instituted. The IDSE plan prepared by City was submitted by April 1, 2007, and identified monitoring and other actions necessary to comply with the Stage 2 D/DBPR; the monitoring was completed, and the report submitted in July 2009.

The Stage 1 D/DBPR set MCLs for bromate (10 μg/L), and chlorite (1.0 mg/L). The Stage 2 D/DBPR does not change the existing MCLs for these DBPs. Since the water purveyors do not use ozone or chlorine dioxide at their WTPs, these two MCLs should not impact treatment operations. DBPs are of concern primarily in the distribution system but DBP precursors, discussed below, are related to source water quality.

5.2.3 Total Organic Carbon (TOC)

The Stage 1 D/DBPR requires applicable systems that use conventional filtration treatment to remove a certain target level of TOC (DBP precursor) by enhanced coagulation. The required removal level is based on Source Water alkalinity and TOC concentration.

There has been no further significant regulatory change associated with this constituent since 2010. While there have been no water treatment regulatory changes, other surface water quality

regulations discussed in Section 4 may have the potential to restrict City to source water with higher concentrations of TOC, which may require changes to City operations.

5.2.4 Perchlorate

Perchlorate is a regulated contaminant of concern with a respective, enforceable, MCL of 0.006 mg/L in the state of California. As of July 1, 2021, the perchlorate DLR is 0.002 mg/L.

5.2.5 Arsenic Rule

The final federal Arsenic Rule, published by EPA on January 22, 2001, established the MCL for this constituent at 0.010 mg/L (10 μg/L). The Rule was to become effective on March 23, 2001, 60 days after publication. The rule established that the revised MCL for arsenic is 0.010 mg/l (10 ug/l) and became enforceable on January 23, 2006.

The State of California completed drafting the Revised Drinking Water Standard for Arsenic, which became effective on November 28, 2008, and officially adopted an MCL equivalent to the EPA standard of 0.010 mg/l.

5.2.6 Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)

Since 2018, there has been a high focus on regulation of PFAS chemicals, primarily in groundwater, such as new monitoring requirements for PFAS as of July 31, 2019, updated notification levels for PFOA and PFOS on August 22, 2019, and updated response levels for PFOA and PFOS on February 6, 2020. In addition, a notification level was issued for PFBS on March 5, 2021, and a notification level for PFHxS was added on October 31, 2022.

5.3 Groundwater Regulations

Although these regulations do not apply to the surface water sources directly within the City's control, they may be applicable to well sources within the Santa Cruz system (e.g., Beltz wells) and SLVWD's Manana Woods wells and are thus included here for completeness.

5.3.1 Radionuclides Rule

The Federal Radionuclides Rule was promulgated on December 7, 2000 and the MCLs published therein became effective in December 2003. Additionally, by the end of 2007, four quarters of initial monitoring are required for each entry point to the distribution system of agencies treating groundwater. The state Radionuclide Drinking Water Regulations became effective June 11, 2006.

5.3.2 Groundwater Rule

On August 9, 2000, EPA proposed a rule specifying the appropriate use of disinfection in groundwater and addresses other components of groundwater systems to assure the protection of public health. The Groundwater Rule (GWR) establishes multiple barriers to protect against bacteria and viruses in drinking water obtained groundwater sources and will establish a targeted strategy to identify groundwater systems at high risk for fecal contamination. The GWR provides four elements that target risks to the system. The rule requires regular sanitary surveys, source water monitoring when a positive sample occurs its TCR monitoring, corrective actions upon evidence of fecal contamination, and compliance monitoring.

The California Groundwater Rule became effective on August 18, 2011.

5.3.3 Groundwater Replenishment using Recycled Water

The federal government does not regulate the use of recycled water, and leaves regulation up to the state. The California Groundwater Replenishment using Recycled Water Rule was promulgated and adopted in 2014 and establishes requirements for Groundwater Replenishment Reuse Projects (GRRPs), which are projects that involve the use of recycled water for the replenishment of a groundwater basin for use as a source of water supply. Requirements include sampling of the aquifer prior to operation of the GRRP, retention of recycled water prior to recharge, maps of the GRRP and area of effects, a hydrogeological assessment of the GRRP's setting, and a plan to mitigate the potential effects of contamination on water supply due to the GRRP. Permits to operate a GRRP must be approved by both the DDW and the Regional Board.

5.4 Water Quality Evaluation

The following subsections summarize the key water quality concerns in the San Lorenzo River and North Coast watersheds based on review of data available from City databases. Generally, the discussion focuses on microbiological parameters, turbidity and sediment, and nitrates. Other parameters discussed are odors, organic contamination and general mineral and metals content.

A major reason for emphasizing total coliform, turbidity, and nitrate is because of the findings from previous studies and field surveys and because the San Lorenzo River is listed as impaired for each of these parameters, with TMDLs already being implemented (pathogens, sediment, and nitrate). Coliform bacteria are the primary microbial group measured to determine the health of a drinking water supply. Total coliform bacteria are considered a good general indicator of contamination but do not indicate specific contamination sources. The turbidity parameter is used commonly in drinking water treatment to quantify water quality, primarily because it is easily measured and provides virtually instantaneous results. Also, high turbidity has been correlated with high protozoa (and bacteria) concentrations in some waters. Nitrate has been a targeted parameter in the subject watersheds, mostly because of the predominance of septic tanks as the domestic wastewater treatment technique, especially from systems located on or near highly permeable soils. Elevated nitrate levels promote algal growth which, upon decay, produces taste and odor compounds that increase water treatment costs. Nitrate-rich water also favors growth of cyanobacteria, some of which produce harmful toxins.

5.4.1 Coliform Bacteria

Coliform bacteria data are evaluated in this subsection. The City water department analyzes San Lorenzo River source water weekly, with other surface water sources sampled 2 to 3 times per month and groundwater sources sampled once a month when in use. In addition, the City wastewater department monitors fecal indicator bacteria, from stormwater sources in the City, at several locations on the San Lorenzo River on a weekly basis. This monitoring will sunset in 2023 and stormwater best management practices are currently being explored. SLVWD samples raw water monthly. Each sample is analyzed for total coliform and *E. coli* data, but City does not measure fecal coliform, a subset of total coliform bacteria, also known as thermotolerant coliforms but uses *E. coli*, enterococci, and microbial source tracking for

indicators of mammalian waste. The County has measured, among other microbiological parameters, total and fecal coliform bacteria, but discontinued fecal coliform in favor of *E. coli*.

Drinking water and sanitary microbiological experience has established the presence or absence of coliform bacteria as an indicator of the sanitary quality of drinking water supplies. The significance of coliform tests and the interpretation of results are well authenticated and have been used as a basis for standards of bacteriological quality of water supplies (Standard Methods for the Examination of Water and Wastewater, 22nd Edition).

Most drinking water purveyors determine the most probable number (MPN) of total coliform and *E. coli* bacteria present in the drinking water sources of supply. All purveyors are also required to determine the presence or absence of total coliform and fecal coliform bacteria in the distribution system.

Total coliform bacteria are a relatively broad group, which includes species that can live for extended periods outside a host body. These sometimes-termed “environmental” coliform bacteria are present in waters exposed to urban development and wildlife activities. Drinking water utilities are required to resample the distribution system in areas where detectable total coliforms are found and eliminate any fecal coliform in the distribution system, as described in the water quality regulation portion of this section. The presence of fecal coliform in the distribution systems can indicate contamination or an improper disinfection process at the treatment works.

Thermotolerant (formerly fecal) coliform bacteria can be present in the gut and feces of warm-blooded animals, soil, and organically enriched waters and are detected in the laboratory by the characteristic of fermenting lactose to produce gas at 44.5˚C. This differentiation yields valuable information concerning the possible source of pollution in water sources.

The fecal coliform to fecal streptococci (FC:FS) ratio has been used to determine if the contamination source originated from human wastes. A ratio greater than 4 was considered indicative of human contamination. Conversely, a ratio less than 0.7 suggested the contamination was non-human related and most likely livestock, poultry, or wildlife. This tool has been questioned of late because of variable survival rates among the fecal streptococcus species, and some researchers do not recommend the use of the FC:FS ratio to evaluate bacteria origin.

Current efforts to differentiate sources of bacterial contamination focus on use of QCPR (quantitative polymerase chain reaction) analysis. The County of Santa Cruz previously used ribotyping, a method of microbiological source tracking that differentiates human *E. coli* from other types of *E. coli*, to assess the source and causes of elevated bacteria levels at local beaches (Ricker and Peters, 2006). Overall, of 1200 bacterial isolates tested between 2002 and 2004, only 15 percent could not be attributed to a particular source. Study results relevant to this sanitary survey update include findings that: contamination by birds was a dominant source of bacteria in both upstream and urban (lower River) locations; cracks in storm drains and sewer pipes, as observed by videography, could facilitate cross-contamination; storm drains and sumps appear to promote incubation and multiplication of bacteria; bacteria loadings from human, pet and livestock wastes, while significant, are much lower than avian loadings; and human contributions in the San Lorenzo River were much higher in wet weather, when runoff scours storm drains and mobilizes waste from developed areas, encampments and the

occasional failing septic system as well as exacerbating high groundwater levels that can come into septic leach lines. *E.coli*, cryptosporidium and giardia are discussed in Section 5.4.6.14.

5.4.1.1 City Surface Water Sources

As discussed in Section 4 earlier, on May 8, 2009, the San Lorenzo River Watershed Pathogen TMDL was approved by RWQCB Central Coast Region, where fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 MPN per 100 mL, nor shall more than 10 percent of samples collected during any 30-day period exceed 400 MPN per 100 mL (for the San Lorenzo River and Estuary, Branciforte Creek, Camp Evers Creek, Carbonera Creek and Lompico Creek). As noted earlier, the City Water Department does not measure fecal coliform, while the City Wastewater Department monitors fecal indicator bacteria..

The results of an analysis of total coliform data for City's San Lorenzo River and North Coast sources are presented on Figures 5-1 and 5-2. Figure 5-1 shows the annual geometric mean of total coliform since calendar year 2017 for City's San Lorenzo River sources (Loch Lomond, Felton Diversion, and Tait Street Diversion).[15] Average values along the San Lorenzo River (Tait Street and Felton Diversions) are greater than 1,000 MPN/100 mL, and slightly increase over time. Values from Loch Lomond are less than 1,000 MPN/100 mL but seem to be fluctuating since 2017. These values suggest that the type of water year can influence total coliform in Loch Lomond, where drier years or years following a dry year have lower values, and very wet years, like 2017, have higher values, potentially as a result of pumping water from the San Lorenzo River at the Felton Diversion into Loch Lomond.

Figure 5-2 shows the annual geometric mean of total coliform since calendar year 2017 for City's North Coast sources (Liddell Spring, Laguna Creek, and Majors Creek). Values for North Coast sources are generally lower than the Felton Diversion or Tait Street Diversion sources, with Laguna Creek and Liddell Spring almost one and two orders of magnitude lower, respectively. The plotted averages for Laguna Creek and Majors Creek during Calendar Year 2021 were unexpectedly high, though these stations were out of service/not in use during Water Year 2021, so the data for these locations are skewed towards wet weather trends (end of Calendar Year 2021). The City prefers the use of the North Coast sources, when available, because of the lower coliform levels and therefore higher source water quality. However, as discussed earlier, other regulations related to fisheries recovery restrict access to North Coast water sources.

5.4.1.2 SLVWD Surface Water Sources

The Annual Geometric Mean of Total Coliform for sources from the SLVWD is graphically represented on Figure 5-3. The data presented is from 2017 to 2021. In 2013, SLVWD modified their coliform analytical method to be one that reports in Colony Forming Units (CFUs) which reports a definitive number, while MPN reports the probability of occurrence. Results seem to be rather consistent from year to year, however the 2021 calendar year results are elevated in Foreman Creek and Fall Creek which is being investigated. The annual geometric mean was calculated from monthly data collected over the separate calendar years. Periods where data

[15] A geometric mean, unlike an arithmetic mean, tends to dampen the effect of very high or low values, which is helpful since levels may vary anywhere from 10 to 10,000 over a given period.

were unavailable or simply labeled as “Present” or “Absent” were left out of the geometric mean calculations. The following raw water sources were included in the graph: Bennett Springs, Bull Springs-1, Bull Springs-2, Clear Creek, Fall Creek, Foreman Creek, Peavine Creek, and Sweetwater Creek.

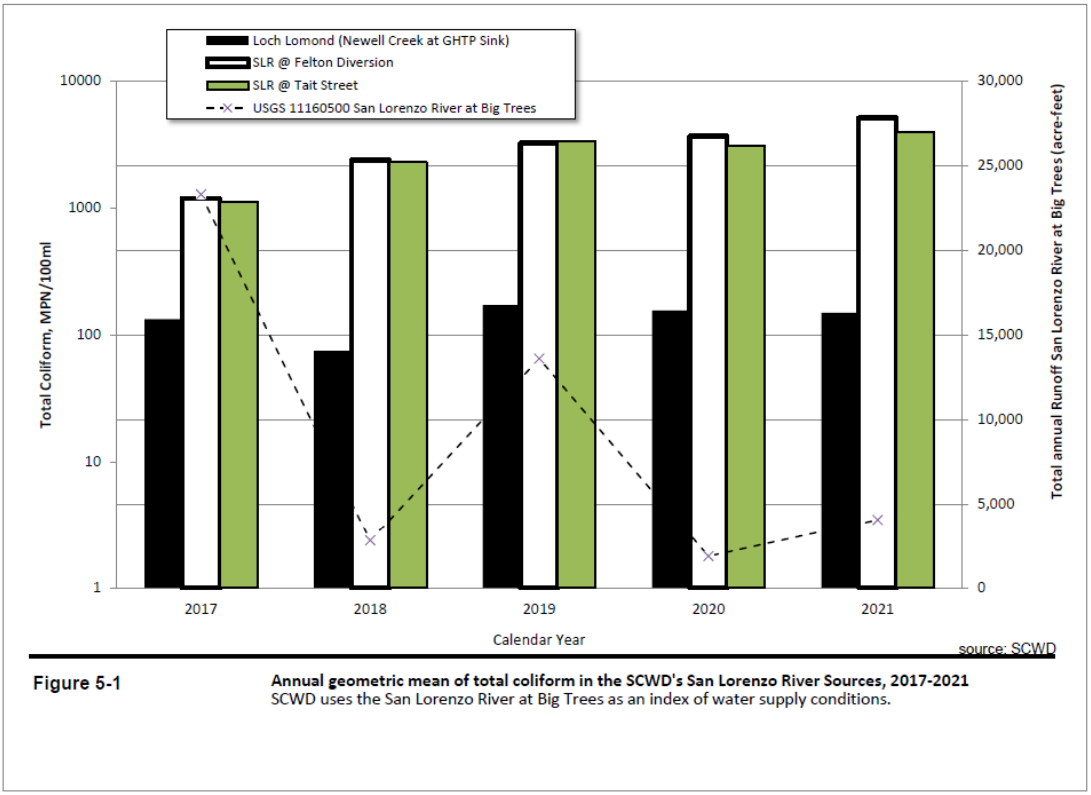

Figure 5-1: Annual Geometric Mean of Total Coliform in the City's San Lorenzo River Sources, 2017-2021

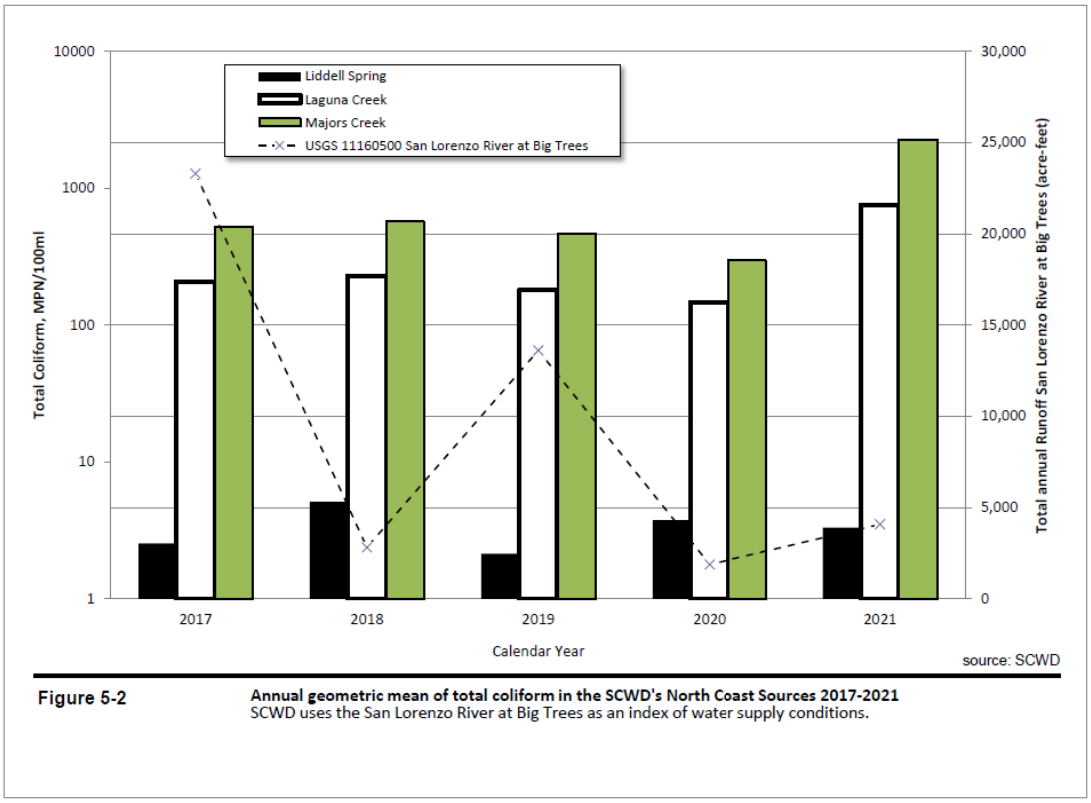

Figure 5-2: Annual Geometric Mean of Total Coliform in the City's North Coast Sources, 2017-2021

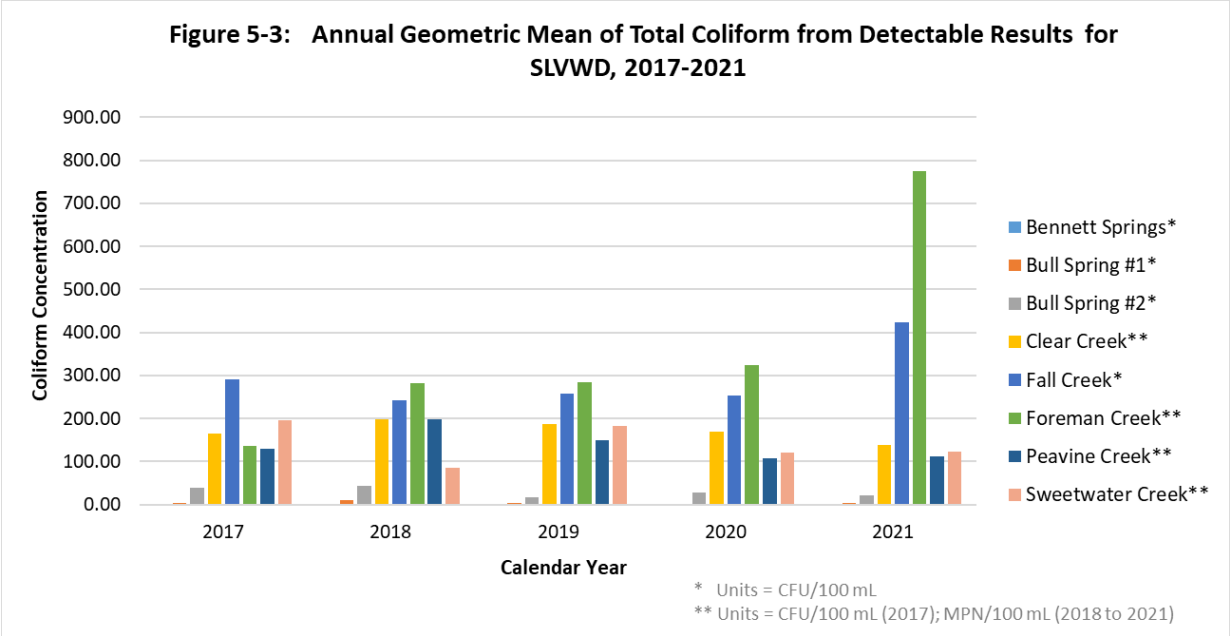

Figure 5-3: Annual Geometric Mean of Total Coliform from Detectable Results for SLVWD, 2017-2021

5.4.2 Turbidity

Disruption of the river and creek beds, small to large landslides, and runoff from barren earth areas tend to extend high turbidity events, especially in high rainfall/runoff years. These events are common occurrences in California caused by the geology, topography, and climate. Many of the water utilities experience treatment problems during the initial few days of high stormwater runoff periods. It is often useful to distinguish 'persistent turbidity' as a set of issues with different causes and likely responses. The definition of persistent turbidity as accepted by the County for quarry facilities is turbidity which precludes diversions for more than about 3 days for smaller streams, and up to 5 days for the San Lorenzo River after a significant storm. In Liddell Spring, according to the 1964 County-CEMEX contract, persistent turbidity increases in turbidity over the baseline which exceed 2 units for 48 hours following the storm event. Usually, persistent turbidity occurs in streams receiving a continuing supply of fine-grained sediment from banks, tributaries, or cut slopes. The continuing sediment supply often can be traced to a particular disturbance, such as a landslide, poorly executed timber harvest, road failure, or large wildfire. In addition, review of long-term turbidity data during active quarry operations at Bonny Doon in the Liddell Springs watershed indicated blast-related turbidity spikes have ceased since closure of the quarry in 2009.

Because high turbidity has correlated with increased protozoa concentrations in some surface waters, it is prudent to have some contingency treatment plan during the initial "flush" of the wet year. Avoiding highly turbid water and relying on alternative sources in the short-term seems to be good, well-practiced policy and is implemented in the City's Source Selection Policy to the greatest extent possible.

Streams which experience extensive disturbances (such as might be caused by a major landslide or fire) are often 10 to 100 times as turbid as baseline, or best-case conditions, at least for the first year or two following the event. The same streams, which take longer to clear after a storm, are usually also affected by excess turbidity persisting into late spring or early summer. These include creeks downstream from large impoundments which can continue to be turbid for a year or longer.

As summarized earlier in Section 4, on May 16, 2003, the RWQCB Central Coast Region adopted a TMDL for sediment for the San Lorenzo River, Carbonera Creek, Lompico Creek and Shingle Mill Creek and incorporated the TMDL and associated Implementation Plan into the Basin Plan. The RWCQB documented various actions implemented by the City, County, and RCD to reduce sediment loading over the past decade, namely reducing the risk of culvert failure and road erosion (Rose, 2011).

The City has previously completed culvert removals/improvements in the Newell Creek watershed while the County has completed similar improvements eight projects in the San Lorenzo River watershed; these improvements, if maintained, should provide sediment reduction that will moderate turbidity peaks.

Parke and others (2010) monitored streamflow and suspended-sediment in water year 2009 and 2010 and used sequential rating-curve analysis[16] to compare sediment–transport rates over the past three decades for Zayante Creek, the San Lorenzo River, and Soquel Creek. A substantial decrease in transport at a given flow can be seen in each case, although lumping all the 1970s and 1980s data probably d[17] With possible load reductions between 464 and 106 percent, it is important to note that these differences are large relative to the 24- to 27-percent reductions sought as part of the San Lorenzo Sediment TMDL staff report. This may be extremely challenging as winters with significant rainfall, such as occurred in 2017, can trigger landslides throughout the County which are associated with large sediment loads.

To demonstrate progress towards achieving load-based allocations and beneficial use protection, RWQCB staff recommended revision of the San Lorenzo Sediment TMDL to replace existing numeric targets with the sediment and biological indicators recommended in Herbst et al. (2011) (Rose, 2011) although no action has been taken as of 2022.

5.4.2.1 City Surface Water Sources

City currently has some capability to use different water sources if turbidity increases for one or more of the sources for reasons other than rainfall (e.g., landslides) and is also making treatment improvements to allow treatment of higher turbidity sources as described in Section 2.8.3.1. This source water and treatment flexibility can be helpful to meet fish flow requirements, particularly in the North Coast sources. During heavy rain events, however, all surface sources are often not used due to elevated turbidity, leaving Loch Lomond Reservoir and Liddell Spring as the only sources with which to meet customer demands. During moderate events, Liddell and Laguna can be available for use. T

Figure 5-4 and Figure 5-5 show the turbidity measurements from January 2017 to December 2021 for the San Lorenzo River and North Coast sources, respectively. There is no apparent overall increasing or decreasing trend over the entire period and variations appear to be storm-related, as expected. Majors Creek was offline from mid-2020 through all of 2021 and therefore there is no data.

Figures 5-6 and 5-7 show similar data as above but is a 10-sample running average to clarify the trends over the past 5 years. Generally, Loch Lomond shows relatively lower storm-related increases in turbidity than the other sources. All other sources, except Majors Creek (lack of data) and Laguna Creek, show relatively higher storm-related increases in turbidity in normal and wet years as compared with dry years, e.g., 2017 vs 2021. The North Coast sources experience significantly less turbidity than the San Lorenzo River sources. Overall, these North Coast sources provide consistent low turbidity, treatable water.

[16] An increase in sediment transport at a given flow generally means that more sediment is readily available on the bed for transport, and (generally) that habitat conditions have deteriorated; conversely, less transport at a given flow is usually associated with improvements in bed conditions and in the relative success of erosion-control efforts.

[17] Episodic events do increase sediment yields and do temporarily move sediment-rating curves ‘upward’, or to the left (Hecht, 2007), sometimes substantially.

5.4.2.2 SLVWD Surface Water Sources

Table 5-2 below, shows the turbidity results taken from eight raw surface water sources within SLVWD, from 2017 to 2021. Most of the data was sampled in the month of March.

Table 5-2: Turbidity Results for SLVWD (Unit: NTU)

Year	Bennett Spring	Bull Spring #1	Bull Spring #2	Clear Creek	Fall Creek	Foreman Creek	Peavine Creek	Sweetwater Creek	Lompico Creek
2017	0.28	0.31	1.1	3.2	4.7	< 0.10	1.1	5	NR
2018	0.31	0.38	0.68	N/A	0.61	N/A	N/A	N/A	NR
2019	0.25	0.35	0.4	0.4	1.3	0.3	0.5	0.9	NR
2020	0.4	0.7	0.4	0.1	2.125	3.92	0.4	0.45	NR
2021	0.15	< 0.10	0.1	0.4	0.7	0.875	0.3	0.45	NR

Source[1]: SLVWD
Note: NR = Not Recorded; N/A = Data not available

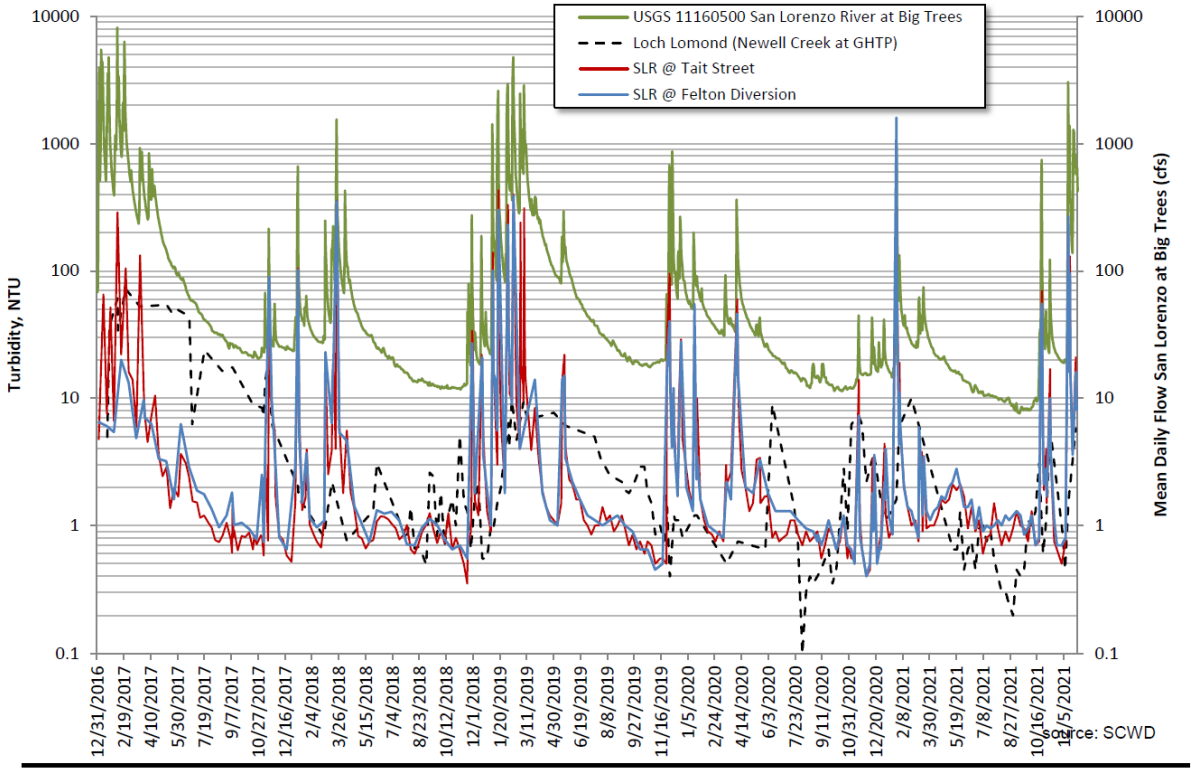

Figure 5-4 **Turbidity in SCWD's San Lorenzo River Sources, 2017-2021**
Turbidity data is collected once or twice a month. Mean daily flows from San Lorenzo River at Big Trees are shown for reference to sediment transport conditions.

Figure 5-4: Turbidity in City's San Lorenzo River Sources, 2017-2021

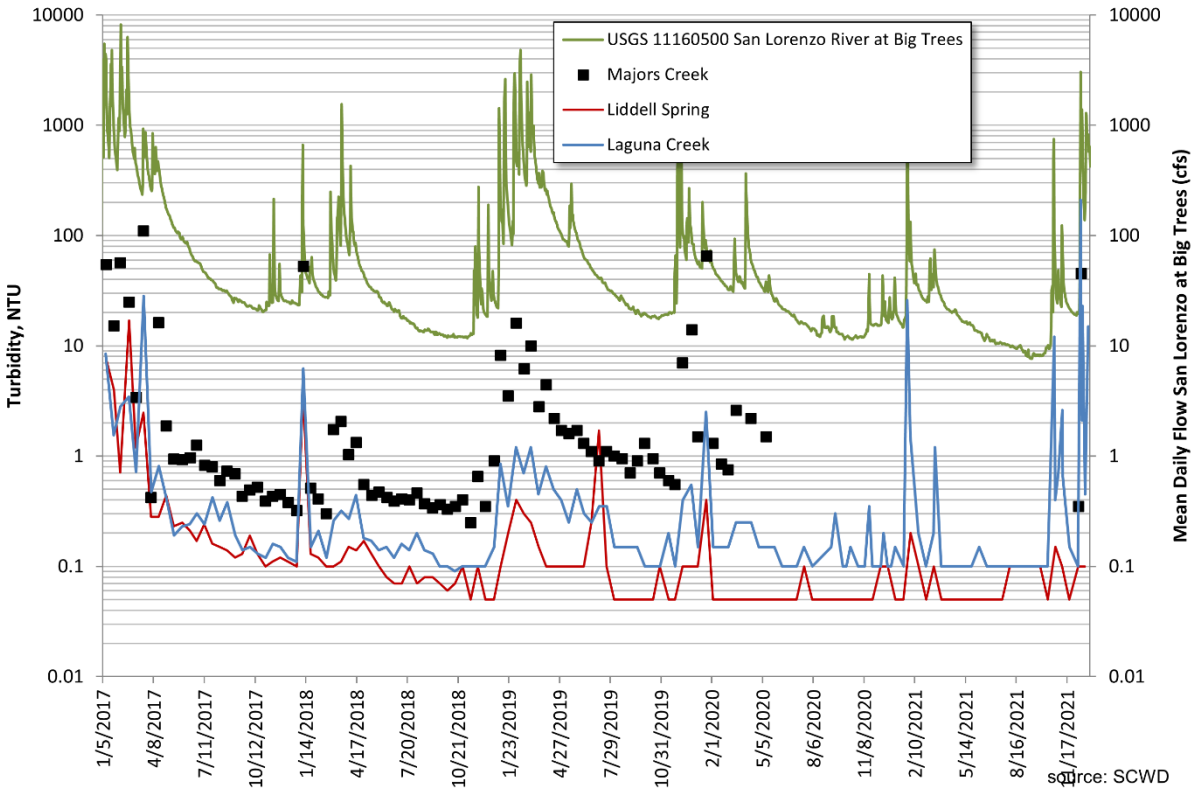

Figure 5-5 **Turbidity in SCWD's North Coast Sources, 2017-2021**
Turbidity data is collected at varying intervals. Mean daily flows from San Lorenzo River at Big Trees are shown for reference to sediment transport conditions. Majors Creek was off line from May 2020 - November 2021.

Figure 5-5: Turbidity in City's North Coast Sources, 2017-2021

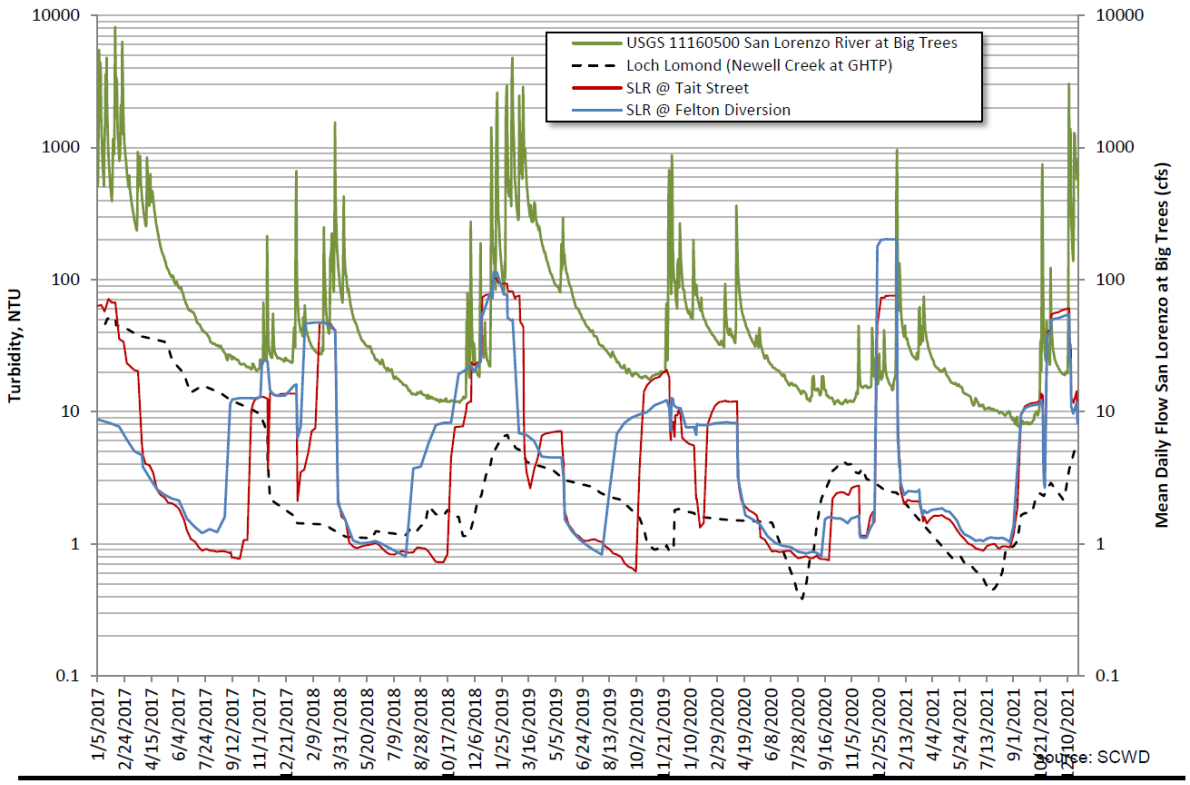

Figure 5-6 **Turbidity in SCWD's San Lorenzo River Sources, 2017-2021**
Ten point running average shown for clarity; data taken at varying intervals. Mean daily flows from San Lorenzo River at Big Trees are shown for reference to sediment transport conditions.

Figure 5-6: Turbidity in City's San Lorenzo River Watershed Sources, 2017-2021 (10 point running average shown for clarity)

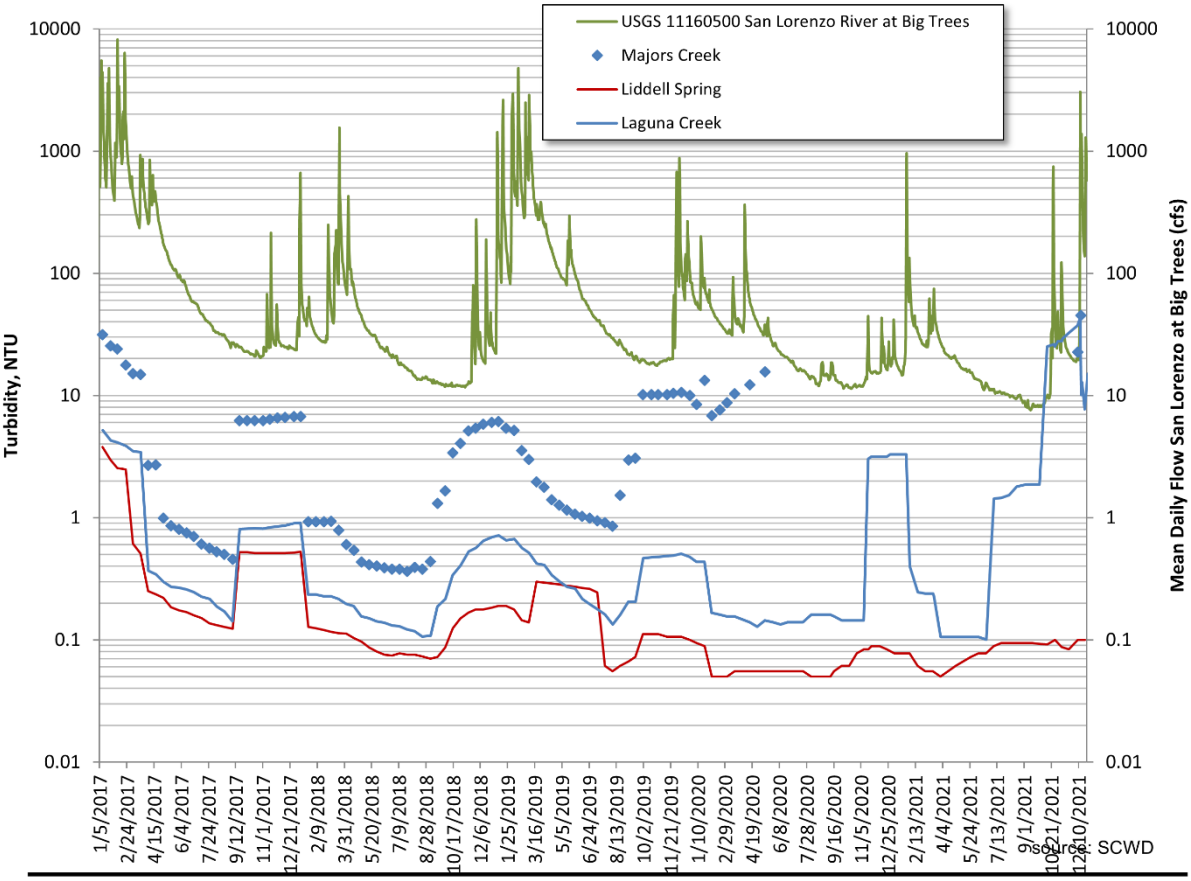

Figure 5-7 **Turbidity in SCWD's North Coast Sources, 2017-2021**
Ten point running average shown for clarity; data taken at varying intervals. Mean daily flows from San Lorenzo River at Big Trees are shown for reference to sediment transport conditions. Majors Creek was offline from May 2020 - November 2021.

Figure 5-7: Turbidity in City's North Coast Sources, 2017-2021 (10 point running average shown for clarity)

5.4.3 Nitrate

The MCL for nitrate in drinking water is 10 mg/L as nitrogen, or 45 mg/L as nitrate. The nitrate concentrations in the surface water systems located within the watersheds do not approach this limit. However, in response to the 303(d) listing for nutrient impairment and implementation of the resulting nitrate TMDL, the County and the Regional Board have implemented numerous management and regulatory actions to reduce nitrate loadings to the river and tributary creeks. The primary source of nitrate is from septic leach fields located in sandy soil areas (Santa Margarita sandstone), mostly located east of the San Lorenzo River. Other key sources are septic systems near waterways, a community leach field at the Boulder Creek Country Club, and the Scotts Valley nitrate plume. Table 5-3 provides a summary of the nitrate data provided. Additional graphs and narrative for each water purveyor follows.

Table 5-3: Summary of Nitrate Data Evaluated

	Nitrate (mg/L as N)				No. of Samples	Water Year	
Utility/Location	**Average**	**Median**	**Low**	**High**		**From**	**To**
Santa Cruz Water Department[1]							
Liddell Spring	0.3	0.2	0.2	0.3	32.0	2017	2021
Laguna Creek	0.0	0.0	0.0	0.2	36.0	2017	2021
Majors Creek	0.2	0.3	0.0	0.4	18.0	2017	2021
Loch Lomond	0.2	0.2	0.0	0.4	31.0	2017	2021
SLR @ Tait Street	0.3	0.3	0.0	1.2	78.0	2017	2021
SLR @ Felton	0.5	0.5	0.0	1.2	77.0	2017	2021
San Lorenzo Valley Water District[2]	**YEAR**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	< 0.10	0.13	< 0.10	N/A	0.13	< 0.10	< 0.10
Bull Springs-1	0.11	< 0.10	< 0.10	N/A	0.15	< 0.10	0.12
Bull Springs-2	NR	NR	< 0.10	N/A	0.12	< 0.10	0.25
Clear Creek	< 0.10	< 0.10	< 0.10	N/A	< 0.10	< 0.10	< 0.10
Fall Creek	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	N/A	< 0.10
Foreman Creek	< 0.10	< 0.10	< 0.10	N/A	< 0.10	< 0.10	< 0.10
Peavine Creek	< 0.10	< 0.10	< 0.10	N/A	< 0.10	< 0.10	< 0.10
Sweetwater Creek	< 0.10	< 0.10	0.15	N/A	0.14	0.17	0.13
Lompico Creek	ND	ND	NR	NR	NR	NR	NR

[1]Source: City

[2]Source: SLVWD, 2017 data is 6 months Note: NR = Not Recorded; N/A = Data not available; ND = Non-detectable

SLR = San Lorenzo River

5.4.3.1 City Surface Water Sources

City has monitored the nitrate levels in its water sources since the late 1960s. The following paragraphs describe the key findings of the nitrate evaluation.

Figure 5-8 shows the nitrate data over calendar years 2017–2021 for the City's San Lorenzo River sources. In early 2017, which saw record-level rain events, values for all three sources were significantly lower compared to subsequent years. While values are higher for the two river sources compared to Loch Lomond, values for Loch Lomond reached closer to the same levels as the other two sources [18]. Overall, sample concentrations for the last 5 years have been less than 1.0 mg/L as N and have not changed much since early 2017.

Figure 5-9 shows the nitrate trend over the past five years for the City's North Coast sources. While Laguna Creek has the lowest concentrations, values for Laguna Creek spike in early 2017 during the record rain events, while values for Majors Creek are significantly reduced. Liddell Spring does not have any nitrate spikes since CEMEX ceased operation of the quarry in 2010. Values are slightly lower for the North Coast sources than the San Lorenzo River sources.

Figure 5-10 provides an additional historic perspective on nitrate concentrations as a single plot at in both the San Lorenzo River locations as well as at Loch Lomond followed by individual plots on Figures 5-11 – 5-13 for individual sources. For each plot, four time-based lines of best fit and an overall time series line of best fit have been provided for the data with the first-time period from 1967 to 1990 that indicates potential increasing trend in nitrate, a second-time period from 1991 to 2010 that shows levelling of nitrate, a third from 2011 to 2016 that indicates a potential decreasing trend, and finally a fourth from 2017–2021 which indicates increasing trends at San Lorenzo River sources and a decreasing trend at Loch Lomond. The overall time series indicates slowly increasing nitrate levels at all three locations. Long-term evaluation of nitrate data should be continued in the future to assess the continued focus on water quality, and particularly onsite wastewater management, which has occurred since about 1995.

5.4.3.2 SLVWD Surface Water Sources

The summary of nitrate data for the SLVWD surface water sources is included in Table 5-3. The nitrate results were often found to be below reporting limits, and for this reason no graph illustrating these results was provided.

[18] Groundwater typically has a higher dissolved ion concentration than direct runoff, which presumably enters the channel shortly after precipitation with little residence time in the groundwater reservoir and limited contact with soil or vegetation.

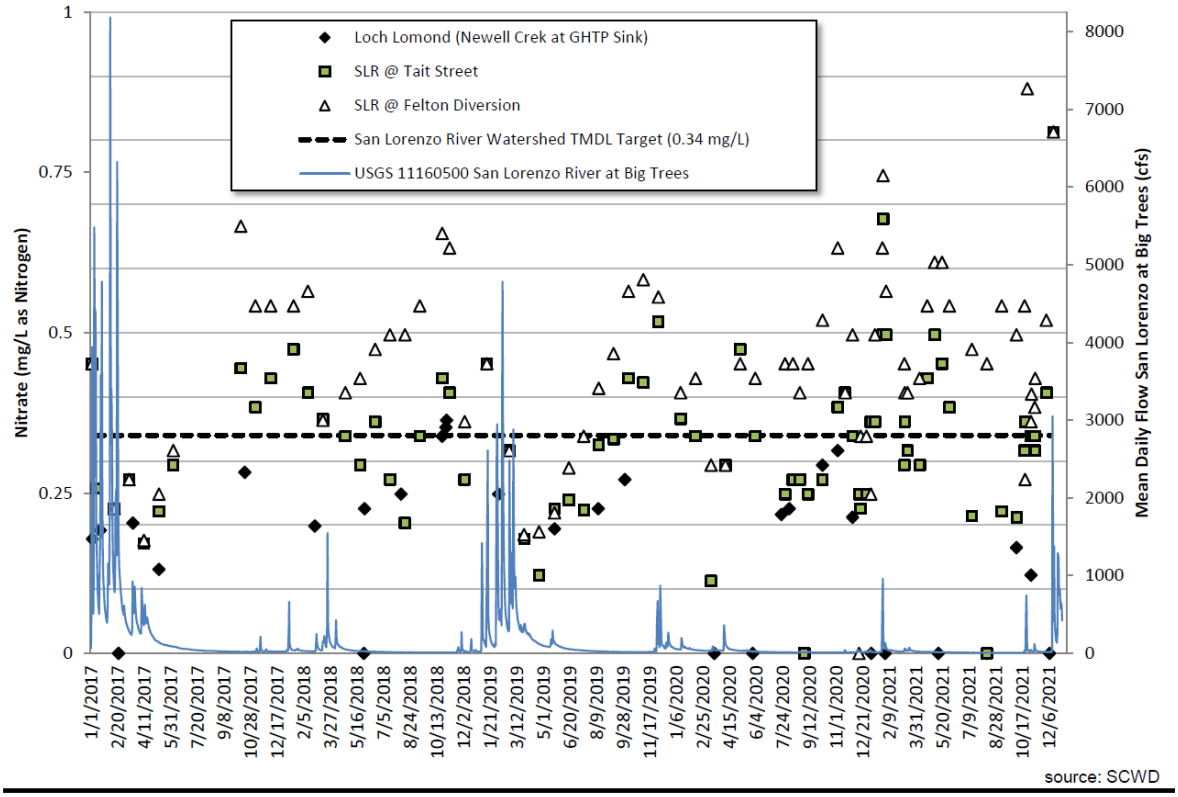

Figure 5-8 **Nitrate Concentrations in the SCWD San Lorenzo River Sources, 2017-2021**
Mean daily flows from San Lorenzo River at Big Trees are shown for reference to runoff conditions

Figure 5-8: Nitrate Concentrations in the City's San Lorenzo River Watershed Sources, 2017-2021

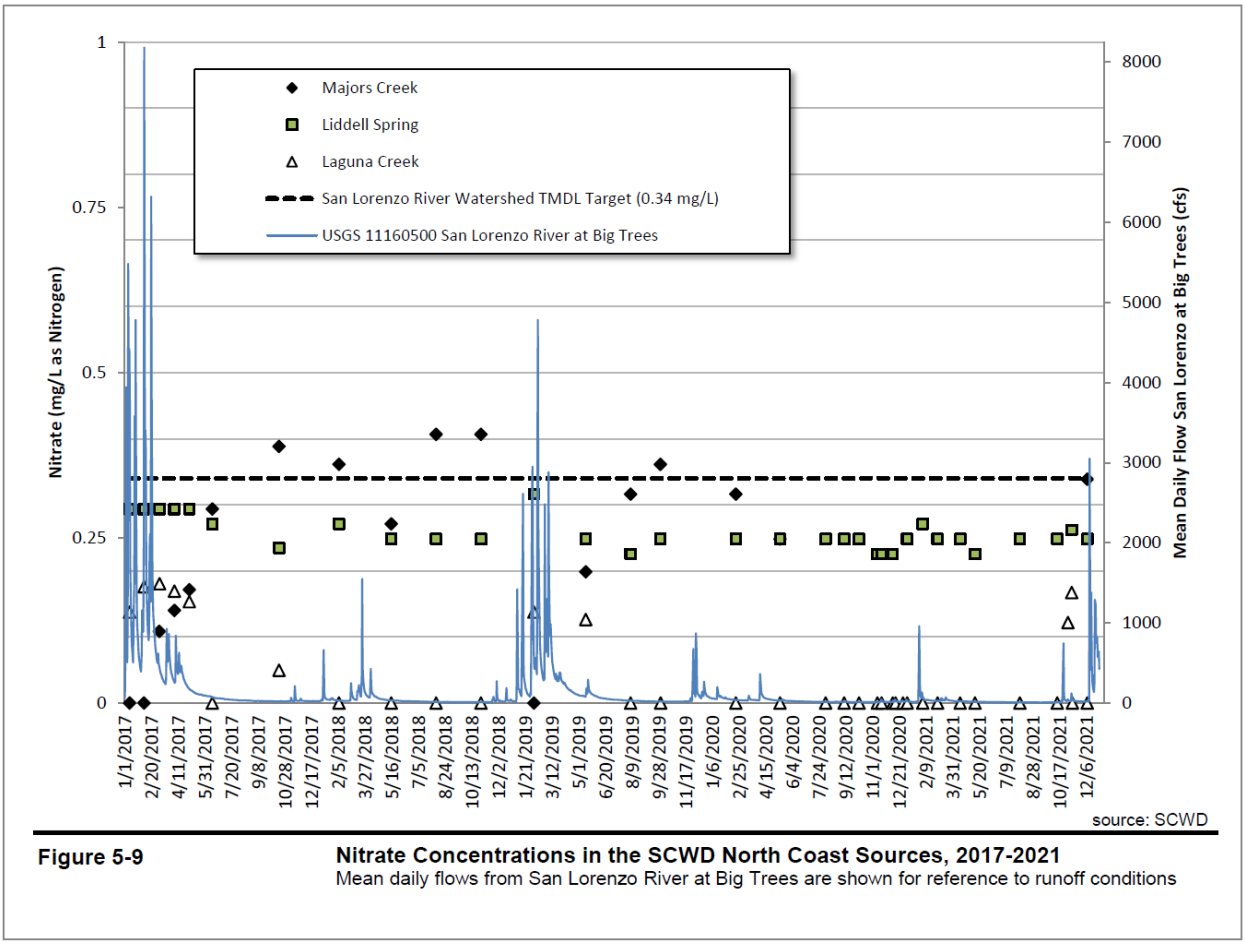

Figure 5-9 **Nitrate Concentrations in the SCWD North Coast Sources, 2017-2021**
Mean daily flows from San Lorenzo River at Big Trees are shown for reference to runoff conditions

Figure 5-9: Nitrate Concentrations in the City's North Coast Sources, 2017-2021

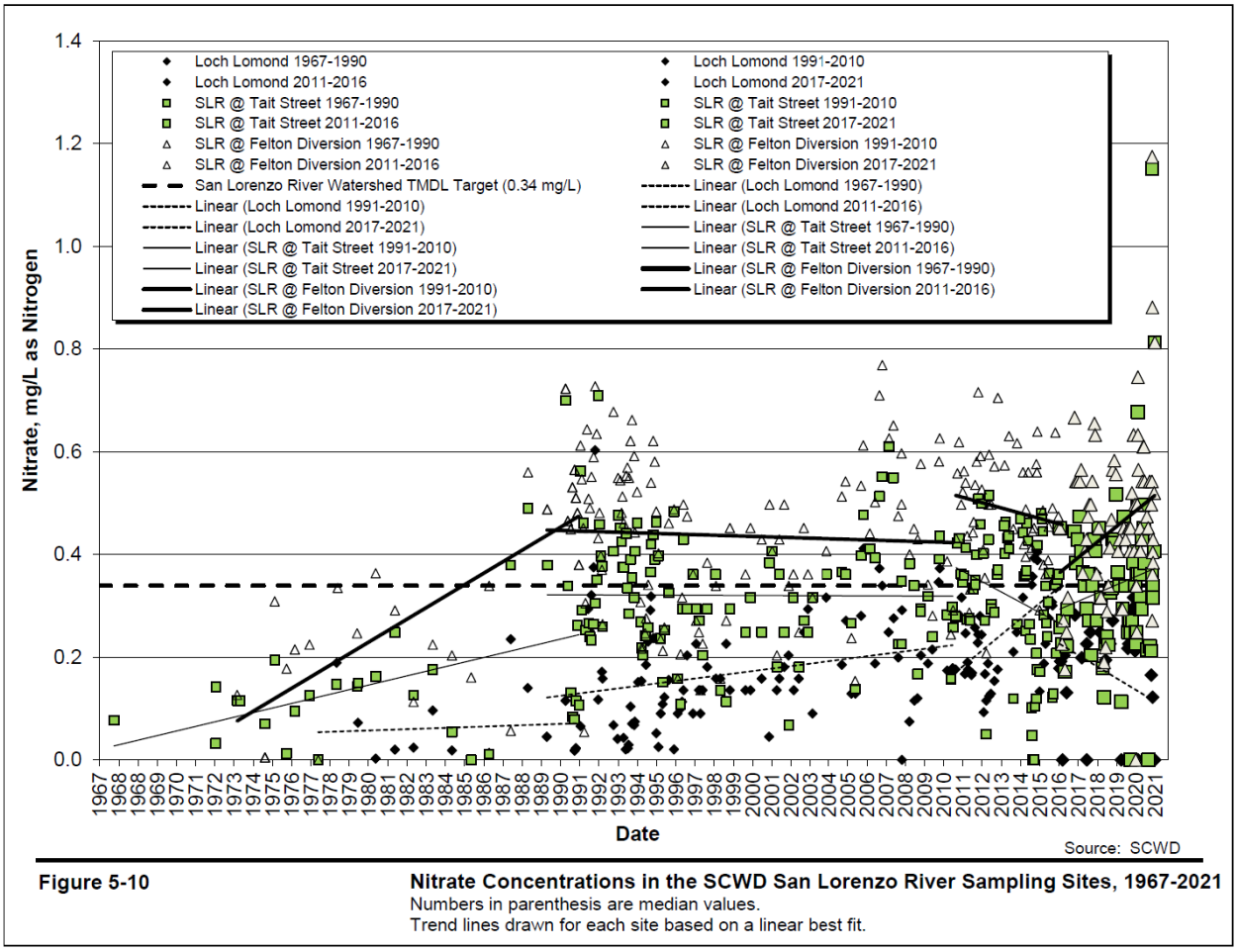

Figure 5-10 **Nitrate Concentrations in the SCWD San Lorenzo River Sampling Sites, 1967-2021**
Numbers in parenthesis are median values.
Trend lines drawn for each site based on a linear best fit.

Figure 5-10: Nitrate Concentrations in the City San Lorenzo River Sampling Site 1967-2021

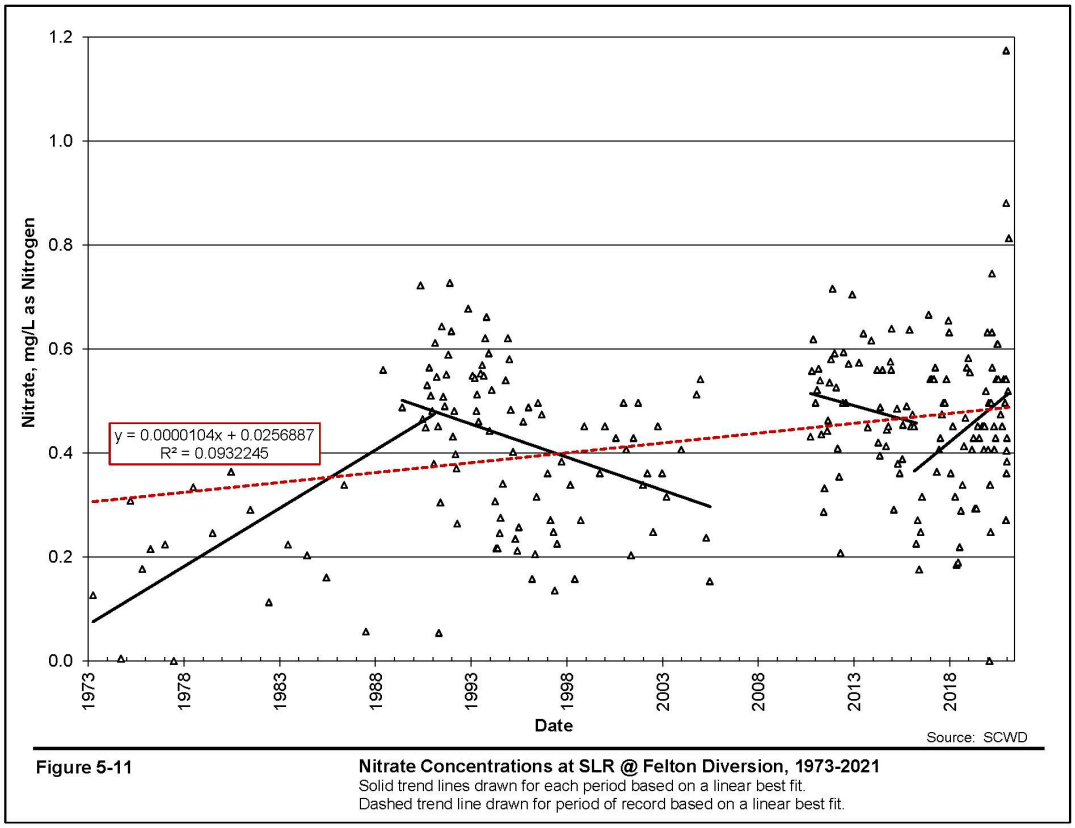

Figure 5-11 **Nitrate Concentrations at SLR @ Felton Diversion, 1973-2021**
Solid trend lines drawn for each period based on a linear best fit.
Dashed trend line drawn for period of record based on a linear best fit.

Figure 5-11: Nitrate Concentrations at SLR at Felton Diversion 1973-2021

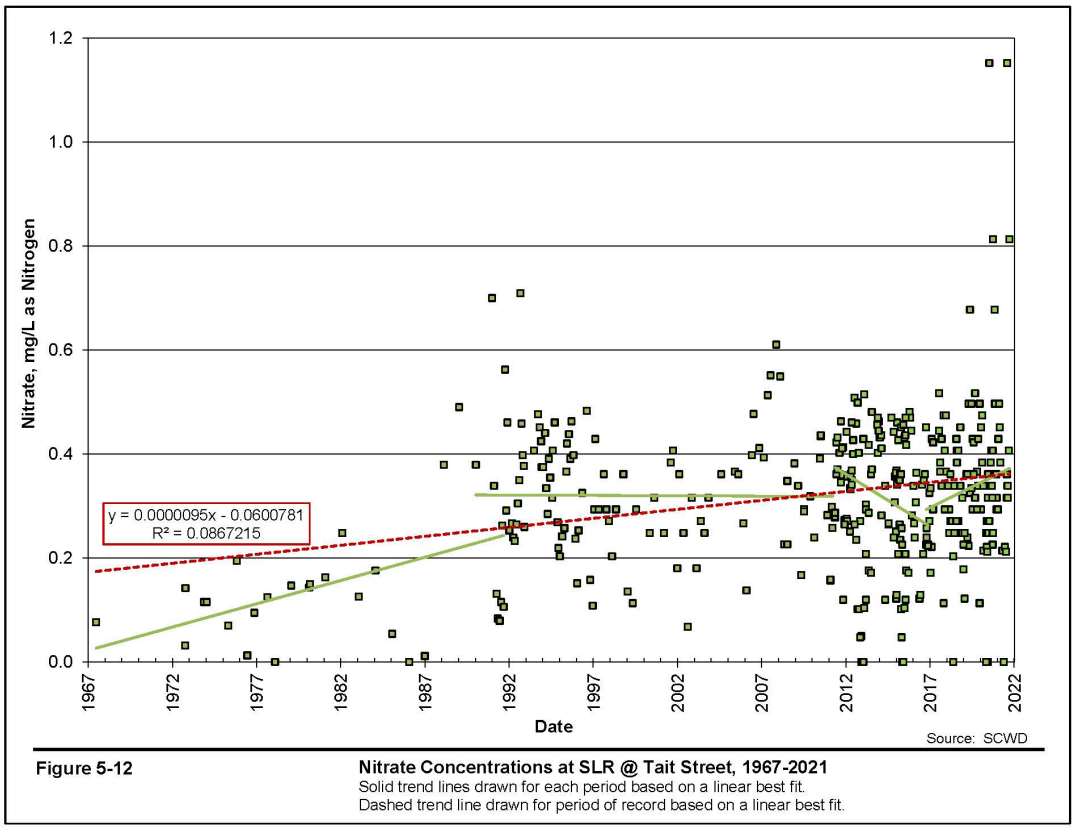

Figure 5-12 **Nitrate Concentrations at SLR @ Tait Street, 1967-2021**
Solid trend lines drawn for each period based on a linear best fit.
Dashed trend line drawn for period of record based on a linear best fit.

Figure 5-12: Nitrate Concentrations at SLR at Talt Street 1967-2021

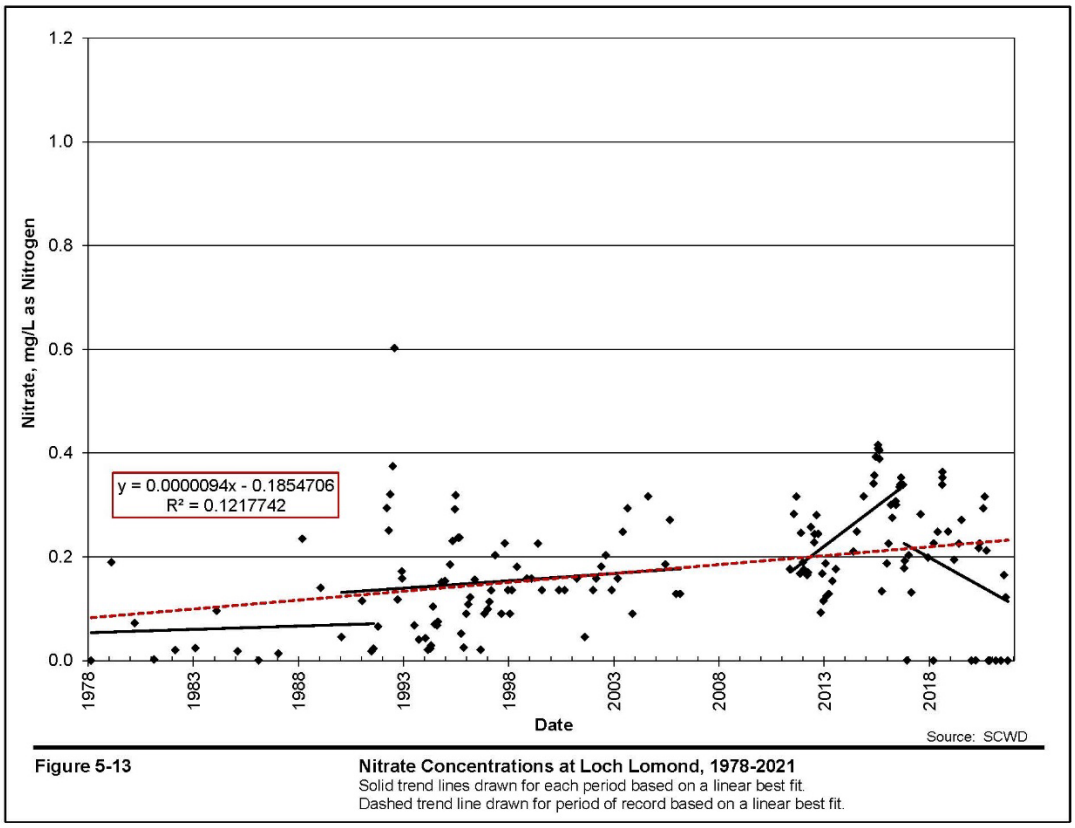

Figure 5-13: Nitrate Concentrations City's San Lorenzo River at Felton Diversion, Tait Street Diversion, and Loch Lomond, 1967-2021

5.4.4 Odors

Odors of raw water typically relate to natural organic matter and algae degradation products. The City has extensive data on the Threshold Odor Numbers (TON) parameter. Raw and treated TONs were monitored more aggressively starting in the mid-1980s, primarily because of customer complaints.

Figure 5-14 shows TON values for the City's San Lorenzo River sources for calendar years 2017-2021. TON at Loch Lomond, Tait Street Diversion, and the Felton Diversion appear relatively constant, which may align with both a focus on algae control and a stabilizing in the nitrate concentrations and therefore a relatively lower algae production rate. Significant spikes in 2021 for Felton Diversion may be attributed to the first significant rain events to occur in over a year. Values following that event for all sources dropped to lower values immediately after.

Figure 5-15 shows TON values for City's North Coast sources over the same 5-year period. TON at Liddell Spring is much lower than at Laguna and Majors Creeks. Generally, values for the San Lorenzo River and North Coast sources are about the same, but the spikes for the San Lorenzo River during significant rain events are more dramatic.

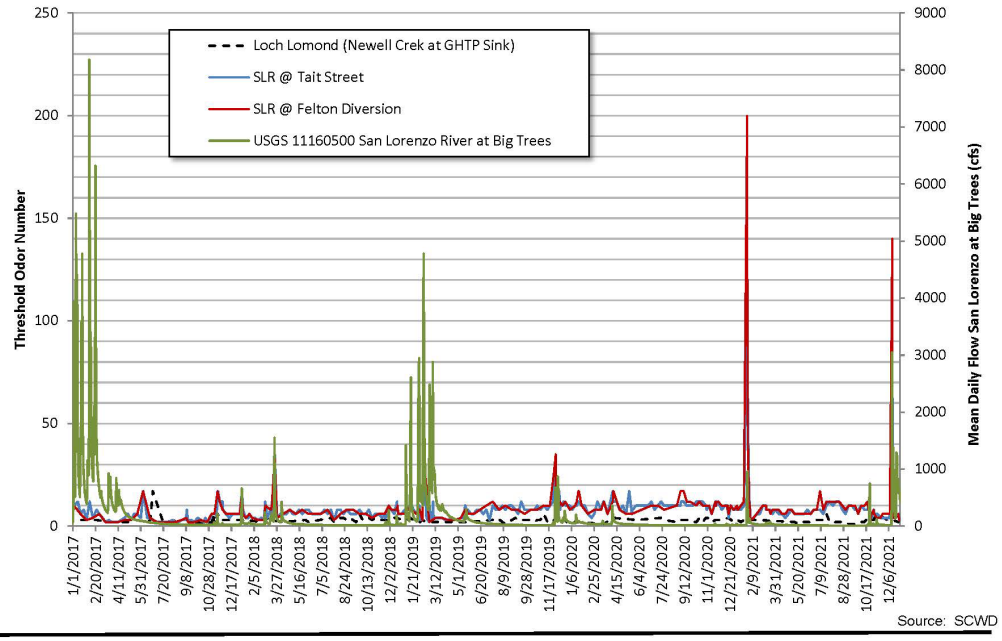

Figure 5-14 **TON measured in SCWD's San Lorenzo River Sources, 2017-2021**
Odor data is collected twice a month. Mean daily flows from San Lorenzo River at Big Trees are shown for reference to runoff conditions. Values greater than or equal to 20 correspond with significant rainfall, with the highest numbers during severe storm events.

Figure 5-14: TON Measured in City's San Lorenzo River Watershed Sources, 2017-2021

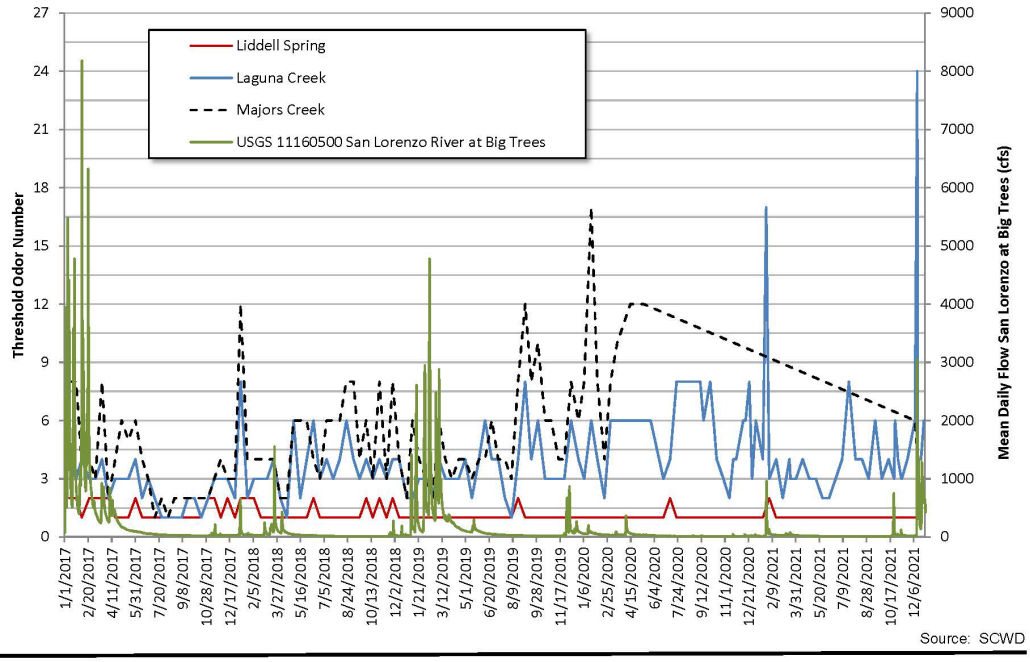

Figure 5-15 **TON measured in SCWD's North Coast Sources, 2017-2021**
Odor data is collected twice a month. Mean daily flows from San Lorenzo River at Big Trees are shown for reference to runoff conditions. Values greater than or equal to 20 correspond with significant rainfall, with the highest numbers during severe storm events.

Figure 5-15: TON Measured in City's North Coast Sources, 2017-2021

5.4.5 Organic Contaminants

5.4.5.1 Synthetic Organic Compounds (SOCs)

City conducts triennial monitoring of SOCs at all raw sources and consists of 12 man-made carbon-based compounds such as pesticides, defoliants, and fuel additives. Table 14 of the City Source Water Monitoring Study Report Water Year 2021 (October 1, 2020 – September 30, 2021) (WY2021 Report), prepared after the CZU Lightning Complex Fire, provides a list of the SOC compounds analyzed during WY 2021 and their associated primary MCLs as can be found in Appendix B. Historically, SOCs have not been detected in the source water or in the GHWTP finished water.

The City (WY2021 Report) increased the monitoring of SOCs following the CZU Lightning Complex Fire to include monthly and storm event sampling and added 2,3,7,8-TCDD. TCDD, commonly referred to as dioxin, is a chemical that is mainly a byproduct of industrial and manufacturing processes such as chlorine bleaching of paper, uncontrolled waste incinerators, and manufacturing of some herbicides and pesticides. TCDD can also result from natural processes including volcanic eruptions and forest fire. In a wildfire or structure fire setting, the volume of building materials, chemicals, pesticides, cleaners, automotive components, electronics, appliances, and other household items manufactured with chlorinated products such as polyvinyl chloride (PVC) can create immense amounts of TCDD. The City previously analyzed for a larger SOC list, including TCDD, but was granted a waiver from the SWRCB-DDW to reduce the list by removing compounds that were not detected.

During WY 2021, all SOC results were non-detect except for one result of 0.12 µg/L 2,4-D at SLR Highlands Park on January 27, 2021.

5.4.5.2 Volatile Organic Compounds (VOCs)

City and SLVWD conducts annual monitoring of VOCs at all surface sources and consists of 27 compounds primarily of carbon and hydrogen which are predominantly used as solvents, degreasers, cleaning solutions, dry cleaning fluids, and components of pesticides and plastics.

The City added monthly, quarterly, and storm event monitoring for VOCs to evaluate potential impacts from the CZU Lightning Complex Fire as documented in the WY2021 Report. The source water locations that were monitored include Laguna Creek, SLR Felton Diversion, and SLR Tait Street Diversion. The GHWTP finished water was also monitored for VOC compounds as well as Upper Laguna and SLR Highlands Park. All VOC compounds collected from the GHWTP finished water, source water and upper watershed locations were non-detect for WY 2021.

The SLVWD added daily, monthly, and quarterly monitoring for VOCs beginning in November of 2020 in response to the potential impacts of the CZU fire. The District followed a thorough testing plan that began with daily sampling during the first few months of the fire before shifting to a monthly then finally to a quarterly water sampling schedule. Because the samples did not detect VOCs above the maximum contaminate level, the District returned to the standard once-a-year VOC monitoring plan beginning in December 2022.

5.4.5.3 Dioxin and Furan

As previously discussed in Section 5.4.5.1, TCDD was not detected during WY 2021. Table 18 of the WY2021 Report summarizes the sixteen unregulated dioxin and furan chemicals that were analyzed from the City source water and upper watershed locations. Three unregulated dioxin and furan chemicals were detected during WY 2021 at Laguna Creek, SLR Tait Street Diversion, and SLR Highlands Park during the January 27, 2021, storm

5.4.6 Other Water Quality Parameters/

Tables 5-4 through 5-17 summarize the recent historical data for other water quality parameters in the general mineral category. The data includes summary tables for Total Hardness, calcium, magnesium, sodium, potassium, alkalinity, sulfate, chloride, fluoride, pH, Total Dissolved Solids (TDS), conductivity, color, and Methylene Blue Active Substances (MBAS), which are indicative of soaps/detergents:

5.4.6.1 Total Hardness

Table 5-4: Total Hardness — The majority of the data indicate that most area surface waters are moderately hard, with values around 115 to 255 mg/l as CaCO3. One City source, Liddell Spring, has average and median hardness values of above 250 mg/l as CaCO3. This hardness is most likely caused by the extensive limestone (karst) geology in the spring vicinity. SLVWD samples were generally one time per year. Most SLVWD creek waters have significantly lower hardness than City waters, while spring waters are similar to Liddell Spring.

Table 5-4: Total Hardness Summary of Available Data (mg/L as CaCO3)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	255	244	224	400	130	2017	2021
Laguna Creek	127	136	44	176	142	2017	2021
Majors Creek	116	126	44	154	88	2017	2021
Loch Lomond	150	150	110	184	151	2017	2021
SLR @ Tait Street	137	147	58	180	352	2017	2021
SLR @ Felton Diversion	139	148	64	210	236	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	220	NR	NR	N/A	230	220	230
Bull Springs-1	280	300	260	N/A	290	270	280
Bull Springs-2	260	220	210	N/A	210	240	260
Clear Creek	68	44	38	N/A	40	63	73
Fall Creek	110	92	91	100	87	N/A	120

Utility/Location	Average	Median	Low	High	No. Samples	Sample Dates (WY)	
Foreman Creek	71	46	42	N/A	42	65	77
Peavine Creek	85	68	50	N/A	54	83	90
Sweetwater Creek	94	63	68	N/A	69	77	96
Lompico Creek	200	180	NR	NR	NR	NR	NR

[1]Source: City
[2]Source: SLVWD, NR = Not Recorded, N/A = Data not available

5.4.6.2 Calcium

Table 5-5: Calcium — This table lists similar results as for hardness; moderate values for most sources (e.g., about 40 mg/l) except for Liddell Spring -. SLVWD samples were generally one time per year. Several of SLVWD's calcium values that were analyzed are lower than those of City.

Table 5-5: Calcium Summary of Available Data (mg/L)

Utility/Location	Average	Median	Low	High	No. Samples	Sample Dates (WY)	
Santa Cruz Water Department[1]							
Liddell Spring	88.2	84.0	78.0	130.0	31	2017	2021
Laguna Creek	38.3	42.0	15.0	54.0	44	2017	2021
Majors Creek	39.7	42.0	12.0	86.0	19	2017	2021
Loch Lomond	44.8	45.5	30.0	52.0	26	2017	2021
SLR @ Tait Street	41.1	44.0	21.0	50.0	84	2017	2021
SLR @ Felton Diversion	42.0	45.0	21.0	62.0	83	2017	2021
San Lorenzo Valley Water District[2]	Year						
	2015	**2016[3]**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	77	NR	NR	N/A	81	76	80
Bull Springs-1	80	86	73	N/A	82	78	81
Bull Springs-2	NR	NR	63	N/A	62	71	76
Clear Creek	NR	NR	NR	N/A	10	16	19
Fall Creek	34	31.53	28	31	27	N/A	28
Foreman Creek	NR	NR	NR	N/A	9.6	14	18
Peavine Creek	NR	NR	NR	N/A	13	20	22
Sweetwater Creek	NR	NR	NR	N/A	16	18	22
Lompico Creek	50	43	NR	NR	NR	NR	NR

Source[1]: SLVWD
Source[1]: City, * Median based on 2017-2021 values
Source[2]: SLVWD: NR = Not Recorded; N/A = Data not available; ND= Non-Detectable
[3] Average of March and April 2016 values

5.4.6.3 Magnesium

Table 5-6: Magnesium — Magnesium concentrations are low compared to calcium. This indicates most of the total hardness is from calcium, as expected considering the geologic formations throughout the watershed area. SLVWD's Bull Springs and Lompico Creek sources were slightly higher in magnesium than those of City.

Table 5-6: Magnesium Summary of Available Data (mg/L)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	9.6	8.9	8.2	16.0	31	2017	2021
Laguna Creek	4.8	5.0	2.8	6.4	44	2017	2021
Majors Creek	5.1	3.4	2.8	35.0	19	2017	2021
Loch Lomond	9.3	9.5	7.4	12.0	26	2017	2021
SLR @ Tait Street	8.6	8.7	5.8	12.0	84	2017	2021
SLR @ Felton Diversion	8.9	8.9	6.3	22.0	83	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	7.4	NR	NR	N/A	7.5	7.0	7.1
Bull Springs-1	19	21	18	N/A	20	18	18
Bull Springs-2	18	15	13	N/A	13	16	17
Clear Creek	6.1	4	3.2	N/A	3.6	5.6	6.3
Fall Creek	6.6	5	5.1	5.8	4.7	N/A	6.6
Foreman Creek	6.9	5	4.4	N/A	4.4	7.2	7.8
Peavine Creek	8.6	6.85	5	N/A	5.2	8.1	8.5
Sweetwater Creek	7.6	5.5	6.2	N/A	7.0	7.8	10.0
Lompico Creek	17	17	NR	NR	NR	NR	NR

Source[1]: City, * Median based on 2017-2021 values
Source[2]: SLVWD, Note: NR = Not Recorded, N/A = Data not available

5.4.6.4 Sodium

Table 5-7: Sodium — The average sodium content in City waters ranges from about 10 to 24 mg/l. Lompico Creek had sodium analyses in the range of 18 to 28 mg/L, which are higher than the other SLVWD's sources and more similar to most of City's sources.

Table 5-7: Sodium Summary of Available Data (mg/L)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	11.4	11.0	10.0	14.0	31	2017	2021
Laguna Creek	10.6	10.0	6.3	14.0	44	2017	2021
Majors Creek	15.6	16.0	8.6	40.0	19	2017	2021
Loch Lomond	18.1	18.0	0.0	25.0	26	2017	2021
SLR @ Tait Street	22.5	24.0	10.0	29.0	84	2017	2021
SLR @ Felton Diversion	23.1	24.0	9.7	30.0	83	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	6.7	NR	NR	N/A	6.8	6.3	7.0
Bull Springs-1	9	8.9	7.7	N/A	7.7	8.6	8.5
Bull Springs-2	11	9.4	8.7	N/A	9.4	9.8	11.0
Clear Creek	10	6.9	6.9	N/A	7.4	9.8	10.0
Fall Creek	10	9.25[3]	8.4	9.8	8.4	N/A	10.0
Foreman Creek	9.8	6.7	7.4	N/A	7.4	9.9	10.0
Peavine Creek	11	8.7[3]	7.6	N/A	8.1	11.0	11.0
Sweetwater Creek	11	8.6	9.2	N/A	9.5	11.0	12.0
Lompico Creek	28	24	NR	NR	NR	NR	NR

Source[1]: City* Median based on 2017-2021 values
Source[2]: SLVWD, Note: NR = Not Recorded, N/A = Data not available [3] Average of March and April data

5.4.6.5 Potassium

Table 5-8: Potassium — The typical potassium content in City waters is about 2 mg/l. Lompico Creek had potassium in a range from 1.1 to 1.4 mg/L, which is slightly lower than SLVWD and City values.

Table 5-8: Potassium Summary of Available Data (mg/L)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	1.7	1.6	1.4	2.3	31	2017	2021
Laguna Creek	1.8	1.7	1.4	4.0	44	2017	2021
Majors Creek	1.8	1.5	1.2	3.7	19	2017	2021
Loch Lomond	2.0	1.9	1.7	2.8	26	2017	2021
SLR @ Tait Street	2.3	2.1	1.5	6.3	83	2017	2021
SLR @ Felton Diversion	2.2	2.0	1.5	11.0	83	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	2	NR	NR	N/A	1.6	1.7	1.9
Bull Springs-1	1.8**	1.7**	1.6**	N/A	1.5	1.5	1.6
Bull Springs-2	1.6**	1.5**	1.5**	N/A	1.1	1.4	1.4
Clear Creek	2.0**	1.6**	1.5**	N/A	1.2	1.6	1.8
Fall Creek	1.9**	1.9**	2.0**	1.8	1.3	N/A	1.8
Foreman Creek	2.2**	1.6**	1.8**	N/A	1.4	1.8	2.3
Peavine Creek	2.7**	2.45**	2.2**	N/A	1.9	2.5	2.7
Sweetwater Creek	2.2**	1.7**	2.1**	N/A	1.6	1.8	2.1
Lompico Creek	2	1.3	NR	NR	NR	NR	NR

Source[1]: City * Median based on 2017-2021 values
Source[2]: SLVWD, Note: NR = Not Recorded, N/A = Data not available ** indicates Intraday Average

5.4.6.6 Alkalinity

Table 5-9: Alkalinity — Alkalinity varies widely in City, presumably because of high runoff periods. The average value for Liddell Spring is 196 mg/l as CaCO3, due to karst bedrock geology, and about 92 to 118 mg/l as CaCO3 for the other sources. Lompico Creek had an alkalinity range from 180 to 190 mg/L during 2015-2016, which is in the mid-range of SLVWD's other water sources; again, highlighting that the spring sources with their contact to karst (limestone) have higher alkalinity compared to the creeks.

Table 5-9: Alkalinity Summary of Available Data (mg/L as CaCO3)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	196	194	176	226	130	2017	2021
Laguna Creek	118	126	30	152	142	2017	2021
Majors Creek	92	101	32	118	88	2017	2021
Loch Lomond	101	100	70	126	151	2017	2021
SLR @ Tait Street	103	114	34	132	352	2017	2021
SLR @ Felton Diversion	105	116	34	128	236	2017	2021
San Lorenzo Valley Water District[2]	Year						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	220	NR	NR	N/A	210	210	210
Bull Springs-1	280	280	250	N/A	250	270	260
Bull Springs-2	260	210	210	N/A	190	240	250
Clear Creek	78	47	43	N/A	46	71	78
Fall Creek	120	90	89	100	84	N/A	120
Foreman Creek	82	51	48	N/A	48	72	81
Peavine Creek	100	71	58	N/A	60	94	98
Sweetwater Creek	110	72	70	N/A	80	86	100
Lompico Creek	190	180	NR	NR	NR	NR	NR

Source[1]: City
Source[2]: SLVWD, Note: NR = Not Recorded, N/A = Data not available

5.4.6.7 Sulfate

Table 5-10: Sulfate — The secondary MCL for sulfate is 250 mg/l. The maximum value measured in annual samples of City water was 210 mg/l in Liddell Spring. Averages range from 15 to 70 mg/l. Lompico Creek had sulfate in the range from 25 to 29 mg/L during 2015-2016, while the other SLVWD sources had sulfate values are lower than both City and Lompico Creek.

Table 5-10: Sulfate Summary of Available Data (mg/L)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	67.4	57.5	42.0	210.0	32	2017	2021
Laguna Creek	15.1	15.0	5.7	28.0	35	2017	2021
Majors Creek	28.4	31.0	10.0	44.0	18	2017	2021
Loch Lomond	69.4	71.0	52.0	75.0	31	2017	2021
SLR @ Tait Street	48.5	48.0	30.0	69.0	73	2017	2021
SLR @ Felton Diversion	49.5	49.5	32.0	69.0	72	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	12	16	NR	N/A	14	9.8	11
Bull Springs-1	10	9.6	7.4	N/A	8.1	9.3	9.8
Bull Springs-2	11	8.6	6	N/A	7.2	9.2	12
Clear Creek	4.1	2.8	2.2	N/A	2.4	3.4	5.1
Fall Creek	11	9.1	5.9	8.9	7.1	N/A	11
Foreman Creek	4.7	3.7	2.7	N/A	2.5	5.4	6.9
Peavine Creek	3.8	2.75	2	N/A	2.1	3.4	4.2
Sweetwater Creek	4.4	4.2	2.8	N/A	3.7	4.4	4.7
Lompico Creek	29	25	NR	NR	NR	NR	NR

Source[1]: City
Source[2]: SLVWD, Note: NR = Not Recorded

5.4.6.8 Chloride

Table 5-11: Chloride — The secondary MCL for chloride is 250 mg/l. The maximum value measured in City water was 34 mg/l (at Felton Diversion). Averages range from 10 to 23 mg/l. Lompico Creek had chloride in the range of 16 to 25 mg/L, which is lower than the other SLVWD sources but similar to Majors Creek and Loch Lomond.

Table 5-11 Chloride Summary of Available Data (mg/L)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	10.1	10.0	8.5	12.0	32	2017	2021
Laguna Creek	10.3	10.0	7.1	13.0	35	2017	2021
Majors Creek	15.1	16.0	9.2	17.0	18	2017	2021
Loch Lomond	11.5	11.7	7.3	15.8	31	2017	2021
SLR @ Tait Street	22.1	24.0	9.1	29.0	73	2017	2021
SLR @ Felton Diversion	22.6	24.0	9.9	34.0	72	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	7.1	6.8	NR	N/A	7.1	7.5	7.5
Bull Springs-1	9.5	9	8.7	N/A	8.7	9.8	
Bull Springs-2	10	8.8	9.6	N/A	9.2	11	11
Clear Creek	6.6	5.1	5.5	N/A	4.6	6.5	7.3
Fall Creek	7.9	6.8	7.5	8.4	6.8	N/A	9
Foreman Creek	6.2	4.5	5.7	N/A	4.3	5.5	6.6
Peavine Creek	5.7	5.15	6.1	N/A	4.8	6.1	6.6
Sweetwater Creek	6.6	5.6	6.3	N/A	5.9	7.2	6.9
Lompico Creek	25	16	NR	NR	NR	NR	NR

Source[1]: City
Source[2]: SLVWD, Note: NR = Not Recorded, N/A = Data not available

5.4.6.9 Fluoride

Table 5-12: Fluoride — The primary MCL for fluoride is 2.0 mg/l (see Appendix A). The maximum value measured in annual samples of City water is 0.32 mg/l in Loch Lomond. Averages range from 0.08 to 0.26 mg/l, with the North Coast sources having lower levels than the San Lorenzo River. Lompico Creek had fluoride in the range from 0.15 to 0.29 mg/L, which is higher than most of the SLVWD and City sources but similar to Loch Lomond.

Table 5-12: Fluoride Summary of Available Data (mg/L)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	0.09	0.09	0.08	0.14	32	2017	2021
Laguna Creek	0.08	0.09	0.00	0.11	35	2017	2021
Majors Creek	0.08	0.08	0.00	0.10	18	2017	2021
Loch Lomond	0.26	0.26	0.22	0.32	31	2017	2021
SLR @ Tait Street	0.17	0.18	0.10	0.22	73	2017	2021
SLR @ Felton Diversion	0.18	0.18	0.10	0.23	72	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	0.1	NR	NR	N/A	0.12	0.09	0.1
Bull Springs-1	0.12	0.11	0.15	N/A	0.11	0.1	0.1
Bull Springs-2	0.12	0.11	0.14	N/A	0.13	0.1	0.1
Clear Creek	0.08	0.06	0.07	N/A	0.06	0.08	0.08
Fall Creek	0.08	0.06	0.08	0.08	0.07	N/A	0.08
Foreman Creek	0.08	0.09	0.08	N/A	0.07	0.1	0.09
Peavine Creek	0.09	0.08	0.07	N/A	0.08	0.08	0.08
Sweetwater Creek	0.09	0.06	0.06	N/A	0.06	0.06	0.09
Lompico Creek	0.24	0.29	NR	NR	NR	NR	NR

Source[1]: SWD
Source[2]: SLVWD, Note: NR = Not Recorded

5.4.6.10 pH

Table 5-13: pH — The pH values for City waters have ranged from 7.3 to 7.9 units, with median values between 7.2 and 8.0. Lompico Creek had pH levels in the range of 7.6 to 8.0 which is similar to the other SLVWD sources waters but at the upper end of pH for the City source waters.

Table 5-13: Summary of Available pH Data (units)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water[1] Department							
Liddell Spring	7.3	7.3	7.0	7.6	130	2017	2021
Laguna Creek	7.9	8.0	7.3	8.2	142	2017	2021
Majors Creek	7.8	7.8	7.3	8.1	88	2017	2021
Loch Lomond	7.3	7.2	6.6	7.8	151	2017	2021
SLR @ Tait Street	7.8	7.8	7.2	8.3	352	2017	2021
SLR @ Felton Diversion	7.7	7.7	7.3	8.2	236	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	7.6	7.4	7.4	7.5	7.6	7.6	7.6
Bull Springs-1	7.4	7.3	7.5	7.1	7.4	7.3	7.5
Bull Springs-2	7.5	7.5	7.7	7.3	7.5	7.5	7.6
Clear Creek	7.7	7.8	7.7**	N/A	7.8	8.0	8.0
Fall Creek	8.1	8.1	8.1	8.1	8.0	8.1	8.1
Foreman Creek	7.9	9.0	7.7**	N/A	7.8	7.9	7.9
Peavine Creek	8.0	8.1**	7.9**	N/A	7.9	8.1	8.1
Sweetwater Creek	7.8	8.0	7.9**	N/A	7.9	8.1	8.2
Lompico Creek	7.6	8.0	NR	NR	NR	NR	NR

Source[1]: City
Source[2]: SLVWD, Note: NR = Not Recorded, N/A = Data not available ** indicates Intraday Average

5.4.6.11 TDS and Conductivity

Tables 5-14 and 5-15: TDS and Conductivity — The secondary MCL for TDS is 500 mg/l. The maximum value measured in annual samples of City water is 540 mg/l at Liddell Spring, with averages ranging from 184 to 338 mg/l. Lompico Creek had TDS values in the range from 190 to 280 mg/L which is in the middle of the TDS range of the other SLVWD sources and lower than many values in the City watersheds. Conductivity (or specific conductance) can be used as a surrogate parameter for TDS. The secondary MCL for specific conductance is 900 umhos/cm, while the maximum value observed was 785 umhos/cm at Liddell Spring. Median values from all City sources have ranged from 310 to 510 umhos/cm.

Table 5-14: Total Dissolved Solids Summary of Available Data (mg/L)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	338	320	270	540	31	2017	2021
Laguna Creek	184	190	80	240	31	2017	2021
Majors Creek	191	210	90	240	18	2017	2021
Loch Lomond	239	240	180	280	25	2017	2021
SLR @ Tait Street	246	250	190	290	60	2017	2021
SLR @ Felton Diversion	249	250	200	290	59	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	280	NR	NR	N/A	270	280	260
Bull Springs-1	350	350	280	N/A	320	310	320
Bull Springs-2	320	280	250	N/A	250	290	300
Clear Creek	120	90	88	N/A	78	100	110
Fall Creek	180	140	140	150	130	N/A	170
Foreman Creek	130	98	94	N/A	76	110	110
Peavine Creek	140	115	110	N/A	92	130	120
Sweetwater Creek	150	110	110	N/A	110	130	120
Lompico Creek	280	280	NR	NR	NR	NR	NR

Source[1]: City
Source[2]: SLVWD Note: NR = Not Recorded, N/A = Data not available

Table 5-15: Conductivity Summary of Available Data (µmhos/cm)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	530	510	455	785	130	2017	2021
Laguna Creek	294	310	100	430	142	2017	2021
Majors Creek	302	325	120	380	88	2017	2021
Loch Lomond	381	385	290	440	151	2017	2021
SLR @ Tait Street	372	400	145	455	352	2017	2021
SLR @ Felton Diversion	381	405	140	470	236	2017	2021
San Lorenzo Valley Water District[2]							
Bennett Spring	NR	NR	NR	NR			
Bull Springs-1	533	540	510	550	3	2019	2021
Bull Springs-2	467	470	420	510	3	2019	2021
Clear Creek	153	170	110	180	3	2019	2021
Fall Creek	240	250	200	270	3	2018	2021
Foreman Creek	160	170	120	190	3	2019	2021
Peavine Creek	187	200	140	220	3	2019	2021
Sweetwater Creek	207	200	190	230	3	2019	2021
Lompico Creek	NR	NR	NR	NR			

Source[1]: City
Source[2]: SLVWD, Note: NR = Not Recorded

5.4.6.12 Color

Table 5-16: Color — Apparent color of City source waters has been as high as 3,000 units , with the higher values from the San Lorenzo River sources, although this high result is during a storm event and is not typical. Median values range from 1 to 16 units. Treated water typically has very little or no detectable color. SLVWD sources are very low by comparison. For the 2018 to 2021 reporting period, data was only available for SLVWD's raw water sources in the northern portion of the watershed, i.e., Clear Creek, Foreman Creek, Peavine Creek and Sweetwater Creek. Data for the Felton sources was unavailable for that period.

Table 5-16: Apparent Color Summary of Available Data (units: CU)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	1.6	1.0	1.0	28.0	130	2017	2021
Laguna Creek	9.9	4.0	1.0	400.0	142	2017	2021
Majors Creek	20.0	8.0	3.0	200.0	88	2017	2021
Loch Lomond	22.8	16.0	6.0	120.0	151	2017	2021
SLR @ Tait Street	36.9	15.0	8.0	800.0	352	2017	2021
SLR @ Felton Diversion	49.0	16.0	8.0	3000.0	236	2017	2021
San Lorenzo Valley Water District[2]	**Year**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bennett Spring	< 3.0	< 3.0	< 3.0	N/A	N/A	N/A	N/A
Bull Springs-1	< 3.0	< 3.0	< 3.0	N/A	N/A	N/A	N/A
Bull Springs-2	< 3.0	< 3.0	< 3.0	N/A	N/A	N/A	N/A
Clear Creek	< 3.0	NR	< 3.0	N/A	3.0	< 3.0	< 3.0
Fall Creek	< 3.0	< 3.0	< 3.0	N/A	N/A	N/A	N/A
Foreman Creek	< 3.0	< 3.0	< 3.0	N/A	3.0	24.5[3]	11.5[4]
Peavine Creek	< 3.0	< 3.0	< 3.0	N/A	6.0	< 3.0	< 3.0
Sweetwater Creek	< 3.0	< 3.0	< 3.0	N/A	4.0	< 3.0	< 3.0
Lompico Creek	190	180	NR	NR	NR	NR	NR

Source[1]: City
Source[2]: SLVWD, Note: NR = Not Recorded, N/A = Data not available
[3] Average of March, October, and November
[4] Average of February and March

5.4.6.13 MBAS

Table 5-17: MBAS (Foaming Agents) — The MCL for MBAS, or foaming agents, in drinking water is 0.5 mg/l. There were no MBAS measurements found to be above the detection limit in City waters. Of the SLVWD values measured, the MBAS values were very low.

Table 5-17: MBAS Summary of Available Data (mg/L)

Utility/Location	*Average*	*Median*	*Low*	*High*	*No. Samples*	*Sample Dates (WY)*	
Santa Cruz Water Department[1]							
Liddell Spring	ND	ND	ND	ND	6	2017	2021
Laguna Creek	ND	ND	ND	ND	13	2017	2021
Majors Creek	ND	ND	ND	ND	5	2017	2021
Loch Lomond	ND	ND	ND	ND	16	2017	2021
SLR @ Tait Street	ND	ND	ND	ND	50	2017	2021
SLR @ Felton Diversion	ND	ND	ND	ND	48	2017	2021

Source[1]: City

5.4.6.14 E. Coli

The concentration of *E. coli* provides an indication of the extent of human and animal fecal contamination of a watershed, as it is more specific than total coliform. For drinking water supplies, the common guidance is that fecal coliform levels above 200 MPN/100 mL signifies a source with potentially large contamination from human sources (NRC 2004). However, the distribution system is frequently sampled for the presence of *E. coli*, and should it be detected, extensive customer and agency notifications are required, along with flushing and disinfection of the affected area of the distribution network.

Data for *E. Coli* values from 2017-2021 in the San Lorenzo River Sources and North Coast Sources indicate an increasing trend in *E. Coli* at Laguna Creek, though all values still remain under 200 MPN/100 m. *E. Coli* levels for the rest of the sources seem to be generally constant from 2017-2021 and under 200 MPN/100 mL, though SLR @ Tait Street Diversion and SLR @ Felton Diversion sees large *E. Coli* spikes above this limit concurrent with rain events.

5.4.6.15 Microbial Source Tracking (MST)

As reported in the WY 2021 Report, MST is the process of identifying the particular source (e.g., human, cattle, and bird) of fecal contamination in water. In December 2016, the City began MST monitoring in the SLR in order to gain a better understanding of the source of the fecal contamination in the SLR. The four MST analyses performed include Universal Bacteroides, Human Bacteroides (HF-183), MS2 Coliphage, and Somatic Coliphage. Universal Bacteroides tests for fecal contamination from all sources including animals, birds, and humans, while Human Bacteroides (HF-183), MS Coliphage, and Somatic Coliphage are fecal indicators of human influence particularly from wastewater. Human Bacteroides (HF-183) are a genus of bacteria that predominantly thrive in the lower gastrointestinal tract of humans and are therefore directly associated with fecal contamination. MS2 and Somatic Coliphage are bacteriophage viruses that infect *E. coli* bacterial cells. There are no current regulations for MST as they are primarily used as indicators of human influence in recreation and source water. Storm event MST analysis was added to WY 2021 to further evaluate storm water quality for treatment at the GHWTP. MST results were found to be variable throughout the year with Human Bacteroides, MS2 Coliphage, and Somatic Coliphage concentrations were generally higher during the wet season, suggesting that there is a greater human microbial influence during winter storms, potentially from septic systems in the San Lorenzo Valley located along the SLR. Universal Bacteroides concentrations were found to be high during the dry season when there are lower rates of flow and an increase in animal activity, as well as human recreation occurring in the SLR.

5.4.6.16 PFAS

As part of the Water Year (WY) 2020 source water monitoring program, the City began PFAS monitoring at source water locations. In WY 2021, PFAS monitoring was increased to evaluate potential impacts from the CZU Lightning Complex Fire as reported in the WY 2021 Report. A summary of the source water and finished water detected PFAS results for calendar years 2019-2021 is shown in Table 5-18 as reported in the WY2021 Report. PFAS were detected in three City's source waters including Laguna Creek, SLR @ Felton Diversion, and SLR @ Tait Street Diversion, as well as in the GHWTP finished water. PFAS were detected in small amounts throughout the WY in the SLR but were only detected during storm events at Laguna

Creek. The highest PFAS result of 46.0 ppt Perfluorobutanoic acid (PFBA) was detected at Laguna Creek during the first storm of the year (November 18, 2020). PFBA does not have a California NL. PFAS were not collected at Loch Lomond and were not detected in Liddell Spring. Out of the twenty-five PFAS compounds analyzed, only two were detected in the GHWTP finished water. With the exception of the high PFBA result from Laguna Creek in November 2020, all other results are considered low, and below their respective NLs.

Storm event PFAS monitoring was conducted at two upper watershed locations including Upper Laguna and SLR Highlands Park. A summary of the detected PFAS results for Upper Laguna and SLR Highlands are shown in Table 21. PFAS were only detected during the November 18, 2020, and January 27, 2021 storms and all results were below their NLs.

Table 5-18: Summary of Unregulated PFAS Parameters Measured in Source Waters and Finished Water between October 2020 and September 2021[1]

Sample Location	*Date*	*Analyte*	*Acronym*	*California Notification Level (ng/L)*	*Result (ng/L)*
Laguna Creek (20 sampling events)	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	3.8
	11/18/20	Perfluorobutanoic acid	PFBA		46
	11/18/20	Perfluorohexanoic acid	PFHxA		3.6
	11/18/20	Perfluoropentanoic acid	PFPeA		3.1
	12/14/20	Perfluorobutanoic acid	PFBA		6.6
	01/27/21	Perfluorobutanoic acid			4.7
	10/25/21	Perfluorobutanesulfonic acid	PFBS	500	2.5
	10/25/21	Perfluorobutanoic acid	PFBA		3.1
SLR Tait Street Diversion (32 sampling events)	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	3.7
	11/18/20	Perfluorobutanoic acid	PFBA		4.1
	11/18/20	Perfluorohexanoic acid	PFHxA		3.5
	11/18/20	Perfluorooctanesulfonic acid	PFOS	6.5	6.1
	11/18/20	Perfluorooctanoic acid	PFOA	5.1	3.7
	11/18/20	Perfluoropentanoic acid	PFPeA		4.2
	12/14/20	Perfluorobutanoic acid	PFBA		4.3
	12/14/20	Perfluorohexanoic acid	PFHxA		2.3
	12/14/20	Perfluorooctanesulfonic acid	PFOS	6.5	2.8
	12/14/20	Perfluorooctanoic acid	PFOA	5.1	2.3
	12/14/20	Perfluoropentanoic acid	PFPeA		2.8
	12/28/20	Perfluorobutanesulfonic acid	PFBS	500	2.2
	12/28/20	Perfluorobutanoic acid	PFBA		2.1
	12/28/20	Perfluoropentanoic acid	PFPeA		2
	01/05/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.4
	03/10/21	Perfluorooctanesulfonic acid			3.5
	03/10/21	Perfluorooctanoic acid	PFOA	5.1	2.2
	03/15/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.7
	04/07/21	Perfluorooctanesulfonic acid			2
	05/05/21	Perfluorooctanesulfonic acid			2.2
	06/02/21	Perfluorooctanesulfonic acid			2.3
	07/14/21	Perfluorobutanesulfonic acid	PFBS	500	2.1
	07/14/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.4
	07/14/21	Perfluorooctanoic acid	PFOA	5.1	2.1

Sample Location	Date	Analyte	Acronym	California Notification Level (ng/L)	Result (ng/L)
	07/14/21	Perfluoropentanoic acid	PFPeA		2
	09/08/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.1
	10/06/21	Perfluorooctanesulfonic acid			2.2
	10/21/21	Perfluorobutanoic acid	PFBA		2.5
	10/21/21	Perfluorohexanoic acid	PFHxA		2.6
	10/21/21	Perfluorooctanesulfonic acid	PFOS	6.5	4.2
	10/21/21	Perfluorooctanoic acid	PFOA	5.1	2.6
	10/21/21	Perfluoropentanoic acid	PFPeA		2.5
	10/27/21	Perfluorobutanesulfonic acid	PFBS	500	3
	10/27/21	Perfluorobutanoic acid	PFBA		5.7
	10/27/21	Perfluorohexanoic acid	PFHxA		3.3
	10/27/21	Perfluorooctanoic acid	PFOA	5.1	2.5
	10/27/21	Perfluoropentanoic acid	PFPeA		3
	11/02/21	Perfluorobutanesulfonic acid	PFBS	500	2.1
	11/02/21	Perfluorobutanoic acid	PFBA		3.8
	11/02/21	Perfluorohexanoic acid	PFHxA		3
	11/02/21	Perfluorooctanesulfonic acid	PFOS	6.5	3.1
	11/02/21	Perfluorooctanoic acid	PFOA	5.1	2.9
	11/02/21	Perfluoropentanoic acid	PFPeA		3.2
	11/03/21	Perfluorobutanesulfonic acid	PFBS	500	2.1
	11/03/21	Perfluorobutanoic acid	PFBA		2.5
	11/03/21	Perfluorooctanesulfonic acid	PFOS	6.5	2
	11/03/21	Perfluoropentanoic acid	PFPeA		2.5
	11/09/21	Perfluorobutanoic acid	PFBA		2.8
	11/09/21	Perfluorohexanoic acid	PFHxA		2.6
	11/09/21	Perfluorooctanesulfonic acid	PFOS	6.5	4
	11/09/21	Perfluorooctanoic acid	PFOA	5.1	2.5
	11/09/21	Perfluoropentanoic acid	PFPeA		2.4
	12/01/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.3
SLR Felton Diversion (31 sampling events)	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	2.4
	11/18/20	Perfluorobutanoic acid	PFBA		4.5
	11/18/20	Perfluorohexanoic acid	PFHxA		3.2
	11/18/20	Perfluorooctanesulfonic acid	PFOS	6.5	5
	11/18/20	Perfluorooctanoic acid	PFOA	5.1	3.9
	11/18/20	Perfluoropentanoic acid	PFPeA		3.5
	12/14/20	Perfluorobutanesulfonic acid	PFBS	500	2.9
	12/14/20	Perfluorobutanoic acid	PFBA		3.8
	12/14/20	Perfluorooctanesulfonic acid	PFOS	6.5	2.2
	12/14/20	Perfluoropentanoic acid	PFPeA		3
	02/03/21	Perfluorobutanoic acid	PFBA		2
	03/10/21	Perfluorooctanesulfonic acid	PFOS	6.5	3.6
	03/10/21	Perfluorooctanoic acid	PFOA	5.1	2
	03/15/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.3
	04/07/21	Perfluorooctanesulfonic acid			2.1
	06/02/21	Perfluorooctanesulfonic acid			2.5
	07/14/21	Perfluorohexanoic acid	PFHxA		2
	07/14/21	Perfluorooctanesulfonic acid	PFOS	6.5	3.3
	07/14/21	Perfluorooctanoic acid	PFOA	5.1	2.4

Sample Location	Date	Analyte	Acronym	California Notification Level (ng/L)	Result (ng/L)
	07/14/21	Perfluoropentanoic acid	PFPeA		2
	09/08/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.1
	10/06/21	Perfluorooctanesulfonic acid			2.3
	10/21/21	Perfluorobutanesulfonic acid	PFBS	500	2.2
	10/21/21	Perfluorobutanoic acid	PFBA		5.2
	10/21/21	Perfluorohexanoic acid	PFHxA		3.8
	10/21/21	Perfluorooctanesulfonic acid	PFOS	6.5	4.7
	10/21/21	Perfluorooctanoic acid	PFOA	5.1	3
	10/21/21	Perfluoropentanoic acid	PFPeA		3.8
	10/27/21	Perfluorobutanesulfonic acid	PFBS	500	2.6
	10/27/21	Perfluorobutanoic acid	PFBA		4.5
	10/27/21	Perfluorohexanoic acid	PFHxA		2.5
	10/27/21	Perfluorooctanoic acid	PFOA	5.1	2.1
	10/27/21	Perfluoropentanoic acid	PFPeA		3
	11/02/21	Perfluorobutanesulfonic acid	PFBS	500	2.2
	11/02/21	Perfluorobutanoic acid	PFBA		2.5
	11/02/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.3
	11/02/21	Perfluorooctanoic acid	PFOA	5.1	2
	11/02/21	Perfluoropentanoic acid	PFPeA		2.1
	11/03/21	Perfluorobutanesulfonic acid	PFBS	500	2
	11/03/21	Perfluorobutanoic acid	PFBA		2.5
	11/03/21	Perfluorohexanoic acid	PFHxA		2
	11/03/21	Perfluorooctanesulfonic acid	PFOS	6.5	2
	11/03/21	Perfluorooctanoic acid	PFOA	5.1	2
	11/03/21	Perfluoropentanoic acid	PFPeA		2.8
	11/09/21	Perfluorobutanesulfonic acid	PFBS	500	2.1
	11/09/21	Perfluorobutanoic acid	PFBA		2.6
	11/09/21	Perfluorohexanoic acid	PFHxA		2
	11/09/21	Perfluorooctanesulfonic acid	PFOS	6.5	3.2
	11/09/21	Perfluorooctanoic acid	PFOA	5.1	2.3
	11/09/21	Perfluoropentanoic acid	PFPeA		2.2

[1]Source: WY2021 Report; Notification levels have been updated since publication of the WY 2021 Report.

Table 5-19: Unregulated PFAS Parameters Measured in Upper Watershed Waters from 2020-2021

Sample Location	*Date*	*Analyte*	*Acronym*	*California Notification Level (ng/L)*	*Result (ng/L)*
Upper Laguna	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	10.0
	11/18/20	Perfluorobutanoic acid	PFBA		12.0
	11/18/20	Perfluorohexanesulfonic acid	PFHxS		4.9
	11/18/20	Perfluorohexanoic acid	PFHxA		4.5
	11/18/20	Perfluorooctanoic acid	PFOA	5.1	2.7
	11/18/20	Perfluoropentanoic acid	PFPeA		4.0
	01/27/21	Perfluorobutanesulfonic acid	PFBS	500	2.1
	01/27/21	Perfluorobutanoic acid	PFBA		3.4
SLR Highlands Park	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	3.3
	11/18/20	Perfluorobutanoic acid	PFBA		7.0
	11/18/20	Perfluorohexanoic acid	PFHxA		2.7
	11/18/20	Perfluorooctanesulfonic acid	PFOS	6.5	3.8
	11/18/20	Perfluorooctanoic acid	PFOA	5.1	2.0
	11/18/20	Perfluoropentanoic acid	PFPeA		2.6

Source: WY2021 Report

5.4.6.17 Constituents of Emerging Concern (CEC)

In 2015, City initiated quarterly sampling at five locations including raw and treated water sampling locations as well as a first flush sampling of the San Lorenzo River at Felton and at Tait and analyzed them for 96 CEC including herbicides, artificial sweeteners, personal care products, and pharmaceuticals. Most of the CECs (76) were never detected in source water, while the remainder were detected at very low levels. Table 22 of the WY 2021 Report, which is attached as Appendix B, provides results of additional routine and storm event CEC monitoring that was implemented to evaluate potential impacts from the CZU Lightning Complex Fire.

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Section 6 Conclusions and Recommendations

This section begins by discussing conclusions related to the SWTR and AWWA/DHS *Guidance Manual*, then presents specific conclusions related to contaminant sources, monitoring programs, and overall watershed management. Section 6.5 provides a summary of activities, some of which are detailed in Section 6.4, that City and SLVWD can focus on over the next five years that contribute to maintaining and improving source water quality.

6.1 SWTR Disinfection Compliance Requirements

The SWTR requires a minimum of 4-log (or 99.99 percent) virus and 3-log (99.9 percent) Giardia cyst removal/inactivation. DDW requires utilities that report monthly median total coliform concentrations greater than 1,000 MPN/100 mL to increase the minimum level of pathogen inactivation at their treatment plant. Previously, there was a 13 July 1998 letter from DDW's predecessor agency DHS, to City requiring a 5-log (or 99.999 percent) virus and 4-log (99.99 percent Giardia) cyst removal/inactivation because the City's August 1996 to March 1998 median monthly total coliform concentrations exceeded 1,000 MPN/100 mL in 12 out of 16 months. The City has collected bi-monthly total coliform samples from the intakes of each water source and since 1996, and has also monitored total coliform and *E. coli* in the blended water as well as *E. coli* in the individual sources entering the GHWTP. As discussed earlier, in 2012 and 2013, City submitted to DDW an evaluation of GHWTP filter performance data that resulted in a 1-log Giardia treatment credit that remains today.

As shown in Section 5.4.1, raw water total coliform for the utilities have ranged in the moderate to high (> 1,000 MPN/100 mL) concentrations, particularly in areas downstream of urbanization. It also should be noted that crypto and Giardia data presented in the 2018 WSS update indicate very low presence of these pathogens, relative to the total coliform. The waters sources that generally have stream intake structures located upstream of human developed areas (e.g., SLVWD) or downstream from open space areas typically have lower total coliform. The higher total coliform in raw water indicates that removal and inactivation of 4-log viruses and 3-log Giardia cysts is appropriate. The utilities continue to collect and evaluate total coliform data to verify the log removal and inactivation requirements for each system. As improvements are made to the upstream watershed, the data may suggest that review of the requirements are merited.

The one raw water source of most concern is the City San Lorenzo River Intake in Santa Cruz. Between 2017-2021, the highest annual median values of total coliform continue to be measured at the San Lorenzo River sources as shown on Figure 5-1. Felton Diversion water is not pumped directly to GHWTP, rather is pumped to Loch Lomond Reservoir on Newell Creek for storage before use at GHWTP. Loch Lomond water, which is piped directly to the GHWTP, has relatively lower coliform levels; therefore, meriting higher concern regarding the diversion at Tait Street as a source water.

The San Lorenzo River sources are not usually used during the first seasonal rains when turbidity, color and coliform counts can be significantly increased. The San Lorenzo River sources are put back into service after turbidity and color return to baseline levels. When used, San Lorenzo River Intake is usually blended with North Coast and/or water from the Tait Wells,

both of which contain significantly lower total coliform and *E.coli* concentrations. The City continually evaluates the need to modify the required level of treatment and disinfection, especially if in-stream flow requirements for fisheries result in source adjustments that do not allow the source blending that currently occurs. Upgrades to treatment at GHWTP as described in 2.8.3 will allow for reliable treatment of higher turbidity water.

6.2 Significant Contaminant Sources

From the survey findings, there are several sources of contaminants, detailed in Section 3, that are potentially significant to the drinking water sources (especially the San Lorenzo River). These sources, in order of relative priority, include:

- wastewater, including discharges from failing septic systems that can contribute pathogens and nutrients;
- unauthorized activity such as homeless encampments that can contribute microbial contaminants, and illegal mountain bike trails contributing erosion and sediments;
- wildfire;
- urban runoff;
- confined animal facilities/stables;
- agriculture including cannabis cultivation (now regulated) which can contribute pollutants including sedimentation from soil disturbance for roads and cultivation, increased nitrate, pesticides/herbicides, and increased water diversions from cultivation; monitoring for unpermitted operations also continues;
- geologic hazards which can contribute sediments.

While a TMDL for chlorpyrifos has been developed for the lower San Lorenzo River, USDA sampling does not indicate this constituent continues to occur very frequently, if at all.

The contaminants on the Regional Board listings extend beyond the constituents found in the drinking water regulations. Not all these contaminants are under the control of the water purveyors, creating complexities in managing them. Table 6-1 associates the existing and proposed TMDLs found in Table 4-1 with the contaminants associated with these sources and the management actions currently undertaken in the watershed to address the TMDL sources. Discussion of individual sources of contamination follow in the sections that follow.

Table 6-1. Total Mass Daily Load (TMDL) Projects and Primary Sources: San Lorenzo Valley, Loch Lomond Reservoir and Upper Newell Creek, and North Coast Watersheds and Associated Management Activities

		Potential Contaminant Sources and Associated Management Activities						
	Target	***Wastewater*** *(septic systems)*	***Livestock/ stables***	***Urban runoff***	***Timber harvests/ logging*** *(including THP roads)*	***Geologic Hazards and Fires***	***Unauthorized activity*** *(e.g., small-scale grading and homeless encampments)*	*Other Management Activities and Comments*
				Includes Public/Private Roads				
San Lorenzo River Watershed [1]								
Pathogen TMDL *(May 8, 2009)* ***Fecal Coliform TMDL*** *(July 20, 2011)*	Fecal coliform 30-day log mean < 200 MPN, where 10-percent of samples < 400 MPN	•Continued implementation of the County Wastewater Management Program which may further improve meeting nitrogen and pathogen TMDLs.	•Ecology Action's Livestock and Land program has reduced manure loads.	•City adopted a stormwater ordinance •City, County and Scotts Valley have stormwater management plans	not applicable	not applicable	•City has ordinance to obtain conservation easements on private lands in the County adjacent to creeks in order to limit unauthorized activities •City has increased funding for patrols of riparian corridors upstream of the Tait St. •Sheriffs department conducts homeless camp cleanups on an as needed basis	•City partnered with the Santa Cruz RCD to improve community awareness of the watershed by installing signs identifying the creeks and watersheds throughout the County.
Sediment TMDL *(May 16, 2003)*	The sediment TMDL target is currently based on numeric targets for pool volumes for fish habitat and particle size and percent of fines for spawning gravel. RWQCB staff recommends revision of the San Lorenzo Sediment TMDL to replace existing numeric targets with the sediment and biological indicators recommended in Herbst and others (2011).[2]			•County and City previously implemented 8 culvert repairs/retrofit projects which reduce sediment load •RCD implemented a rural roads erosion control assistance program. •County riparian, grading, erosion control ordinances •City stakeholder and school outreach including signage on creek crossings •City regulatory interaction including timber harvest review County code violations, etc. •City retains certified erosion control specialist for road mgmt				
Nitrate TMDL *(September 15, 2000)*	Nitrate as nitrate levels <1.5 mg/L. (Nitrate as nitrogen levels < 0.34 mg/L)	• Continued implementation of the Wastewater Program has resulted in significant declines in on-site wastewater system failure rates and stopped the rise of nitrate. •SWRCB has adopted policy for on-site wastewater treatment systems pursuant to AB885. • Sewering of areas close to sanitary sewer collection systems has occurred on a periodic basis.						
Chlorpyrifos TMDL *(May 29, 2014)*	TMDL adopted with impairments in San Lorenzo River (below Zayante Creek confluence near Felton), Branciforte and Zayante Creek and Arana Gulch. 2010/2011 data indicate that numeric targets are currently being met			Urbanized areasand roadways are likely contributors				
Chlordane TMDL	TMDL to be developed by 2027							*Sources unknown*
PCBs TMDL	TMDL to be developed by 2027							*Sources unknown*
Temperature TMDL	TMDL to be developed by 2023							*Many factors including sedimentation, nutrients, loss of vegetation, loss of baseflow*
Newell CreekWatershed								
pH 303d List	TMDL to be developed by 2027							
Loch Lomond								
Proposed Mercury 303d List	No TMDL date indicated at this time							

Notes

[1] Date approved by RWQCB

[2] Studies conducted by various authors have concluded erosion rates were two to four times the natural rates … Desired conditions taken from values published in scientific literature were 27% lower on average for the San Lorenzo River than measured values. Parke and others (2010) compared sediment transport in WY 2009 and 2010 to rates in the 1970s and 1980s, and note possible load reductions between 464- and 106-percent.

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6.2.1 Significance of Contaminants

Distinguishing between significant and less-than-significant contaminant sources is often difficult but is important, especially in Santa Cruz County, which is 100 percent reliant on local streams and aquifers for its water sources – a relatively rare situation in most of California. As described in the Watershed Sanitary Survey Guidance Manual, the significance of a potential contaminant source is intended to be comparative within the watershed and can be evaluated on a case-by-case basis. The relative significance of a contaminant source can be based on the relative health significance, the distance to the intake, the magnitude of the contaminant source as well as other factors. Microbial contaminants may result in acute illnesses while many chemical contaminants result in chronic illnesses.

Another burden in assigning contaminant significance is that some sources become significant only during years of extreme conditions or following episodic events. An additional threshold in establishing significance is the possibility that one or more sources may be permanently lost or lost long-term to any number of causes. Within this context of significance, a discussion of each contaminant source and potential recommendations are provided in the following paragraphs. Table 6-2 summarizes the significant contaminant sources and their relevance to the City's water sources.

Table 6-2. Potential Contaminant Sources and Recommendations: San Lorenzo Valley, Loch Lomond Reservoir and Upper Newell Creek, and North Coast Watersheds

Contaminant Source	*San Lorenzo Valley*	*Loch Lomond Reservoir and upper Newell Creek*	*North Coast*	*Information supporting significance*	*Recommendations*
	✓ denotes significance				
Wastewater (septic systems)	✓	✓		Elevated/increasing nitrate in streams, downstream of more densely populated areas	- Continue Implementation of LAMP for AB885 implementation - Evaluate water quality data from City and County to assess need for updated study on nitrate and microbial contributions especially in sandy soils and karst - Review proposed development plans near intakes
				Elevated coliform counts downstream of urban areas.	- Continue to support County implementation of LAMP wastewater activities and additional requirements, if any, of AB885 Septic system regulations especially as they relate to accessory dwelling units in the watershed - Continue collection and review of water quality data on short-term basis and notify if elevated coliform or nitrate is detected and conduct a more detailed long-term data evaluation to determine if a updated nitrate load and/or nitrate management plan is merited - Coordinate with County and RWQCB on monitoring and assess which portions of the watershed are still considered impaired -The County should work with SLVWD to consolidate its Bear Creek Estates Wastewater System into the County's CSA7 sewer system and future projects
Unauthorized Activity	✓	✓	✓	Homeless encampments adjacent to waterways can be a source of human waste. Small-scale grading and timber harvests frequently use poor practices, which increases sediment loading to the surface water streams. Trespass by vehicles and mountain bikes also results in erosion and sedimentation. Illicit methamphetamine laboratories and cannabis cultivation occur in the watershed.	- Continue to advocate and support homeless encampment relocation away from waterways -Continue past recommendations of homeowner outreach; collaboration with DFW, RCDs and other organizations; County enforcement of grading/clearing violations; patrolling and enforcement of existing ordinances for unauthorized activity that can result in water quality impacts[2] -Continue active involvement/coordination in cannabis related regulation in the watershed - Continue to develop conservation easements on key riparian properties[2]
Geologic Hazards and Fires	✓	✓	✓	•Elevated sediment loading during the wet season, frequently caused by landslides or slumping of roads. •Persistent turbidity may be experienced for several months to several years following a major watershed-scale fire.	•Continue past recommendations to manage fuels and reduce wildfire hazards; •Enhance collaboration with CalFire on supporting CWPP priority projects. -Lobby for the CWPP to recognize Loch Lomond as an asset at risk. -Complete the City's fire protection plan for watershed properties. -Maintain fuel breaks on watershed lands -Continue Integrated Pest Management Program that addresses herbicide application for maintenance of fuel breaks for fire preparedness; and -Monitor water quality after fires and if needed, develop plans to augment water supply/restrict water used during and after fires
Urban Runoff[1]	✓	✓		-Elevated coliform bacteria downstream of urban areas. Reduced coliform through open space areas. Baseline fecal coliform bacteria mostly attributed to non-human sources; in the San Lorenzo River no human contributions were identified in dry season sampling. Microbial Source Tracking found wildlife account for the majority of bacterial contamination, especially in dry season. - Urban runoff is also associated with other pollutants as well as increased erosion. Urbanization over sandy soils is particular concern because they are prone to substantially more sedimentation than other soils and reduced recharge can increase concentration of constituents in groundwater.	-Evaluate development of sandy soil BMP guidelines with a focus on implementing LID measures in new and redevelopment which reduces sediment production as well as other water quality benefits[2] -Continue SWMP implementation and stormwater management including sediment/erosion control from roads, and LID conversion on areas of urbanization[2] -Coordinate with IRWM Program on stormwater management -Review applicaiton and enforcement of County riparian ordinance. - Evaluate water quality data from City and County to assess need for updated study on nitrate and microbial contributions especially in sandy soils and karst
Concentrated Animal Facilities	✓		✓	Horses are considered a major source of pathogens and nitrogen and can also contribute to persistent turbidity in the water supply watersheds. Hecht and others (1991) estimated that horses in the San Lorenzo Valley contributed nitrogen equal to one fifth or more of the amount released from septic systems.	-Support funding for RCD Livestock and Land Program and owner outreach to continue its success. - Conduct targeted enforcement of problem facilities especially those in the vicinity of diversions; attempt to leverage the Regional Board in enforcement and site visits. - Water purveyors should continue to investigate opportunities for acquisition/conservation easements/partnerships with lands trusts/alternative funding.
Public/Private Roads and Timber Harvests	✓		✓	The primary potential problem arises with erosion resulting from the roads constructed to access residences and logging areas. Another major regional challenge especially specific to the San Lorenzo watershed is to reduce sediment delivery from erosion of road treads. Deep, multi-branched gully systems tend to develop on roads cut into weathered slopes within (especially) the Vaqueros and Butano sandstones. The gullies are left to continue growing, or are temporarily filled during spring re-opening of harvest areas only to re-erode with the next wet season.	-Continue past recommendation of coordinating locations to stabilize and dispose of landslide material. -Continue to support RCD rural private roads evaluation and maintenance training programs - Develop road density analysis using County GIS information for key water supply watersheds. -Continue past recommendations of monitoring proper road abandonment after logging; enforcement of existing requirements, where applicable; lobby for notification of timber harvest permits and inspections2 - Monitor RWQCB implementation of 2012 updated conditional waiver of waste discharge requirements for timber harvest2 -Emergency exemptions, which enable landowners to do salvage logging following wildfires should be revised to require pre-harvest inspections for areas with an erosion hazard rating of "high" or "extreme" - Salvage logging should be prohibited in municipal and public water district watersheds. -Water purveyors should continue to lobby to be included as official review team members for harvests which have the potential to impact supply. -Water purveyors should investigate opportunities for acquisition/conservation easements/partnerships with lands trusts/alternative funding.
Quarries	✓		✓	Of the 4 quarries in the San Lorenzo River Watershed, Felton and Quail Hollow Quarries are still active. Reclamation at Hanson Quarry is presently underway, while reclamation at Olympia Quarry is stalled due to endangered species issues. Mining ceased at the CEMEX Bonny Doon Quarry in the Liddell Springs Watershed, and reclamation is underway. Cclosed mines can still impact water supplies until reclamation is complete or by post-quarry land uses.	- Continue efforts to obtain water quality and quantity data monitored by quarry operators on an informal basis. - Continue past recommendations of tracking and review of staff and EIR reports including closure and post-closure water quality monitoring reports[2] -Monitor regulatory oversight of industrial operation at Bonny Doon Quarry.
Vehicle Upsets and Spills (LUSTs)	Potential		Potential	▪ Valeteria Dry Cleaners LUST monitoring results in downstream San Lorenzo River show occasional PCE detections in 2012 and 2013 and ongoing groundwater detection in 2017 suggesting wastes released at the site have migrated, and may continue migrating downgradient - remediation is ongoing; while Chevron and Sturdy Oil sites have closed; and, Watkins-Johnson show no indication of contamination within the stream network; and •The potential exists for significant chemical spills caused by traffic accidents and in recent years several accidents have affected local waterways. City staff report that timely notification from the County is an ongoing area of concern and is not consistently performed in a functional manner.	-Continue raw water testing for testing of chemical contaminants especially those from fire retardants and combustion products -Continue to improve collaboration with County Hazardous Materials Section -Improve communication with dispatchers at 911/NetCom (Santa Cruz Consolidated Emergency Communications Center) by meeting annually with dispatchers at regularly scheduled meetings
Pesticide and Herbicide Use	✓			-RWQCB TMDL for chlorpyrifos and recommendation to list San Lorenzo River for chlordane although water quality sampling has not confirmed presence -City has continued its herbicide use to maintain fuel breaks on ridge tops for fire preparedness. -When algal blooms do occur or are predicted to occur, chemical algaecide applications are made to the Newell Creek Reservoir to protect against degradation of beneficial uses	-Continue Integrated Pest Management Program that addresses herbicide application for maintenance of fuel breaks for fire preparedness. -Coordinate with the RWQCB/CalFire/Law Enforcement to identify sources, especially as related to illegal/legal cannabis cultivation. -Continue periodic pesticide/herbicide scans of raw water, especially in alignment with timing of application for cannabis cultivation -Monitor Caltrans' preparation of a Vegetation Control Plan

Notes

[1]Point source discharges regulated by the RWQCB do not exist in the watershed areas.

[2]These recoemmendations are supportive of the draft Habitat Conservation Plan for Steelhead and Coho Salmon that has been prepared by the City

6.2.1.1 General Land use and Urbanization Conclusions

As discussed in Section 3.2, the San Lorenzo Valley has a large number of septic systems on both sandy and non-sandy soils, with some systems that overlie karst; septic systems are recognized as a major source of nitrate to the river and its tributary streams. Wastewater, urban runoff including from homeless encampments, and horses, other domestic animals and pets also contribute to elevated nitrate levels. Microbial contaminants are associated with failing septic systems, urban runoff, and horse stables.

The County's wastewater management program endeavors to address problem septic systems, promoting system upgrades where feasible, requiring alternative systems where appropriate, and encouraging connection to wastewater treatment/disposal systems that discharge outside the watershed as has occurred at the Rollingwoods subdivision. The Bear Creek Estates package plant, serving 54 homes, was upgraded in 2005 yet still experienced spills during the heavy rains of 2017. SLVWD is reaching out to the County to consolidate Bear Creek Estates into the County's CSA7 sewer system. The package plant at Boulder Creek Golf and Country Club was upgraded to reduce nitrates and wastewater spills from the force main. Implementation of the San Lorenzo River Nitrate TMDL and the County's Nitrate Management Plan shows short-term (5-year) variability in nitrate concentrations but evidence of long-term (50-year) increases in nitrate concentrations per Figure 5-10. The effectiveness of current water quality improvement activities and the need for additional control actions may require further study.

Previous studies have indicated that septic systems, wildlife, livestock and pets, and urban runoff are all significant sources of microbial contaminants in the San Lorenzo River. More recently, homeless encampments adjacent to the rivers and tributaries have also been identified as a source of microbial contamination.

As described in 5.4.6.15, the City's microbial source tracking monitoring, which uses four analytical methods, identified that human microbial influences, potentially from septic systems, appear generally higher in the winter. The findings contrast with the dry season results with higher animal influences when flows are lower and animal activity is higher.

The San Lorenzo Valley does not have a system of curbs, gutters, and storm drains to convey runoff to the River; roadways with curbs, etc can also have unintended consequences of concentrating runoff if not well maintained, especially during storms. Water quality impacts of road runoff can be mitigated by protecting existing open space areas near stream banks to filter runoff, focusing public education on source control, and preventing contamination of runoff, and maintaining the water treatment plants in optimal working condition.

Previous WSS Updates have noted contaminant reduction in the six stream miles in Henry Cowell Redwoods State Park between southern Felton and northern Santa Cruz. One reason why nitrate and bacterial loadings have historically remained at lower levels than experts predicted may be due to the reaches of undeveloped stream between communities in many areas of the San Lorenzo Valley. A more comprehensive evaluation of microbial data from the City's sampling as well as stormwater sampling with septic system installations/improvements and stormwater improvements may be merited.

6.2.1.2 Water Utilities Influenced

Utilities that obtain surface water from an urbanized watershed area are influenced by both septic system and urban runoff discharges to area streams. These utilities include primarily the Santa Cruz Water Department and selected areas of the San Lorenzo Valley Water District including Lompico Creek.

6.2.1.3 Wastewater Discharge Recommendations

To minimize the impacts from wastewater treatment discharges, primarily septic systems, recommended actions include:

- The County should continue implementation of the LAMP, the successor to the 1995 Wastewater Management Plan which was prepared in accordance with AB885 as discussed in Section 4.9.2.4, especially as they relate to accessory dwelling units. Inspection frequency should be increased. Records of inspections and upgrades should be kept in both tabular and in map form, preferably on the County's GIS system, to allow focus on problem areas, especially those overlying sandy soils and/or karst.

- Purveyors should continue to collect, tabulate, and review the water quality data on a frequent basis (e.g., annually) and to review long-term data to evaluate the effectiveness of ongoing wastewater and stormwater management programs. These data should be reviewed in collaboration with the County Environmental Health and the Regional Water Quality Control Board so that appropriate follow-up action can be taken by the appropriate agency.

- Drinking water purveyors should inform County Environmental Health when elevated coliform or nitrate levels are detected in raw water sources. While there have not been nitrate levels in exceedance of the maximum contaminant level, the need for a more detailed data evaluation to corroborate the long-term gradual increases of nitrates in the San Lorenzo River on Figure 5-10a–d should be considered to assess whether an update of the nitrate load estimate and, if appropriate, the County's 1995 Nitrate Management Plan is merited.

- Water purveyors should review development plans for sites upstream of source water intakes to verify that measures are in place that will address key issues such as septic system discharges and urban runoff. Specifically, City (and secondarily, SLVWD) should work with County Environmental Health and Planning to review proposed developments upstream of their intakes to verify that acceptable control measures planned and that mitigation measures have been appropriately implemented and maintained.

- The County should work with SLVWD to consolidate its Bear Creek Estates Wastewater System into the County's CSA7 sewer system and future projects. The current Bear Creek Wastewater system is unable to meet the 50 percent nitrogen reduction set by the California RWQCB Central Coast WDRs and has been out of compliance since 2012. The costs determined in a 2020 feasibility study to upgrade to the system to meet the permit requirements ranged from $67,000 to modify existing trickling filters to $4,135,000

to construct a new collection system and packed bed filter. Costs to serve the 57 connections resulted in monthly wastewater rates ranging from approximately $345-$857 per month per connection, dependent on the treatment system upgrades selected. Consolidation with the County may facilitate moderating a sudden increase in operations and maintenance costs while reducing nitrogen into the SLR.

6.2.1.4 Urban Runoff Recommendations

Recommendations to control water quality impacts from urban runoff include:

- In coordination with 6.2.1.3, evaluate surface water quality data to evaluate effectiveness of ongoing wastewater and stormwater management programs.

- Evaluate development of best management practices such as low impact development (LID), and management measures directed at the unique properties of sandy soils and karst within watersheds, which call for a common set of measures to minimize nutrient loads, maintain aquifer recharge and the resulting baseflow, minimize erosion, sedimentation, and channel incision, and protect springs/seeps/wetlands and riparian-zone resilience during dry months and dry years.

- The County should implement the SWMP in the watersheds as accepted by the Regional Board. Implementation should include conversion of existing urbanized areas to LID, especially in areas of high water quality benefit.

- Coordinate with Santa Cruz Integrated Regional Water Management (IRWM) program on stormwater management including implementing public education/involvement program to minimize contaminant loading from stormwater runoff. The IRWM program can be used to supplement efforts by the purveyors and the County to inform customers and watershed residents of the ongoing water quality and supply issues. Many residents are not aware or do not appreciate the dual nature of the San Lorenzo Valley – a rural residential area, locally approaching urban densities, and the central water-supply source for the region.

- The County should improve its enforcement of ordinances (e.g., grading, riparian corridor and wetlands protection, sensitive habitat protection, and water quality control) as well as increase coordination efforts with the City and others in riparian protection incentive and mitigation bank opportunities in coho recovery and water supply watersheds to maximize and protect riparian setbacks from drainageways and streams.

- The County should review how and when the ordinance has been applied and its effectiveness and review whether strengthening of the riparian ordinance, discussed in Section 4.9.1.2., is merited.

6.2.2 Confined Animal Facilities

6.2.2.1 Conclusions

Horses, the main confined animals in both the North Coast and San Lorenzo River watersheds, can be a major source of wet season nitrate and bacteria levels in surface waters, and a contributor to persistent turbidity as well. Nutrients and pathogens can be mobilized from uncovered manure piles. Trails which cross stream channels degrade stream banks and facilitate direct contamination of surface waters. Similar effects are observed where paddocks adjoin waterways and horses traverse stream banks to reach the water. While the County, the NRCS, the RCD, Ecology Action and various equestrian and watershed groups have developed programs to educate horse owners and assist them; funding has been limited to promote and implement design and installation of measures to control pollution from horsekeeping. The County requires that manure management programs are developed for all new permittees and that it is able to apply its riparian ordinance to provide the buffers and access management required to minimize nutrient, bacterial, and sediment loadings to surface waters. Although substantial improvements have been realized since the original 1996 Watershed Sanitary Survey, primarily through voluntary methods that are discussed in Section 3.6.2, continued sustained effort is needed on both education regarding voluntary programs and enforcement of existing ordinances by the County.

6.2.2.2 Water Utilities influenced

Utilities that draw surface water downstream from bankside stables or areas intensively used by horses can observe higher turbidity and coliform counts. These entities include the Santa Cruz Water Department and the San Lorenzo Valley Water District.

6.2.2.3 Confined Animal Facilities Recommendations

It is recommended that the voluntary measures such as the RCD's Livestock and Land Program, with particular focus on horse owners near the waterways, be continued and supported. In addition, it is recommended that the County track complaints and permit violations as well as conduct periodic inspection and monitoring targeting those stables closest to the streams and river. The County has a Livestock Property Regulation document for landowners. Prior to enforcement, it is suggested that these stable owners should be made aware of the voluntary programs, and only if non-compliance consistently and broadly occurs should enforcement (including referral to the RWQCB) or development of an ordinance be considered. If developed, an ordinance should include simple and effective control measures coordinated through user groups and/or non-regulatory entities with stricter enforcement reserved for significant non-compliance. As an alternative to enforcement, opportunities to develop conservation easements and/or partnerships with land trusts and alternative funding should be considered. Horse stable runoff control practices should be implemented regularly, but particularly emphasized during the fall months in order to minimize contaminant loading during the next rainy season.

6.2.3 Unauthorized Activity

6.2.3.1 Conclusions

Activities, such as non-permitted grading and mountain biking outside of designated areas, cause significant sediment loading to streams as well as posing a fire threat, drawing valuable first responder resources, and introducing invasive species. Homeless encampments can contribute microbes. As discussed in Section 3.13.1, illegal cannabis cultivation in the watershed has declined with legalization; the County conducts flyovers to identify illegal cannabis. Some cultivation may be moving indoors, which has fewer water quality impacts but produces more greenhouse gas as a result of the energy usage for lighting and ventilation, and could be subject to fire hazards from non-compliant electrical systems. Legal cannabis cultivation, discussed in 3.4.2 is regulated by the County and other agencies. Illegal cannabis cultivation can contribute a range of contaminants including sediments from tree removal and grading, chemicals/nutrients, sanitary waste as well as diverting water valuable to ecosystems. Unauthorized water diversions can limit City source availability and result in lower raw water quality. The cumulative impact of such activities in and near channels can significantly increase turbidity and other water quality threats in streams.

Changes to the City municipal code have facilitated code enforcement by authorizing City rangers to take enforcement actions on City-managed lands that may be outside of the City limits (e.g. Loch Lomond and the San Lorenzo River). In addition, a conservation easement/license program has been established to expand the City's enforcement area to private lands between the San Lorenzo River Intake and Sycamore Grove and is part of the City's Riparian Conservation Program. Coordination with other officials in the watershed, e.g., the County, CDFW, and CalFire has occurred and should continue.

6.2.3.2 Water Utilities Influenced

Utilities that use surface water collected from developed and undeveloped watershed areas are influenced by unauthorized activities. These utilities include the Santa Cruz Water Department and San Lorenzo Valley Water District as well as smaller purveyors throughout the survey area.

6.2.3.3 Unauthorized Activities Recommendations

As discussed in Section 3.13, unauthorized activities are considered a chronic and ongoing source of contamination. It is recommended that:

- The City and SLVWD should continue to patrol and advocate for and support removal of homeless encampments, education of the mountain biking community regarding water quality impacts of illegal trails, as well as developing conservation easements/licenses on riparian properties; mitigation banks for making riparian improvements and other incentives for riparian property owners.

- Outreach to homeowners regarding negative impacts of grazing should be continued, perhaps through reinvigorating past programs such as RCD's Lands and Livestock.

- Collaboration with State Parks, CDFW, CalFire, and/or NGOs regarding other threats should be improved so that water utilities can be prepared for potential contaminants.

- Seeking compliance with existing ordinances and providing education and enforcement should be prioritized, with water-quality protection in mind.

6.2.4 Roads

6.2.4.1 Conclusions

As discussed in Section 3.3 Urban Runoff and Section 3.15 Geologic Hazards, roadways are a source of a range of contaminants including sediments and chemicals. Roadways that contribute contaminants include roads maintained by private landowners, as part of roads associated with residences and timber harvest and management, as well as public roads maintained by the County Public Works Department, and by Caltrans. Clearing of landslide debris on roadways and poor maintenance of public and private roads increase erosion and sediment loading to local streams. Roads which require recurrent replacement due to failure of the underlying slopes disproportionately contribute to sedimentation, turbidity, and persistent turbidity.

6.2.4.2 Water Utilities Influenced

All drinking water purveyors that rely on surface water supplies located downstream from any roadway are influenced by this source.

6.2.4.3 Roadway Maintenance Recommendations

In the past, Caltrans and the County Public Works Department have taken significant measures to improve roadway debris control and general maintenance. Measures taken include developing suitable practices to stabilize and dispose of landslide material and to control runoff from stockpiled material. The County, in consultation with water agencies, should identify areas suited to establish additional road maintenance service sites, and mechanisms to quickly move stockpiled material to long-term storage areas, such as has been implemented at the Cabrillo Quarry in Aptos.

As discussed in Section 4.7.1, the County previously maintained a Road Maintenance Manual that is used for road maintenance activities to minimize water quality impacts. In addition, the RCD and the NRCS have developed rural road assessment and education materials which evaluated rural private roads. They also developed a maintenance training program which has acquired a statewide reputation over the past 10 years. These programs and manuals help assure that appropriate measures are being implemented on both private and public roads and can be a resource for those individuals embarking on licensing of legal cannabis cultivation. The County has previously secured grants to evaluate improved roadside maintenance practices in riparian areas (herbicide reduction/elimination) and to prepare a new manual for road maintenance practices (erosion and sedimentation reduction). Herbicide use on road right of ways, discussed in Section 3.7.2, are likely the largest source of herbicides in the watersheds; therefore, continued herbicide reduction should be a priority to the County, Caltrans and PG&E. The inventory of potential sediment sources along county roads in the San Lorenzo River

watershed identified priority projects for designed, permitting and implementation through the Integrated Watershed Restoration Program (IWRP) with funds from the Coastal Conservancy, State water bonds such as Proposition 1, and other sources.

Roads do, however, remain a major source of turbidity, and road systems periodically contribute large volumes of sediment when culverts are blocked or when concentrated runoff from roads cause incision: (a) into slopes between the road and the stream network, and (b) within the channels, by concentrating runoff and magnifying peak flows in streams.

It is recommended that:

- The County continue to use and augment the road maintenance measures and procedures developed by CalTrans and Public Works, including updating the County website with guidance documents and implement measures to control the downstream incision and bank erosion and stabilize and dispose of landslide material as well as measures to minimize pesticide and herbicide use.

- The County develop road density analysis using County GIS information for key water supply watersheds. The mapping information can be used to identify areas for inspection and maintenance activity. Rural roads, including those in the City and SLVWD properties, should be inspected prior to the rainy season and maintained as needed.

- Water purveyors support the RCD private rural road evaluation and maintenance training program to private residential and timber-harvest roads within the County (especially those in proximity to diversions and intakes).

6.2.4.4 Timber Harvests Roadway Recommendations

The recommendations stated above for roadway maintenance should also be applied to roads allowing access for timber harvests, especially after wildfire, by CalFire, owners, and other participants in THP review. Other recommendations are:

- For major portions of road networks, owners should require properly abandoned or rested (closed until next harvest) roads after logging activities are completed. Regulatory agencies should confirm this with monitoring. Methods include blocking access to the area and restoring road cuts to the original slopes, especially in areas where road densities exceed 3.0 miles per square mile (as recommended by NOAA Fisheries) within portions of a particular watershed within the THP ownership and adjacent to it.

- Purveyors should advocate for follow-up restoration of roads from NOAA fisheries road density analysis for key water-supply watersheds, using NOAA fisheries threshold of 3 miles per square mile as an indicator of ecosystem health.

- Purveyors and the County should work with CalFire to aggressively enforce existing requirements to minimize area damage and maintain roadways, with special attention to segments close to streams and emergency exemptions for salvage logging in high erosion hazard areas.

- Support effort to prohibit salvage logging in key municipal and public water district watersheds where it is inconsistent with fire resiliency and overall forest management needs.

- Monitor RWQCB implementation of 2012 updated conditional waiver of waste discharge requirements for timber harvests.

- The City and other water purveyors should lobby for inclusion in the official THP review team, including PG&E right of way maintenance activities, rather than be limited to an advisory role particularly for those harvest that have high potential water quality risk.

6.2.5 Mining/Quarry Activities

6.2.5.1 Conclusions

Quarries have been identified as a potential source of sediment during major storm events, reportedly caused by the failure of onsite settling/retention ponds to contain event stormwater runoff.

In the North Coast watersheds, Bonny Doon Quarry operations, specifically blasting, have historically contributed to periodic turbidity and nitrate spikes at Liddell Spring which pose challenges at the City's water treatment plant.

However, as discussed in Section 3.9, the Bonny Doon Quarry is now closed and undergoing reclamation. Therefore, this sediment source has decreased. In addition, nitrate data collected at Liddell Spring since 1967 suggests that background nitrate levels at the Spring had been steadily increasing from about 0.3 mg/l in the late 1960s to values above 1.0 mg/l in the 1990s. More recent data from 2017 to 2021 as shown on Figure 5-9 show that historic peak value of 2.3 mg/l in 2001, has not occurred recently and that most values are < 0.3 mg/l. The possible source of some of the historic elevated nitrate levels could be from quarry blasting (ammonium nitrate) at Bonny Doon Quarry – however, this was never confirmed and is no longer an issue with closure of the quarry. Post-quarry industrial activities and other land use changes should be evaluated for potential sources of contaminant including wastewater treatment for employees, chemical storage, and stormwater runoff.

6.2.5.2 Utilities influenced

The City has been periodically influenced by turbidity increases in the Liddell Spring source. In the San Lorenzo River watershed, the City is affected by sediment contributions from the one active sand quarry (Quail Hollow), one rock quarry (Felton) and from discontinued quarries (Olympia and Hanson) should stormwater containment facilities fail.

6.2.5.3 Quarries and Mines Recommendations

The City should advocate for water quality monitoring during closure and reclamation.

The City should also continue to review staff and EIR reports including closure and post-closure water quality monitoring reports.

Quarry operators and downstream water users should also:

- Review trends of water quality data collected. This review will help to identify effectiveness of implemented BMPs or any failure of onsite treatment practices, as well as promote meaningful input from purveyors into appropriate modifications of conditions during the 5-year permit-renewal process through the County.

- Recommend specific water quality objectives for springs and streams located downstream of quarries and request additional water quality data, if and where necessary.

- Inspect quarries routinely, including visits in the fall period to verify the capacity and condition of onsite settling/retention ponds and erosion control structures, and that these are prepared for heavy rainfalls.

- Monitor regulatory oversight of potential industrial land uses at Bonny Doon Quarry.

6.2.6 Geologic Hazards and Fires

6.2.6.1 Conclusions

Landslides are the most frequently occurring geologic event affecting the drinking water supply, causing elevated turbidities following major storm events. Earthquakes and erosion from fire areas can severely increase sediment and natural organic matter loading to surface waters, both initially and during the process of 'recovery' from these episodic events. Flame retardants associated with fighting wildfires and combustion products from homes and vehicles also pose a risk to water quality. Finally, erosion following major fires, floods, landslides and possibly droughts or earthquakes can disrupt use of some or many surface water intakes for periods ranging from several months to several years, or deliver a pulse of sediment to the channel which may take years to dissipate.

6.2.6.2 Utilities influenced

All utilities that use surface water can be influenced by geologic hazards and fires in these watersheds. Water treatment plant operators are usually aware of the potential turbidity spikes that may occur through review of online turbidity information.

6.2.6.3 Recommendations

Many of the recommendations from Section 6.2.4 for Roads are relevant for Geologic Hazards. Further recommendations regarding fires, some of which were discussed in Section 4.8, include:

- Continue to manage fuels and reduce wildfire hazards.

- For the watershed that drains to Loch Lomond, the City should continue to meet with fire management staff to communicate changes to security, field conditions, and other information necessary for fire management as well as incorporate recommendations of

the 2021 Opportunities and Constraints Report, the Wildfire Resiliency Plan currently under preparation and continue the increased patrolling during fire season.

- Enhance collaboration with CalFire on improving Community Wildfire Protection Plan projects which includes Loch Lomond and SLVWD watershed lands as an asset at risk under CWPP.
- Maintain fuel breaks on watershed lands relative to use of herbicides in alignment with Integrated Pest Management Program policies. Most purveyors drawing upon surface or spring supplies should anticipate extended turbidity events following a large fire in their watersheds. Surface or spring supplies could also be impacted by flame retardants that should be monitored for in the wet season post fire. Planning should include monitoring water quality, implementation of water treatment processes for more turbid water, and for protecting diversion or distribution facilities from post-fire erosion and slope instability. While difficult, identifying alternative sources of supply, if needed, during the months or years following the fire for both turbidity and flame retardants should also be investigated.

6.2.7 Chemical Spills

6.2.7.1 Conclusions

Three groundwater chemical plumes in Felton have been reasonably contained by contemporary standards. The former Chevron and Exxon stations cases have been closed with investigation and follow up remediation at the Valeteria site anticipated as described in 3.10. The potential remains for chemical spills on highways, on major County roads such as Felton Empire Road or Smith Grade.

6.2.7.2 Utilities influenced

All utilities which obtain surface water from developed watershed areas are potentially influenced by spills on local roadways which should be managed by halting water diversion until clean-up has been completed and the pollutant has passed. In addition, long-term discharges such as from leaking underground tanks can be a source that eventually make their way to the creeks and rivers. Currently, the City is the only utility which has detected any solvent-type chemicals in the water. One chemical, PCE has been detected at levels 5 to 10 times below the regulated limit at the Felton Diversion, and not at any intake used to supply water directly to the treatment plant.

6.2.7.3 Recommendations

In an effort to minimize the impacts of chemicals, it is recommended that:

- Continue raw water testing of chemical contaminants, as appropriate,especially those that may be associated with post fire retardants and combustion products
- Collaboration with the Santa Cruz County Hazardous Materials Interagency Team (SCHMIT). Regarding notification of long-term spills and advocate for control of

hazardous materials transport be improved through periodic calls/meetings. SCHMIT responds to major hazardous materials incidents county-wide and is staffed by hazardous materials technicians from several area fire departments; and

- Continue efforts to communicate with dispatchers at NetCom and on-scene responders to discuss water agency spill notification procedures.

6.2.8 Pesticides and Herbicides

6.2.8.1 Conclusions

While the RWQCB established a TMDL for chlorpyrifos for the lower San Lorenzo River including the area of the San Lorenzo River Intake and the San Lorenzo River is now listed as impaired for chlordane as well as for PCBs as shown in Table 4-2, the occurrence of pesticides/herbicides has historically been low and not detected in the WY2021 as discussed in Section .5.4.5. However, the merits of the TMDL are unclear as data are limited to a few samples and chemical usage in the past has been limited.

6.2.8.2 Utilities influenced

All utilities that obtain surface water from watershed areas are potentially influenced by pesticides/herbicides, especially as illegally used for cannabis cultivation and for other agriculture such as vineyards, in the watershed.

6.2.8.3 Recommendations

In an effort to minimize the impacts of pesticide/herbicide use, it is recommended that:

- Continued implementation of an Integrated Pest Management Program to address appropriate herbicide application for fuel break maintenance.
- Coordinate with agricultural users (e.g., legal cannabis cultivation, vineyards, and tree farms) to identify sources.
- Advocate for organic-only agriculture in the watershed.
- Continue periodic pesticide/herbicide scans of raw water to identify in alignment with timing of application for vineyard/tree farm cultivation for potential frequency and severity of water quality impact.
- Monitor preparation of Caltrans' Vegetation Control Plan required under 2022-XXX-DWQ (no number was available for this order adopted) the NPDES permit for stormwater management as well as PG&E and County pesticide/herbicide use.

6.3 Potential Contaminant Sources That Are Not Significant

Table 6-3 lists the potential contaminant sources which are not deemed to be significant contributors affecting public health at this time. The table lists the supporting information and exceptions when noted. Given the particular Santa Cruz County environment, most of these sources could become significant at times, conditions, or with events discussed above (Section 6.1). Conclusions for these potential contaminant sources are discussed in the following paragraphs.

Table 6-3: Potential Contaminant Sources Less Significant: San Lorenzo Valley, Loch Lomond Reservoir and Upper Newell Creek, and North Coast Watersheds			
Contaminant Source	***Supporting Information***	***Exceptions***	***General Conclusion***
Wildlife	SLVWD staff indicate that feral pigs no longer appear to be an erosion problem near intakes.		Pigs and other wild animal populations do not appear to have a significant potential for contamination of surface waters at this time.
Solid/Hazardous Waste Facilities	The Ben Lomond municipal landfill closed in 1987. No known hazardous waste facilities exist in the watershed.	Any remaining plume is not deemed a threat to water supply. County has needed to remove naturally-occurring cadmium which leaches from shales as a result of their exposure to the atmosphere as a result of landfill excavating activities.	Down-gradient monitoring indicates no contamination of surface waters.
Recreation	Recreational activities generally considered of most significance involve water contact recreation. However, an evaluation of the County fecal coliform bacteria data, conducted by the County Health Services Agency, found no significant increase in bacteria in the swimming areas of the San Lorenzo River system. Bacterial water quality appears to improve as the water passes through large open space parks (Henry Cowell State Park) or resides in a reservoir for extended periods (Loch Lomond Reservoir).	The introduction of fecal matter from horses may be significant, especially at stream crossings. The potential for erosion from hiking, horseback riding, and mountain biking may also be significant.	There is an apparent trend of decreasing coliform counts through reaches that pass through the State Parks, which are mostly open space. Erosion control measures have spread quickly throughout the survey area, both on public and private lands. Law enforcement has begun issuing tickets to bikers using illegal trails.
Agricultural Land Use	Less than one tenth of one percent of area of the watersheds is cultivated although some expansion in the Majors Creek watershed has occurred. Wineries may require National Pollutant Discharge Elimination System (NPDES) permits for process waters. Legal cannabis cultivation is limited to one grower in the watershed and is closely regulated.	Some small facilities or private-home vineyards need to improve their erosion control practices, particularly on steeper slopes.	Vineyards are generally not located near streams. Sediment contributions from these areas are usually attenuated before it reaches streams and intakes. Legal cannabis cultivation locations, especially near water ways, should be identified and monitored

6.3.1 Wildlife

The previous County's microbial source assessment study identified birds/wildlife as major contributor to elevated bacteria levels in the San Lorenzo River and tributary streams, especially during the summer as discussed in Section 6.2.1.1. Other wildlife was also found to be a significant source of bacteria, including stocked fish and geese that are found at Loch Lomond. Along with the SLVWD, all utilities with surface and/or spring water intakes in the upper watershed are potentially influenced by birds and other wild animals in the area. If wildlife access at diversions is occurring, fencing, and providing alternative water supply should be considered.

6.3.2 Grazing Animals and Livestock

Grazing is not widespread in the subject watersheds. Most of the existing grazing occurs away from local streams.

6.3.3 Solid or Hazardous Waste Facilities

The one closed landfill in the San Lorenzo River watershed (the Ben Lomond Landfill) does not appear to be contaminating the nearest stream, Newell Creek. Overall, illegal dumping is not a significant contaminant source in any of the watersheds with respect to drinking water quality.

6.3.4 NPDES Point Sources

Only small wastewater facilities exist in the San Lorenzo watershed. These facilities include the 1970s-vintage package treatment plant at the Boulder Creek Golf and Country Club, the Bear Creek Estates Wastewater Treatment Plan constructed in 1986 and upgraded in 2008, and the new facility at the San Lorenzo Valley schools in Felton. As noted earlier, SLVWD is considering upgrades at Bear Creek to improve operational reliability. These facilities are currently located with onsite wastewater disposal and operated in a manner to minimize downstream water quality impacts. Furthermore, the Country Club is investigating the feasibility of reclaiming treated wastewater to a quality suitable for onsite irrigation.

6.3.5 Recreational Uses

The long-term fecal coliform data indicates that swimming may not appreciably impact the microbiological water quality of the streams. In addition, the number of summer swimming holes has decreased as inflatable dams for recreational swimming have been limited in the watershed; a summer dam on Zayante Creek has been observed in recent years and other informal swimming holes may have come into use following winters where heavier rains may have continued the runoff period. County monitoring of swimming holes is limited and has not historically indicated significant water quality problems. The most potentially significant recreational activities are horseback riding, trail maintenance, and use of off-road vehicles of various types and sizes, all of which constitute locally significant sources of sediment. The use of bikes and vehicles in the watersheds and illicit recreational use in Henry Cowell State Park may increase erosion and sedimentation. To the extent that these trails and uses are routed

away from stream channels, or are at least separated from them by setbacks or open space areas, sediment and microbial contributions to the adjoining streams will be reduced.

As discussed in Section 4.2.2., the City conducted a study in 2012 for expansion of recreational use at Loch Lomond, which concluded, with input from CalFire, that additional recreational use is not advisable because of the increase to fire risk and the inability to quickly respond. As discussed in Section 3.12.3, CDFW has increased fish stocking to meet recreational needs which may contribute to HAB events.

6.3.6 Agricultural Land Use

Although agricultural acreage continues to remain very small in both total acreage and individual operations, legalization of cannabis cultivation raised concerns in previous WSS updates with potential for significant effects on water supply remains and had been moved to the significant category. Following legalization, cannabis cultivation described earlier is limited to one grow in the watershed, which is closely monitored and therefore no longer a significant source of contamination. Non-cannabis agricultural has some relatively low risks. Vineyards potentially pose more a more serious challenge than Christmas tree plantations or organic vegetable farms, due to tillage disruption of steep slopes that result in erosion and use of chemicals for pest control. The chemical contributions from agriculture are discussed in Section 6.2.8.

6.4 Other Conclusions and Recommendations

6.4.1 Water-Quality Monitoring

6.4.1.1 Conclusions Regarding Water Quality Monitoring Programs

The drinking water purveyors participating in this study conduct the required monitoring for raw surface water quality; in addition, the City has recently conducted more extensive water quality monitoring especially following wildfire. Results are submitted to regulatory agencies, and in many cases will be available to the public through various purveyor and County web sites. Bacterial data, collected weekly, are routinely tabulated with some analysis now conducted by staff. The County website makes beach water quality data readily available to the public for assessing risk for water contact recreation, however long-term river data are less available in a form that allows for evaluation. Budget and staffing constraints continue to limit the ability to improve sharing of water quality data beyond what is currently available. The data collected by individual agencies are sufficient for water treatment plant operators to make real-time operating decisions regarding bypass of high turbidity source waters.

6.4.1.2 Recommendations Regarding Water Quality Monitoring Programs

Water purveyors should consider the following to their monitoring programs:

- Weekly raw water blend and bi-weekly source water total coliform and *E. coli* data collection should be continued.

- As described earlier under Section 6.2.6 Geologic Hazards and Fires and 6.2.8 for Pesticides and Herbicides and , the raw water-quality data programs should be augmented for pesticides and herbicides, as well as retardants and combustion by products post wildfire, because of the potential vulnerability of the water source to these type of contamination. Augmentation should intrinsically include electronic recordation and dissemination of data.

- Evaluate the data, such as for nitrate as described in Section 6.2.1.3, to identify any long-term adverse or improving trends and the underlying cause(s) of significant changes and assess the need for updates of the nitrate loading and nitrate management plan or other planning documents.

- Purveyors and the County should seek an assessment of water-quality trends following episodic events, such as large wildfires such as the 2020 CZU fire, earthquakes, and major storms such as occurred in 1982, 1998, 2012 and 2017, such that trends may be anticipated, contingency plans developed, and any needed interties or backup facilities identified. Western Santa Cruz County appears to have an unusual number and range of such events, and the experience from such events in and near the County could be readily distilled such that responses to these types of events can be readily planned and implemented.

- As discussed in Section 6.2.5 – Mining/Quarry Activities, current utility water quality databases should be augmented with data collected by quarry operators or other projects responsible for water-quality monitoring in surface or ground waters in either watershed. One potential quarry related monitoring activity is during reclamation grading of the closed Bonny Doon Quarry, which could require significant earth moving.

- Prepare for the next watershed sanitary survey update in 5 years by noting and recording concerns or problem areas, and implementing control measures applicable to specific watershed conditions.

6.4.2 Watershed Management Practices

6.4.2.1 **Conclusions Regarding Watershed Management Practices**

Established policies, ordinances, and regulations in the County's General Plan are available to improve surface water quality that are implemented by the County's Environmental Health and Planning Departments. As noted in the prior sanitary survey updates, the City has engaged in watershed management activities with a formal emphasis on source protection since 1997, and as discussed in Section 4.2.2.1, has a pool of staff that includes some full-time positions and support from other City staff such as ranger patrols and others that provide education and outreach. The City developed a comprehensive watershed lands management plan which includes no commercial logging (not precluding the cutting of trees for the purposes of restoration, widlife enhancement or ecoysystem management opportunities) on City watershed lands. SLVWD updated its watershed plan in 2010 and has had a no-commercial logging policy in place since 1985. The County updated its Watershed Management Plan for the San Lorenzo River Watershed in 2001.

County and local non-profit organizations efforts have led to numerous structural improvements and involvement with citizen groups to educate the general public, most notably during prior County-wide effort to develop watershed assessment and enhancement plans for selected watersheds, including the San Lorenzo Valley. Previously, the City led a coordinated effort called San Lorenzo River 2025 which targets action to improve riparian habitat that can leverage several resources including the County, RCD, and non-profits. The City also continues to spearhead the State of the San Lorenzo River Symposium ever year as well. This event should be continued in order to maintain scientific literacy and awareness of watershed stakeholders. Multiple staff commitments and limited bandwidth, however, tend to interfere with watershed management program progress. Therefore, to make the most of limited agency staff, it seems prudent to engage with County staff to update the 2001 watershed management plan and/or to coordinate program activities to take advantage of water purveyor and local non-profit organization staff. Local non-profits have been successful, for example, in engaging private horse owners in improving stable and manure management and could also be used to ramp up riparian protection incentive programs and road management programs.

6.4.2.2 Recommendations for Management Efforts for Water Utilities

Most of the ongoing watershed management efforts are coordinated by County staff as part of the wastewater management program, regional erosion-control efforts, and programs to promote salmonid recovery as well as incentive programs including mitigation banks. Therefore, the drinking water utilities should continue to be active in current watershed management programs, in part to meet the specific objectives for drinkable waters. Since County and/or NGO staff periodically change, an annual workshop to communicate City priorities and to find coordination and collaboration opportunities maybe prudent. State and federal funding may be available for some of the activities identified.

Some programs to consider, many of which are discussed in prior recommendations are:

Public Education/Relations —Formalized coordination with local NGOs on public education program may be effective at minimizing soil disruption, improving erosion control practices, and reducing urban runoff contamination. Purveyors can increase programs to mail educational pamphlets or develop informational websites.

Increase Watershed Surveillance — Staff should collaborate with other agencies regarding new development and redevelopment projects, code compliance and report activities within the watershed which can impact water quality, including the importance of preventing contaminants from entering the karst areas. For example, utilities can establish and publicize a watershed “hotline” telephone number to report illegal, unauthorized, or detrimental activities.

Political Support — Water utilities should enhance existing political support through activities such as collaboration on management plan activities, commenting on pending and proposed regulations, and inviting representatives to watershed focused events.

Special Sandy Soil Provisions – An integrated program should be developed and implemented to mesh use of BMPs and other measures designed to minimize the erosion, sedimentation, nutrient, and pathogen issues of Zayante and other sandy soils, plus protect the ground water, wetlands, and valuable stream habitats that they support. Such a program would mean more

recharge of aquifers with lower level of contaminants, less sand in streams, more water in wetlands and channels, and less maintenance of public facilities, in addition to cleaner water.

Road Restoration based on Road Density Analysis – Lobby Board of Supervisors and County Management to develop and fund road restoration program based on road density analysis for key water-supply watersheds developed as an indicator of ecosystem health. Identify grant funding to support these and other activities that benefit water quality and the Coho Recovery Plan.

San Lorenzo Valley Watershed Management Plan In 2001 County Environmental Health completed an update to the 1979 Watershed Management Plan. Water utilities should review and consider updating the plan in addition to emphasizing to their staff and customers the benefits likely to accrue to drinking water quality from successfully achieving the programs goals. They should also continue their participation in the program and support implementation through the County's Integrated Regional Water Management Plan.

6.4.2.3 Recommendations for Watershed Managers

Other issues the County and water utilities should consider when developing watershed management programs include:

Continue to investigate and implement feasible management practices. Descriptions of alternative practices are available from numerous sources, especially from such agencies as the American Water Works Association (AWWA) and Water Environment Federation (WEF). Both of these agencies have recently sponsored research projects and conferences to assist communities improve watershed management and protection.

Publicize the programs and materials: Materials are available from the RCD, other County agencies, and local NGOs which describe specific practices to control erosion from hillsides and roadways, stabilize slopes, construct silt fences construct spring boxes, and to site, construct and maintain septic or advanced onsite waste-disposal systems:

Investigate methods to integrate watershed management projects with other benefits. Some projects, such as riparian restoration and mitigation bank incentives, can enhance watershed management and may be able to obtain Federal and State funding if other benefits (e.g., fishery improvements and groundwater storage) are integrated. The existing 2001 watershed management program, which could merit review and potential update may be a good vehicle for identifying specific activities and may be a good candidate for funding. Several watershed management projects are funded using this approach especially through the Department of Water Resources IRWM program. Through the IRWM program, the City and County staff are able to meet with other agencies and utilities to discuss watershed management funding needs for specific programs. This includes establishing guidelines to propose projects to councils, boards, etc., and to request support from non-conventional sources for pilot programs, etc.

Collaboration with utilities and local large land owners: Water utilities should work collaboratively with each other and other large land holders to find aggregated large-scale management projects to improve fuel reduction, erosion, and road maintenance.

Development of a holistic approach to manage areas with sandy soils – As described earlier, these measures which (a) limit erosion, (b) reduce sedimentation of streams and drainage improvements, (c) maintain needed recharge to the sandy aquifers critical to the region's drought-year water supply, (d) sustain sufficient recharge to protect water quality and control nitrate accumulation in the aquifers, and (e) allow springs and wetlands supported by these aquifers to maintain their functions and values.

Engage in County Ordinance Update – The County septic ordinances were updated in 2022; since other ordinances in Chapter 16 are to be reviewed in the coming years, the watershed management staff should provide input during the review process for those ordinances that can be strengthened to improve water quality.

6.4.3 Emergency Plans

All water purveyors now have vulnerability assessments, risk, and resiliency assessments, and have or are updating emergency response plans, including links to 911 and emergency services agencies. Continued maintenance and updating of these plans as well as routinely conducting emergency drills by the purveyors is needed. Improved maps are available to emergency crews through the County's GIS services and via web-based mapping and aerial photography available through commercial websites at all times. As discussed in Section 6.2.7, continued efforts to improve notification of water utilities of chemical spills and other water quality emergencies by dispatchers and on-scene planning is an important element of emergency planning.

6.5 Summary of Activities

Implementation of the broad range of recommended actions (as described in Section 6.4) is outside of City's & SLVWD's direct control; therefore, collaboration with other agencies and NGOs is likely the most feasible means as reallocation of, or possibly additions to, existing staff is unlikely to occur. In addition, the City and SLVWD should continue to seek opportunities to identify and apply for funding for projects/programs that could be implemented by law enforcement and watershed staff as well as by NGOs. Therefore, the drinking water utilities and County should discuss the watershed issues with other entities and develop an implementation plan, including the need for additional staffing and exploration of outside funding, for the selected management practices.

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Appendix A: Primary and Secondary Maximum Contaminant Limits

MCLs, DLRs, PHGs, for Regulated Drinking Water Contaminants

(Units are in milligrams per liter (mg/L), unless otherwise noted.)

Last Update: January 3, 2023

The following tables includes California's maximum contaminant levels (MCLs), detection limits for purposes of reporting (DLRs), public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA). For comparison, Federal MCLs and Maximum Contaminant Level Goals (MCLGs) (USEPA) are also displayed.

Inorganic Chemicals Table, Chemicals with MCLs in 22 CCR §64431

State Regulated Inorganic Chemical Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Aluminum	1	0.05	0.6	2001	--	--
Antimony	0.006	0.006	0.001	2016	0.006	0.006
Arsenic	0.010	0.002	0.000004	2004	0.010	zero
Asbestos (MFL = million fibers per liter; for fibers >10 microns long)	7 MFL	0.2 MFL	7 MFL	2003	7 MFL	7 MFL
Barium	1	0.1	2	2003	2	2
Beryllium	0.004	0.001	0.001	2003	0.004	0.004
Cadmium	0.005	0.001	0.00004	2006	0.005	0.005
Chromium, Total - OEHHA withdrew the 0.0025-mg/L PHG	0.05	0.01	withdrawn Nov. 2001	1999	0.1	0.1

State Regulated Inorganic Chemical Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Chromium, Hexavalent - 0.01-mg/L MCL & 0.001-mg/L DLR repealed September 2017	--	--	0.00002	2011	--	--
Cyanide	0.15	0.1	0.15	1997	0.2	0.2
Fluoride	2	0.1	1	1997	4.0	4.0
Mercury (inorganic)	0.002	0.001	0.0012	1999 (rev2005)*	0.002	0.002
Nickel	0.1	0.01	0.012	2001	--	--
Nitrate (as nitrogen, N)	10 as N	0.4	45 as NO3 (=10 as N)	2018	10	10
Nitrite (as N)	1 as N	0.4	1 as N	2018	1	1
Nitrate + Nitrite (as N)	10 as N	--	10 as N	2018	--	--
Perchlorate	0.006	0.002	0.001	2015	--	--
Selenium	0.05	0.005	0.03	2010	0.05	0.05
Thallium	0.002	0.001	0.0001	1999 (rev2004)	0.002	0.0005

Copper and Lead Table, 22 CCR §64672.3

Values referred to as MCLs for lead and copper are not actually MCLs; instead, they are called “Action Levels” under the lead and copper rule.

State Regulated Copper and Lead Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Copper	1.3	0.05	0.3	2008	1.3	1.3
Lead	0.015	0.005	0.0002	2009	0.015	zero

Radiological Table, Radionuclides with MCLs in 22 CCR §64441 and §64443

[units are picocuries per liter (pCi/L), unless otherwise state; n/a = not applicable]

State Regulated Radionuclides Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Gross alpha particle activity - OEHHA concluded in 2003 that a PHG was not practical	15	3	none	n/a	15	zero
Gross beta particle activity - OEHHA concluded in 2003 that a PHG was not practical	4 mrem/yr	4	none	n/a	4 mrem/yr	zero
Radium-226	--	1	0.05	2006		
Radium-228	--	1	0.019	2006		
Radium-226 + Radium-228	5	--	--	--	5	zero

State Regulated Radionuclides Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Strontium-90	8	2	0.35	2006	--	--
Tritium	"20,000"	"1,000"	400	2006	--	--
Uranium	20	1	0.43	2001	30 µg/L	zero

Organic Chemicals Table, Chemicals with MCLs in 22 CCR §64444

Volatile Organic Chemicals (VOCs)

State Regulated Volatile Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Benzene	0.001	0.0005	0.00015	2001	0.005	zero
Carbon tetrachloride	0.0005	0.0005	0.0001	2000	0.005	zero
1,2-Dichlorobenzene	0.6	0.0005	0.6	1997 (rev2009)	0.6	0.6
1,4-Dichlorobenzene (p-DCB)	0.005	0.0005	0.006	1997	0.075	0.075
1,1-Dichloroethane (1,1-DCA)	0.005	0.0005	0.003	2003	--	--
1,2-Dichloroethane (1,2-DCA)	0.0005	0.0005	0.0004	1999 (rev2005)	0.005	zero
1,1-Dichloroethylene (1,1-DCE)	0.006	0.0005	0.01	1999	0.007	0.007

State Regulated Volatile Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
cis-1,2-Dichloroethylene	0.006	0.0005	0.013	2018	0.07	0.07
trans-1,2-Dichloroethylene	0.01	0.0005	0.05	2018	0.1	0.1
Dichloromethane (Methylene chloride)	0.005	0.0005	0.004	2000	0.005	zero
1,2-Dichloropropane	0.005	0.0005	0.0005	1999	0.005	zero
1,3-Dichloropropene	0.0005	0.0005	0.0002	1999 (rev2006)	--	--
Ethylbenzene	0.3	0.0005	0.3	1997	0.7	0.7
Methyl tertiary butyl ether (MTBE)	0.013	0.003	0.013	1999	--	--
Monochlorobenzene	0.07	0.0005	0.07	2014	0.1	0.1
Styrene	0.1	0.0005	0.0005	2010	0.1	0.1
1,1,2,2-Tetrachloroethane	0.001	0.0005	0.0001	2003	0.1	0.1
Tetrachloroethylene (PCE)	0.005	0.0005	0.00006	2001	0.005	zero
Toluene	0.15	0.0005	0.15	1999	1	1
1,2,4-Trichlorobenzene	0.005	0.0005	0.005	1999	0.07	0.07

State Regulated Volatile Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
1,1,1-Trichloroethane (1,1,1-TCA)	0.200	0.0005	1	2006	0.2	0.2
1,1,2-Trichloroethane (1,1,2-TCA)	0.005	0.0005	0.0003	2006	0.005	0.003
Trichloroethylene (TCE)	0.005	0.0005	0.0017	2009	0.005	zero
Trichlorofluoromethane (Freon 11)	0.15	0.005	1.3	2014	--	--
"1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)"	1.2	0.01	4	1997 (rev2011)	--	--
Vinyl chloride	0.0005	0.0005	0.00005	2000	0.002	zero
Xylenes	1.750	0.0005	1.8	1997	10	10

Non-Volatile Synthetic Organic Chemicals (SOCs)

State Regulated Non-Volatile Synthetic Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Alachlor	0.002	0.001	0.004	1997	0.002	zero
Atrazine	0.001	0.0005	0.00015	1999	0.003	0.003
Bentazon	0.018	0.002	0.2	1999 (rev2009)	--	--

State Regulated Non-Volatile Synthetic Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Benzo(a)pyrene	0.0002	0.0001	0.000007	2010	0.0002	zero
Carbofuran	0.018	0.005	0.0007	2016	0.04	0.04
Chlordane	0.0001	0.0001	0.00003	1997 (rev2006)	0.002	zero
Dalapon	0.2	0.01	0.79	1997 (rev2009)	0.2	0.2
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00001	0.000003	2020	0.0002	zero
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.07	0.01	0.02	2009	0.07	0.07
Di(2-ethylhexyl)adipate	0.4	0.005	0.2	2003	0.4	0.4
Di(2-ethylhexyl)phthalate (DEHP)	0.004	0.003	0.012	1997	0.006	zero
Dinoseb	0.007	0.002	0.014	1997 (rev2010)	0.007	0.007
Diquat	0.02	0.004	0.006	2016	0.02	0.02
Endothal	0.1	0.045	0.094	2014	0.1	0.1

State Regulated Non-Volatile Synthetic Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Endrin	0.002	0.0001	0.0003	2016	0.002	0.002
Ethylene dibromide (EDB)	0.00005	0.00002	0.00001	2003	0.00005	zero
Glyphosate	0.7	0.025	0.9	2007	0.7	0.7
Heptachlor	0.00001	0.00001	0.000008	1999	0.0004	zero
Heptachlor epoxide	0.00001	0.00001	0.000006	1999	0.0002	zero
Hexachlorobenzene	0.001	0.0005	0.00003	2003	0.001	zero
Hexachlorocyclopentadiene	0.05	0.001	0.002	2014	0.05	0.05
Lindane	0.0002	0.0002	0.000032	1999 (rev2005)	0.0002	0.0002
Methoxychlor	0.03	0.01	0.00009	2010	0.04	0.04
Molinate	0.02	0.002	0.001	2008	--	--
Oxamyl	0.05	0.02	0.026	2009	0.2	0.2
Pentachlorophenol	0.001	0.0002	0.0003	2009	0.001	zero
Picloram	0.5	0.001	0.166	2016	0.5	0.5

State Regulated Non-Volatile Synthetic Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Polychlorinated biphenyls (PCBs)	0.0005	0.0005	0.00009	2007	0.0005	zero
Simazine	0.004	0.001	0.004	2001	0.004	0.004
Thiobencarb	0.07	0.001	0.042	2016	--	--
Toxaphene	0.003	0.001	0.00003	2003	0.003	zero
1,2,3-Trichloropropane	0.000005	0.000005	0.0000007	2009	--	--
2,3,7,8-TCDD (dioxin)	3x10-8	5x10-9	5x10-11	2010	3x10-8	zero
2,4,5-TP (Silvex)	0.05	0.001	0.003	2014	0.05	0.05

Disinfection Byproducts Table, Chemicals with MCLs in 22 CCR §64533

State Regulated Disinfection Byproducts Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Total Trihalomethanes	0.080	--	--	--	0.080	--
Bromodichloromethane	--	0.0010	0.00006	2020	--	zero
Bromoform	--	0.0010	0.0005	2020	--	zero

State Regulated Disinfection Byproducts Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Chloroform	--	0.0010	0.0004	2020	--	0.07
Dibromochloromethane	--	0.0010	0.0001	2020	--	0.06
Haloacetic Acids (five) (HAA5)	0.060	--	--	--	0.060	--
Monochloroacetic Acid	--	0.0020	0.053	2022	--	0.07
Dichloroacetic Acid	--	0.0010	0.0002	2022	--	zero
Trichloroacetic Acid	--	0.0010	0.0001	2022	--	0.02
Monobromoacetic Acid	--	0.0010	0.025	2022	--	--
Dibromoacetic Acid	--	0.0010	0.00003	2022	--	--
Bromate	0.010	0.0050**	0.0001	2009	0.01	zero
Chlorite	1.0	0.020	0.05	2009	1	0.8

Chemicals with PHGs established in response to DDW requests. These are not currently regulated drinking water contaminants.

State Regulated Disinfection Byproducts Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
N-Nitrosodimethylamine (NDMA)	--	--	0.000003	2006	--	--

*OEHHA's review of this chemical during the year indicated (rev20XX) resulted in no change in the PHG.

**The DLR for Bromate is 0.0010 mg/L for analysis performed using EPA Method 317.0 Revision 2.0, 321.8, or 326.0.

Appendix B: Water Year 2021 Source Water Quality Monitoring Report

Santa Cruz Water Department

Source Water Monitoring Study Report

Water Year 2021 (October 1, 2020 – September 30, 2021)

Prepared by the Santa Cruz Water Department's Water Quality Laboratory

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List of Acronyms

Acronym/Abbreviation	Definition
AL	Action Level
ASR	Aquifer Storage and Recovery
CEC	Contaminants of Emerging Concern
CCR	Consumer Confidence Report
CFS	Cubic Feet per Second
CZU	Cal Fire designation for its San Mateo-Santa Cruz Unit
DBP	Disinfection Byproduct
DBPR	Disinfection Byproduct Rule
DOC	Dissolved Organic Carbon
EPA	United States Environmental Protection Agency
GHWTP	Graham Hill Water Treatment Plant
GWUDI	Groundwater Under the Direct Influence of Surface Water
HAL	Health Advisory Level
LCR	Lead and Copper Rule
LT2ESWTR	Long Term 2 Enhanced Surface Water Treatment Rule
MCL	Maximum Contaminant Level
MST	Microbial Source Tracking
NL	Notification Level
PCDD	Polychlorinated dibenzo-p-dioxin
PCDF	Polychlorinated dibenzofuran
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PVC	Polyvinyl Chloride
RTCR	Revised Total Coliform Rule
SCWD	City of Santa Cruz Water Department
SDWA	Safe Drinking Water Act
SLR	San Lorenzo River
SMCL	Secondary Maximum Contaminant Level
SOC	Synthetic Organic Compound
SOP	Standard Operating Procedure
SWRCB-DDW	State Water Resources Control Board Division of Drinking Water
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TSS	Total Suspended Solids
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WQL	Santa Cruz Water Department's Water Quality Laboratory
WSAC	City's Water Supply Advisory Committee
WSAS	Water Supply Augmentation Strategy
WSS	Watershed Sanitary Survey
WY	Water Year

List of Data Units

Unit	Definition
CU	Color Unit
GC/mL	Genome Copies per milliliter
MFL	Million Fibers per Liter
mg/L	Milligrams per Liter
mL	Milliliter
MPN/100 mL	Most Probable Number per 100 milliliters
ND	Not Detected
NTU	Nephelometric Turbidity Unit
pCi/L	Picocuries per Liter
PFU/mL or PFU/100 mL	Plaque Forming Unit
ppb	Parts per Billion or µg/L
ppm	Parts per Million or mg/L
ppq	Parts Per Quadrillion
ppt	Parts Per Trillion
µg/L	Micrograms per Liter

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Executive Summary

The purpose of this report is to provide results from the Santa Cruz Water Department's (SCWD) Source Water Monitoring Program for Water Year (WY) 2021 (October 1, 2020 through September 30, 2021). During the study period, the SCWD's Water Quality Laboratory (WQL) staff conducted weekly, monthly, quarterly and storm event sampling to characterize source waters for conventional, fire-related and emerging contaminants. This report focuses on the water quality of source water, before treatment and delivery to the City of Santa Cruz customers. The WQL implements a robust compliance sampling program that collects over 1,350 treated water samples from the Graham Hill Water Treatment Plant (GHWTP) and the distribution system each year. As detailed in the 2020 Consumer Confidence Report (CCR), the SCWD's treated water meets all applicable State and Federal drinking water standards. The San Lorenzo River and North Coast Watersheds Sanitary Survey Report Update -February 2018 (Kennedy/Jenks Consultants), referred to as Watershed Sanitary Survey (WSS) throughout this document, complements this report and describes how hydrology, watershed processes, and land use can affect water quality.

The SCWD increased source water monitoring in 2016 in an effort to develop a comprehensive characterization of water quality to inform future decision making for improvements to the GHWTP. The Source Water Monitoring Program was revised for WY 2021 in response to the CZU Lightning Complex Wildfire that damaged portions of the SCWD's upper watersheds. The SCWD facilities did not sustain damage from the wildfire, however approximately 20% of the San Lorenzo River (SLR) watershed was within the CZU fire perimeter, as well as the upper reaches of the North Coast watersheds (Laguna Creek, Majors Creek, and Liddell Creek) were affected by the wildfire. The Source Water Monitoring Program was expanded in WY 2021 to incorporate additional parameters related to fire impacts on water quality, additional sampling locations in the upper source watersheds, and soil sampling in the affected watersheds. Sampling frequency was also increased to include routine wet season, dry season and storm event sampling. Additional sample locations in upper Majors Creek, upper Laguna Creek, and two locations in the upper SLR watershed, including Junction Park in Boulder Creek and Highlands Park in Ben Lomond, were established to monitor in conjunction with SCWD's routine source water locations. Additionally, five soil and water quality sampling locations were established in the affected watersheds at Clear Creek-Private Property, Clear Creek-City Property, Felton Empire Rd-Tributary to Fall Creek, Laguna Creek at Ice Cream Grade, and Pine Ridge-Tributary to Laguna Creek.

Drinking water quality is regulated by the State Water Resources Control Board Division of Drinking Water (SWRCB-DDW). Several types of regulatory levels exist for drinking water quality, including action level (AL), health advisory level (HAL), primary maximum contaminant level (MCL), secondary maximum contaminant level (SMCL), and notification level (NL). While these regulatory levels do not apply to source water, their application to source water results can provide context.

Over 90% of the water served to SCWD's customers is produced at the GHWTP, which operates under a BIN 2 classification as prescribed by the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), with specific requirements for pathogen removal. The GHWTP raw blend influent consists of multiple surface water and groundwater sources including Loch Lomond Reservoir, the San Lorenzo River, three north coast sources (Liddell Spring, Laguna Creek and Majors Creek), and three groundwater wells under the direct influence of surface water at Tait St. (Tait Wells) of varying proportions. These

source waters have variable water quality largely influenced by winter storms. In general, the SLR provides the greatest quantity of water treated throughout the year, while Loch Lomond Reservoir is the largest volume of stored water available for use. Loch Lomond Reservoir water is utilized conservatively to preserve supple for us during the dry season or drought conditions, when other sources are not available. The North Coast sources consistently have the best water quality compared to the other sources, but are used the least, as available flows for diversion are frequently unavailable. Water Treatment Operators utilize source availability and water quality data to make operational decisions to choose which raw sources to treat and the quantity of each source to ensure that the finished water quality leaving the GHWTP is of high quality.

During WY 2021, the WQL collected weekly, biweekly, monthly, and quarterly water quality samples from the sources and upper watershed locations. In addition, nine storm events were sampled between the months of October 2020 and May 2021, with the most significant rainfall occurring on January 27, 2021. As expected, elevated color, turbidity, dissolved organic carbon (DOC), total organic carbon (TOC), total coliform/*E. coli*, and metals (primarily aluminum, arsenic, iron, lead, and manganese) were observed in the SCWD's source water and upper watershed locations during the storm. Routine follow-up monitoring confirmed that within a few days, once the precipitation and streamflow rate or discharge decreased, water quality results returned to normal baseline levels.

Unregulated contaminants of emerging concern (CECs) that include pharmaceuticals and personal care products such as caffeine, DEET, and sucralose as well as per- and polyfluoroalkyl substances (PFAS) were detected in small amounts in the SLR throughout the WY. Fire related parameters associated with urban and rural run-off such as asbestos were not detected; however, three dioxin and furan chemicals were detected at Laguna Creek, SLR Tait St. Diversion, and SLR Highlands Park during the January 27, 2021 storm. Radiological compounds including radium 226, radium 228, gross alpha, and uranium were detected during the January 27, 2021 storm in the SLR; all results were below the primary maximum contaminant levels (MCLs). The treated water leaving the GHWTP continuously met all State and Federal drinking water standards during the WY. The 2021 CCR, which will provide more information on the SCWD's treated finished water during WY 2021, will be available by July 1, 2022.

The 2020 CCR can be found at the following location:
https://www.cityofsantacruz.com/home/showpublisheddocument/84858/637594518948170000

Limited to no historical data exists for the newly established sampling locations and specific water quality parameters added to the Source Water Monitoring Program to characterize impacts of the CZU Wildfire. As such, it is difficult to determine the extent of fire-related impacts.

Section 1 of this report includes the introduction and background on the initial 2016 source water monitoring study, in addition to the updates to the program for WY 2021. It also provides a description of the GHWTP source waters and SCWD watersheds, details on the CZU Lighting Complex Fire, and the WY 2021 sampling plan. Section 2 presents the results of the WY 2021 source water quality monitoring, as well as a discussion of historical data. Data summaries and trends in treatment, microbial, and regulated and unregulated chemistry parameters are also provided. Conclusions and next steps are summarized in Section 3 and references are provided in Section 4.

This report was prepared by the WQL.

Section 1: Introduction

1.1 Background on Source Water Monitoring Program

The Santa Cruz Water Department (SCWD) began an intensive year-round Source Water Monitoring Program in October 2016 to characterize source water quality in an effort to inform future decision making for improvements to the Graham Hill Water Treatment Plant (GHWTP). The SCWD draws on several sources to supply the GHWTP including the San Lorenzo River (SLR), Loch Lomond Reservoir, three North Coast sources-Laguna Creek, Liddell Spring, and Majors Creek and three groundwater wells (Tait Wells) that are under the direct influence of surface water. The GHWTP is a conventional surface water treatment plant that uses coagulation, flocculation, sedimentation, filtration, and disinfection for water treatment. A particular focus of the 2016 study was to better understand the range of high turbidity winter flow rates from the SLR to determine if they could be used to augment water supply.

This work was initiated from efforts in 2014 to 2015 when the SCWD's Water Supply Advisory Committee (WSAC) developed strategies for improving both the quantity and reliability of the Santa Cruz water supply. The outcome of the WSAC's effort was the Water Supply Augmentation Strategy (WSAS), which is currently being implemented by the SCWD (WSAC 2015). The WSAS identified multiple paths forward, in order of priority, (1) conservation, (2) aquifer storage and recovery (ASR), (3) in-lieu water transfers to neighboring agencies, and (4) potable reuse or desalination. Two of the proposed strategies, ASR and in-lieu transfers, involve increased treatment of higher-turbidity winter water flow rates from the SLR and North Coast sources. In the ASR strategy, additional potable supply (i.e., in excess of the daily demands) would be produced in the winter months and injected and stored in the mid-county or Santa Margarita groundwater basins for future use. Similarly, the in-lieu option would utilize the additional potable supply during the winter to provide drinking water to neighboring agencies (e.g. Soquel Creek Water District). The recommendation to study the water quality of winter flow rates were adopted from the SCWD's WSAC to better understand the chemical components and treatability of winter water flows to augment the water supply.

Currently, SLR water is not consistently used throughout much of the winter because storm events lead to elevated turbidity, color, bacteria, and total organic carbon (TOC) levels that, in turn, lead to treatment challenges. The implementation of the ASR and in-lieu transfer strategies, however, hinges on some of this water being used as the source for the increased potable supply. As a result, extensive sampling of winter water of the SLR was needed to understand the implications of treating water affected by winter storms at the GHWTP and to determine the required level of treatment based on source water conditions. The GHWTP, which was commissioned in 1960, is an aging treatment plant facing several challenges. Over the years, various upgrades have been completed to ensure the plant can continue to meet customer demand and regulatory requirements. The Graham Hill Water Treatment Plant Source Water Quality Monitoring Study Report - February 25, 2019 (Trussell Technologies) included the findings from the initial source water quality monitoring study for Water Year (WY) 2017 (October 1, 2016 – September 30, 2017) and WY 2018 (October 1, 2017 – September 30, 2018). The report also provided a preliminary evaluation on strategies to mitigate the current treatment issues at the GHWTP while treating winter water SLR water.

1.2 Water Year 2021 Source Water Monitoring Program Update

The Source Water Monitoring Program was revised for Water Year (WY) 2021 in response to the CZU Lightning Complex Wildfire that began on August 16, 2020 and damaged upper portions of the Santa Cruz Water Department's (SCWD's) source water watersheds. Revisions included the incorporation of key parameters related to fire impacts on water quality, additional sampling locations in the upper source watersheds, soil sampling in the affected watersheds, and a standard sampling frequency including routine wet and dry season as well as event-based winter storm sampling. Additional sample locations in upper Majors Creek, upper Laguna Creek, and two locations in the upper San Lorenzo River (SLR) watershed, including Junction Park in Boulder Creek and Highlands Park in Ben Lomond, were established to monitor in conjunction with SCWD's routine source water locations. A detailed description of the WY 2021 sampling plan is provided in Section 1.5, Sampling Plan.

Additionally, five soil and water quality sampling locations were established in the affected watersheds at Clear Creek-Private Property, Clear Creek-City Property, Felton Empire Rd-Tributary to Fall Creek, Laguna Creek at Ice Cream Grade, and Pine Ridge-Tributary to Laguna Creek. A report with these results will be available at a later date.

1.3 Graham Hill Water Treatment Plant Source Waters

Over 90% of the water served to Santa Cruz Water Department's (SCWD's) customers is produced at the Graham Hill Water Treatment Plant (GHWTP). As previously mentioned, the GHWTP is a conventional surface water treatment plant that uses coagulation, flocculation, sedimentation, filtration, and disinfection for water treatment. The raw blend influent consists of multiple surface water and groundwater sources including Loch Lomond Reservoir, the San Lorenzo River (SLR), Liddell Spring, Laguna Creek, Majors Creek and three groundwater wells under the direct influence of surface water at Tait St. (Tait Wells) (Figures 1 and 2). In addition, a small proportion of the raw blend influent consists of reclaimed waters recycled from the treatment process. A detailed description of each water source is provided below.
More detailed information about each water source and its watershed is provided in the San Lorenzo River and North Coast Watersheds Sanitary Survey Update - February 2018 (Kennedy/Jenks Consultants), which can be found here:
https://www.cityofsantacruz.com/home/showpublisheddocument/85117/637605784635270000

San Lorenzo River

The San Lorenzo River (SLR) water is diverted at two locations: Tait St. Diversion (Intake to GHWTP) and Felton Diversion. The Tait St. Diversion, located in the City of Santa Cruz (west) of the GHWTP (Figure 1), pumps water from both the river and the Tait Wells located next to the river. These waters are combined in an intake sump to then enter the Coast Pipeline (discussed below) and conveyed to the GHWTP. SLR water is also diverted about five miles upstream of the Tait St. Diversion in Felton at the Felton Diversion. This water can be pumped to the Loch Lomond Reservoir for additional reservoir storage and ultimately back to the GHWTP by way of the Newell Creek pipeline. Under the current water rights diversion permit for the Felton Diversion, they cannot be directly diverted to the GHWTP.

Loch Lomond Reservoir

Loch Lomond Reservoir is located on Newell Creek, about ten miles northeast of the City of Santa Cruz. The reservoir's maximum storage capacity is about 8,600 acre-feet. Water is conveyed from Loch Lomond to the GHWTP through the Newell Creek Pipeline. Loch Lomond primarily receives local watershed runoff but can also receive a small amount of water diverted from the SLR at the Felton Diversion during wet years, as allowed under the current water rights diversion permit.

North Coast

The North Coast water supply consists of two coastal streams and one spring located approximately six to eight miles northwest of the City of Santa Cruz. Water from Liddell Spring, Laguna Creek, and Majors Creek is transported through the Coast Pipeline to the Tait St. Diversion (Figure 1), where it is then conveyed to the GHWTP. These three source waters exhibit significant differences in source water quality and are discussed individually throughout the following document.

The Majors Creek pipeline is currently out of service, although it is expected to be back in service in early 2022. SCWD commitments to bypass flows to support the anadromous Laguna Diversion Dam Project. Laguna Creek was not in use during Water Year (WY) 2021 and therefore did not contribute to the raw blend influent. Liddell Spring was the only North Coast source to contribute to the raw blend influent during WY 2021.

Tait Wells

The Tait Wells are three groundwater wells located near the SLR at the Tait St. Diversion. The water drawn from these wells is classified as Groundwater Under Direct Influence of Surface Water (GWUDI), as they are hydraulically connected to the SLR. Because the wells are considered to be under the influence of surface water, SCWD is restricted to conditions in the surface water right when taking water from the wells. Water produced by the Tait Wells is delivered to the SLR intake sump at the Coast Pump Station and then pumped to the common transmission pipeline that also conveys the SLR and North Coast water to the GHWTP.

Reclaim

GHWTP filter backwash water and sedimentation basin solids are blended in a reclaim tank before being clarified and recycled back to the head works of the GHWTP. In the clarification process, concentrated solids are wasted to the sanitary sewer. Clarified water flows through an air stripper designed to remove disinfection byproducts in the recycled water stream before it returns to the beginning of the treatment process. The GHWTP Wastewater Discharge permit limits the concentration and amount of solids that can be discharged.

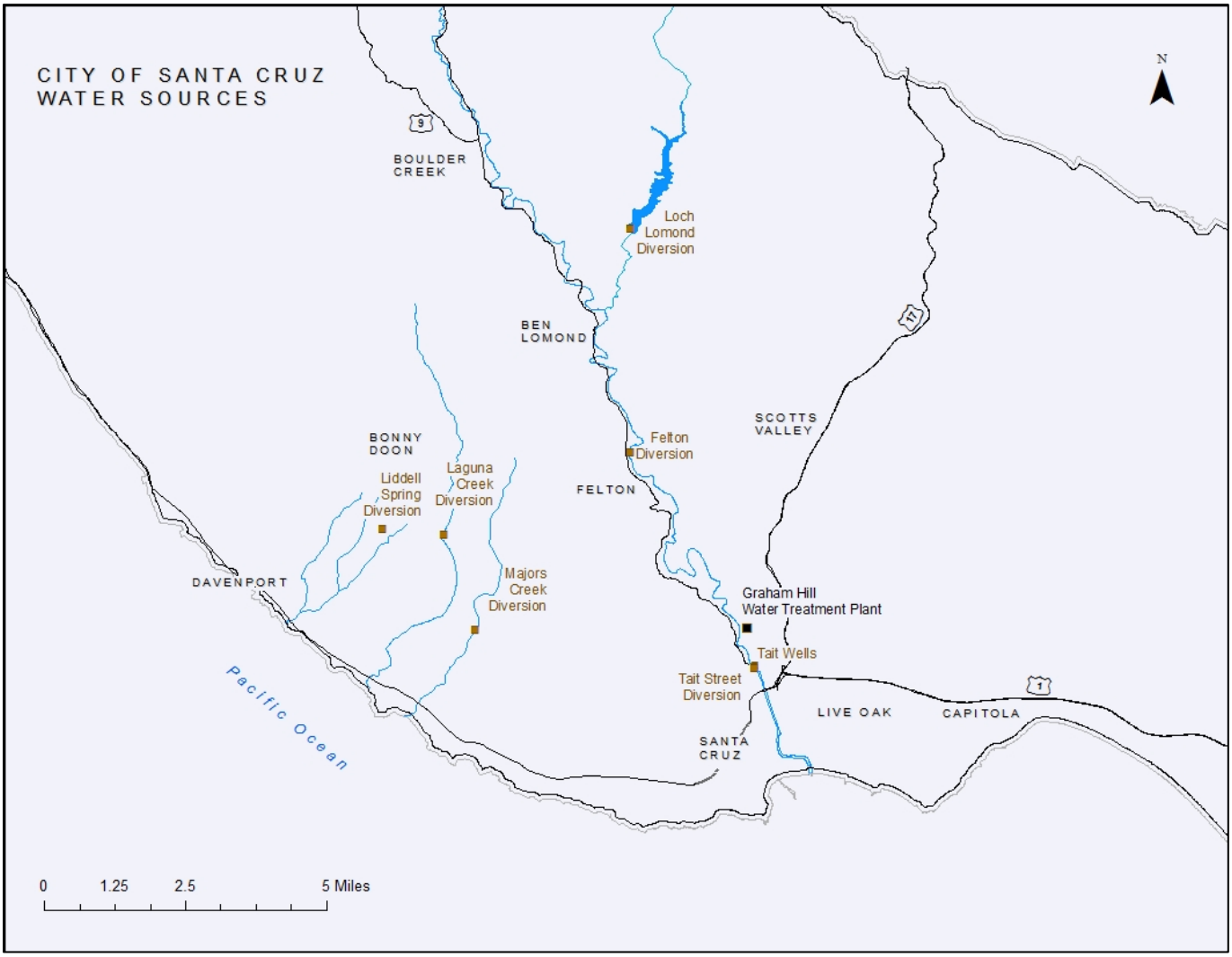


Figure 1. Map of Source Waters to the Graham Hill Water Treatment Plant

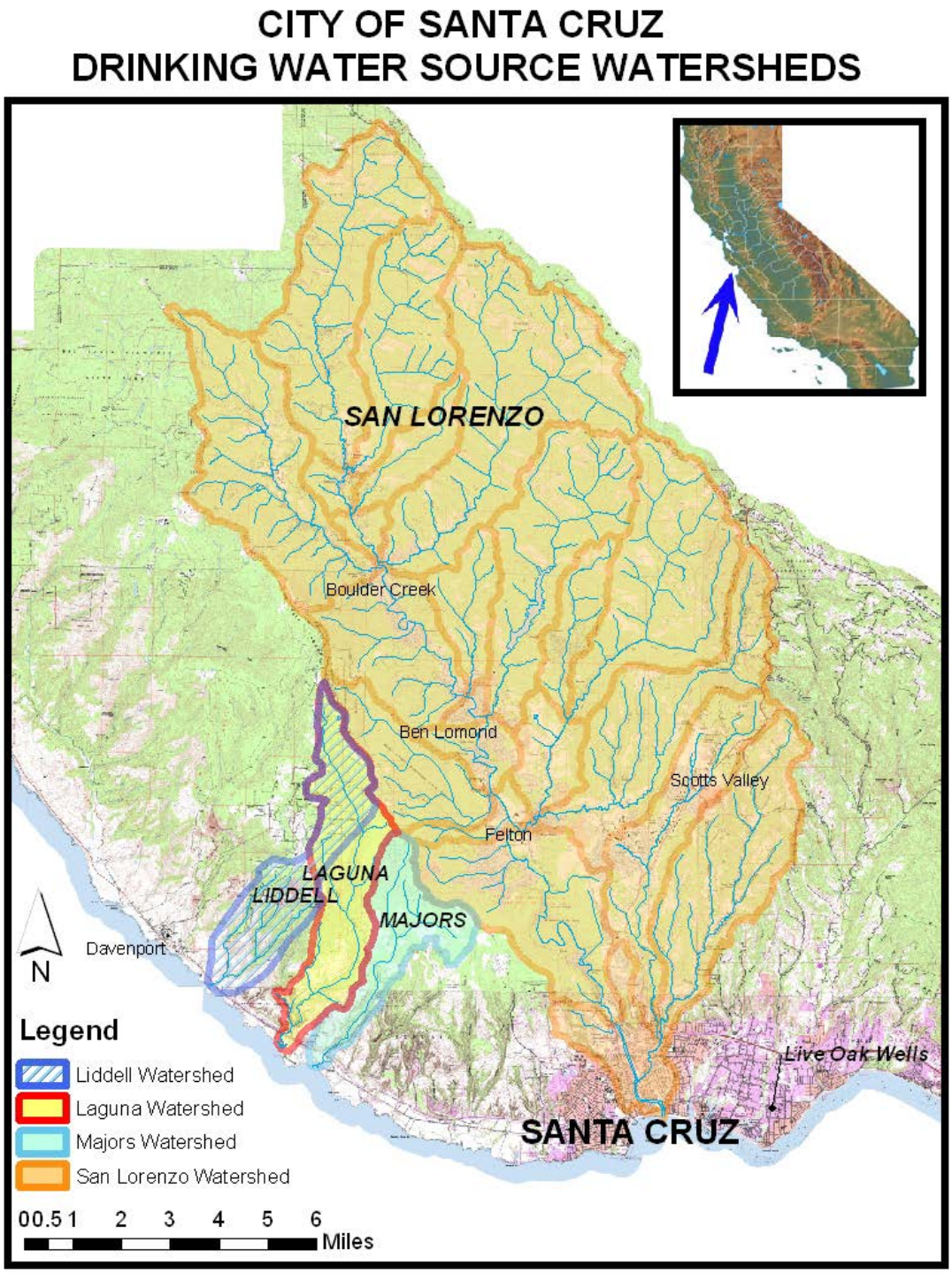


Figure 2. Map of Santa Cruz Water Department's Drinking Water Source Watersheds

During WY 2021 (October 1, 2020-September 30, 2021), surface water and GWUDI contributed to 96% and 4%, respectively, of the total source water influent for treatment at the GHWTP. The SLR was the largest contribution (57%) of source water influent during the WY 2021 water quality monitoring period (Figure 3).

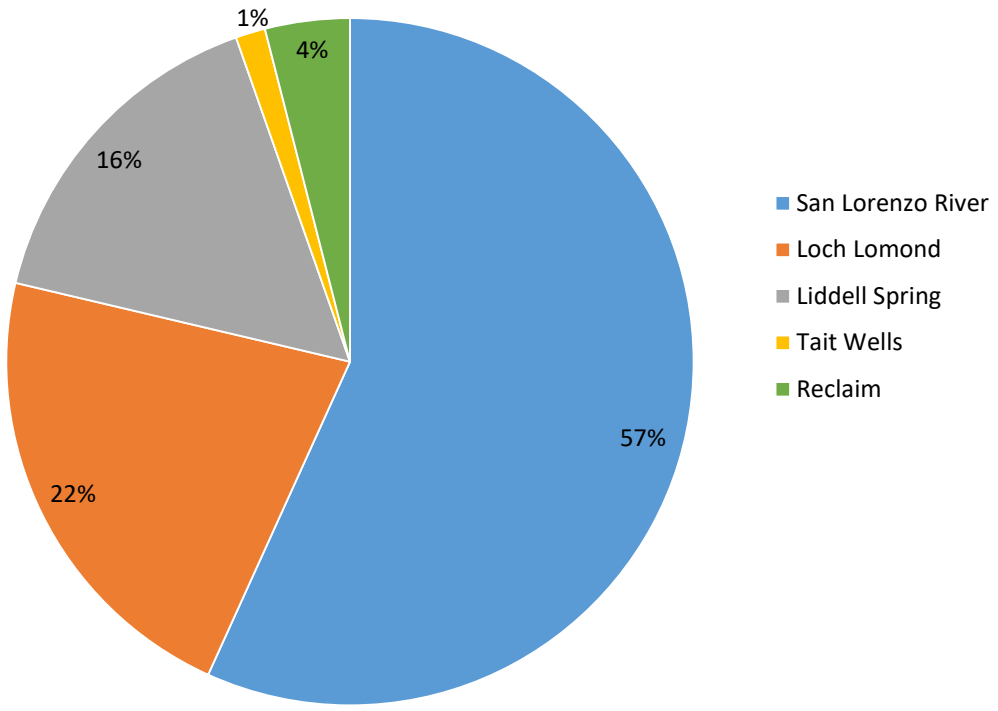


Figure 3. Contributions of various source waters to the raw blend at the Graham Hill Water Treatment Plant during Water Year WY 2021 (October 2020 – September 2021)

1.4 CZU Lightning Complex Fire

The Santa Cruz Water Department (SCWD) facilities did not sustain direct damage from the CZU Lighting Complex Fire. However, approximately 20% of the San Lorenzo River (SLR) watershed was included in the CZU fire perimeter, as well as the upper reaches of the North Coast watersheds (Laguna Creek, Majors Creek, and Liddell Creek). Because the SLR typically supplies approximately half of the SCWD's drinking water, the impacts to its watershed may have the greatest impact on source water quality and treatment operations. The Loch Lomond Reservoir and surrounding watershed were not within the affected fire zones. A brief description of potential post wildfire source water quality impacts is provided in this section. Figure 4 provides a detailed image of the CZU Lightning Complex Fire Perimeter in relation to the SCWD source and upper watershed locations.

The SCWD's Water Quality Laboratory (WQL) performed a literature review on source water quality impacts following a wildfire prior to developing the post CZU Wildfire Sampling Plan for Water Year (WY) 2021. It was found that source water quality impacts are expected to directly correlate with precipitation events and may be the greatest following the first flush storm event after a fire (Writer & Murphy, 2021). Water quality impacts typically/are expected to vary with each storm depending on a number of factors including, rainfall amounts, intensity and antecedent conditions, principally soil saturation. Generally, storms with more rainfall result in higher turbidity but lower concentrations of constituents such as nutrients, metals or organic carbon because the latter are diluted. Maximum concentrations will likely decline with subsequent storms, but may remain elevated above baseline levels for a number of years. Sediment, turbidity and total organic carbon (TOC) loadings are typically the most prominent post fire effect on water quality. Turbidity and total suspended solids (TSS) levels can vary widely, but may approach high values during first flush and heavy precipitation events after an extended period of dryness.

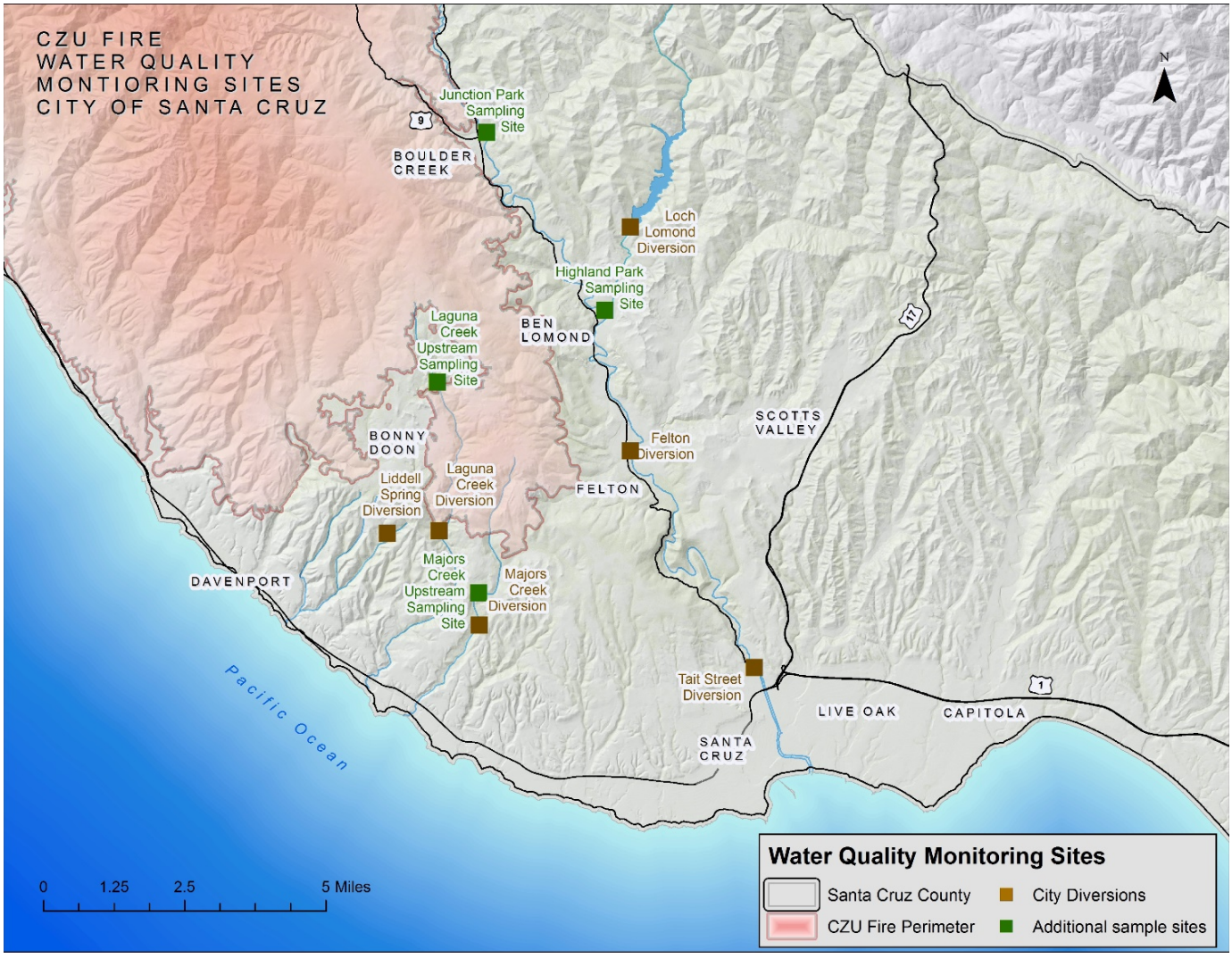


Figure 4. Map of Santa Cruz Water Department's Source and Upper Watershed Sampling Locations in relation to the CZU Lightning Complex Fire Perimeter

1.5 Sampling Plan

The Santa Cruz Water Department's Water Quality Laboratory (WQL) collected weekly, biweekly, monthly, and quarterly water quality samples from eleven locations, including five surface water sources, four upper watershed locations, and the Graham Hill Water Treatment Plant (GHWTP) finished water and raw blend according to the wet season, storm event, and dry season sections of the Water Year (WY) 2021 Source Water Monitoring Plan. Water quality parameters collected in accordance with the Source Water Monitoring Plan for WY 2021 are summarized in Table 1. The wet season, storm event, and dry season sections of the Source Water Monitoring Plan for WY 2021 are summarized in Tables 2-4.

Table 1. Water Quality Parameters for Monitoring Watershed Conditions Post CZU Lightning Fire

Category	Water Quality Parameter	Individual Parameters
Primary Drinking Water Standards	Volatile Organic Compounds	Full Title 22 VOC Screen (including parameters such as Benzene, PCE, Toluene, and MTBE)
	Synthetic Organic Compounds	1,2,3-TCP, 2,4-D, Alachlor, Atrazine, Bentazon, Carbofuran, Diquat, Endothall, Ethylene Dibromide (EDB), Lindane, Oxamyl, Simazine
	Radiological	Gross Alpha, Radium 226, Radium 228, Uranium
Primary/ Secondary Water Standards	Inorganics (Total/Dissolved)	Aluminum, Antimony, Arsenic, Asbestos, Barium, Beryllium, Cadmium, Chromium, Chromium VI, Cobalt, Copper, Lead, Lithium, Mercury, Molybdenum, Nickel, Perchlorate, Selenium, Silver, Thallium, Vanadium and Zinc
	Anions	Bromide, Chloride, Fluoride, Nitrate, Nitrite, Phosphate (Ortho/Total) and Sulfate
Secondary Drinking Water Standards	General Physical	Alkalinity, Color, Conductivity, Hardness, Odor, pH and Turbidity
	Metals	Cations (Calcium, Magnesium, Potassium and Sodium), and Total/Dissolved Iron and Manganese
	MBAS	Foaming Agents
Treatment	TOC/DOC	Total Organic Carbon/ Dissolved Organic Carbon
	UV254/SUVA	UV absorbance at 254 nm/ Specific Ultraviolet Absorbance
	TSS	Total Suspended Solids
	TDS	Total Dissolved Solids
	MIB/Geosmin	Methylisoborneol/Geosmin
Indicator	Microbial Profile	Bacteroides (Human Specific and Universal), Ms-2 Coliphage, Somatic Coliphage
	Total Coliform/ *E.coli*	
	Enterococci	
Environmental	Ammonia Nitrogen	
Unregulated Contaminants of Emerging Concern	PFAS/PFOS	Per- and Polyfluoroalkyl Substances
	CEC	Contaminants of Emerging Concern (including parameters such as pharmaceuticals and personal care products)
	Dioxins/Furans	Polychlorinated, aromatic hydrocarbons released from municipal waste and residential wood combustion (including parameters such as 2,3,7,8-TCDD)

1.5.1 Wet Season (October 2020 – May 2021)

The source water monitoring sampling plan for WY 2021 indicates the location, sampling frequency and water quality parameters collected during the wet season (Table 2). The wet season data correlates with the WY and captures first flush runoff as well as, winter and spring storm events. Notably, the sampling plan sought to target intra-storm variability, and as such, samples were collected during the rising and falling limbs of the storm hydrograph, as well as baseline rate of flows following the storm events. Sampling frequency was increased from monthly to weekly or biweekly for select parameters including color, turbidity, and dissolved/total organic carbon (DOC/TOC) given these parameter's effect on treatability. In addition, the collection of fire-related parameters was also increased from quarterly to monthly in order to characterize the impact of urban and rural run-off to source waters in fire-impacted watersheds.

Table 2. Water Year WY 2021 Wet Season Sampling Plan

WY 2021 Source Water Monitoring Program Wet Season Sampling Frequency											
Water Quality Parameter	**Laguna Creek**	**Liddell Spring**	**Loch Lomond**	**SLR Felton Diversion**	**SLR Tait St. Diversion**	**Raw Blend**	**GHWTP**	**SLR Highlands**	**Upper Laguna Creek**	**SLR Junction**	**Upper Majors**
Volatile Organic Compounds				M	M		M	M		Q	Q
Synthetic Organic Compounds				M	M		M				
Radiological				M	M		M				
Inorganics	M	M	M	M	M		M	M	M	Q	Q
Anions	M	M	M	M	M	M	M	M	M	Q	Q
General Physical	BW	BW	BW	W	W	W	W	M	M	Q	Q
Metals	M	M	M	M	M		M	M	M	Q	Q
MBAS				M	M			M	M	Q	Q
TOC/DOC	BW	BW	BW	W	W	W	W	M	M	Q	Q
UV254/ SUVA	BW	BW	BW	W	W	W	W	M	M	Q	Q
TSS	BW	BW	BW	W	W			M	M	Q	Q
TDS	M	M	M	M	M			M	M	Q	Q
MIB/Geosmin			Q								
Microbial Profile				M	M						
Total Coliform/ *E. coli*	BW	BW	BW	W	W	W	W	M	M	Q	Q
Enterococci	BW	BW	BW	W	W	W	W	M	M	Q	Q
Ammonia Nitrogen	M	M	M	M	M			M	M	Q	Q
PFAS/PFOS				M	M		M				
CEC				M	M		M				
Bromide	M	M	M	M	M	M		M	M	Q	Q
Glyphosphate				M	M			M		Q	
W= Weekly BW=Biweekly M=Monthly Q=Quarterly											

Storm Event

Storm event monitoring occurred during the initial increase of discharge and rising limb of the hydrograph (pre-peak), during peak discharge, during the receding limb of the hydrograph (post-peak), and once the discharge leveled off and established a new baseline at select locations based on storm intensity and source contribution. Primarily, storm event monitoring was performed at the San Lorenzo River (SLR) Felton Diversion and Tait St. Diversion in order to better characterize the impact of winter storms on water quality. These sites were selected given the nature of the fire's impact on the watershed, and because the SLR is the largest source water contribution to the GHWTP. It is important to note that the WQL has not previously monitored during storm events, and as such, caution should be used when comparing the most recent results to historic data. The Source Water Monitoring Plan for WY 2021 storm event sampling indicates the location and water quality parameters that were collected during a storm event (Table 3).

Table 3. Water Year WY 2021 Storm Event Sampling Plan

WY 2021 Source Water Monitoring Program Storm Event Sampling Frequency								
Water Quality Parameter	**Laguna Creek**	**Liddell Spring**	**SLR Felton Diversion**	**SLR Tait St. Diversion**	**SLR Highlands**	**Upper Laguna Creek**	**SLR Junction**	**Upper Majors**
Volatile Organic Compounds	X		X	X	X	X	X	X
Synthetic Organic Compounds	X		X	X	X	X	X	
Radiological	X		X	X	X	X	X	
Inorganics	X		X	X	X	X	X	X
Anions			X	X	X		X	
General Physical	X	X	X	X	X	X	X	X
Metals	X		X	X	X	X	X	X
MBAS	X		X	X	X	X	X	X
TOC/DOC	X	X	X	X	X	X	X	X
UV254/ SUVA	X	X	X	X	X	X	X	X
TSS	X	X	X	X	X	X	X	X
Asbestos	X		X	X	X	X	X	X
Microbial Profile			X	X				
Total Coliform/ *E. coli*	X	X	X	X	X	X	X	X
Enterococci	X	X	X	X	X	X	X	X
PFAS/PFOS	X		X	X	X	X	X	
CEC	X		X	X	X	X	X	
Bromide	X		X	X	X	X	X	X
Dioxin/Furan	X		X	X	X	X	X	X
X indicates that samples were collected								

1.5.2 Dry Season (June 2021 – September 2021)

The source water monitoring sampling plan for WY 2021 indicates the location, sampling frequency and water quality parameters collected during the dry season (Table 4). The dry season data captures low rate of flow baseline data for the post CZU Lighting Fire water quality parameters (Table 1). Historic sampling and analysis demonstrates that water quality is strongly influenced by storm water runoff. As such, dry season sampling was reduced from weekly or biweekly to monthly and quarterly to determine background contaminant concentrations.

Table 4. Water Year WY 2021 Dry Season Sampling Plan

WY 2021 Source Water Monitoring Program Dry Season Sampling Frequency											
Water Quality Parameter	**Laguna Creek**	**Liddell Spring**	**Loch Lomond**	**SLR Felton Diversion**	**SLR Tait St. Diversion**	**Raw Blend**	**GHWTP Finished Water**	**SLR Highlands**	**Upper Laguna Creek**	**SLR Junction**	**Upper Majors**
Volatile Organic Compounds				Q	Q		Q	Q		Q	Q
Inorganics	Q	Q	Q	M	M		M	Q	Q	Q	Q
Anions	Q	Q	Q	M	M	M	M	Q	Q	Q	Q
General Physical	BW	BW	W	W	W	W	W	Q	Q	Q	Q
Metals	Q	Q	Q	M	M		M	Q	Q	Q	Q
MBAS				Q	Q			Q	Q	Q	Q
TOC/DOC	M	M	M	M	M	M	M	Q	Q	Q	Q
UV254/ SUVA	M	M	M	M	M	M	M	Q	Q	Q	Q
TSS	BW	BW	BW	W	W			M	M	Q	Q
TDS	Q	Q	Q	M	M		Q	Q	Q	Q	Q
MIB/Geosmin			Q								
Microbial Profile				M	M						
Total Coliform/ *E. coli*	BW	BW	W	W	W	W	W	Q	Q	Q	Q
Enterococci	BW	BW	W	W	W	W	W	M	M	Q	Q
Ammonia Nitrogen	Q	Q	Q	M	M			Q	Q	Q	Q
PFAS/PFOS				M	M		M				
CEC				M	M		M				
Bromide	Q	Q	Q	M	M	M		Q	Q	Q	Q
Glyphosphate				M	M			Q		Q	
W= Weekly BW=Biweekly M=Monthly Q=Quarterly											

Additional information on the SCWD's Post CZU Source Water Quality Sampling Plan for WY 2021 and potential water quality impacts can be found at the following location: https://www.cityofsantacruz.com/government/city-departments/water/water-quality/czu-fire-water-quality.

1.6 Source Selection

The raw source water blend (Raw Blend) at the Graham Hill Water Treatment Plant (GHWTP) consists of multiple raw sources including surface water and groundwater wells under the direct influence of surface water (GWUDI). These sources are vulnerable to changing water quality due to environmental conditions such as drought, wildfire, precipitation and storm events that contribute water runoff. All of these conditions have the potential to affect the water quality of surface sources, therefore affecting their treatability.

Water Treatment Operators utilize source availability and water quality data when choosing how much of each of the raw sources to treat to ensure that the finished water quality leaving the GHWTP meets all State and Federal drinking water standards. In general, the San Lorenzo River (SLR) provides the greatest quantity of water treated throughout the year, while Loch Lomond Reservoir is the largest volume of stored water available for use. Loch Lomond Reservoir water is utilized conservatively to preserve supply for drought periods and is used only when other sources are unavailable due to water quality concerns or insufficient streamflow. Diversifying source selection based on source availability and water quality is a fundamental treatment operations practice with established criteria for source selection.

1.7 San Lorenzo River Turn In/Out Procedure

Water Treatment Operators follow a standard operating procedure (SOP) that utilizes water treatment parameters including color, turbidity, and total organic carbon (TOC) to trigger the turning in and out of the San Lorenzo River (SLR) during storm events. Generally, water from the North Coast is the first water to be used, followed by the SLR and Tait Wells, and finally the Loch Lomond Reservoir. The Santa Cruz Water Department (SCWD) has an established SOP that guides the use of the SLR during storm events. Turbidity is closely monitored in the SLR and the source is turned out when turbidity reaches 10 NTU at the sample location at the Graham Hill Water Treatment Plant (GHWTP) or 25 NTU at the SLR intake (Tait St. Diversion). The source is turned back in when turbidity decreases below 10 NTU and when other water quality parameters, notably TOC, is better than what is available from Loch Lomond.

In response to the CZU Lighting Complex Wildfire and the potential for post wildfire water quality impacts on the SLR, the SOP was revised for Water Year (WY) 2021 to include a more conservative trigger for turning the source out prior to a storm event and incorporate the use of additional wildfire water quality data to review before turning the source back in use. When the SLR is turned back in following a weather related turn out, Water Treatment Operators adjust the SLR intake flow rate to contribute only 25% of the total raw water blend. If the GHWTP finished water quality is acceptable after 12 hours, including TOC <2.5 mg/L, the SLR intake flow rate contribution is increased. A detailed summary of the post CZU SLR Turn In/Out SOP is provided below:

Criteria for turning out the SLR due to weather related event:

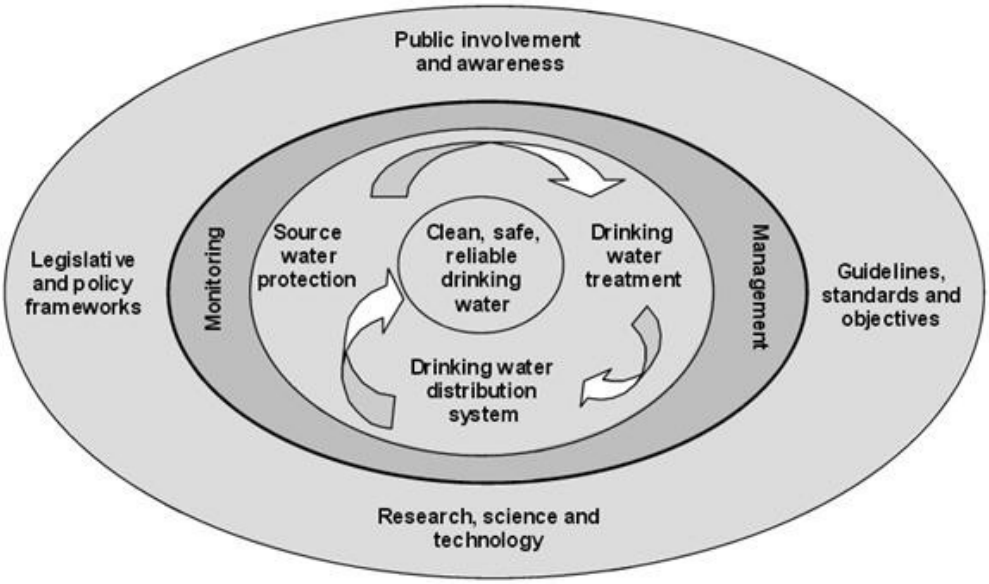
- Any rise of the SLR cubic feet per second (CFS) at the United States Geological Survey (USGS) Big Trees gage (Felton Diversion) after a rain event has started. (First flush rain event runoff is expected at the SLR intake (Tait St. Diversion) within hours.)
- SLR turbidity >25 NTU at the SLR intake (Tait St. Diversion)

Criteria for reestablishing use of the SLR after a weather related turn out:

- First flush event has peaked and the SLR CFS is declining;
- Acceptable water quality for all of the following parameters based on a grab sample collected from the SLR near the intake (Tait St. Diversion):
    - Color <50 CU;
    - pH, odor, and temperature all in normal range;
    - TOC <4.0 mg/L (or less than alternative sources); and
    - Turbidity <25 NTU

1.8 Water Quality Management Multi-Barrier Approach

Like many other water utilities, the Santa Cruz Water Department (SCWD) uses a multi-barrier approach to protecting water quality. The multi-barrier approach is an integrated system of procedures, processes and tools that collectively prevent or reduce contamination of drinking water from source to tap in order to reduce risks to public health. The first barrier is source water protection, the second is effective water treatment, which also includes multiple barriers, and the third is careful management of the treated water distribution system to keep water quality from degrading as it moves from treatment to tap (Figure 5). This multi-barrier approach allows the SCWD to manage the risk of contamination and waterborne disease to ensure that the water meets all state and federal drinking water standards. A diagram of how SCWD manages each of the three elements is provided below.



From Source to Tap – May 2002

Figure 5. Multi-Barrier Approach

Source Water Protection

Source water assessment and active watershed management are the key elements of an effective source water protection program. The Water Resources section of the SCWD patrols the watersheds from which it draws water, and completes a thorough sanitary survey of each watershed every three years. These efforts keep the SCWD aware of changes in activities or occurrences in the watersheds that may be sources of contamination from natural conditions, such as soil erosion that increases sediment loading in source water, or human-caused sources such as agricultural run-off that may introduce fertilizers, herbicides or pesticide residues into the water. High quality drinking water begins with actively protecting and managing water sources.

The water quality results presented in this report are complemented by the discussion of watershed processes found in the Watershed Sanitary Survey (WSS), notably on pages 2-3 to 2-17. Nonpoint source runoff, which is runoff that is generated during storm events, picks up pollutants as it moves over the land surface, and is the main driver for water quality concerns in the SCWD's source water watersheds. As described in the WSS, rainfall, watershed processes and land use are all important factors to understand when attempting to understand water quality. The reader of this report is encouraged to also review the WSS in order to have a context for the results presented herein.

The most recent SCWD WSS can be found at the following location:
https://www.cityofsantacruz.com/home/showpublisheddocument/85117/637605784635270000

Water Treatment

Water treatment is key to both the multi-barrier approach and to protecting public health. State and Federal regulations require water utilities who rely on surface water sources such as rivers, streams, and lakes to provide significant levels of treatment, typical of a facility like the Graham Hill Water Treatment Plant (GHWTP). As previously discussed in Section 1.3 Graham Hill Water Treatment Plant Source Waters, the GHWTP is a conventional surface water treatment plant that uses coagulation, flocculation, sedimentation, filtration, and disinfection for water treatment. Work is currently underway to upgrade the GHWTP. As part of the upgrades, the treatment process will be modified to use high rate clarification via the use of plate settlers, ozone, and combination of granular activated carbon and biologically activated filtration. Together these improvements will allow the process to treat higher levels of turbidity while also improving our ability to address existing and emerging contaminants of concern.

Distribution System

The distribution system is the final physical barrier in the multi-barrier approach. After treated drinking water leaves the GHWTP, its quality is maintained throughout the distribution system. Diligence is required by SCWD's Distribution and Production sections to ensure sufficient disinfectant, chlorine residual, is present at all points throughout the distribution system in order to adequately protect public health. Distribution system barriers prevent new contaminants from entering the water distribution system by maintaining positive pipeline pressure and regulating cross-connections. Local flushing of dead ends is also used to reduce residence times of treated water in parts of the distribution system. On average, approximately 1, 300 samples are taken annually from the distribution system to demonstrate that water quality meets all applicable standards. Additionally, the SCWD employs standard practices to

reduce water age and address water quality concerns at various locations by regularly flushing water mains.

Section 2: Source Water Quality Summary

2.1 Stream Discharge Reference and Storm Event Monitoring

For the Santa Cruz Water Department (SCWD), source water quality is most impacted by nonpoint source runoff generated during storm events. Water quality parameters including color, turbidity, total organic carbon (TOC), nitrate, metals, total coliform, and *E. coli* have shown to be affected by severe weather conditions and trend closely with stream discharge or rate of flow data and water year (WY) classification. Overall, annual weather conditions, represented through stream discharge, WY classification and storm events, can be correlated with water quality parameters to provide weather related water quality trends. The SCWD's Water Quality Laboratory (WQL) monitors real-time stream discharge to determine storm related sampling events so that water quality data can be correlated with current and historical discharge and WY classification.

The SCWD uses the United States Geological Survey (USGS) Stream Gages at San Lorenzo River (SLR) in Santa Cruz, located below the SCWD's Tait St. Diversion intake, and at Big Trees located below the Felton Diversion, to monitor real time stream discharge. Real time stream discharge data is used to determine when to collect storm event sampling (pre-peak, peak, receding and baseline). Storm events are indicated on the USGS stream gage with a peak and rise in river discharge. Nine storm events were sampled during WY 2021, with the most significant rainfall occurring on January 27, 2021 (Figure 6). Figure 7 provides a visual summary of the SLR discharge between October 2020 and September 2021.

In addition, the USGS stream gage at the SLR in Santa Cruz is used to compare WY 2021 water quality parameters results to historical stream discharge data results. To aid in the visualization of trends in water quality parameters, many of the figures shown in this section have been overlaid on a plot of the SLR in Santa Cruz stream discharge data. Historical stream discharge data from the stream gage at SLR in Santa Cruz shows the critically dry and dry conditions in 2012, 2014, 2015, 2018, and 2020 as well as the more extreme wet conditions in 2017 and 2019 (Figure 8). The WY classification at the SLR Tait St. Diversion intake is determined by calculating the total annual runoff in the SLR, which also provides historical information on WY trends (Figure 9). Additionally, cumulative runoff in each WY is used to determine required bypass rate of flows at each stream diversion, which has an impact on which sources are available at any given time.

The following source water quality summary provides data on water quality parameters throughout the wet season, dry season and storm events of WY 2021 at five surface water sources, four upper watershed locations and the Graham Hill Water Treatment Plant (GHWTP) finished water and raw blend. In addition, this water quality summary report provides context as to how WY 2021 water quality parameter data compares to historical water quality data based on WY for SCWD's SLR Tait St. Diversion intake. Most historical data trends begin in 2015. The following source water quality summary adds to the SCWD's continued monitoring of source water over a variety of stream flow rates, WYs and storm event conditions to determine correlations between water quality parameters and weather related water quality trends.

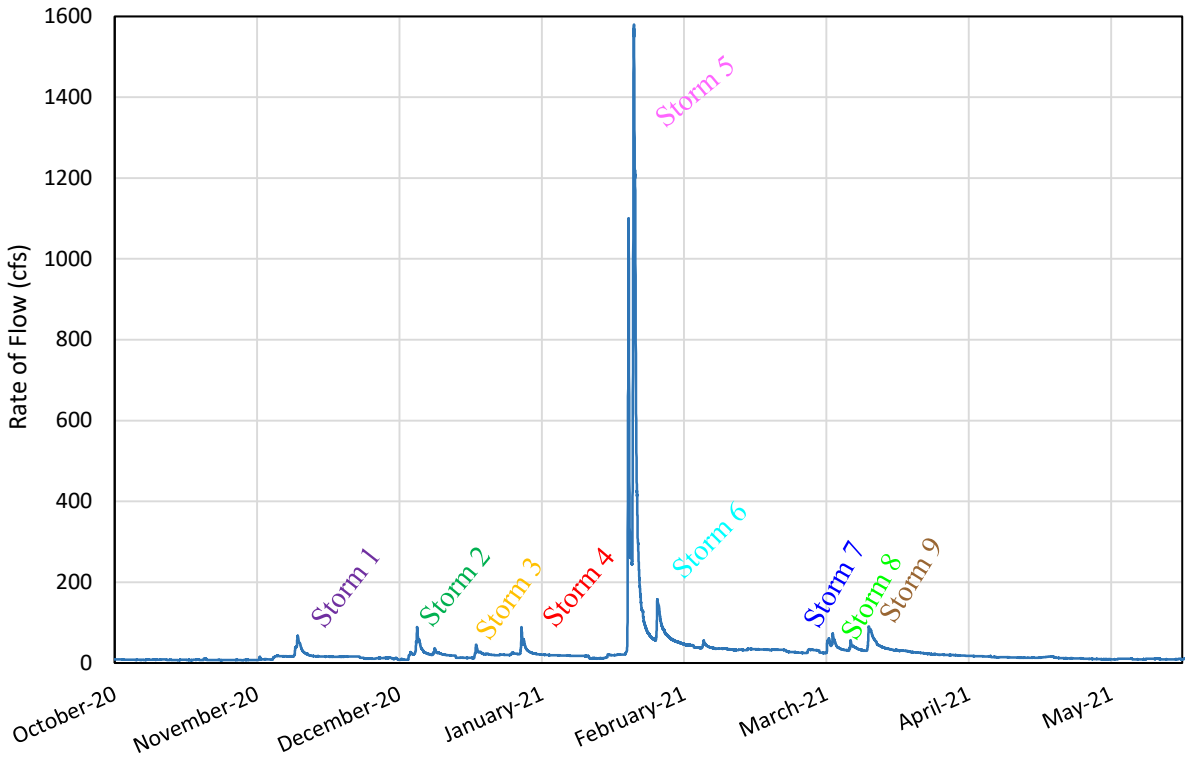


Figure 6. Assigned storms during the WY 2021 Wet Season (October 2020 – May 2021). River rate of flow data were obtained from the USGS 11161000 San Lorenzo R A Santa Cruz CA stream gage.

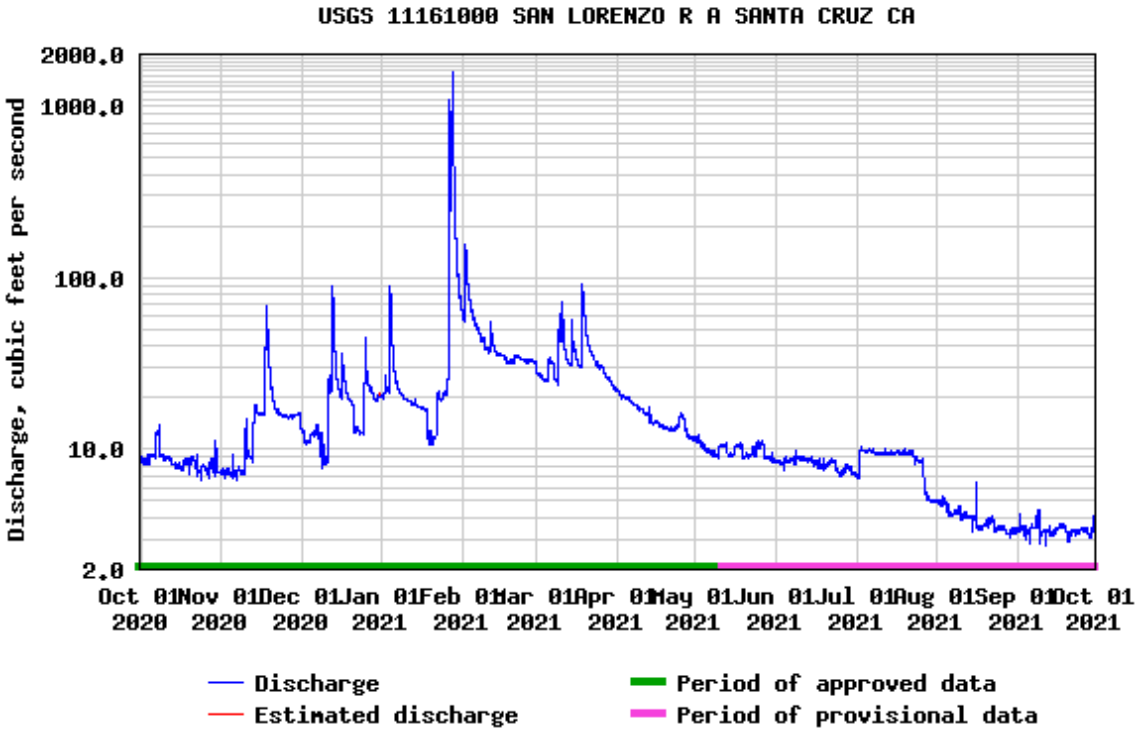


Figure 7. San Lorenzo River Discharge during WY 2021

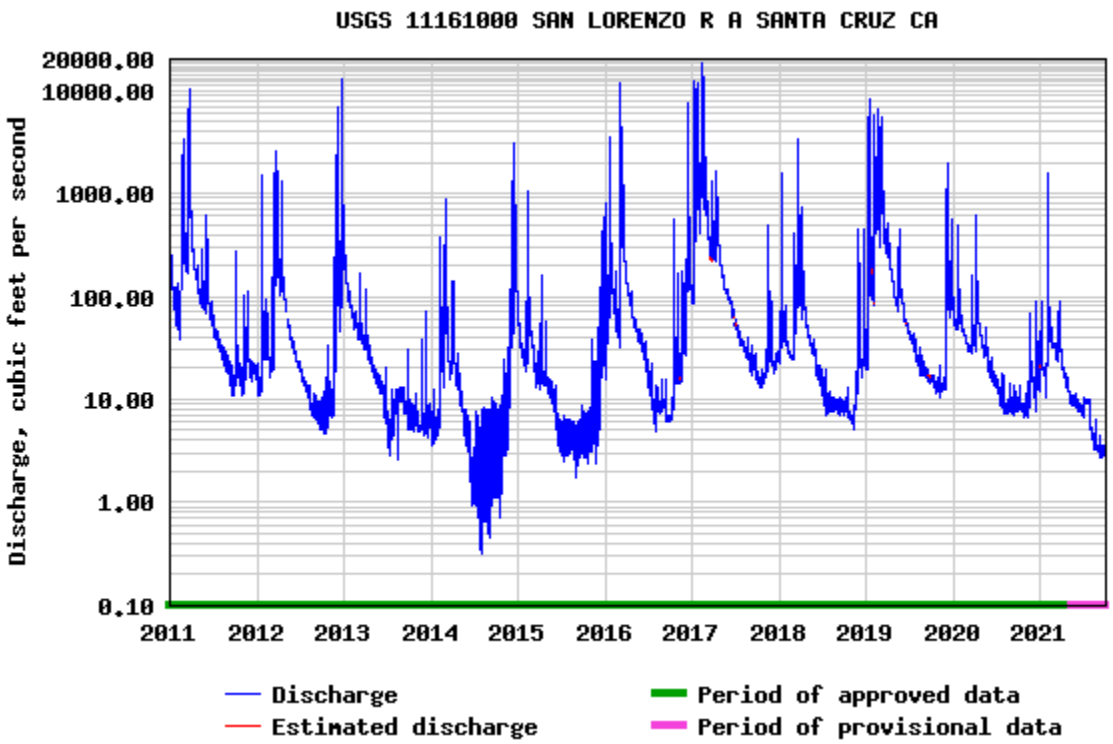


Figure 8. Historical San Lorenzo River Discharge between January 2011 and December 2021

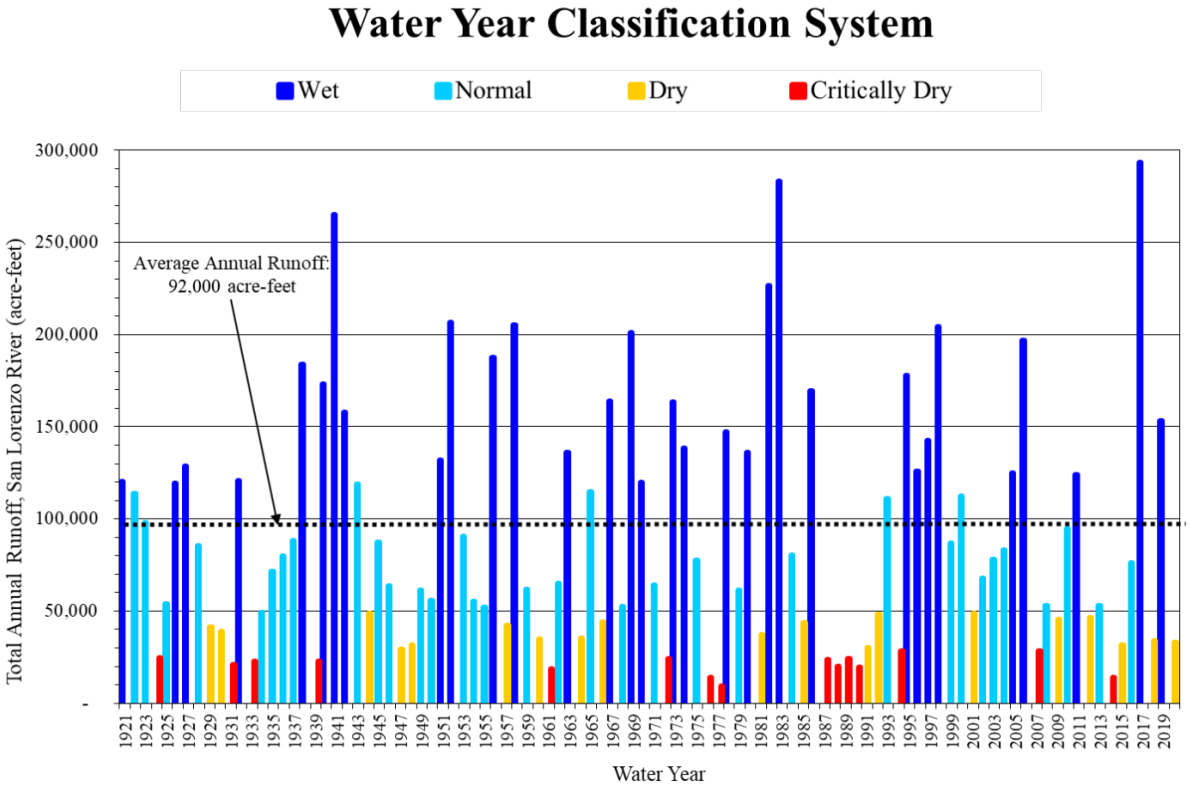


Figure 9. Santa Cruz Water Department's Water Year Classification

2.2 Drinking Water Regulations

The United States Environmental Protection Agency (EPA) and/or state agencies regulate the water quality of drinking water systems. EPA delegates primary enforcement responsibility for drinking water program implementation and enforcement to the State. In California, the State Water Resources Control Board Division of Drinking Water (SWRCB-DDW), formerly Department of Public Health, is the primacy agency for drinking water regulations. To maintain primacy, the authority to enforce drinking water regulations, under the Safe Drinking Water Act (SDWA), the SWRCB-DDW must adopt drinking water regulations that are at least as stringent as the federal regulations and meet other relevant criteria. The paragraphs below provide a brief description of four regulatory terms used throughout this report including, action level (AL), health advisory level (HAL), primary maximum contaminant level (MCL), secondary maximum contaminant level (SMCL), and notification level (NL).

Primary drinking water standards are legally enforceable standards and treatment techniques that apply to public water systems. They protect public health by limiting the levels of contaminants in drinking water. The MCL of a primary standard is the highest level of a contaminant that is allowed in public drinking water supplies. Primary MCLs are typically reported in milligrams per liter (mg/L) or micrograms per liter (µg/L) unless otherwise noted.

The list of primary drinking water standards and their associated MCLs can be found here: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/ccr/mcls_epa_vs_dwp.pdf.

Secondary drinking water standards are recommendations rather than legally enforceable standards and are intended to supplement the primary standards by providing guidance for public water systems. Secondary drinking water standards include a list of contaminants that may affect drinking water cosmetic or aesthetic qualities. The Secondary Maximum Contaminant Level (SMCL), when exceeded, may adversely affect the aesthetic quality (e.g. color, taste, odor or appearance) of drinking water or may interfere with water treatment methods.

The list of secondary drinking water standards and their associated SMCLs can be found here: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/ddw_secondary_standards.pdf.

Notification Levels (NLs) are non-regulatory health-based advisory levels established by SWRCB-DDW for chemicals in drinking water that are unregulated and/or lack primary/secondary MCLs. Monitoring conducted by public water systems for unregulated chemicals with notification levels is not required. However, public water systems are required to participate in EPA studies to monitor unregulated contaminants under the Unregulated Contaminants Monitoring Rule (UCMR). A list of California's current drinking water notification levels can be found here: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/notificationlevels/notification_levels_response_levels_overview.pdf.

Action Levels (ALs) are a specified concentration of a contaminant in treated water that, if exceeded, triggers further action (e.g. further treatment and monitoring) that a water system must follow. For

example, lead and copper are regulated by ALs and the lead and copper rule (LCR), which allows up to 10% of the study's samples to exceed the AL to remain in compliance.

Health advisories provide information on contaminants that can cause human health effects and are known or anticipated to occur in drinking water. EPA's health advisories are non-enforceable and non-regulatory and provide technical information to state agencies and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination. EPA's health advisory level (HAL) for Perfluorooctanoic Acid (PFOA) and Perfluorooctane sulfonic acid (PFOS) offers a margin of protection for all Americans throughout their life from adverse health effects resulting from exposure to PFOA and PFOS in drinking water.

Table 5 provides context for drinking water measurement units and can be used throughout this document as a reference when interpreting water quality results.

Table 5. Drinking Water Measurement Units

Units	Units	Equivalence
mg/L = milligrams per liter	ppm = parts per million	1 second in 11.5 days
µg/L = micrograms per liter	ppb = parts per billion	1 second in nearly 32 years
ng/L = nanograms per liter	ppt = parts per trillion	1 second in nearly 32,000 years
pg/L = picograms per liter	ppq = parts per quadrillion	1 second in nearly 32,000,000 years

2.3 Treatment Parameters

2.3.1 Color

Color is a water quality parameter used to define the aesthetic quality of water resulting from the presence of certain dissolved species and natural organic matter including humic and fulvic acids. Additionally, color can be an indication of the presence of other constituents including suspended particles such as algae, clay, iron, and manganese. The secondary maximum contaminant level (SMCL) for color in finished water is 15 color units (CU).

As shown in Table 6 and in Figure 10, color increased during storm events and was therefore consistently higher during the wet season at all of the source water locations, except for Liddell Spring. The North Coast sources including Liddell Spring and Laguna Creek consistently have the lowest color compared to the other sources, with Liddell Spring consistently having a color of 1 CU throughout the WY. Loch Lomond color varies slightly between the dry and wet season, primarily due to algae growth and storm water runoff. The San Lorenzo River (SLR), both Felton Diversion and Tait. St. Diversion locations are the most variable and susceptible to increase in color during winter storms, and have the highest values overall. It is also notable that water quality generally improves between the SLR Felton Diversion and the SLR Tait St. Diversion locations. Between these sample locations water flows through the Henry Cowell Redwoods State Park and a relatively un-developed portion of the watershed. The natural

landscape serve to clean water as it travels. This is keeping in line with the multi-barrier approach that seeks first to manage watershed lands to maintain water quality.

The Raw Blend average color was below 10 CU even though the blend consisted mostly of contributions from the overall high color waters of the SLR. This is due to the contribution from Liddell Spring; a source with a consistent color of 1 CU, which provides a buffer against the color fluctuations of the San Lorenzo, and Loch Lomond sources (Figure 11). The average color data for Laguna Creek, SLR Felton Diversion, and SLR Tait St. Diversion was significantly higher than the median values, as those sources are more impacted by storm runoff events compared to Loch Lomond. The Graham Hill Water Treatment Plant (GHWTP) finished water color average of less than 1 CU was consistently below the SMCL throughout the WY.

A comparison of the SLR stream rate of flow in Santa Cruz and color grab sample data is shown in Figure 12. As can be seen, the SLR stream rate of flow and color data trend well, with the color increasing with storm events and river flow rate.

As shown in Figure 13, the color of the SLR Tait St. Diversion had a color result of 800 CU on January 27, 2021 during the largest storm recorded in WY 2021. A color result of 800 CU is the highest result recorded by the WQL since January 2015. However, event based storm sampling was not consistently conducted; therefore higher color results may have previously occurred but were not captured by the WQL's sampling.

As shown in Table 7, color increased during storm events and were therefore consistently higher during the wet season at all upper watershed sampling locations. Upper Laguna Creek had the lowest color results compared to the other locations, as Upper Majors Creek, SLR Junction Park, and SLR Highlands Park are more susceptible to an increase in color during winter storms.

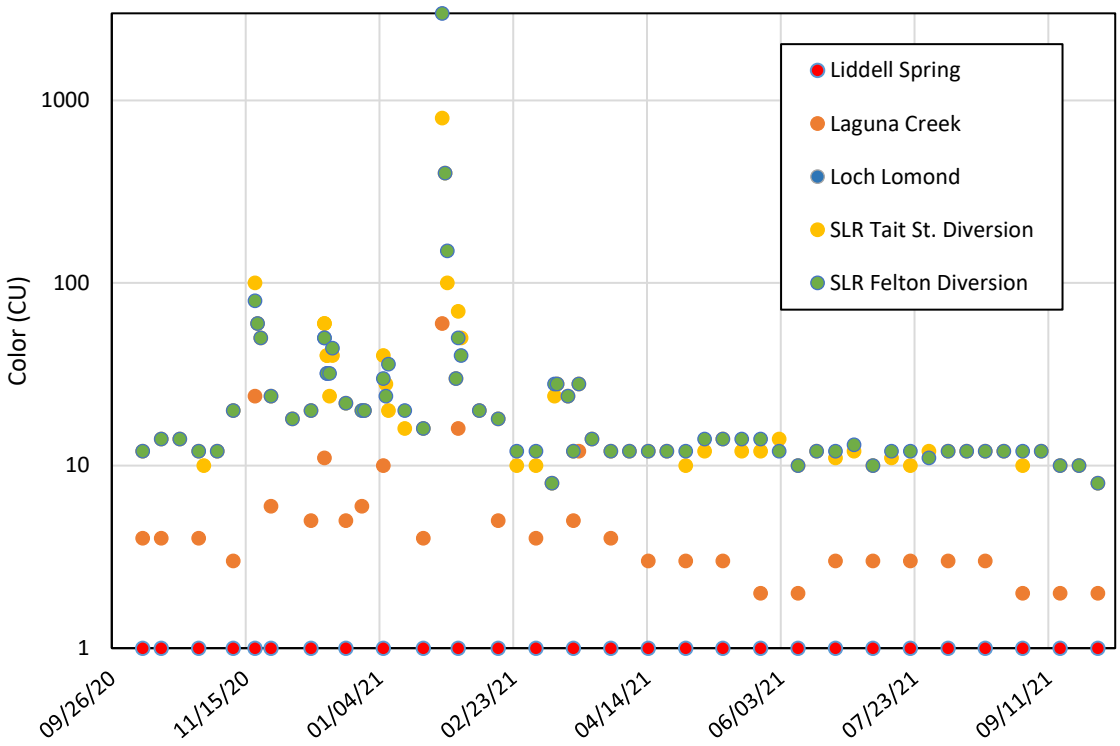


Figure 10. Color of source waters between October 2020 and September 2021. Data is presented using a logarithmic scale.

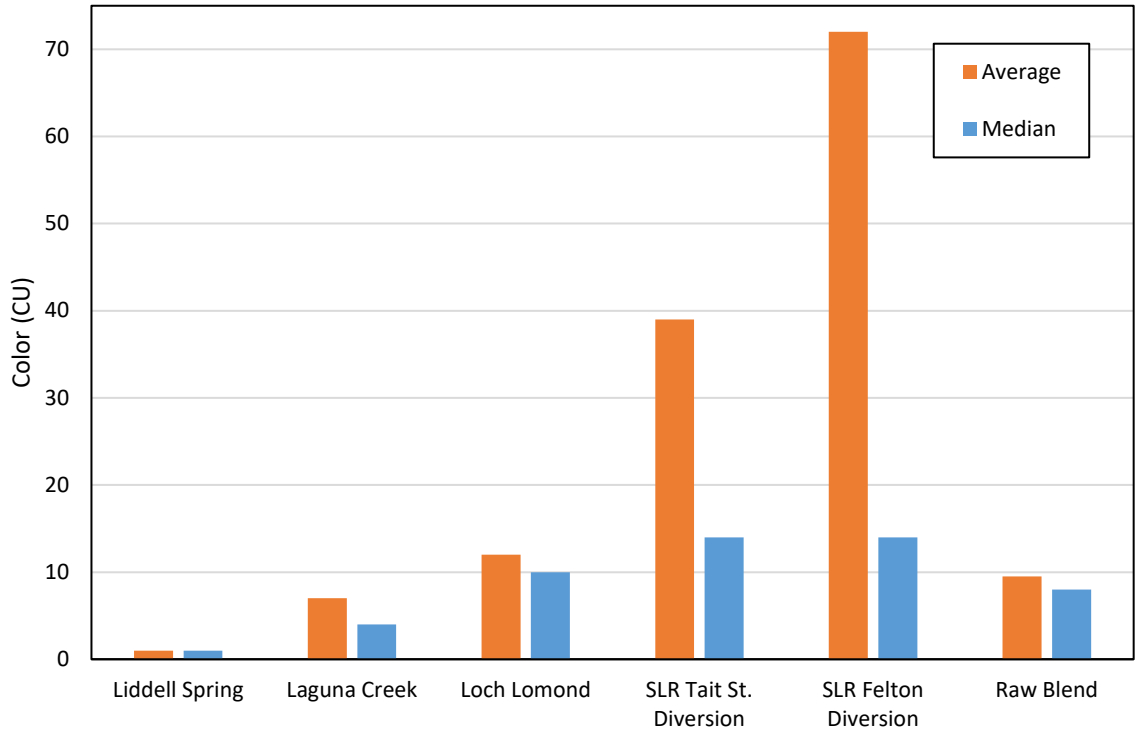


Figure 11. Average and median source water color data for WY 2021

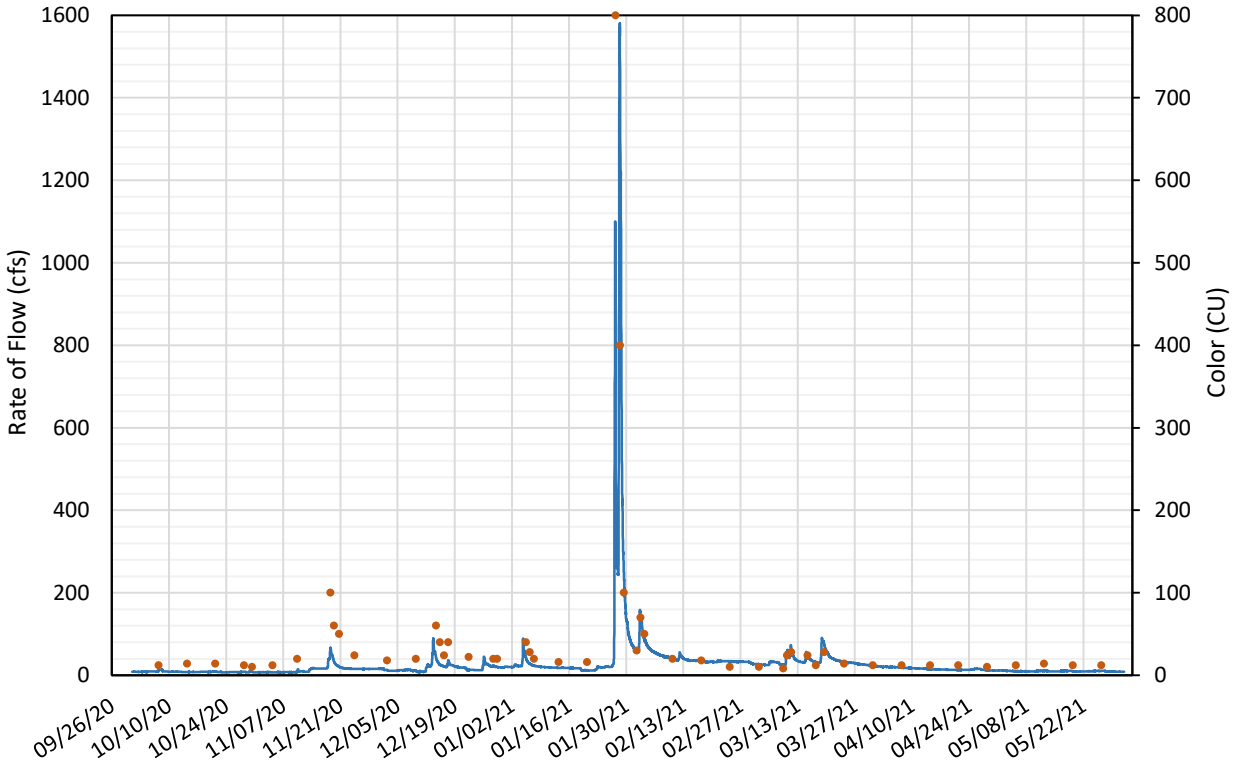


Figure 12. Summary of the San Lorenzo River rate of flow and color data during the Wet Season (October 2020 – May 2021). Color data are from grab samples taken by the Santa Cruz Water Department's Water Quality Laboratory. River rate of flow data were obtained from the USGS 11161000 San Lorenzo R A Santa Cruz CA stream gage.

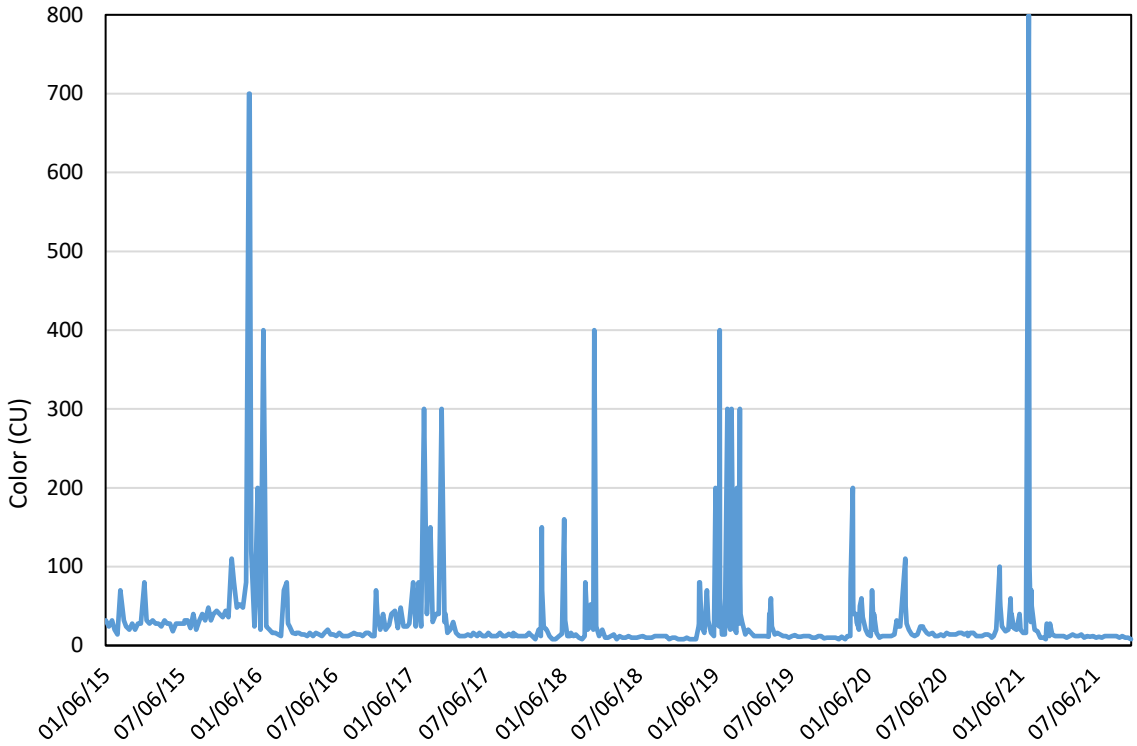


Figure 13. Summary of color data from the San Lorenzo River Tait St. Diversion between January 2015 and September 2021

2.3.2 Turbidity

Turbidity is an optical assessment of water clarity; it measures the scattering of light by suspended particles – a phenomenon that causes water to appear cloudy (Crittenden et al. 2012). Turbidity is thus a measurement of the suspended and colloidal particles in water such as clay, silt, algae, plankton, and other microscopic organisms and has implications for solids handling and disinfection at the Graham Hill Water Treatment Plant (GHWTP). Turbidity can be thought of as a proxy for overall water quality, as higher turbidity reflects soil erosion and watershed runoff that can include nonpoint source pollution. In addition, higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. The GHWTP has historically removed San Lorenzo River (SLR) water as a source when the turbidity rises above 25 NTU in order to ensure this goal is met and to avoid issues with solids production, per operations standard operating procedures. The secondary MCL (SMCL) for turbidity in finished water is 5 nephelometric turbidity units (NTU).

As shown in Table 6 and in Figure 14, turbidity followed a similar trend to color and increased during the wet season during storm events as a result of soil erosion and runoff. Generally, turbidity was consistently higher during the wet season at all of the source water locations with Liddell Spring affected the least. The North Coast sources including Liddell Spring and Laguna Creek consistently had the lowest turbidity compared to the other sources. This reflects the fact that Liddell Spring is, as the name implies, a spring that flows below ground and thus not subject to influence of storm water runoff. Laguna Creek results may be due to the fact that the watershed is less-intensively developed than is the SLR watershed. Loch Lomond turbidity varied slightly between the dry and wet season, primarily due to algae and storm water runoff. The SLR locations, both Felton Diversion and Tait. St. Diversion, are the most variable and susceptible to an increase in turbidity during winter storms, having the highest values overall. The SLR locations exceeded 25 NTU six times between November 2020 and February 2021, with a high result of 1600 NTU at Felton Diversion on 01/27/21. On average, the turbidity at Felton Diversion was greater than at the Tait St. Diversion (Figure 15), which again demonstrates the improvement generally seen as water flows through the undeveloped portions of the watershed, including Henry Cowell State Park. The San Lorenzo River Tait St Diversion was not used during periods of high turbidity per operations standard operating procedures. The maximum recorded turbidity for Raw Blend was 12 NTU; however, the average Raw Blend turbidity did not exceed 5 NTU during WY 2021 (Figure 15). This is due to the blending of Liddell Spring, which generally has lower turbidity and provides a buffer against the fluctuations of the SLR and Loch Lomond to reduce the overall turbidity of the Raw Blend. The average turbidity data for Laguna Creek, SLR Felton Diversion, and SLR Tait St. Diversion was significantly higher than the median values, as those sources are more impacted by storm runoff events compared to Loch Lomond. The GHWTP finished water turbidity was consistently below the secondary MCL (SMCL) throughout the WY with a result of 0.05 NTU.

A comparison of the SLR stream rate of flow in Santa Cruz and turbidity grab sample data is shown in Figure 16. As can be seen, the SLR stream rate of flow and turbidity data trend well, with the color increasing with storm events and river flow rate.

As shown in Figure 17, the turbidity of the SLR Tait St. Diversion reached a result of 400 NTU during the largest storm recorded in WY 2021. The storm events captured during WY 2019 (October 1, 2018-September 30, 2019) produced higher turbidity results than during the WY 2021 monitoring period.

As shown in Table 7, turbidity increased during storm events and was therefore consistently higher during the wet season at all upper watershed sampling locations. Upper Laguna Creek had the lowest turbidity compared to the other locations, as Upper Majors Creek, SLR Junction Park, and SLR Highlands Park are more susceptible to an increase in turbidity during storm events.

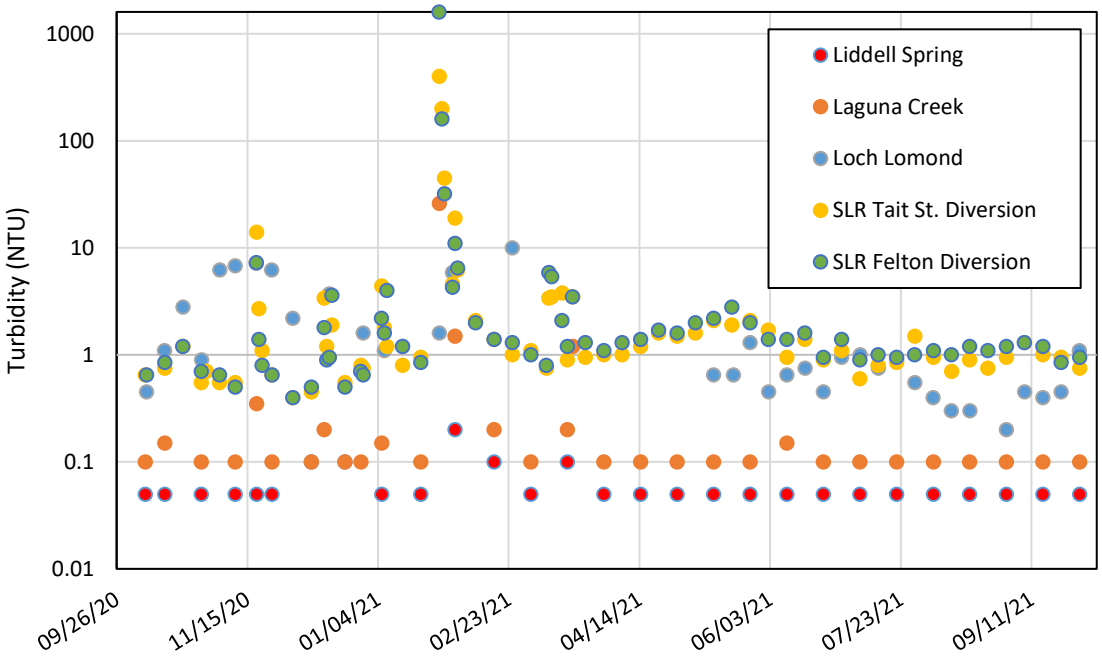


Figure 14. Turbidity of source waters between October 2020 and September 2021. Data is presented using a logarithmic scale.

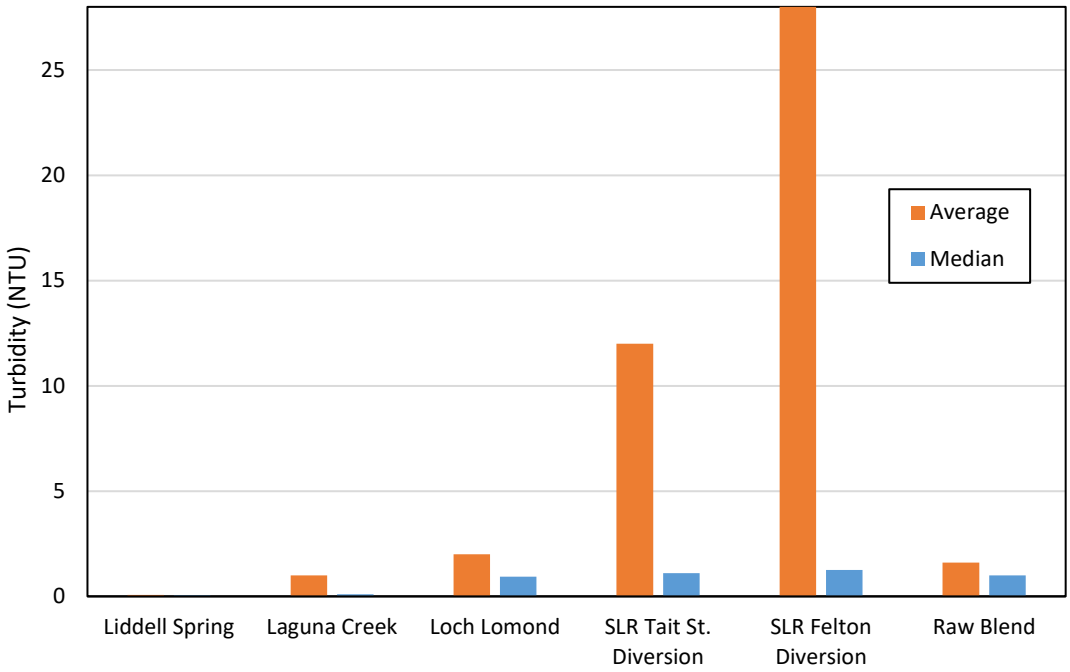


Figure 15. Average and median source water turbidity data for WY 2021

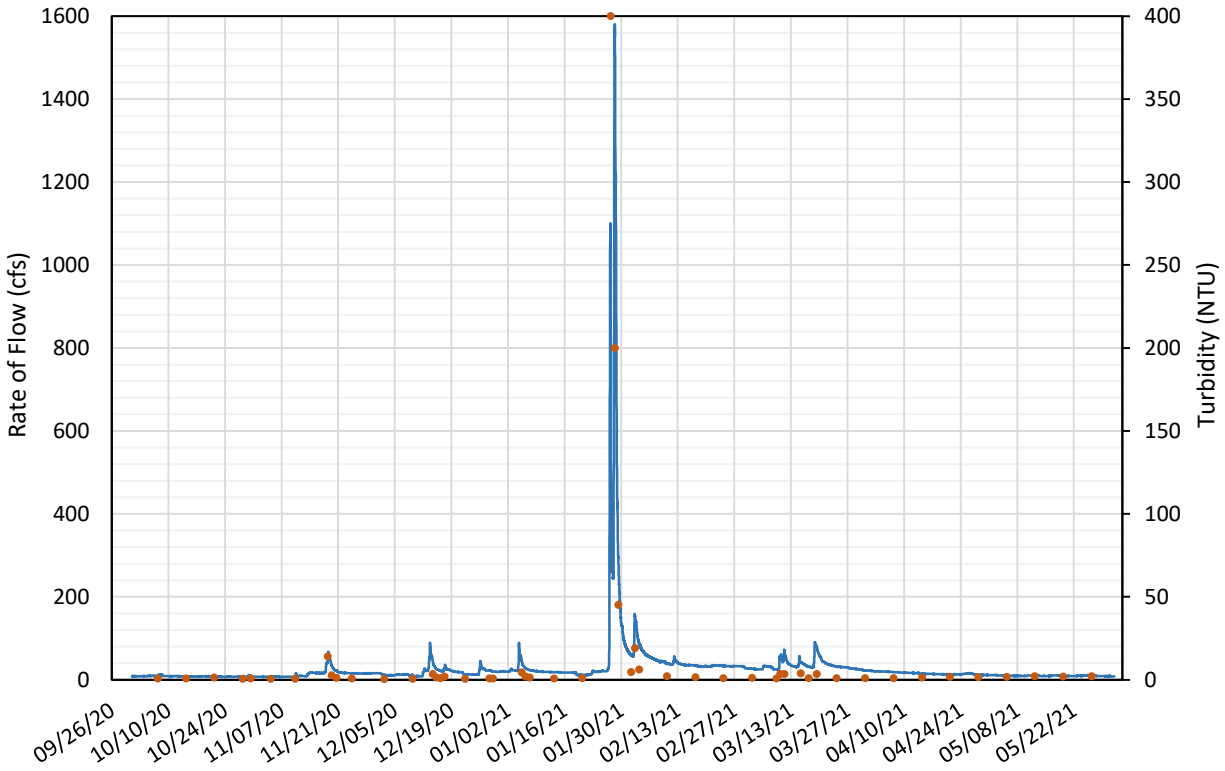


Figure 16. Summary of the San Lorenzo River rate of flow and turbidity data during the Wet Season (October 2020 – May 2021). Turbidity data are from grab samples taken by the Santa Cruz Water Department's Water Quality Laboratory. River rate of flow data were obtained from the USGS 11161000 San Lorenzo R A Santa Cruz CA stream gage.

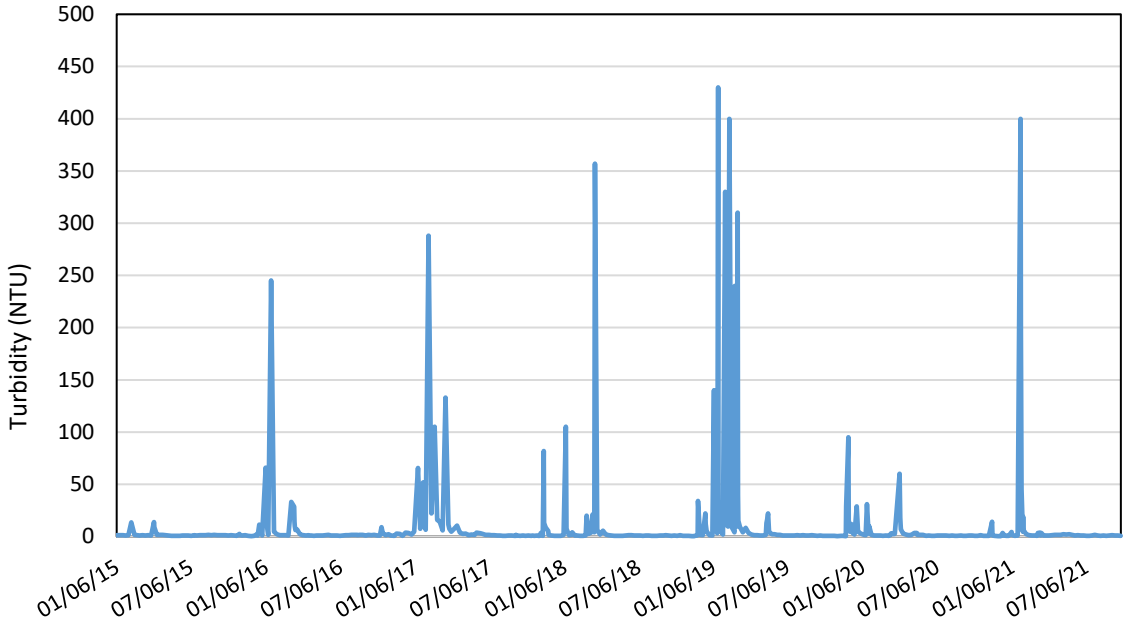


Figure 17. Summary of turbidity data from the San Lorenzo River Tait St. Diversion between January 2015 and September 2021

2.3.3 Total Organic Carbon / Dissolved Organic Carbon

Total Organic Carbon (TOC) is a measurement of the total amount of carbon (dissolved and particulate carbon) in water. The difference between dissolved and total fractions is a somewhat arbitrary difference, with the former being the amount of carbon that is able to pass through a 0.45 µm filter. For drinking water, dissolved organic carbon (DOC) is an important water quality parameter measured for several purposes including aesthetic problems, disinfection efficacy at the treatment plant, and an increase in the potential for bacterial growth in the distribution system. In the Santa Cruz Water Department's (SCWD) source water and upper watershed locations studied, essentially all (97- 100%) of the TOC is present in dissolved form (DOC), so DOC and TOC can be used interchangeably.

TOC is an important water quality treatment parameter because it has implications for a number of issues, including coagulation treatment requirements and disinfection byproduct (DBP) formation. DBPs are formed when chlorine is added to water and interacts with carbon to form a number of by-products that may be harmful to human health. The SCWD actively manages sources, treatment and the distribution system to limit formation of DPBs, and collects routine samples to ensure that they are below applicable maximum contaminant levels (MCLs). Water Treatment Operators remove the San Lorenzo River (SLR) water as a source when the TOC rises above 4 mg/L in order to avoid treatment issues per standard operating procedures. There is not a primary and/or secondary MCL for TOC in finished water.

TOC concentrations in most of the source waters displayed seasonal trends, with TOC increasing in the wet season including fluctuations at the North Coast sources (Table 6 and Figure 18). While some water quality constituents such as pH, conductivity, alkalinity, and hardness experience a decrease in concentration in the winter because of dilution by rainwater, TOC is similar to color and turbidity and increases as storms wash organic material into the water. The TOC concentrations of the North Coast sources generally remained low during the wet season, even during storm events, consistent with the trends previously discussed. Results fluctuated, with Liddell Spring ranging from a minimum of non-detect to a maximum of 0.98 mg/L and Laguna Creek ranging from 0.56 mg/L to 6.3 mg/L. Loch Lomond generally had the highest TOC, ranging between 3.4 and 4.2 mg/L, and did not exhibit a high degree of variability as a result of storm events. Loch Lomond had the highest average TOC for WY 2021 (Figure 19). The SLR showed the greatest variation in TOC concentration during storms exceeding 4 mg/L numerous times between November 2020 and March 2021, with a high result of 19 mg/L at Felton Diversion on January 27, 2021. The average TOC of the Raw Blend was below 2.5 mg/L for WY 2021. This is due to the blending of Liddell Spring, which generally has lower TOC and provides a buffer against the fluctuations of the SLR and the consistent high average of Loch Lomond to reduce the overall TOC of the Raw Blend. The average TOC data for Laguna Creek, SLR Felton Diversion, and SLR Tait St. Diversion was significantly higher than the median values, as those sources are more impacted by storm runoff events compared to Loch Lomond. Loch Lomond TOC results are consistent throughout the year; therefore, the average and median values are similar.

As shown in Figure 20, the TOC of the SLR Tait St. Diversion reached a result of 12 mg/L during the largest storm recorded in WY 2021, which occurred on January 27, 2021. A TOC result of 17 mg/L is the highest result recorded by the WQL since January 2015. However, event based storm sampling was not consistently conducted; therefore higher TOC results may have previously occurred but not captured by the WQL's sampling.

As shown in Table 7, TOC concentrations increased during storm events and were therefore consistently higher during the wet season at all upper watershed sampling locations. Upper Laguna Creek had the lowest TOC compared to the other locations.

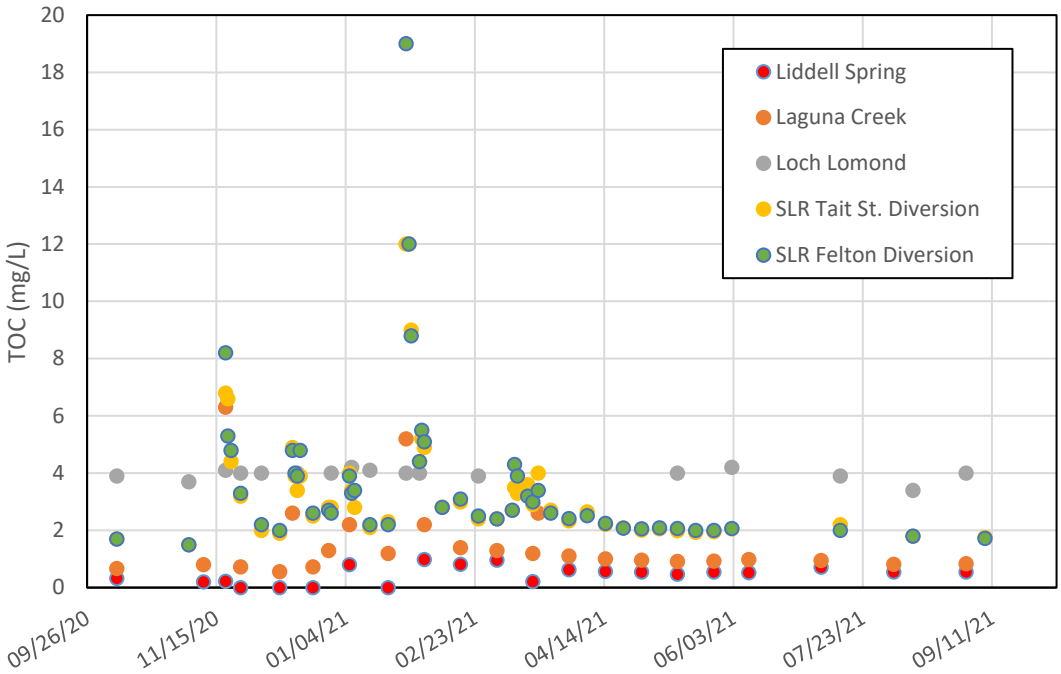


Figure 18. Total organic carbon (TOC) of source waters between October 2020 and September 2021

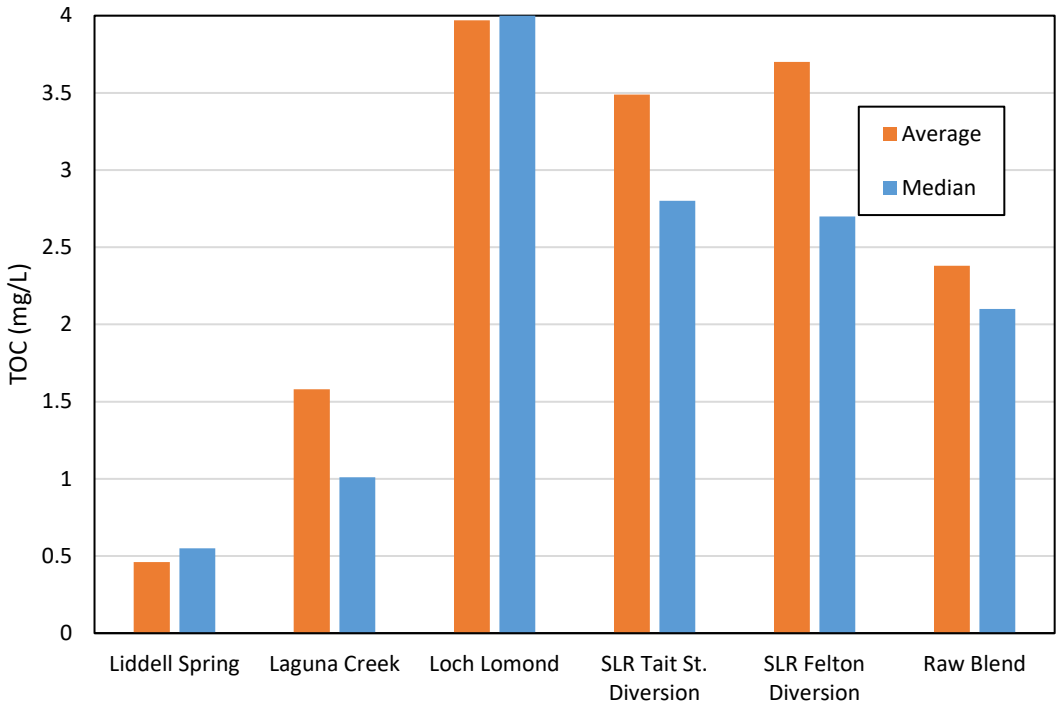


Figure 19. Average and median source water total organic carbon (TOC) data for WY 2021

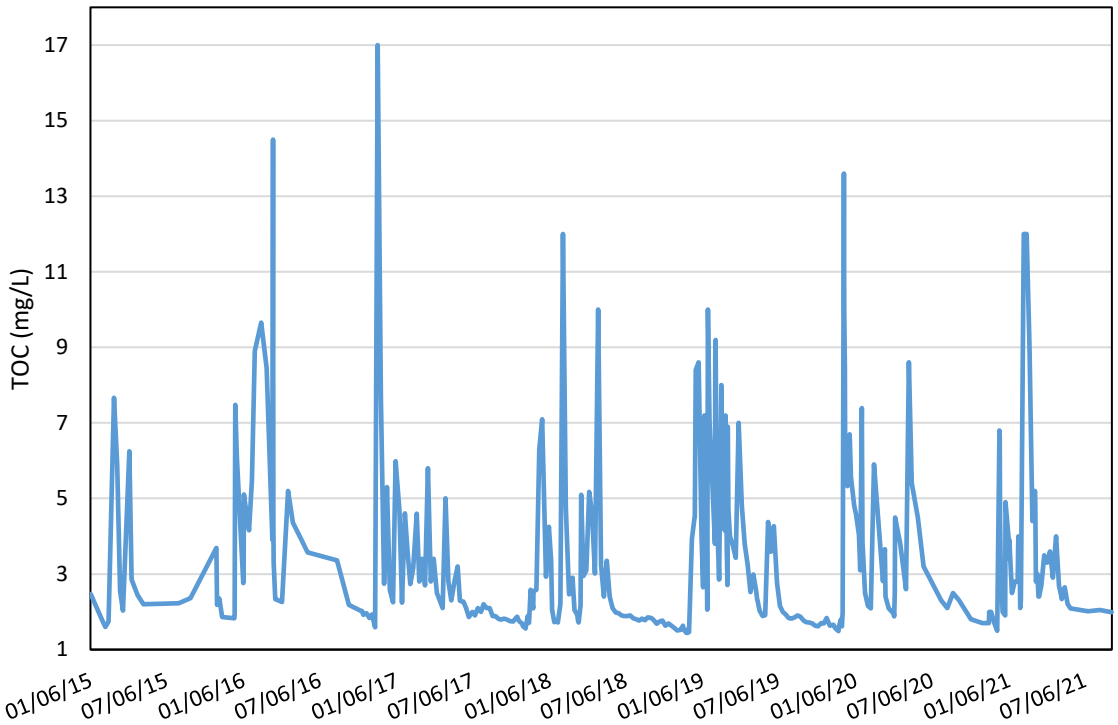


Figure 20. Summary of total organic carbon (TOC) data from the San Lorenzo River Tait St. Diversion between January 2015 and September 2021

2.3.4 Dissolved Organic Carbon

The Graham Hill Water Treatment Plant (GHWTP) has historically switched off (turned out) the San Lorenzo River (SLR) as a source water when the total/dissolved organic carbon (TOC/DOC) rises above 4 mg/L in order to avoid treatment issues per standard operating procedures. There is not a primary and/or secondary maximum contaminant level (MCL) for DOC in finished water.

Given the overlap between TOC and DOC, it is unsurprising that DOC displayed similar seasonal trends as TOC (Table 6 and Figure 21). The concentrations of the North Coast sources generally remained low during the wet season, even during storm events, however, results fluctuated with Liddell Spring ranging from a minimum of 0.20 mg/L to a maximum of 0.56 mg/L and Laguna Creek ranging from 0.56 mg/L to 6.2 mg/L. Loch Lomond generally had the highest DOC for WY 2021, ranging between 3.6 and 4.4 mg/L, and did not exhibit a high degree of variability as a result of storm events. Loch Lomond had the highest average DOC for WY 2021 (Figure 22). The SLR showed the greatest variation in DOC concentration during storms exceeding 4 mg/L numerous times between November 2020 and March 2021, with a high result of 11 mg/L at Felton Diversion on January 27, 2021. The average DOC concentration of the Raw Blend was below 2.5 mg/L for WY 2021 (Figure 22). This is due to the blending of Liddell Spring, which generally has lower TOC and provides a buffer against the fluctuations of the SLR and the consistent high average of Loch Lomond to reduce the overall DOC of the Raw Blend. The average DOC data for Laguna Creek, SLR Felton Diversion, and SLR Tait St. Diversion was significantly higher than the median values, as those sources are more impacted by storm runoff events compared to Loch Lomond. Loch Lomond DOC results are consistent throughout the year; therefore, the average and median values are similar.

As shown in Figure 23, the DOC of the SLR Tait St. Diversion reached a result of 11 mg/L during the largest storm recorded in WY 2021 on January 27, 2021. A DOC result of 12 mg/L in WY 2017 and WY 2020 are the highest results recorded by the WQL since 2015. However, event based storm sampling was not consistently conducted prior to the current sampling program, and as such, higher DOC results may have previously occurred but were not captured by the WQL's sampling.

As shown in Table 7, DOC upper watershed sampling locations that were sampled during storm events had higher DOC concentrations. Following trends in other constituents, Laguna Creek had the lowest levels of DOC when compared to other sources.

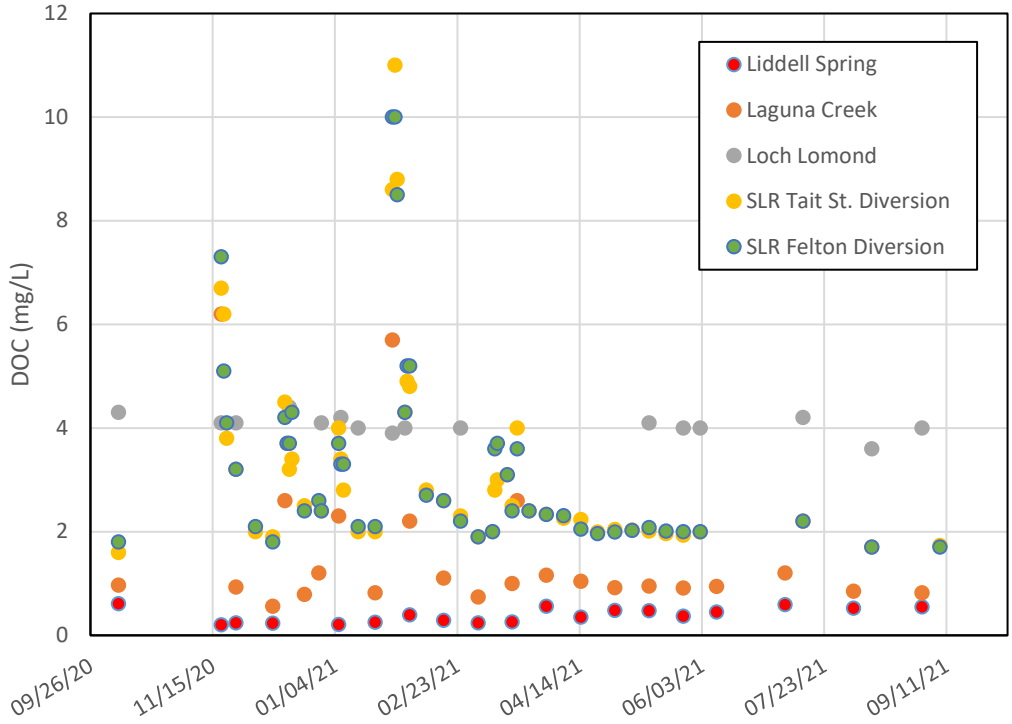


Figure 21. Dissolved organic carbon (DOC) of source waters between October 2020 and September 2021

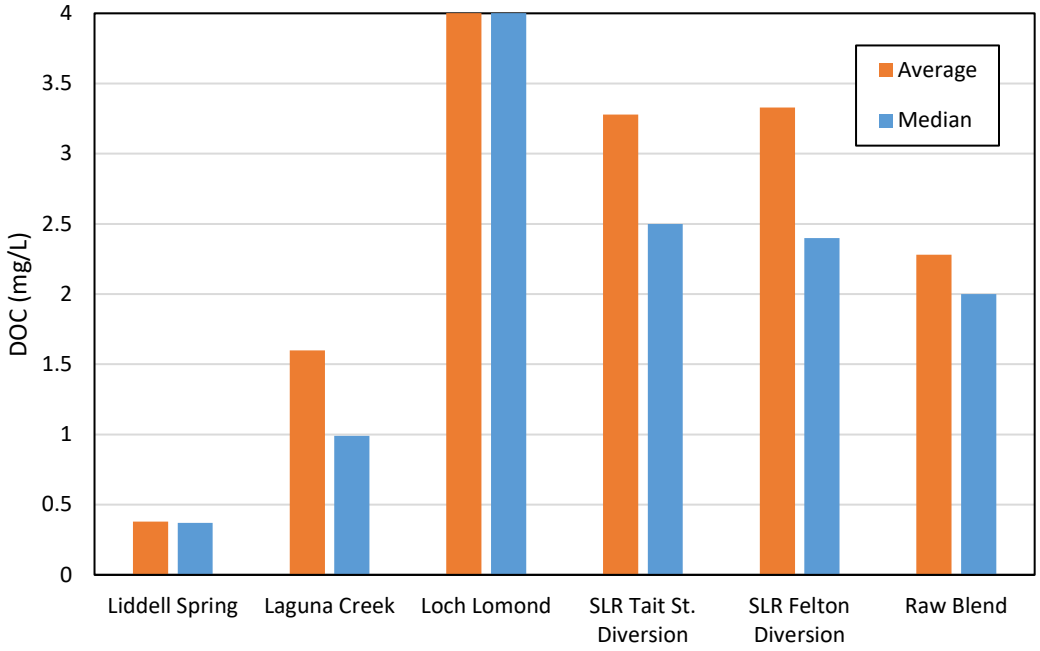


Figure 22. Average and median source water dissolved organic carbon (DOC) data for WY 2021

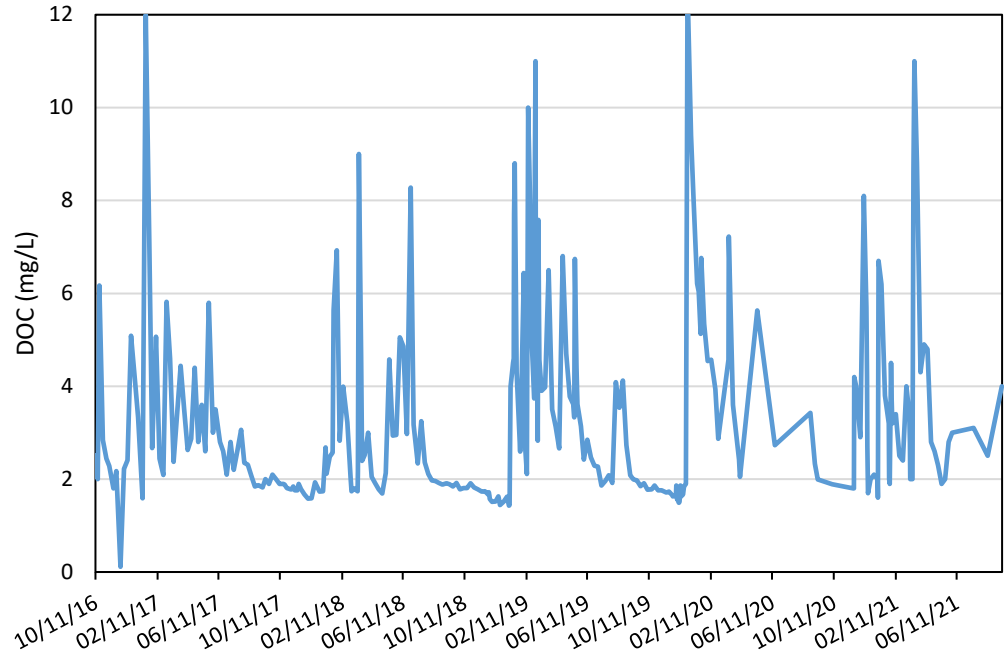


Figure 23. Summary of dissolved organic carbon (DOC) data from the San Lorenzo River Tait St. Diversion between October 2016 and September 2021

2.3.5 Total Suspended Solids

Total suspended solids (TSS) is a direct measurement of the quantity of suspended particles (solids) in a water sample. It is quantified as the dry weight of solids captured through a specified filter size. TSS results inform water treatment and solids handling requirements at the Graham Hill Water Treatment Plant (GHWTP). TSS data was only collected at source water and upper watershed locations and not at the GHWTP finished water or Raw Blend. There is neither a primary or secondary contaminant level (MCL) for TSS in finished water.

The TSS results exhibit the same trends as color, turbidity, and total/dissolved organic carbon (TOC/DOC) increasing dramatically during the wet season (Table 6 and Figure 24). The TSS concentrations of the North Coast sources generally remained low during the wet season, even during storm events. However, results at Laguna Creek fluctuated with results ranging from non-detect (ND) to 22 mg/L. Again, because Liddell Spring is not directly affected by surface runoff, TSS was consistently not detected throughout the WY. Loch Lomond's values varied seasonally due to algae growth in the summer and storm runoff in the winter, ranging from non-detect to a maximum 1.6 mg/L in the dry season and 9.1 mg/L in the wet season. TSS was highest in the San Lorenzo River with a result of 1,630 mg/L at Felton Diversion on January 27, 2021. The San Lorenzo River (SLR) at Felton Diversion had the highest TSS average of 45 mg/L for WY 2021 (Figure 25). The average TSS data for Laguna Creek, SLR Felton Diversion, and SLR Tait St. Diversion was significantly higher than the median values, as those sources are more impacted by storm runoff events compared to Loch Lomond. Loch Lomond TSS results are consistent throughout the year; therefore, the average and median values are similar.

As shown in Figure 26, TSS of the SLR at Tait St. Diversion had a maximum value of 706 mg/L during the largest storm recorded in WY 2021, which is the highest value recorded by WQL since 2015. Again, because event based storm sampling was not consistently conducted prior to this effort, it is unclear how this result compares to historical values.

As shown in Table 7, upper watershed sampling locations that were sampled during storm events had higher TSS concentrations. Following trends in other constituents, Laguna and Majors Creeks had the lowest levels of TSS when compared to other sources.

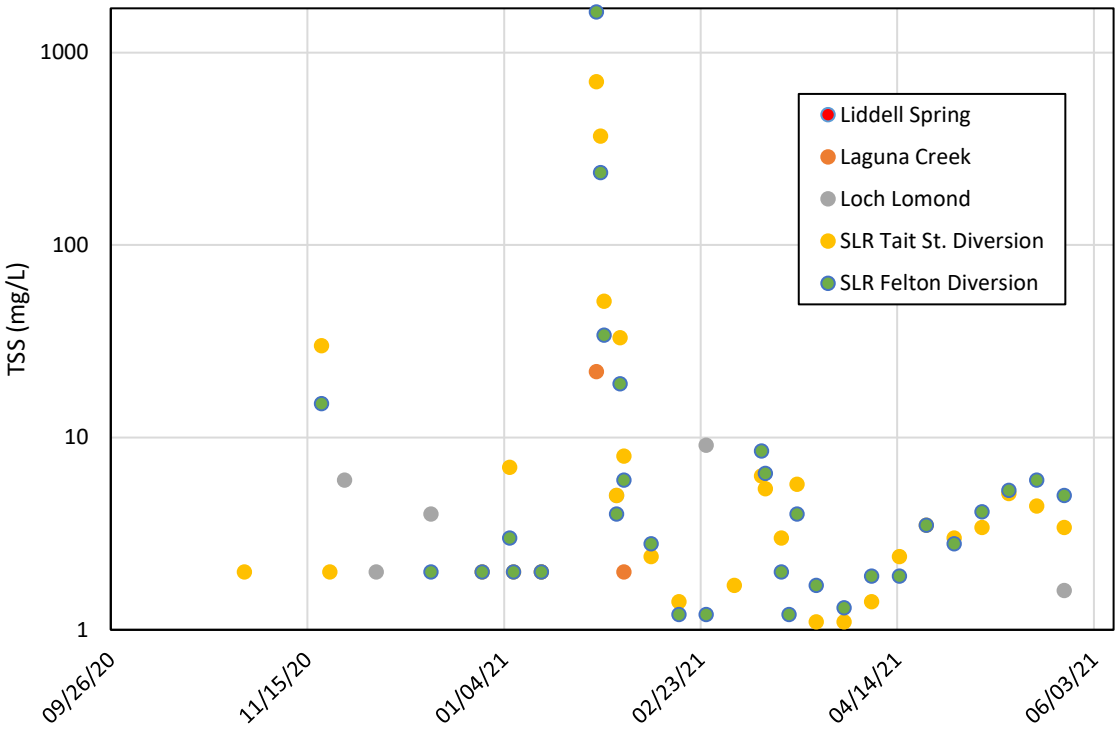


Figure 24. Total suspended solids (TSS) of source waters between October 2020 and September 2021. Data is presented using a logarithmic scale.

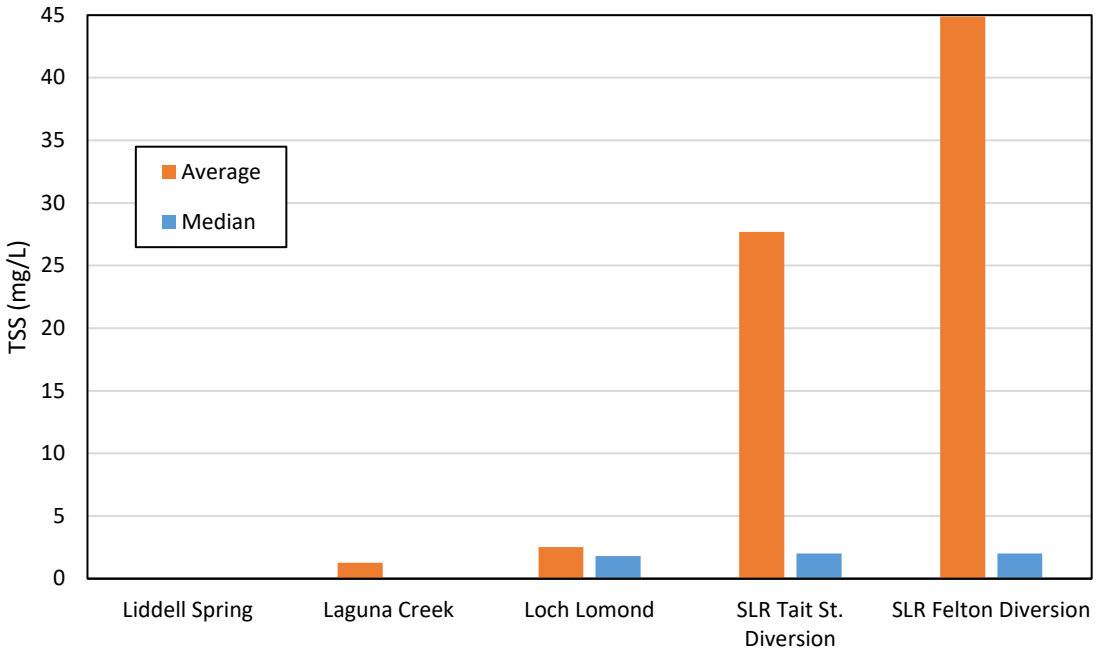


Figure 25. Average and median source water total suspended solids (TSS) data for WY 2021

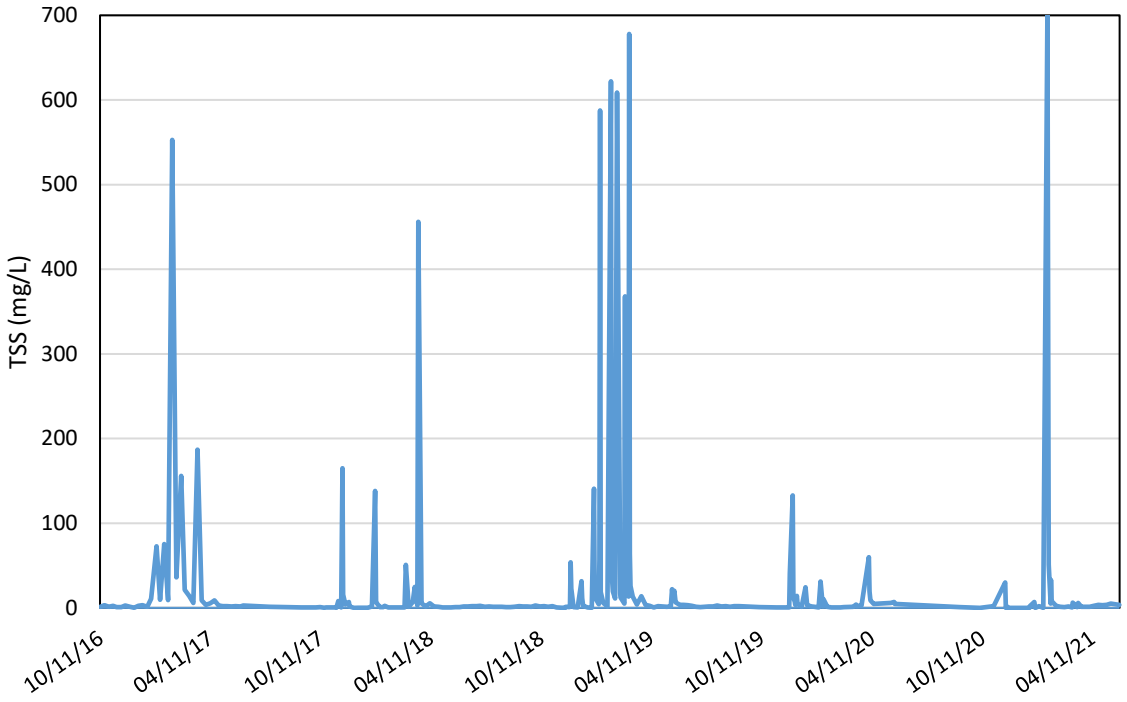


Figure 26. Summary of total suspended solids (TSS) data from the San Lorenzo River Tait St. Diversion between January 2015 and September 2021

Table 6. Summary of Water Treatment Parameters Measured in Source Waters and Finished Water between October 2020 and September 2021. Values presented are average (minimum – maximum)

			GHWTP Finished Water		Raw Blend		Liddell Spring		Laguna Creek		Loch Lomond		SLR Tait St. Diversion		SLR Felton Diversion	
Parameter	**Primary MCL**	**Secondary MCL**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Color (CU)		15	1 (1 - 1)	1 (1 - 1)	8 (6 - 24)	11 (5 - 24)	1 (1 - 1)	1 (1 - 1)	3 (2 - 4)	12 (4 - 60)	11 (6 - 28)	17 (12 - 24)	12 (8 - 20)	63 (8 - 800)	12 (8 - 20)	124 (8 – 3,000)
Turbidity (NTU)		5	0.05 (0.05 - 0.05)	0.05 (0.05 - 0.05)	1.1 (0.55 - 1.8)	2.2 (0.40 - 12)	0.06 (0.05 - 0.10)	0.08 (0.05 - 0.20)	0.10 (0.10 - 0.15)	2.03 (0.10 - 26)	1.2 (0.2 - 6.8)	4.1 (1.1 - 10)	1.1 (0.55 - 2.1)	20.4 (0.4 - 400)	1.2 (0.5 - 2.8)	25 (0.4 – 1,600)
Total Organic Carbon (mg/L)			1.5 (1.1 - 2.6)	2.0 (1.0 - 2.8)	2.1 (1.5 - 4.0)	2.7 (1.3 - 4.0)	0.50 (0.20 - 0.71)	0.42 (ND - 0.98)	0.89 (0.67 - 1.0)	2.0 (0.56 - 6.3)	3.9 (3.4 - 4.2)	4.0 (3.9 - 4.2)	2.0 (1.5- 2.6)	4.1 (1.9 - 12)	2.0 (1.5 - 2.5)	4.4 (2.0 - 19)
Dissolved Organic Carbon (mg/L)			1.5 (1.2 - 2.3)	1.8 (1.1-2.7)	2.0 (1.6 - 3.3)	2.4 (1. 3 - 4.0)	0.49 (0.35 - 0.61)	0.29 (0.20 - 0.56)	0.96 (0.82 - 0.96)	2.0 (0.56 - 6.2)	4.0 (3.6 - 4.3)	4.1 (3.9 - 4.4)	2.0 (1.6 - 2.3)	3.8 (1.9 - 11)	2.0 (1.7 - 2.3)	3.8 (1.8 - 10)
Total Suspended Solids (mg/L)							ND	ND	0.14 (ND - 0.3)	1.6 (ND - 22)	0.67 (ND - 1.6)	3.1 (ND - 9.1)	2.9 (ND - 5.1)	34.6 (ND - 706)	3.4 (ND - 6)	55.2 (ND – 1,630)
ND=Analyte Not Detected																

Table 7. Summary of Water Treatment Parameters Measured in Upper Watershed Locations between October 2020 and September 2021. Values presented are average (minimum – maximum).

			Upper Laguna Creek		Upper Majors Creek		SLR Junction Park		SLR Highlands Park	
Parameter	**Primary MCL**	**Secondary MCL**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Color (CU)		15	3 (2 - 6)	14 (4 - 40)	4 (3 - 6)	47 (24 - 70)	12 (8 - 20)	80 (40 - 120)	14 (12 - 20)	80 (12 - 400)
Turbidity (NTU)		5	0.2 (0.10 - 0.35)	1.6 (0.1 - 8.8)	0.38 (0.35 - 0.45)	8.2 (1.4 - 15)	0.52 (0.45 - 0.60)	9 (4.9 - 13)	1.5 (0.75 - 2.8)	36.1 (0.75 - 200)
Total Organic Carbon (mg/L)			2.1 (0.61 - 5.5)	2.6 (0.63 - 5.5)	0.89 (0.70 - 1.0)	5.2 (4.1 - 6.4)	1.8 (1.6 - 2.1)	10.3 (4.7 - 16)	2.2 (1.9 - 2.4)	5.1 (2.4 - 11)
Dissolved Organic Carbon (mg/L)			0.85 (0.78 - 0.90)	2.5 (0.69 - 5.2)	1.0 (0.91 - 1.0)	5.1 (3.9 - 6.3)	1.8 (1.6 - 2.2)	9.8 (4.5 - 15)	2.0 (1.9 - 2.3)	4.5 (2.2 - 8.7)
Total Suspended Solids (mg/L)			0.06 (ND - 0.1)	1 (ND - 7)	0.3 (ND - 0.6)	5 (2 - 8)	0.3 (ND - 0.6)	14.5 (4.0 - 25)	3.5 (2.0 - 6.1)	49.3 (ND - 374)
ND=Analyte Not Detected										

2.4 Microbial Parameters

Microbial indicators are ubiquitous in the natural environment, but their presence in elevated numbers can suggest the presence of pathogenic organisms. The Graham Hill Water Treatment Plant (GHWTP) management of pathogenic organisms is guided by the Federal Long Term 2 Enhance Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 Disinfection Byproduct Rule (DBPR). Under LT2ESWTR, the Santa Cruz Water Department (SCWD) is classified under BIN 2, which requires treatment techniques that achieve 3-log removal of Cryptosporidium, 4-log removal of Giardia and 5-log virus removal. The GHWTP meets these requirements through a combination of treatment process and filter performance.

2.4.1 Total Coliform

Total coliforms are a group of bacteria that are naturally present in the environment and found in plant and soil material as well as in the digestive tracts of animals and humans. Total coliforms are described as indicator bacteria because while their presence in water does not cause illness, their presence indicates that those organisms that do cause illness are also present. Coliforms come from the same source as pathogenic organisms and provide a reasonable indication of whether other pathogenic bacteria are present. Total coliform is monitored in the Santa Cruz Water Department's (SCWD) water distribution system to comply with the revised Total Coliform Rule (RTCR) and is also used to evaluate the source water microbial load. There are no primary and/or secondary maximum contaminant levels (MCL) for Total coliforms in surface source water.

Sampling demonstrates elevated levels of total coliform counts in some source waters, particularly during storm events, however coliform entering the treatment process is reduced by selectively turning out sources during storm events. Any remaining coliform is effectively treated at GHWTP and water quality is maintained through chlorine residual in the distribution system.

As shown in Table 8 and in Figure 27, total coliform counts are highly variable by source and increase during the wet season due to storm events. In general, total coliforms results are consistently higher during the wet season at all source water locations, except for Liddell Spring. The North Coast sources, including Liddell Spring and Laguna Creek, have consistently low total coliform results compared to the San Lorenzo River (SLR). Results at Laguna Creek fluctuated ranging from 74-7,270 MPN/100 mL during the wet season compared to a maximum value of 92,080 MPN/100 mL for the SLR at Felton Diversion. The SLR, at both Felton Diversion and Tait. St. Diversion locations are the most variable and susceptible to increases in microbial load during winter storms, having the highest total coliform values overall. The Felton Diversion had the highest total coliform geometric mean for WY 2021 (Figure 27). The maximum recorded total coliform result for Raw Blend was 4,611 MPN during the dry season; and the geometric mean Raw Blend total coliform result did not exceed 500 MPN/100 mL during WY 2021. This is due to the blending of Liddell Spring, which generally has lower total coliform load and provides a buffer against the fluctuations of the SLR and Loch Lomond to reduce the overall total coliform load of the Raw Blend. The GHWTP finished water was consistently absent for Total coliforms throughout WY 2021.

As shown in Figure 28, the concentration of total coliform at SLR Tait St. Diversion reached a maximum result of 54,750 MPN/100 mL on the first storm event of WY 2021 (November 18, 2020). A total coliform result of 104,620 MPN/100 mL was the highest result recorded by WQL since 2015 during WY 2019.

As shown in Table 9, total coliform concentrations increased during storm events and are therefore consistently higher during the wet season at all upper watershed sampling locations. The upper SLR watershed locations at Junction and Highlands Park are more susceptible to an increase in total coliform during winter storms. SLR Junction Park is the furthest upstream sample location on the SLR and obtained a maximum result of 173,289 MPN/100 mL on the first storm event of the year (November 18, 2020).

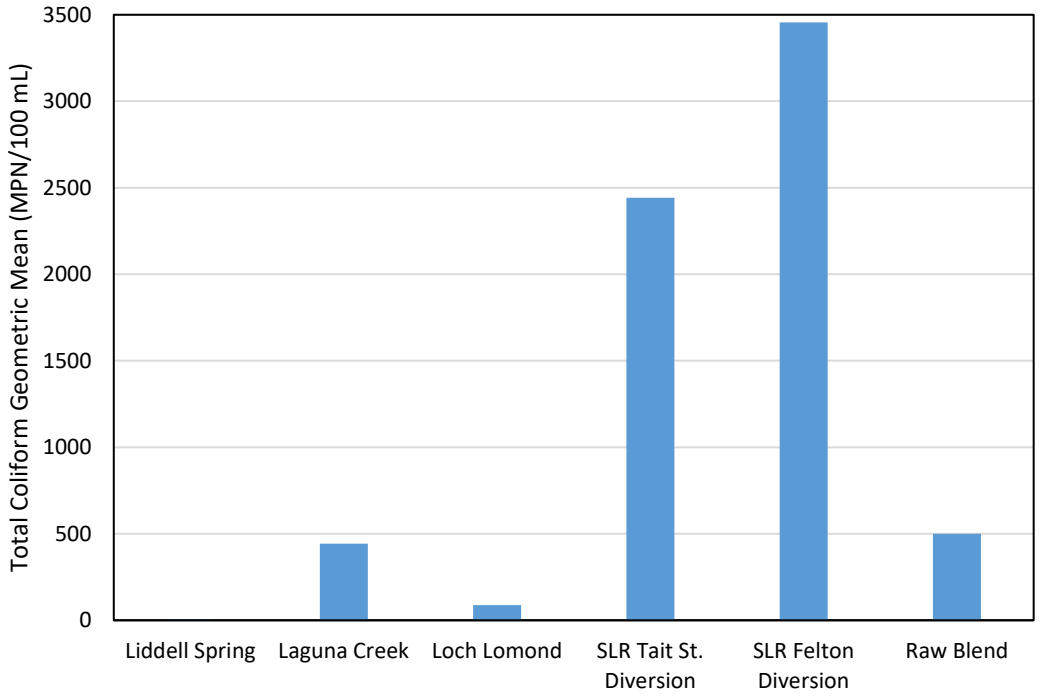


Figure 27. Summary of total coliform geometric mean of source waters between October 2020 and September 2021

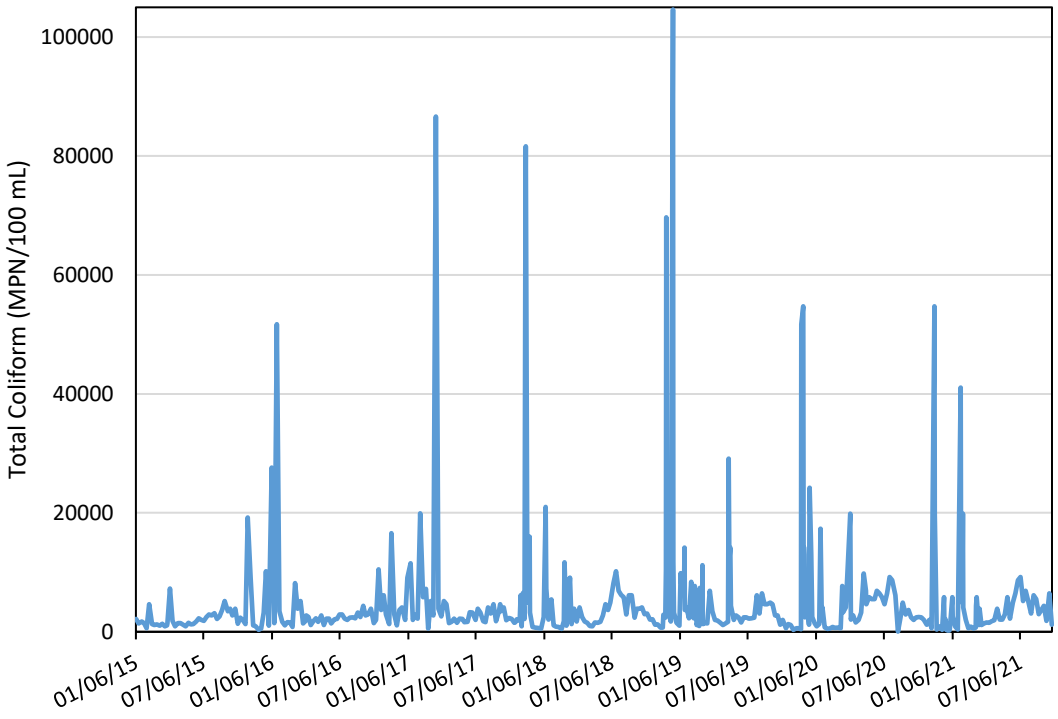


Figure 28. Summary of total coliform data from the San Lorenzo River Tait St. Diversion between January 2015 and September 2021

2.4.2 *E. coli*

The concentration of *E. coli* provides an indication of the extent of human and animal fecal contamination of a watershed, as it is more specific than total coliform. For drinking water supplies, the common guidance is that fecal coliform levels above 200 MPN/100 mL signifies a source with potentially large contamination from human sources (NRC 2004). However, the distribution system is frequently sampled for the presence of *E.coli,* and should it be detected, extensive customer and agency notifications are required, along with flushing and disinfection of the affected area of the distribution network.

Even though there are no formal *E. coli* regulations for source water, the fecal coliform Total Maximum Daily Load (TMDL) can be used as a point of comparison. According to the United States Environmental Protection Agency (EPA), TMDL is the calculation of the maximum amount of a pollutant allowed to enter a water body so that the water body will meet and continue to meet water quality standards for that particular pollutant. A TMDL determines a pollutant reduction target and allocates load reductions necessary to the source(s) of the pollutant. The San Lorenzo River (SLR) Watershed has a TMDL for fecal coliform (*E. coli*) of 200 MPN/100 mL (30-day log-mean limit), with 90% of samples below 400 MPN/100 mL (TMDL Report for the San Lorenzo River, Soquel Creek, and Aptos Creek Watersheds September 2021). The SLR Watershed is densely populated with septic systems, and failing septic systems are considered a threat to water quality. For a more thorough discussion of this concern, please refer to the Watershed Sanitary Survey (WSS).

Similar to total coliform, *E. coli* concentrations were highly variable by source and increased during the wet season due to storm events. *E. coli* results were consistently higher at all source water locations, except for Liddell Spring (Table 8 and Figure 27). The North Coast sources, including Liddell Spring and Laguna Creek, have consistently lower *E. coli* results compared to the San Lorenzo River (SLR); however results at Laguna Creek fluctuated ranging from <1-164 MPN/100 mL during the wet season. Loch Lomond fluctuated slightly in the wet season with results ranging from <1-3.1 MPN/100 mL The SLR, at both Felton Diversion and Tait St. Diversion locations, are the most variable and susceptible to increase in microbial load during the wet season, having the highest *E. coli* values overall. Felton Diversion had the highest *E. coli* result of 5,794 MPN/100 mL on 01/27/21. The Felton Diversion location had the highest *E. coli* geometric mean for WY 2021 (Figure 27). The maximum recorded *E. coli* result for Raw Blend was 260 MPN/100 mL; however, the geometric mean Raw Blend *E. coli* result did not exceed 23.9 MPN/100 mL during WY 2021. This is due to the blending of Liddell Spring and Loch Lomond, which generally have lower *E. coli* loads, and provides a buffer against the fluctuations of the SLR to reduce the overall *E. coli* load of the Raw Blend. The GHWTP finished water was consistently absent for *E. coli* throughout WY 2021.

As shown in Figure 30, the concentration of *E. coli* at SLR Tait St. Diversion for WY 2021 reached a result of 2,430 MPN/100 mL on the first storm event of WY 2021. The highest *E. coli* result recorded was 7,060 MPN/100 mL in WY 2016.

As shown in Table 9, *E. coli* concentrations increased during storm events and were therefore consistently higher during the wet season at all upper watershed sampling locations. The upper SLR watershed locations at Junction and Highlands Park are more susceptible to an increase in *E. coli* during the wet season. SLR Highland Park obtained a result of 6,488 MPN/100 mL on the first storm event of the year (11/18/20).

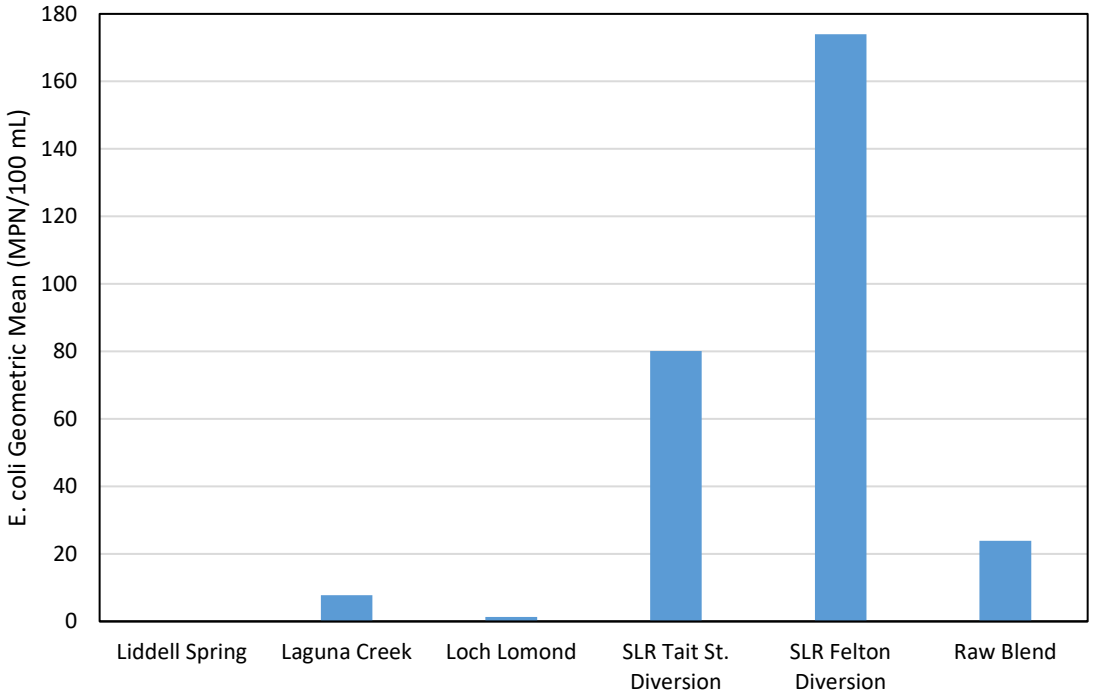


Figure 29. Summary of *E. coli* geometric mean of source waters between October 2020 and September 2021

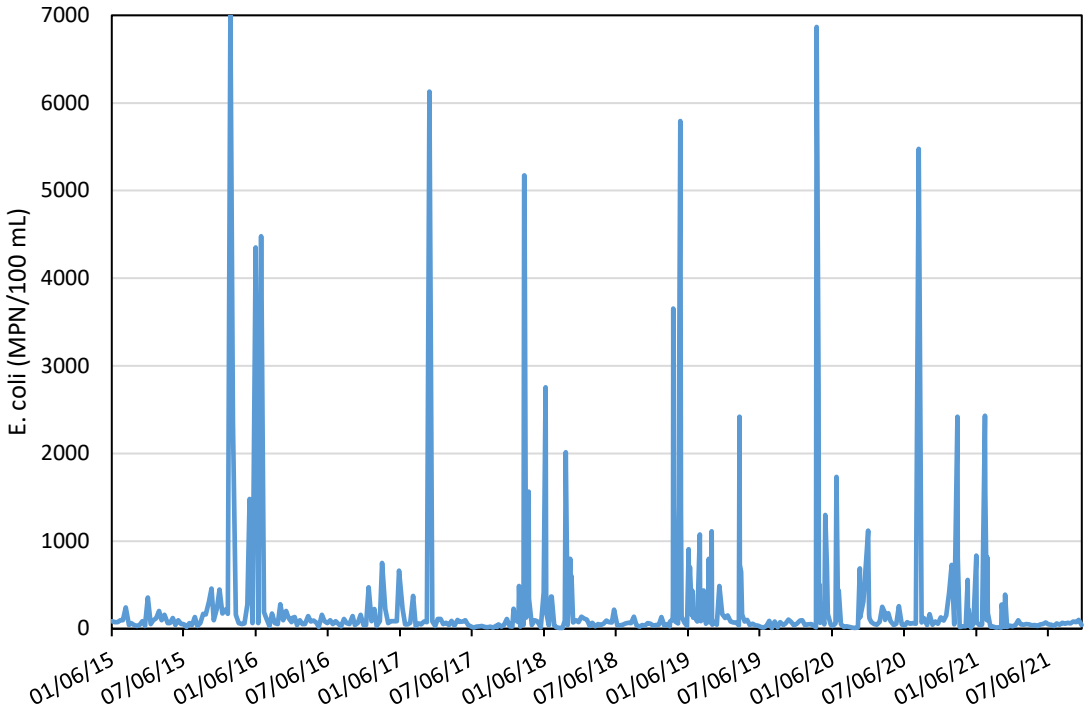


Figure 30. Summary of *E. coli* data from the San Lorenzo River Tait St. Diversion between January 2015 and September 2021

2.4.3 Enterococci

Enterococci are bacteria that live in the intestinal tracts of warm-blooded animals, including humans, and indicate possible contamination by fecal waste. Typical sources of Enterococci include wastewater treatment plant effluent, failing or improperly sited septic systems, storm water runoff, homeless encampments, and domestic animal and wildlife waste. Enterococci are indicators of the presence of fecal material in water and, therefore, of the possible presence of disease-causing bacteria such as viruses, bacteria, and protozoa. There are no formal Enterococci limits for source water.

Similar to total coliform and *E. coli*, Enterococci concentrations are highly variable by source and increased during the wet season due to storm events. Enterococci results were consistently higher during the wet season at all of the source water locations, except for Liddell Spring and Loch Lomond (Table 8 and Figure 31). The North Coast sources, including Liddell Spring and Laguna Creek, have consistently low Enterococci results compared to the San Lorenzo River (SLR); however, results at Laguna Creek fluctuated ranging from <1-266 MPN/100 mL during the wet season. Loch Lomond fluctuated slightly in the wet season with results ranging from <1-1 MPN/100 mL. Both SLR locations, Felton Diversion and Tait. St. Diversion, are the most variable and susceptible to increase in microbial load during the wet season, having the highest Enterococci values overall. Felton Diversion had the highest Enterococci result of 12,340 MPN/100 mL on January 27, 2021. The Felton Diversion location had the highest Enterococci geometric mean for WY 2021 (Figure 28). The maximum recorded Enterococci result for Raw Blend was 158 MPN/100 mL; however, the geometric mean Raw Blend Enterococci result did not exceed 17.5 MPN/100 mL during WY 2021. This is due to the blending of Liddell Spring and Loch

Lomond, which generally have lower Enterococci loads, and provide a buffer against the fluctuations of the San Lorenzo River to reduce the overall Enterococci load of the Raw Blend.

Consistent monitoring of Enterococci by the Santa Cruz Water Department's (SCWD) Water Quality Laboratory (WQL) began in 2017. As shown in Figure 32, the concentrations at SLR Tait St. Diversion reached a result of 7,540 MPN/100 mL during the largest storm recorded (January 27, 2021) for WY 2021. The highest Enterococci result recorded was 9,600 MPN/100 mL in WY 2018.

As shown in Table 9, Enterococci concentrations increased during storm events and were therefore consistently higher during the wet season at all upper watershed sampling locations. The upper SLR watershed locations at Junction and Highlands Park are more susceptible to an increase in Enterococci during winter storms. SLR Highland Park obtained a high result of 15,531 MPN/100 mL during the largest storm recorded for WY 2021 on January 27, 2021.

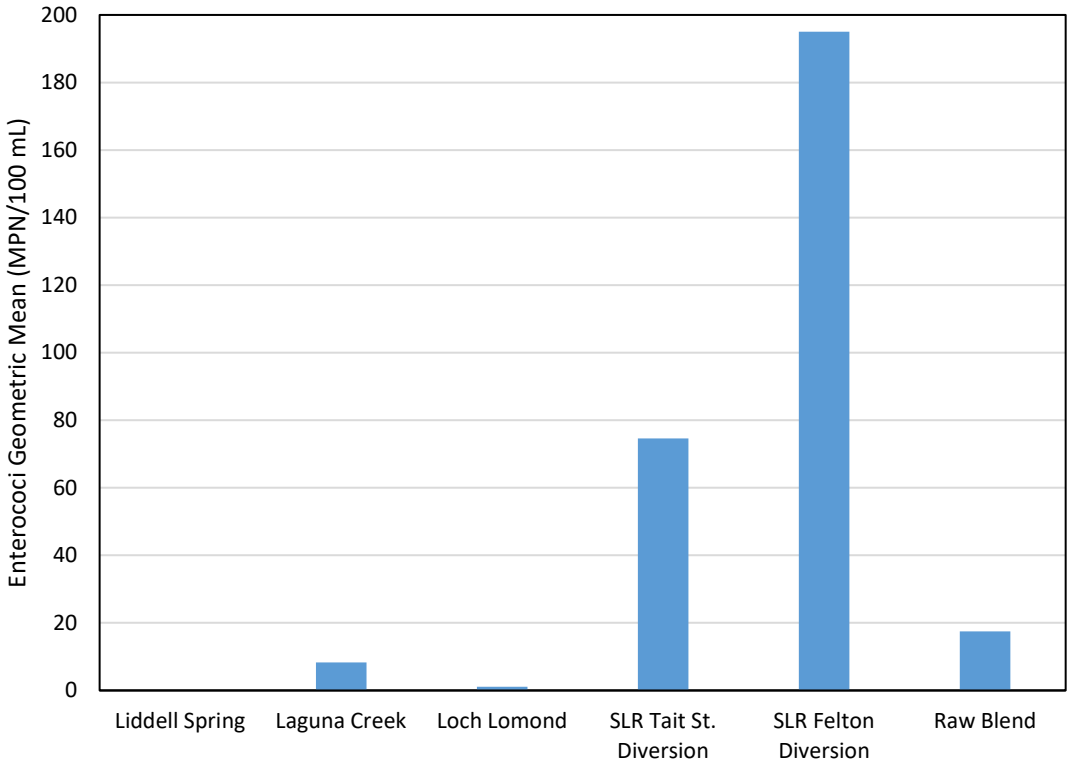


Figure 31. Summary of Enterococci geometric mean of source waters between October 2020 and September 2021

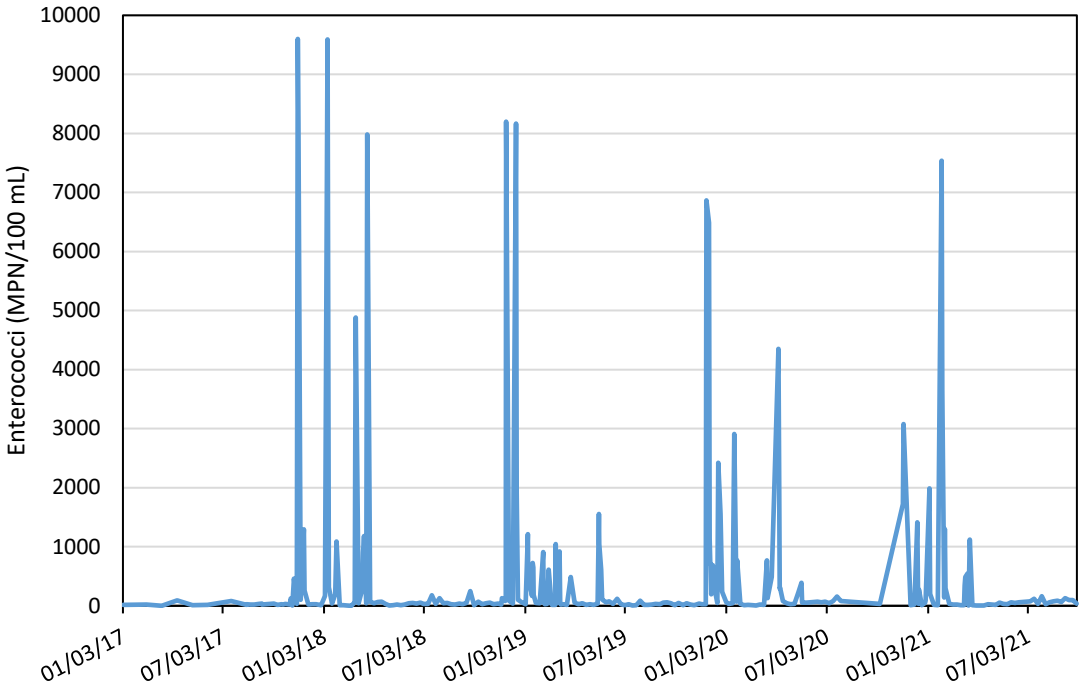


Figure 32. Summary of Enterococci data from the San Lorenzo River Tait St. Diversion between January 2015 and September 2021

2.4.4 Microbial Source Tracking

Microbial Source Tracking (MST) is the process of identifying the particular source (e.g. human, cattle, and bird) of fecal contamination in water. In December 2016, the Santa Cruz Water Department's (SCWD) Water Quality Laboratory (WQL) began MST monitoring in the San Lorenzo River (SLR) in order to gain a better understanding of the source of the fecal contamination in the SLR. The four MST analyses performed include Universal Bacteroides, Human Bacteroides (HF-183), MS2 Coliphage, and Somatic Coliphage. Universal Bacteroides tests for fecal contamination from all sources including animals, birds, and humans, while Human Bacteroides (HF-183), MS Coliphage, and Somatic Coliphage are fecal indicators of human influence particularly from wastewater. Human Bacteroides (HF-183) are a genus of bacteria that predominantly thrive in the lower gastrointestinal tract of humans and are therefore directly associated with fecal contamination. MS2 and Somatic Coliphage are bacteriophage viruses that infect *E. coli* bacterial cells. There are no current regulations for MST as they are primarily used as indicators of human influence in recreation and source water. Storm event MST analysis was added to WY 2021 to further evaluate storm water quality for treatment at the GHWTP.

As shown in Table 8 and in Figures 33-36, MST results are variable throughout the year. Human Bacteroides, MS2 Coliphage, and Somatic Coliphage concentrations were generally higher during the wet season, suggesting that there is a greater human microbial influence during winter storms, potentially from septic systems in the San Lorenzo Valley located along the SLR. Felton Diversion had the highest Human Bacteroides result of 1,959 GC/mL on January 28, 2021. Tait St. Diversion had the highest MS2 Coliphage result of 15 PFU/100 mL on January 28, 2021 as well as the highest Somatic Coliphage result of 242 PFU/mL on November 18, 2020. Universal Bacteroides concentrations were found to be high during the dry season when there are lower rates of flow and an increase in animal activity, as well

as human recreation occurring in the SLR. Tait St. Diversion had the highest Universal Bacteroides result of 439,370 GC/mL on May 5, 2021.

As shown in Figures 33-36, the concentrations of Human Bacteriodes, MS2 Coliphage, and Somatic Coliphage at SLR Tait St. Diversion for WY 2021 were lower than in previous WYs while the concentration of Universal Bacteroides was the highest result recorded since 2016.

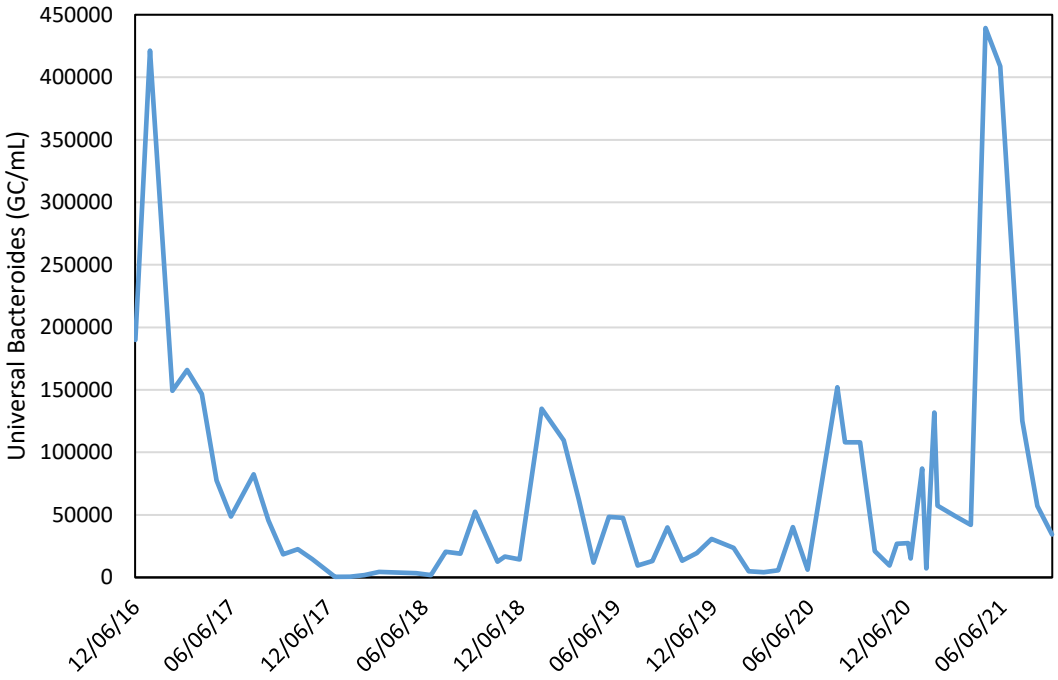


Figure 33. Summary of Universal Bacteroides data from the San Lorenzo River Tait St. Diversion between December 2016 and September 2021

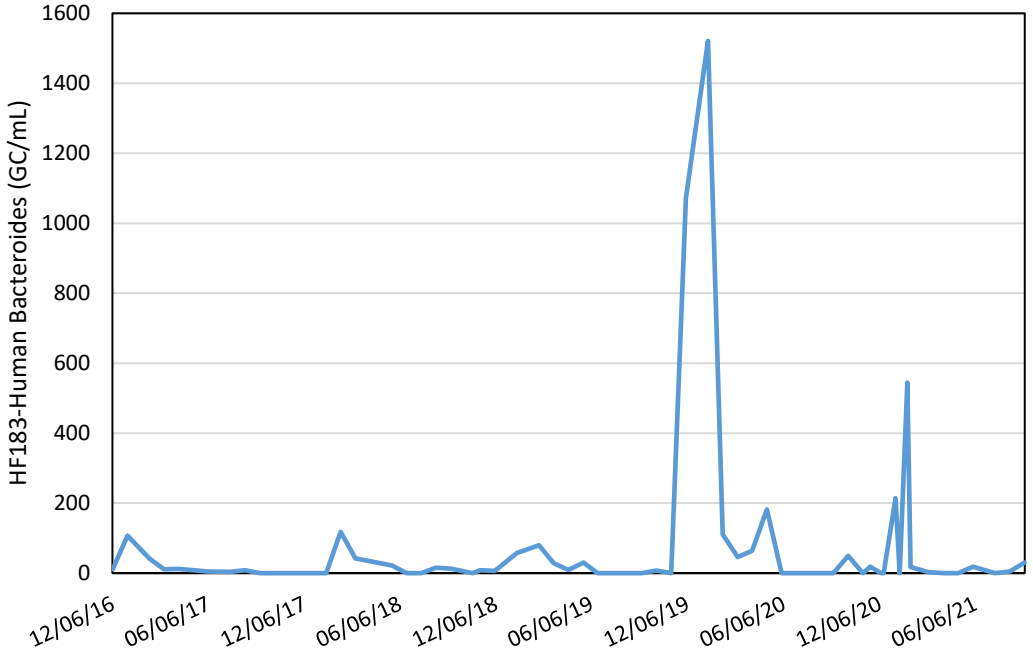


Figure 34. Summary of HF183-Human Bacteroides data from the San Lorenzo River Tait St. Diversion between December 2016 and September 2021

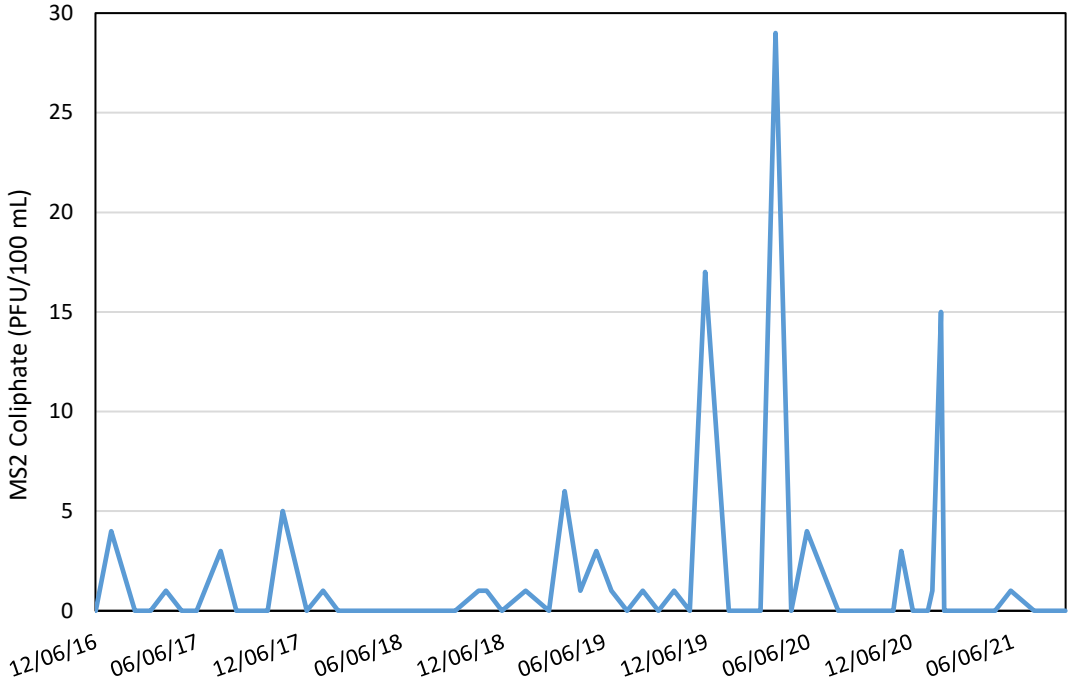


Figure 35. Summary of MS2 Coliphage data from the San Lorenzo River Tait St. Diversion between December 2016 and September 2021

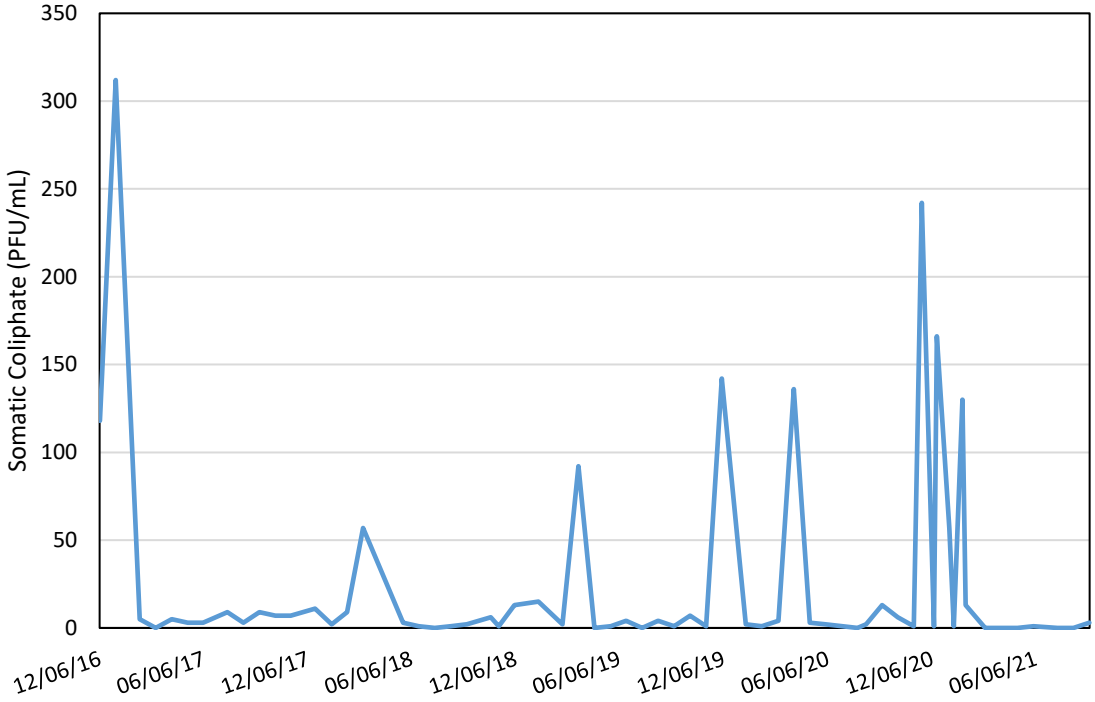


Figure 36. Summary of Somatic Coliphage data from the San Lorenzo River Tait St. Diversion between December 2016 and September 2021

Table 8. Summary of Microbial Parameters Measured in Source Waters between October 2020 and September 2021. Values presented are minimum and maximum concentrations.

	Raw Blend		Liddell Spring		Laguna Creek		Loch Lomond		SLR Tait St. Diversion		SLR Felton Diversion	
Parameter	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Total Coliform (MPN/100 mL)	162 – 4,611	2 – 1,046.2	<1 - 18.9	<1 -18.7	260 – 1,553.1	74 – 7,270	12 - 11,199	2 - 261	613 – 9,208	225 - 54,750	1,553 – 8,664	435 - 92,080
E. *coli* (MPN/100 mL)	<1 - 260	<1 - 33	<1	<1	<1 - 50.4	<1 - 164	<1 - 1	<1 - 3.1	27.5 - 727	12 - 2,430	34.5 - 727	25.6 - 5,794
Enterococci (MPN/100 mL)	3.1 - 98.5	<1 - 158	<1	<1	<1 - 21.3	<1 - 266	<1 - 2	<1 - 1	5.2 - 159.7	6.3 - 7,540	18.3 - 816.4	30 - 12,340
Human Bacteroides (GC/mL)									ND - 49.3	ND - 544.2	ND - 29	5 – 1,959
Universal Bacteroides (GC/mL)									9,524 - 439, 370	7,102.5 - 131,733	22,590 - 423,275	16,938.3 - 301,127.5
MS2 Coliphage (PFU/100 mL)									ND - 1	ND - 15	ND - 1	ND - 6
Somatic Coliphage (PFU/mL)									ND - 6	ND - 242	ND - 222	ND - 155
ND=Analyte Not Detected												

Table 9. Summary of Microbial Parameters Measured in Upper Watershed Locations between October 2020 and September 2021. Values presented are minimum and maximum concentrations.

	Upper Laguna Creek		Upper Majors Creek		SLR Junction Park		SLR Highlands Park	
Parameter	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Total Coliform (MPN/100 mL)	166.4 – 1,539	152 – 6,131	435.2 – 1,553.1	754 - 1,986	1,935 - 6,488	7,270 - 173,289	2,014 - 7,701	770 - 141,361
E. *coli* (MPN/100 mL)	2 - 98	9.7 - 260	3 - 114	42.2 - 228	40 - 125.9	86.5 - 3,255	96 - 155.3	57 - 6,488
Enterococci (MPN/100 mL)	1 - 275.5	3.1 - 365	4.1 - 14.8	24.3 - 435	52 - 316.9	228.2 - 1,986	49 - 435.2	32.7 - 15,531

2.5 Regulated Chemistry Parameters

2.5.1 Metals

The presence of metals can be a concern in drinking water due to health effects and aesthetic issues, particularly with respect to color and taste. Metals can be present in both total (insoluble) and dissolved (soluble) forms, however only the total (insoluble) form is regulated. Iron and manganese are regulated with secondary maximum contaminant levels (SMCLs) of 0.3 and 0.05 mg/L respectively. Arsenic, copper, and lead are regulated with primary maximum contaminant levels (MCLs) of 10 µg/L, 1.3 mg/L, and 0.015 mg/L, respectively, and aluminum has both a primary and secondary MCL of 1 mg/L and 0.2 mg/L. While the primary and secondary MCLs are for the total concentration, the implications for removal are different for the total (insoluble) versus dissolved (soluble) forms. The total (insoluble) metals can easily be removed through conventional water treatment processes such as coagulation, flocculation, sedimentation, and filtration but conventional water treatment processes cannot remove the dissolved (soluble) metals from the water.

As shown in Table 10, total metals increased during storm events and are therefore consistently higher during the wet season at all of the source water locations, except for Liddell Spring. Total (insoluble) forms of aluminum, iron, and manganese did exceed their SMCLs during the wet season at Laguna Creek, Loch Lomond, and both San Lorenzo River (SLR) locations, but again, SMCLs are only applicable to treated water and not source waters. The majority of the measured concentrations existed in the particulate or total form (Figure 37). The dissolved fractions of each metal did not exceed drinking water standards. Arsenic was the only metal detected during both the dry and wet season, from the source at Liddell Spring. All metals were below their respective primary and secondary MCLs at the GHWTP finished water during the WY. As shown in Figures 38-40, the aluminum, iron, and manganese concentrations detected on January 27, 2021 at the SLR Tait St. Diversion were the highest levels measured since 2015. Even though winter storms were more frequent and stronger in previous years, event based storm sampling was not consistently conducted. Additionally, aluminum was not previously analyzed during storm events and was added to the WY 2021 sampling following the CZU Lightning Complex Fire.

As shown in Table 11, metals concentrations typically increased during storm events and are therefore consistently higher during the wet season at all upper watershed locations. The upper SLR watershed locations at Junction and Highlands Park are more susceptible to an increase in metals during winter storms. Copper and lead were only detected at Junction and Highlands Park during the November 18, 2021 and January 27, 2021 storms.

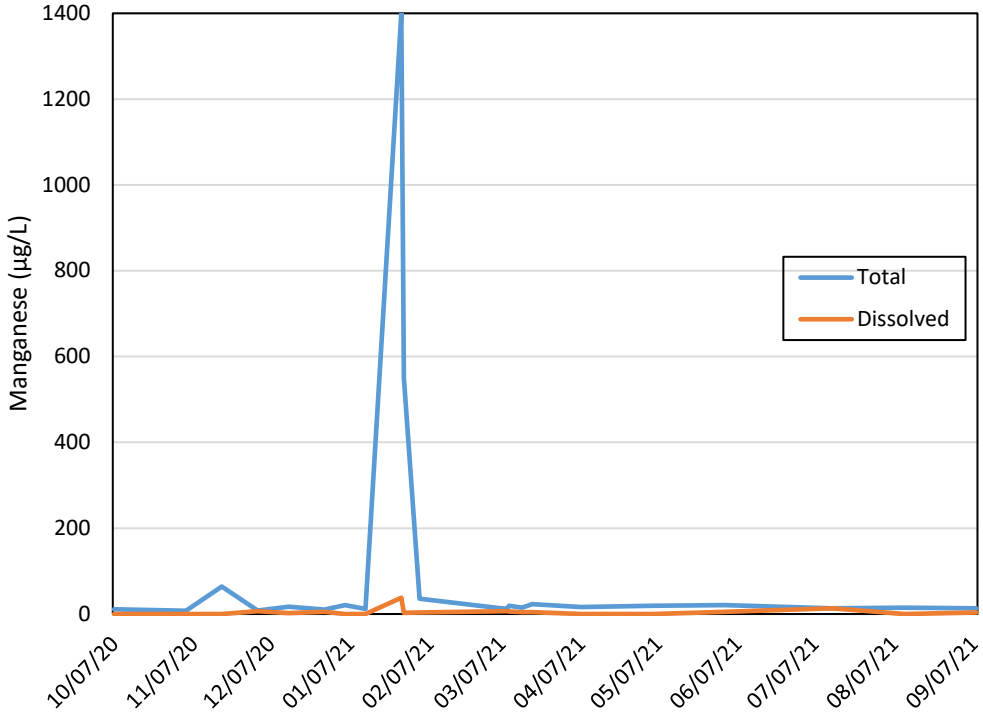


Figure 37. Summary of total and dissolved manganese from the San Lorenzo River Tait St. Diversion between December 2016 and September 2021

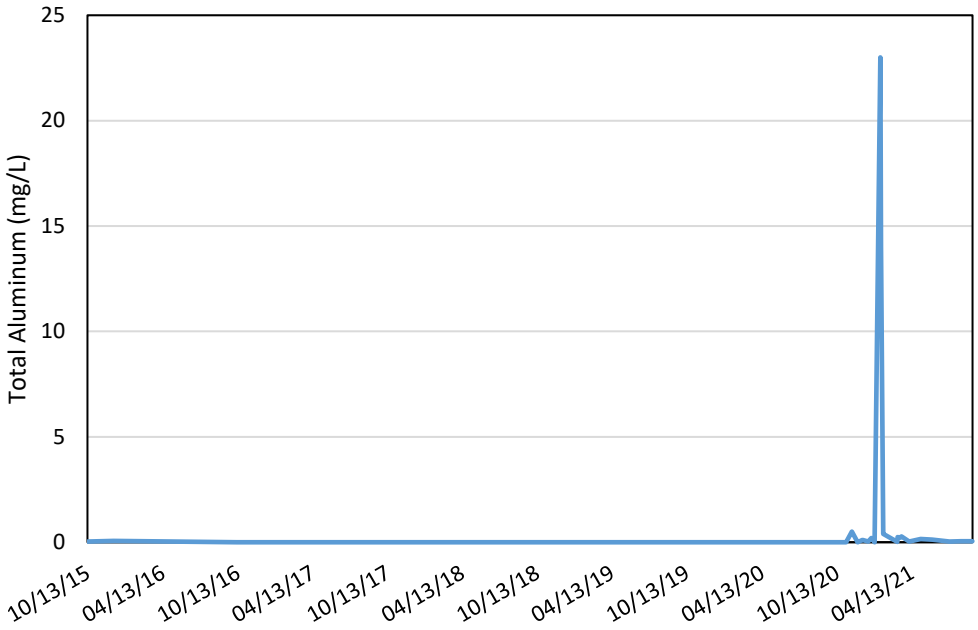


Figure 38. Summary of total aluminum from the San Lorenzo River Tait St. Diversion between January 2016 and September 2021

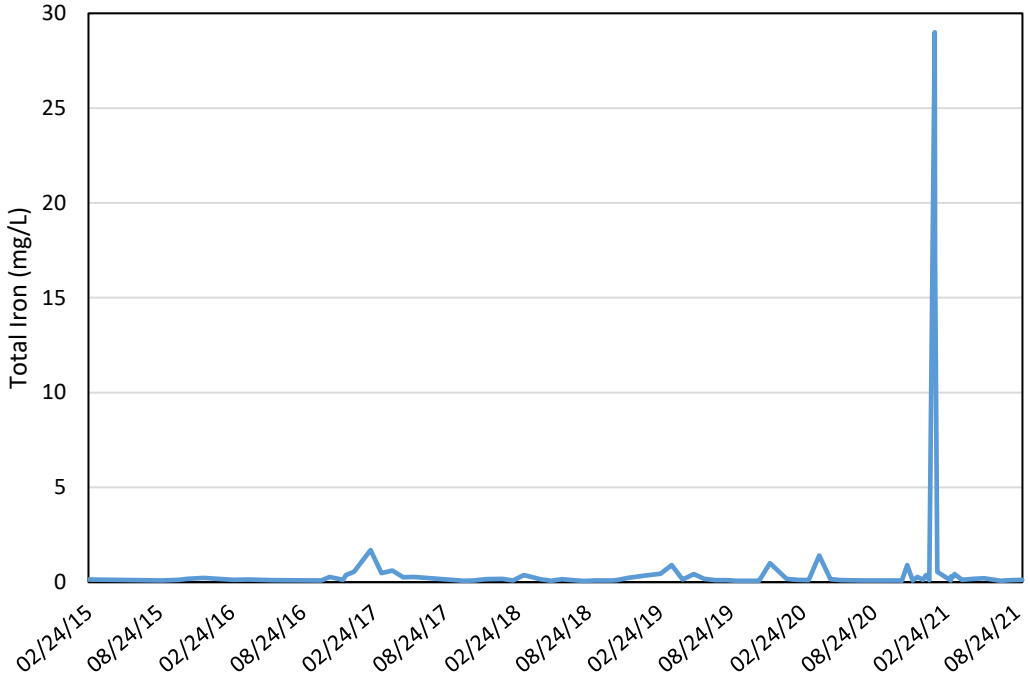


Figure 39. Summary of total iron from the San Lorenzo River Tait St. Diversion between January 2015 and September 2021

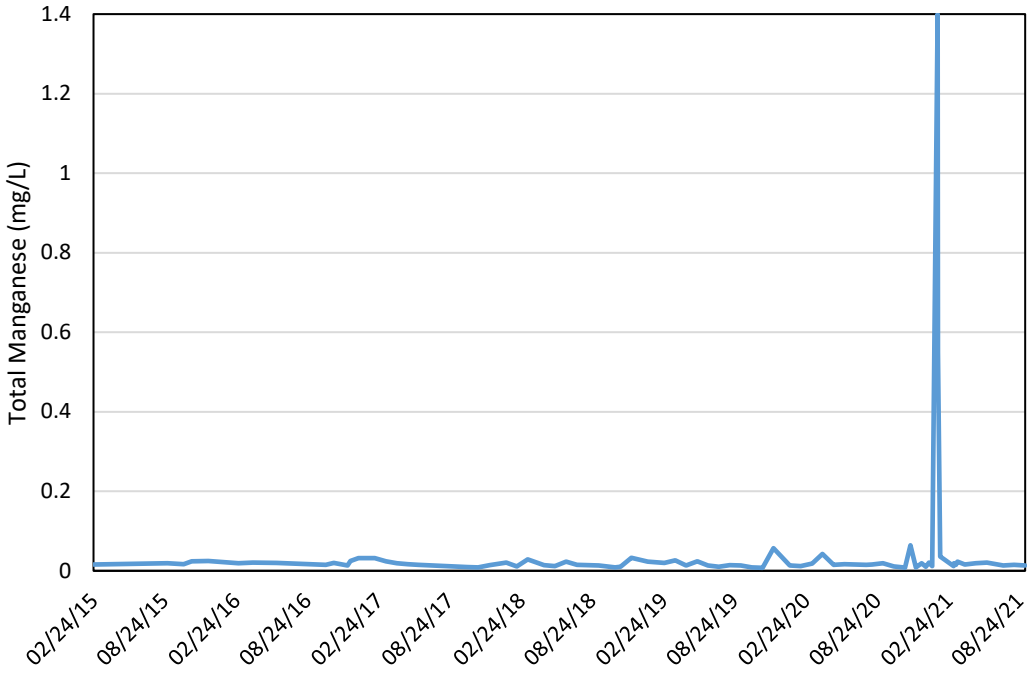


Figure 40. Summary of total manganese from the San Lorenzo River Tait St. Diversion between January 2015 and September 2021

2.5.2 Nitrate

Nitrate is regulated in drinking water as it can cause health impacts in humans and contribute to taste and odor aesthetics of the water. In some surface waters, the presence of nitrate is indicative of the potential for algae in stagnant areas and, in turn, the potential for associated taste and odor events. Nitrate as nitrogen and nitrate as NO3 are regulated with primary maximum contaminant levels (MCLs) of 10 mg/L and 45 mg/L, respectively. Nitrate as nitrogen refers to the element whereas nitrate as NO3 refers to nitrate combined with oxygen to form an ion, which is more bio-available than other forms of nitrogen, and thus has a greater effect on water quality. .

As shown in Table 10, nitrate as NO3 increased during storm events, with the exception of Laguna Creek, where nitrate as NO3 was non-detect throughout WY 2021. The highest nitrate as NO3 concentrations were detected in the San Lorenzo River (SLR), with the lowest concentrations at Loch Lomond and Laguna Creek. In contrast to source waters, concentrations of nitrate as NO3 was below the MCL at the finished water at the GHWTP, which illustrates the effectiveness of the treatment process for this constituent.

As shown in Figure 41, the nitrate as NO3 result of 3.0 mg/L detected at the SLR Tait St. Diversion on January 28, 2021 is the highest result measured since 2015. Nitrate as NO3 was not previously included in storm water analysis and was added in WY 2021 to evaluate the effects from the CZU Lighting Complex Fire.

As shown in Table 11, nitrate as NO3 concentrations were below the MCL during WY 2021. Nitrate as NO3 concentrations in the upper SLR watershed locations at Junction and Highlands Park and Upper Majors were higher during the dry season than the wet season. This may be due to stagnant waters during the dry season, which may foster the growth of algae and in turn contribute to nitrate as NO3 concentrations. Upper Laguna Creek was the only upper watershed location that increased in Nitrate as NO3 concentration during the wet season.

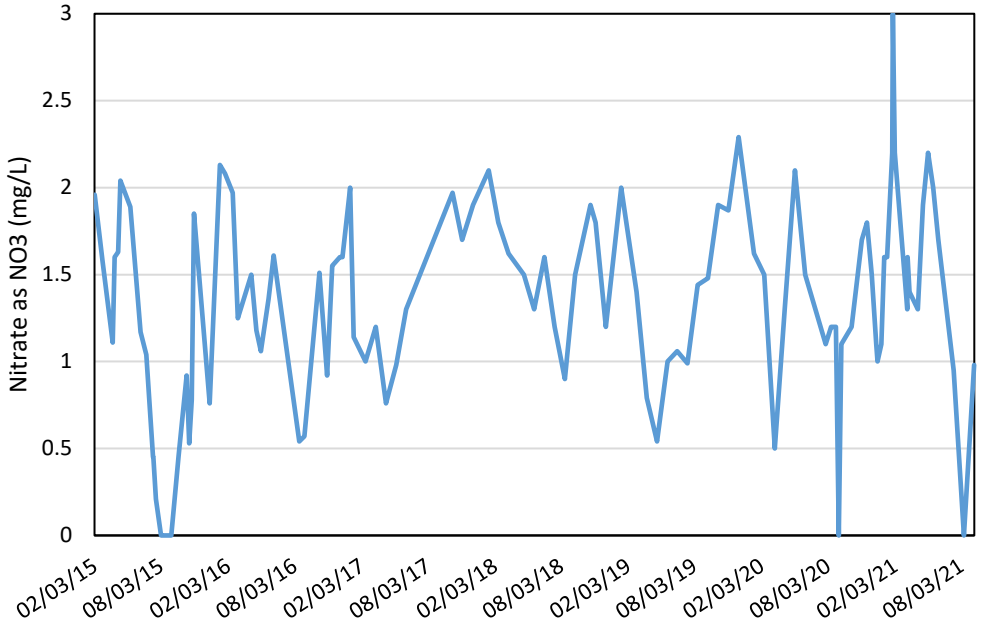


Figure 41. Summary of nitrate as NO3 from the San Lorenzo River Tait St. Diversion during January 2015 and September 2021

2.5.3 Asbestos

Asbestos at certain levels can pose a significant health risk as it has been linked to several health complications. Natural occurring asbestos deposits can enter a water source by wind, flood, landslide, and storm water runoff. Asbestos particles can also be introduced into the water following demolition after fires, floods, or other natural disasters. The Santa Cruz Water Department's (SCWD) current monitoring requirement for asbestos occurs every nine years from all water sources, however, asbestos was added to the source water monitoring program for WY 2021 to evaluate potential impacts from the CZU Lighting Complex Fire. Asbestos is regulated and has a primary maximum contaminant level (MCL) of 7 million fibers per liter (MFL).

As shown in Table 10 and Table 11, asbestos was not detected at any of the source water or upper watershed locations during WY 2021.

2.5.4 Radiological

Radionuclides are types of atoms that are radioactive and are regulated in drinking water. The regulated radionuclides in drinking water are combined radium-226+228, gross alpha particle activity and uranium with primary maximum contaminant levels (MCL) of 5 pCi/L, 15 pCi/L and 20 pCi/L respectively. Most of the radionuclides present in drinking water are from natural sources including certain types of rocks that contain trace amounts of radioactive isotopes such as uranium. However, many human-made devices and processes such as color televisions, medical instruments (x-ray and chemotherapy), coal/lignite power plants, industrial processes and cigarette smoking are sources of radionuclides that can be introduced in the water supply. The Santa Cruz Water Department's (SCWD) regulated radiological monitoring frequency occurs every 9 years at all surface sources and historically, radiological results have not been detected in the source water or in the Graham Hill Water Treatment Plant (GHWTP) finished water. The SCWD's Water Quality Laboratory (WQL) added monthly and storm event radiological monitoring in WY 2021 to evaluate potential impacts from the CZU Lightning Complex Fire. The source water locations that were monitored include Laguna Creek, SLR Felton Diversion, and SLR Tait St. Diversion. The GHWTP finished water was also monitored for radiological compounds as well as Upper Laguna and SLR Highlands Park.

As shown in Table 12, combined radium 226+228, gross alpha particle activity, and uranium were detected in both San Lorenzo River (SLR) locations during the wet season. All results detected were from the January 27, 2021 storm and were below their associated primary MCLs. Radiological results were not detected in the GHWTP finished water.

As shown in Table 13, uranium was detected at SLR Highlands Park during the January 27, 2021 storm and was below the primary MCL, which again, does not apply to source waters.

Table 10. Summary of Regulated Chemistry Parameters Measured in Source Waters and Finished Water between October 2020 and September 2021. Values presented are average (minimum – maximum).

			GHWTP Finished Water		Liddell Spring		Laguna Creek		Loch Lomond		SLR Tait St. Diversion		SLR Felton Diversion	
Parameter	**Primary MCL**	**Secondary MCL**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Aluminum (mg/L)	1	0.2	0.03 (ND - 0.04)	0.03 (0.02 - 0.06)	ND	ND	ND	0.15 (ND - 1.2)	0.12 (ND - 0.30)	0.33 (0.03 - 0.90)	0.03 (ND - 0.12)	2.4 (ND - 23)	0.05 (ND - 0.10)	5.2 (ND - 61)
Arsenic (µg/L)	10		ND	ND	2.1 (1.9 - 2.6)	2.1 (2.0 - 2.2)	2.3 (2.0 - 2.8)	2.1 (1.4 -2.8)	0.40 (ND - 1.2)	1.0 (ND - 1.4)	1.4 (1.2 - 1.6)	2.0 (ND - 6.9)	0.94 (ND - 1.4)	0.82 (ND - 5.9)
Asbestos (MFL)	7				ND	ND	ND	ND			ND	ND	ND	ND
Copper (mg/L)	Action Level 1.3		ND	ND	ND	ND	ND	ND	0.010 (0.007 - 0.012)	0.008 (0.007 - 0.009)	ND	0.003 (ND - 0.021)	ND (ND - 0.003)	0.005 (ND - 0.059)
Iron (mg/L)		0.3	ND	ND	ND	ND	0.018 (ND - 0.023)	0.22 (0.018 - 1.6)	0.18 (0.013 - 0.46)	0.38 (0.070 - 0.91)	0.12 (0.071 – 0.21)	3.5 (0.090 - 29)	0.18 (0.12-0.27)	6.7 (0.10 – 78)
Lead (mg/L)	Action Level 0.015		ND	ND	ND	ND	ND	ND (ND - 0.0006)	ND	ND	ND	0.002 (ND - 0.022)	ND	0.003 (ND – 0.041)
Manganese (mg/L)		0.05	ND (ND - 0.002)	ND (ND - 0.002)	ND	ND	0.004 (0.003 - 0.004)	0.009 (0.003 - 53)	0.021 (0.002 - 0.048)	0.021 (0.007 - 0.039)	0.014 (0.008 - 0.021)	0.16 (0.008 - 1.4)	0.038 (0.022 - 0.047)	0.29 (0.025 - 3.3)
Nitrate as NO3 (mg/L)	45		0.95 (ND - 1.9)	0.52 (ND - 1.1)	1.1 (1.0 - 1.1)	1.1 (1.0 - 1.2)	ND	ND	0.43 (ND - 1.3)	0.58 (ND - 1.4)	1.4 (ND - 2.2)	1.6 (1.0 - 3.0)	2.4 (1.9 - 2.8)	1.9 (ND - 3.3)
ND=Analyte Not Detected														

Table 11. Summary of Regulated Chemistry Parameters Measured in Upper Watershed Locations between October 2020 and September 2021. Values presented are average (minimum – maximum).

			Upper Laguna Creek		Upper Majors Creek		SLR Junction Park		SLR Highlands Park	
Parameter	**Primary MCL**	**Secondary MCL**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Aluminum, Total (mg/L)	1	0.2	0.008 (ND - 0.038)	0.11 (ND - 0.64)	0.009 (ND - 0.026)	0.64 (0.071 - 1.2)	0.10 (ND - 0.28)	0.48 (0.25 - 0.72)	0.060 (0.022 - 0.14)	2.0 (0.029 - 13)
Arsenic, Total (µg/L)	10		0.76 (ND - 1.4)	0.31 (ND - 1.2)	1.2 (1.2 - 1.2)	1.6 (1.4 - 1.8)	ND	0.95 (ND - 1.9)	0.28 (ND - 1.1)	0.84 (ND - 5.4)
Asbestos (MFL)	7		ND	ND					ND	ND
Copper, Total (mg/L)	Action Level 1.3		ND	ND	ND	ND	ND	ND (ND - 0.003)	ND	0.003 (ND - 0.016)
Iron, Total (mg/L)		0.3	0.003 (ND - 0.016)	0.11 (ND - 0.69)	0.020 (0.015 - 0.23)	0.60 (0.11 - 1.1)	0.17 (0.053 - 0.40)	0.68 (0.37 - 1.0)	0.19 (0.14 - 0.30)	2.3 (0.14 - 17)
Lead, Total (mg/L)	Action Level 0.015		ND	ND	ND	ND	ND	ND (ND - 0.001)	ND	0.001 (ND - 0.011)
Manganese, Total (mg/L)		0.05	ND	0.003 (ND - 0.016)	0.003 (0.003 - 0.004)	0.010 (0.007 - 0.015)	0.022 (0.008 - 0.043)	0.047 (0.023 - 0.071)	0.080 (0.050 - 0.099)	0.11 (0.031 - 0.55)
Nitrate as NO3 (mg/L)	45		0.14 (ND - 0.72)	0.30 (ND - 1.8)	1.9 (1.8 - 2.0)	1.1 (1.0 - 1.2)	1.2 (ND - 2.2)	0.75 (ND - 1.5)	3.2 (2.1 - 4.0)	2.0 (0.93 - 3.1)
ND=Analyte Not Detected										

Table 12. Summary of Radiological Chemistry Parameters Measured in Source Waters and Finished Water between October 2020 and September 2021. Values presented are minimum and maximum concentrations.

		GHWTP Finished Water		Laguna Creek		SLR Tait St. Diversion		SLR Felton Diversion	
Radiological Parameter	**Primary MCL**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Combined Radium 226+228 (pCi/L)	5	ND	ND	ND	ND	ND	ND	ND	ND - 3.9
Gross Alpha particle activity (pCi/L)	15	ND	ND	ND	ND	ND	ND - 3.3	ND	ND - 7.1
Uranium (pCi/L)	20	ND	ND	ND	ND	ND	ND - 1.6	ND	ND - 3.7
ND=Analyte Not Detected									

Table 13. Summary of Radiological Chemistry Parameters Measured in Upper Watershed Locations between October 2020 and September 2021. Values presented are minimum and maximum concentrations.

		Upper Laguna Creek		SLR Highlands Park	
Radiological Parameter	**Primary MCL**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Combined Radium 226+228 (pCi/L)	5	ND	ND	ND	ND
Gross Alpha particle activity (pCi/L)	15	ND	ND	ND	ND
Uranium (pCi/L)	20	ND	ND	ND	ND - 1.0
ND=Analyte Not Detected					

2.5.5 Synthetic Organic Compounds

Synthetic organic compounds (SOCs) are man-made carbon-based chemicals such as pesticides, defoliants, and fuel additives. Table 14 provides a list of the SOC compounds analyzed during WY 2021 and their associated primary maximum contaminant levels (MCLs). The Santa Cruz Water Department's (SCWD) current monitoring requirement for SOCs occurs triennially at all raw sources and consists of 12 compounds. Historically, SOCs have not been detected in the source water or in the Graham Hill Water Treatment Plant (GHWTP) finished water.

The SCWD's Water Quality Laboratory (WQL) increased the source water monitoring of SOCs following the CZU Lightning Complex Fire to include monthly and storm event sampling and added 2,3,7,8-TCDD (Dioxin). TCDD, commonly referred to as dioxin, is a chemical that is mainly a byproduct of industrial and manufacturing processes such as chlorine bleaching of paper, uncontrolled waste incinerators, and manufacturing of some herbicides and pesticides. TCDD can also result from natural processes including volcanic eruptions and forest fire. In a wildfire or structure fire setting, the volume of building materials, chemicals, pesticides, cleaners, automotive components, electronics, appliances, and other household items manufactured with chlorinated products such as polyvinyl chloride (PVC) can create immense amounts of TCDD. The SCWD previously analyzed for a larger SOC list, including TCDD, but was granted a waiver from the State Water Resources Control Board Division of Drinking (SWRCB-DDW) to reduce the list by removing compounds that were not detected.

During WY 2021, all SOC results were non-detect except for one result of 0.12 µg/L 2,4-D at SLR Highlands Park on January 27, 2021.

Table 14. Synthetic Organic Compounds List

Synthetic Organic Compounds (SOCs)	
SOC Compound	**Primary MCL (mg/L)**
1,2,3-Trichloropropane (TCP)	0.000005
2,3,7,8-TCDD (Dioxin)	0.00000003
2,4-D	0.07
Alachlor	0.002
Atrazine	0.001
Bentazon	0.018
Carbofuran	0.018
Diquat	0.02
Endothall	0.1
Ethylene Dibromide (EDB)	0.00005
Lindane	0.0002
Oxamyl	0.05
Simazine	0.004

2.5.6 Volatile Organic Compounds

Volatile organic compounds (VOCs) are a variety of compounds composed primarily of carbon and hydrogen and are predominantly used as solvents, degreasers, cleaning solutions, dry cleaning fluids, and components of pesticides and plastics. VOCs can enter drinking water systems through spills and improper disposal. Table 15 provides the list of the 27 VOC compounds sampled as well as their associated primary maximum contaminant levels (MCLs). The Santa Cruz Water Department's (SCWD) current VOC monitoring requirement consists of annual monitoring from all surface sources.

The SCWD's Water Quality Laboratory (WQL) added monthly, quarterly, and storm event monitoring in WY 2021 to evaluate potential impacts from the CZU Lightning Complex Fire. The source water locations that were monitored include Laguna Creek, SLR Felton Diversion, and SLR Tait St. Diversion. The GHWTP finished water was also monitored for VOC compounds as well as Upper Laguna and SLR Highlands Park. All VOC compounds collected from the Graham Hill Water Treatment Plant (GHWTP) finished water, source water and upper watershed locations were non-detect for WY 2021.

Table 15. Volatile Organic Compound List

Volatile Organic Compounds (VOCs)	
VOC Compound	**Primary MCL (mg/L)**
1,1,1-Trichloroethane	0.2
1,1,2,2-Tetrachloroethane	0.001
1,1,2-Trichloroethane	0.005
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	1.2
1,1-Dichloroethane	0.005
1,1-Dichloroethylene	0.006
1,2,4-Trichlorobenzene	0.005
1,2-Dichlorobenzene	0.6
1,2-Dichloroethane	0.0005
1,2-Dichloropropane	0.005
1,3-Dichloropropene	0.0005
1,4-Dichlorobenzene	0.005
Benzene	0.001
Carbon Tetrachloride	0.0005
cis-1,2-Dichloroethylene	0.006
Dichloromethane	0.005
Ethylbenzene	0.3
Methyl-tert-butyl ether (MTBE)	0.013
Monochlorobenzene	0.07
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	0.15
trans-1,2-Dichloroethylene	0.01
Trichloroethylene	0.005
Trichlorofluoromethane (Freon 11)	0.15
Vinyl Chloride	0.0005
Xylenes (total)	1.75

2.6 Unregulated Chemistry Parameters

In addition to performing routine monitoring of source water, treatment plant finished water, and the distribution system to comply with State and Federal regulations, the Santa Cruz Water Department's (SCWD) Water Quality Laboratory (WQL) also voluntarily performs monitoring for unregulated chemistry parameters as well as unregulated chemicals for which monitoring is required. The Unregulated Contaminant Monitoring Rule (UCMR) was developed to address the Safe Drinking Water Act (SDWA) Amendment of 1996 that requires USEPA to monitor for 30 unregulated contaminants every five years. Essentially, the UCMR reflects a data gathering phase of regulation before either primary or secondary MCLs are established for the different contaminants. The proposed fifth UCMR (UCMR5) was published in March 2021, and as proposed, would require sampling for lithium and 29 different per- and polyfluoroalkyl substances (PFAS) between 2023 and 2025.

Since 2001, the WQL has conducted four (UCMR) studies and the SCWD voluntarily monitors other unregulated chemicals including bromide, lithium, dioxins, furans, per- and polyfluoroalkyl substances (PFAS), and constituents of emerging concern (CECs). During Water Year (WY) 2021, increased monitoring frequency of unregulated constituents was performed to evaluate potential impacts from the CZU Lighting Complex Fire to the SCWD's source water. A summary of each unregulated chemical and results are provided below.

Advancements in laboratory technology have increased the ability to accurately measure and detect drinking water contaminants including dioxins, furans, CECs, and PFAS at very low concentrations, such as part per trillion (ppt) and parts per quadrillion (ppq). A result of 1 ppt is equivalent to a single drop of water in 20 olympic-sized swimming pools.

2.6.1 Bromide

Bromide is a naturally occurring element found in surface waters and groundwater. During the water treatment process, bromide can combine with chlorine or other disinfectants, contributing to the formation of brominated disinfection byproducts (DBPs). Bromide is unregulated in drinking water; however, current literature review suggests that brominated DBP formation becomes a concern if bromide concentrations in source waters exceed 300 µg/L.

Bromide has been monitored in the Santa Cruz Water Department's (SCWD) source water since 2014. In Water Year (WY) 2021, the measured bromide concentrations were below 300 µg/L in all source water and the upper watershed locations (Table 16 and Table 17). In fact, all source water and upper watershed locations, including the Raw Blend, have remained below 50% of this limit, with the highest source water bromide concentration reaching 110 µg/L at Laguna Creek on November 18, 2020. The highest upper watershed bromide concentration occurred on October 7, 2020 at SLR Junction Park.

As shown in Figure 42, the bromide concentrations in San Lorenzo River (SLR) Tait St. Diversion fluctuate over time, and decrease during storm events.

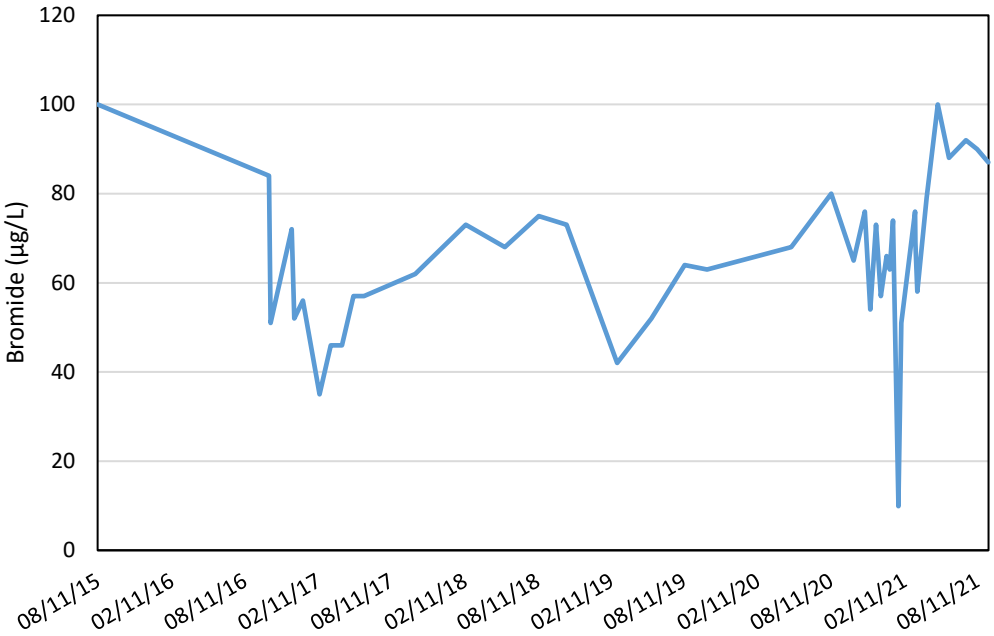


Figure 42. Summary of bromide from the San Lorenzo River Tait St. Diversion during August 2015 and September 2021

2.6.2 Lithium

Lithium is a naturally occurring element found in certain vegetables, grains, spices, and in many rock types. Lithium is currently unregulated in drinking water and was added to the source water monitoring program for Water Year (WY) 2021 to evaluate potential impacts from the CZU Lighting Complex Fire. The Santa Cruz Water Department (SCWD) does not have historical lithium data prior to WY 2021.

As shown in Table 16 and in Figure 43, lithium is present in all of the SCWD's source water with concentrations increasing during storm events. The North Coast sources including Liddell Spring and Laguna Creek consistently have the lowest lithium concentrations compared to the other sources. Loch Lomond generally had the highest concentrations, ranging between 20 and 22 µg/L, and did not exhibit a high degree of variability as a result of storm events. The San Lorenzo River (SLR), both Felton Diversion and Tait. St. Diversion locations exhibited high lithium concentrations of 77 and 34 µg/L during the January 27, 2021 storm. Lithium is also present in the Graham Hill Water Treatment Plant (GHWTP) finished water in small amounts (Figure 44).

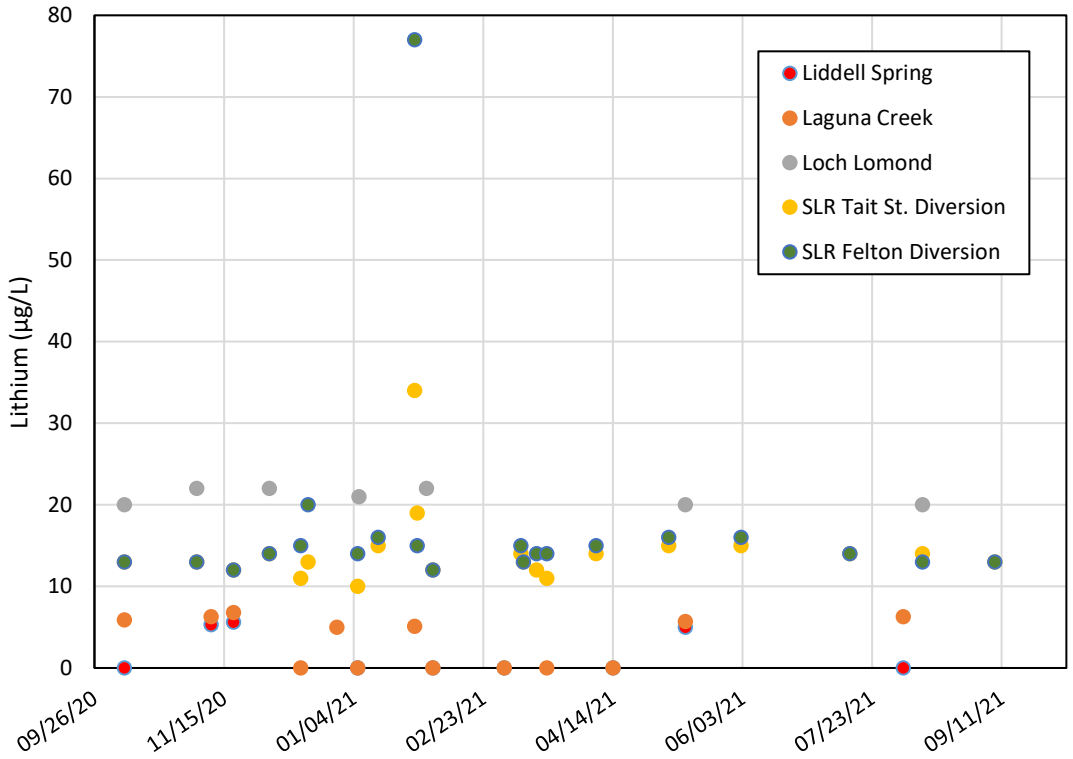


Figure 43. Lithium of source waters between October 2020 and September 2021.

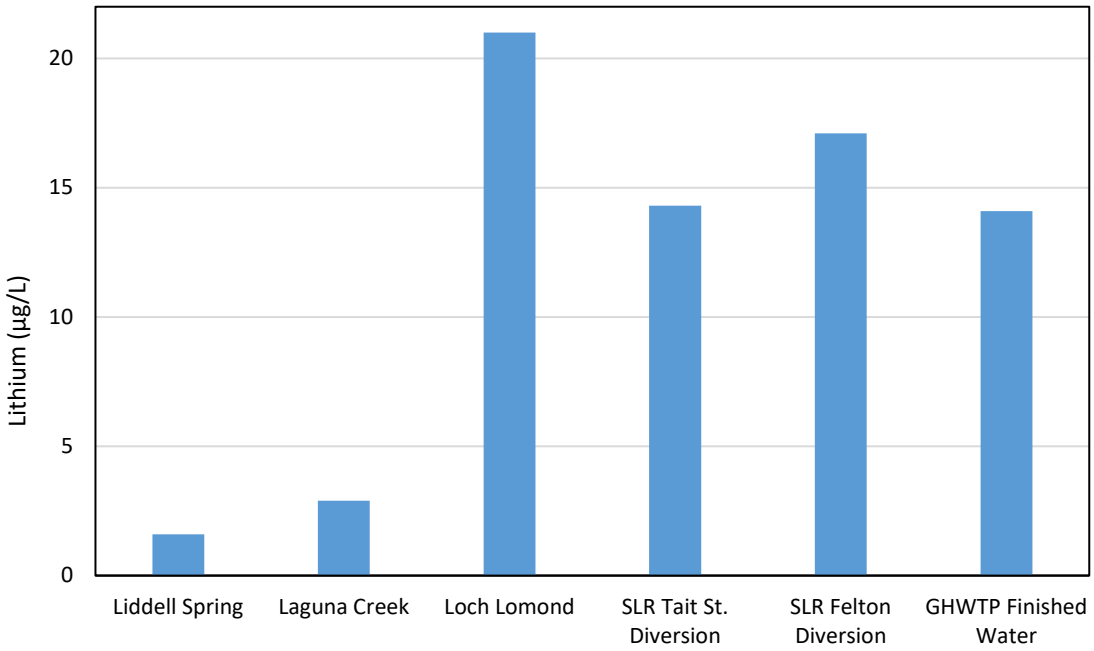


Figure 44. Average source water lithium data for WY 2021.

Table 16. Summary of Unregulated Chemistry Parameters Measured in Source Waters and Finished Water between October 2020 and September 2021. Values presented are average (minimum – maximum)

	GHWTP Finished Water		Raw Blend		Liddell Spring		Laguna Creek		Loch Lomond		SLR Tait St. Diversion		SLR Felton Diversion	
Parameter	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Bromide (µg/L)			77 (58 - 96)	56 (42 - 69)	37 (36 - 38)	37 (36 - 37)	22 (20 - 25)	44 (22 - 110)	51 (46 - 53)	48 (47 - 50)	85 (65 - 100)	55 (9.9 - 76)	89 (80 - 98)	61 (11 - 81)
Lithium (µg/L)	14 (12 - 17)	15 (12 - 19)			2.1 (ND - 5.3)	1.1 (ND - 5.6)	4.8 (ND - 6.3)	1.9 (ND - 6.8)	20 (20 - 22)	22 (21 - 22)	14 (13 - 15)	14 (10 - 34)	14 (13 - 16)	19 (12 - 77)
ND=Analyte Not Detected														

Table 17. Summary of Unregulated Chemistry Parameters Measured in Upper Watershed Locations between October 2020 and September 2021. Values presented are average (minimum – maximum).

	Upper Laguna Creek		Upper Majors Creek		SLR Junction Park		SLR Highlands Park	
Parameter	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
Bromide (µg/L)	35 (34 - 39)	34 (34 - 39)	45 (44 - 46)	39 (37 - 42)	97 (36 - 170)	80 (61 - 98)	72 (64 - 77)	67 (54 - 76)
Lithium (µg/L)	2.2 (ND - 5.6)	0.75 (ND - 5.2)	ND	5.8 (5.7 - 6.0)	12 (5.6 - 22)	16 (16 - 16)	13 (11 - 16)	16 (12 - 25)
ND=Analyte Not Detected								

2.6.3 Dioxin and Furan

Dioxins and furans are anthropogenic compounds created as unintended byproducts from several human activities including the chlorine bleaching of paper products, incomplete or partial combustion and the production of certain types of chemicals. Dioxins and furans are chemically known as polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) and are formed when products containing carbon and chlorine burn, especially plastic, paper, pesticides, herbicides or other products where chlorine is used in the manufacturing process. According to the United States Environmental Protection Agency (EPA), the largest quantified source of dioxin emissions is the uncontrolled burning of household trash, referred to as "backyard" or "barrel burning." More than 90 percent of human exposure is through the consumption of food, mainly meat, dairy products, fish and shellfish. The most toxic dioxin is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), which is regulated as a synthetic organic compound (SOC) contaminant and has a primary maximum contaminant level (MCL) of 0.00000003 mg/L. As previously discussed in Section 2.5.5, TCDD was not detected during Water Year (WY) 2021.

Table 18 summarizes the sixteen unregulated dioxin and furan chemicals that were analyzed from the Santa Cruz Water Department's (SCWD) source water and upper watershed locations. Three unregulated dioxin and furan chemicals were detected during WY 2021 at Laguna Creek, SLR Tait St. Diversion, and SLR Highlands Park during the January 27, 2021 storm (Table 19).

Table 18. Dioxin and Furan Compound List

Dioxin and Furan
1,2,3,4,6,7,8-HpCDD
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8-HxCDD
1,2,3,4,7,8-HxCDF
1,2,3,4,7,8,9-HpCDF
1,2,3,6,7,8-HxCDD
1,2,3,6,7,8-HxCDF
1,2,3,7,8-PeCDD
1,2,3,7,8-PeCDF
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDF
2,3,4,6,7,8-HxCDF
2,3,4,7,8-PeCDF
2,3,7,8-TCDF
OCDD
OCDF

Table 19. Summary of Unregulated Dioxin and Furan compounds measured in Source Waters and Upper Watershed Locations between October 2020 and September 2021

Sample Location	Date	Analyte	Result (ppq)
Santa Cruz Water Department Source Water			
Laguna Creek	01/27/21	1, 2, 3, 4, 6, 7, 8-HpCDD	46
	01/27/21	OCDD	360
SLR Tait St. Diversion	01/27/21	1, 2, 3, 4, 6, 7, 8-HpCDD	57
	01/27/21	OCDD	520
	01/27/21	OCDF	50
Upper Watershed Locations			
SLR Highlands Park	01/27/21	1, 2, 3, 4, 6, 7, 8-HpCDD	40
	01/27/21	OCDD	300

2.6.4 Per- and Polyfluoroalkyl Substances

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that do not occur naturally in the environment. Since the 1940's, PFAS has been used extensively throughout the world in surface coating and protectant formulations due to their ability to reduce the surface tension of liquids. Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) are two types of PFAS that are no longer manufactured or imported into the United States, however, other PFAS materials are still being produced. PFAS are persistent in the environment, can accumulate in the human body over time, and are toxic at relatively low levels. PFAS can be introduced into the body by eating or drinking contaminated food or liquid, breathing in or touching products treated with PFAS, such as carpet or clothing. The four major sources of PFAS in drinking water are fire training/fire response sites, industrial sites, landfills, and wastewater treatment plants. The Santa Cruz Water Department's (SCWD) source waters are located in areas that are not routinely exposed to this type of activity; however, the San Lorenzo River (SLR) does experience some impact from septic systems, which could be sources of low levels of PFAS. Although PFAS chemicals are currently unregulated in drinking water, the United States Environmental Protection Agency (EPA) has established a lifetime health advisory level (HAL) of 70 parts per trillion (ppt) for the combined concentration of PFOS and PFOA. Additionally, in March 2021, the State Water Resources Control Board Division of Drinking Water (SWRCB-DDW) established notification levels (NLs) for three PFAS chemicals including PFOA (5.1 ppt), PFOS (6.5 ppt), and Perfluorobutanesulfonic acid (PFBS) (500 ppt).

As part of the Water Year (WY) 2020 source water monitoring program, the WQL began PFAS monitoring at source water locations. In WY 2021, PFAS monitoring was increased to evaluate potential impacts from the CZU Lightning Complex Fire. A summary of the source water detected PFAS results for WY 2021 are shown in Table 20. PFAS were detected in three SCWD's source waters including Laguna Creek, SLR Felton Diversion, and SLR Tait St. Diversion, as well as in the Graham Hill Water Treatment Plant (GHWTP) finished water. PFAS were detected in small amounts throughout the WY in the SLR but were only detected during storm events at Laguna Creek. The highest PFAS result of 46.0 ppt Perfluorobutanoic acid was detected at Laguna Creek during the first storm of the year (November 18, 2020). Perfluorobutanoic acid (PFBA) does not have a California NL. PFAS were not collected at Loch Lomond

and were not detected in Liddell Spring. Out of the twenty-five PFAS compounds analyzed, only two were detected in the GHWTP finished water. With the exception of the high PFBA result from Laguna Creek in November 2020, all other results are considered low, and below their respective NLs.

Storm event PFAS monitoring was conducted at two upper watershed locations including Upper Laguna and SLR Highlands Park. A summary of the detected PFAS results for Upper Laguna and SLR Highlands are shown in Table 21. PFAS were only detected during the November 18, 2020 and January 27, 2021 storms and all results were below their NLs.

Table 20. Summary of Unregulated PFAS Parameters Measured in Source Waters and Finished Water between October 2020 and September 2021

Sample Location	Date	Analyte	Acronymn	California Notification Level (ng/L)	Result (ng/L)
GHWTP Finished Water	04/07/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.3
	05/05/21	Perfluorooctanesulfonic acid		6.5	2.0
	07/14/21	Perfluorohexanoic acid	PFHxA		6.4
Laguna Creek	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	3.8
	11/18/20	Perfluorobutanoic acid	PFBA		46.0
	11/18/20	Perfluorohexanoic acid	PFHxA		3.6
	11/18/20	Perfluoropentanoic acid	PFPeA		3.1
	12/14/20	Perfluorobutanoic acid	PFBA		6.6
	01/27/21	Perfluorobutanoic acid			4.7
SLR Tait St. Diversion	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	3.7
	11/18/20	Perfluorobutanoic acid	PFBA		4.1
	11/18/20	Perfluorohexanoic acid	PFHxA		3.5
	11/18/20	Perfluorooctanesulfonic acid	PFOS	6.5	6.1
	11/18/20	Perfluorooctanoic acid	PFOA	5.1	3.7
	11/18/20	Perfluoropentanoic acid	PFPeA		4.2
	12/14/20	Perfluorobutanoic acid	PFBA		4.3
	12/14/20	Perfluorohexanoic acid	PFHxA		2.3
	12/14/20	Perfluorooctanesulfonic acid	PFOS	6.5	2.8
	12/14/20	Perfluorooctanoic acid	PFOA	5.1	2.3
	12/14/20	Perfluoropentanoic acid	PFPeA		2.8
	12/28/20	Perfluorobutanesulfonic acid	PFBS	500	2.2
	12/28/20	Perfluorobutanoic acid	PFBA		2.1
	12/28/20	Perfluoropentanoic acid	PFPeA		2.0
	01/05/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.4
	03/10/21	Perfluorooctanesulfonic acid			3.5
	03/10/21	Perfluorooctanoic acid	PFOA	5.1	2.2

SLR Tait St. Diversion	03/15/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.7
	04/07/21	Perfluorooctanesulfonic acid			2.0
	05/05/21	Perfluorooctanesulfonic acid			2.2
	06/02/21	Perfluorooctanesulfonic acid			2.3
	07/14/21	Perfluorobutanesulfonic acid	PFBS	500	2.1
	07/14/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.4
	07/14/21	Perfluorooctanoic acid	PFOA	5.1	2.1
	07/14/21	Perfluoropentanoic acid	PFPeA		2.0
	09/08/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.1
SLR Felton Diversion	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	2.4
	11/18/20	Perfluorobutanoic acid	PFBA		4.5
	11/18/20	Perfluorohexanoic acid	PFHxA		3.2
	11/18/20	Perfluorooctanesulfonic acid	PFOS	6.5	5.0
	11/18/20	Perfluorooctanoic acid	PFOA	5.1	3.9
	11/18/20	Perfluoropentanoic acid	PFPeA		3.5
	12/14/20	Perfluorobutanesulfonic acid	PFBS	500	2.9
	12/14/20	Perfluorobutanoic acid	PFBA		3.8
	12/14/20	Perfluorooctanesulfonic acid	PFOS	6.5	2.2
	12/14/20	Perfluoropentanoic acid	PFPeA		3.0
	02/03/21	Perfluorobutanoic acid	PFBA		2.0
	03/10/21	Perfluorooctanesulfonic acid	PFOS	6.5	3.6
	03/10/21	Perfluorooctanoic acid	PFOA	5.1	2.0
	03/15/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.3
	04/07/21	Perfluorooctanesulfonic acid			2.1
	06/02/21	Perfluorooctanesulfonic acid			2.5
	07/14/21	Perfluorohexanoic acid	PFHxA		2.0
	07/14/21	Perfluorooctanesulfonic acid	PFOS	6.5	3.3
	07/14/21	Perfluorooctanoic acid	PFOA	5.1	2.4
	07/14/21	Perfluoropentanoic acid	PFPeA		2.0
	09/08/21	Perfluorooctanesulfonic acid	PFOS	6.5	2.1

Table 21. Summary of Unregulated PFAS Parameters Measured in Upper Watershed locations between October 2020 and September 2021

Upper Watershed Locations					
Sample Location	**Date**	**Analyte**	**Acronym**	**California Notification Level (ppt)**	**Result (ppt)**
Upper Laguna	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	10.0
	11/18/20	Perfluorobutanoic acid	PFBA		12.0
	11/18/20	Perfluorohexanesulfonic acid	PFHxS		4.9
	11/18/20	Perfluorohexanoic acid	PFHxA		4.5
	11/18/20	Perfluorooctanoic acid	PFOA	5.1	2.7
	11/18/20	Perfluoropentanoic acid	PFPeA		4.0
	01/27/21	Perfluorobutanesulfonic acid	PFBS	500	2.1
	01/27/21	Perfluorobutanoic acid	PFBA		3.4
SLR Highlands Park	11/18/20	Perfluorobutanesulfonic acid	PFBS	500	3.3
	11/18/20	Perfluorobutanoic acid	PFBA		7.0
	11/18/20	Perfluorohexanoic acid	PFHxA		2.7
	11/18/20	Perfluorooctanesulfonic acid	PFOS	6.5	3.8
	11/18/20	Perfluorooctanoic acid	PFOA	5.1	2.0
	11/18/20	Perfluoropentanoic acid	PFPeA		2.6

More information on PFAS in drinking water can be found here:
https://www.waterboards.ca.gov/pfas/
https://www.epa.gov/pfas

2.6.5 Contaminants of Emerging Concern

Compounds identified as contaminants of emerging concern (CEC) is a somewhat loose term, but refers to chemicals that are unregulated and originate from pharmaceuticals, personal care products, flame retardants and insect repellent. Some compounds are known or suspected to be potentially endocrine disrupting, and may produce adverse development, reproductive, neurological, and immune effects both in humans and wildlife. The presence of CECs in water indicates potential impacts from human activity including recreation and septic systems.

The Santa Cruz Water Department's Water Quality Laboratory (WQL) voluntarily began monitoring for 96 CEC compounds in 2015. In Water Year (WY) 2021, additional routine and storm event CEC monitoring was implemented to evaluate potential impacts from the CZU Lightning Complex Fire. A summary of the detected CEC results for WY 2021 are shown in Tables 22-24.

Nineteen different CECs were detected during WY 2021 from the following locations: Liddell Spring, Laguna Diversion, Upper Laguna Creek, SLR Felton Diversion, SLR Tait St. Diversion, SLR Highlands Park, and the Graham Hill Water Treatment Plant (GHWTP) finished water. Six of the 19 CECs detected were found in the GHWTP finished water including1,7-Dimethylxanthine, acesulfame-K, caffeine, DEET, salicylic acid, and sucralose. The most commonly detected CECs during WY 2021 were acesulfame-K and sucralose (artificial sweeteners), caffeine, and DEET (insect repellent).

CECs were detected throughout the WY in the San Lorenzo River (SLR), with the most diversity found in the first flush event of the WY (November 18, 2020) and also during the dry season when there are lower rates of flow and an increase in animal activity, as well as human recreation occurring in the SLR. During the largest storm of the year (January 27, 2021), CEC detections were less frequent, likely a result of dilution by rainwater.

In August 2016, the SCWD published a report on CECs. The report can be found here:
https://www.cityofsantacruz.com/home/showpublisheddocument/85113/637605783033530000

More information on CECs in drinking water can be found here:
https://www.epa.gov/wqc/contaminants-emerging-concern-including-pharmaceuticals-and-personal-care-products

Table 22. Summary of Unregulated Contaminants of Emerging Concern (CECs) Measured in Source Waters, Upper Watershed Locations, and Finished Water between October 1, 2020 and January 5, 2021. All results are reported in parts per trillion (ppt).

		11/18/20			12/02/20			12/14/20				12/28/20			01/05/21		
Detected Analytes	Compound Class	Liddell Spring	SLR Tait St. Diversion	SLR Felton Diversion	SLR Tait St. Diversion	SLR Felton Diversion	GHWTP Finished Water	SLR Tait St Intake	SLR Felton Diversion	Upper Laguna	SLR at Highlands	Laguna Diversion	SLR Tait St. Diversion	SLR Felton Diversion	SLR Tait St. Diversion	SLR Felton Diversion	SLR Highlands
1,7-Dimethylxanthine	Caffeine Degradate		0.01	0.009													
Acesulfame-K	Sugar Substitute		0.06	0.05					0.03		0.03						
Caffeine	Stimulant		0.17	0.11				0.07	0.08		0.06		0.03	0.02	0.05	0.03	0.03
Carbamazepine	Anti-Seizure																
Cotinine	Nicotine Degradate			0.01													
DEET	Mosquito Repellant		0.11	0.04	0.02	0.03		0.02	0.03		0.02		0.02	0.02	0.01	0.02	0.01
Diuron	Herbicide			0.009				0.01							0.01		
Erythromycin	Antibiotic									0.01		0.01					
Iohexol	X-ray Contrast Agent																
Metolachlor	Herbicide																
Propylparaben	Preservative																
Quinoline	Phosphate Pesticide												0.02	0.02			
Salicylic Acid	Antiseptic	0.52					1.2						0.36			0.27	
Sucralose	Sugar Substitute		0.18	0.17					0.14		0.12				0.11	0.14	
Sulfadiazine	Sulfa Antibiotic																
TCEP	Flame Retardant		0.02					0.02									
TCPP	Flame Retardant																
Theophylline	Caffeine Degradate		0.02	0.01													
Triclocarban	Antibacterial																

Table 23. Summary of Unregulated Contaminants of Emerging Concern (CECs) Measured in Source Waters, Upper Watershed Locations, and Finished Water between January 13, 2021 and March 17, 2021. All results are reported in parts per trillion (ppt).

		01/13/21		01/27/21	01/28/21	02/03/21		02/10/21		03/09/21		03/10/21		03/15/21		03/17/21
Detected Analytes	Compound Class	SLR Tait St. Diversion	SLR Felton Diversion	SLR Tait St Intake	SLR Tait St. Diversion	SLR Tait St. Diversion	SLR Felton Diversion	SLR Tait St. Diversion	SLR Felton Diversion	SLR Tait St. Diversion	SLR Felton Diversion	SLR Tait St. Diversion	SLR Felton Diversion	SLR Tait St. Diversion	SLR Felton Diversion	GHWTP Finished Water
1,7-Dimethylxanthine	Caffeine Degradate			0.16												
Acesulfame-K	Sugar Substitute					0.05	0.05	0.04	0.04	0.05	0.07	0.05	0.05	0.06	0.04	0.04
Caffeine	Stimulant				0.01	0.02	0.01			0.01	0.02	0.04	0.08	0.05	0.03	
Carbamazepine	Anti-Seizure															
Cotinine	Nicotine Degradate															
DEET	Mosquito Repellant	0.02	0.02		0.01			0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01
Diuron	Herbicide				0.005								0.005			
Erythromycin	Antibiotic															
Iohexol	X-ray Contrast Agent															
Metolachlor	Herbicide															
Propylparaben	Preservative															
Quinoline	Phosphate Pesticide								0.03							
Salicylic Acid	Antiseptic									0.20		0.23	0.29	0.24	0.21	0.20
Sucralose	Sugar Substitute		0.10			0.14	0.16	0.17	0.23	0.21	0.23		0.14	0.12	0.22	0.23
Sulfadiazine	Sulfa Antibiotic												0.007			
TCEP	Flame Retardant				0.01											
TCPP	Flame Retardant															
Theophylline	Caffeine Degradate															
Triclocarban	Antibacterial		0.07			0.09										

Table 24. Summary of Unregulated Contaminants of Emerging Concern (CECs) Measured in Source Waters, Upper Watershed Locations, and Finished Water between April 7, 2021 and September 8, 2021. All results are reported in parts per trillion (ppt).

		04/07/21			05/05/21			06/02/21			07/14/21			08/11/21			09/08/2021	
Detected Analytes	Compound Class	SLR Tait St. Diversion	SLR Felton Diversion	GHWTP Finished Water	SLR Tait St. Diversion	SLR Felton Diversion	GHWTP Finished Water	SLR Tait St. Diversion	SLR Felton Diversion	GHWTP Finished Water	SLR Tait St. Diversion	SLR Felton Diversion	GHWTP Finished Water	SLR Tait St. Diversion	SLR Felton Diversion	GHWTP Finished Water	SLR Tait St. Diversion	SLR Felton Diversion
1,7-Dimethylxanthine	Caffeine Degradate			0.005							0.008			0.008	0.005		0.02	
Acesulfame-K	Sugar Substitute	0.04	0.04	0.04	0.04	0.08	0.05	0.03	0.04		0.02	0.03						
Caffeine	Stimulant				0.01						0.02			0.02	0.01	0.03	0.03	
Carbamazepine	Anti-Seizure								0.005			0.005			0.005			
Cotinine	Nicotine Degradate																	
DEET	Mosquito Repellant	0.01	0.02	0.01	0.10	0.04	0.02	0.04	0.17	0.09	0.30	0.04	0.02	0.37	0.05	0.03		
Diuron	Herbicide																	
Erythromycin	Antibiotic																	
Iohexol	X-ray Contrast Agent				0.03													
Metolachlor	Herbicide							0.02	0.005									
Propylparaben	Preservative														0.04			
Quinoline	Phosphate Pesticide																	
Salicylic Acid	Antiseptic							0.32			0.35	0.41		0.33	1.0			
Sucralose	Sugar Substitute	0.17	0.18	0.12		0.12			0.12						0.11		0.11	0.16
Sulfadiazine	Sulfa Antibiotic																	
TCEP	Flame Retardant																	
TCPP	Flame Retardant										0.33	0.41	0.04	0.23	0.20			
Theophylline	Caffeine Degradate				0.01			0.01						0.01			0.03	
Triclocarban	Antibacterial																	

Section 3: Conclusions and Next Steps

During water year (WY) 2021, the Santa Cruz Water Department's (SCWD) Water Quality Laboratory (WQL) collected weekly, biweekly, monthly, and quarterly water quality samples from the source water and upper watershed locations. In addition, the rising, peak and falling limbs of the hydrograph for nine storm events were sampled between the months of October 2020 and May 2021, with the most significant rainfall occurring on January 27, 2021. As expected, elevated color, turbidity, dissolved organic carbon (DOC), total organic carbon (TOC), total coliform/*E. coli*, and metals (primarily aluminum, arsenic, iron, lead, and manganese) were observed in the SCWD's source water and upper watershed locations during the wet season, particularly during the large storm event on January 27th. Routine follow-up monitoring confirmed that within a few days, once the precipitation and streamflow rate decreased, water quality results returned to baseline levels. Water quality was generally better in the North Coast sources, including Liddell Spring and Laguna and Majors creeks. Water quality in the San Lorenzo River (SLR) reflects a greater degree of development in the watershed along with a high concentration of septic systems.

Unregulated contaminants of emerging concern (CECs) that include pharmaceuticals and personal care products such as caffeine, DEET, and sucralose and Per- and polyfluoroalkyl substances (PFAS) were detected in small amounts in the SLR throughout the WY. Fire related parameters associated with urban and rural run-off, such as asbestos, were not detected, however, three dioxin and furan chemicals were detected in Laguna Creek, SLR Tait St. Diversion, and SLR Highlands Park. Radiological compounds (including radium 226, radium 228, gross alpha, and uranium) were detected during the January 27, 2021 storm in the SLR; all results were below the primary drinking water standards. The treated water leaving the Graham Hill Water Treatment Plant (GHWTP) continuously met all State and Federal drinking water standards during the WY.

Given that the post CZU Wildfire Source Water Monitoring Plan consisted of an increased routine and storm event sampling frequency, as well as an expanded analysis list including fire related unregulated parameters, it is difficult to determine if results are influenced by runoff from the CZU Wildfire. Continued monitoring of all sources and upper watersheds will be necessary to establish trends and determine long term affects from the CZU Lightning Complex Fire. The WQL has continued the source water monitoring program in WY 2022 (October 1, 2021-September 30, 2022).

Section 4: References

Standard Methods for the Examination of Water and Wastewater 22nd Edition

Final Report: Graham Hill Water Treatment Plant Source Water Quality Monitoring Study February 25, 2019 (Trussell Technologies)
https://www.cityofsantacruz.com/home/showpublisheddocument/85111/637605780723170000

City of Santa Cruz Graham Hill Water Treatment Plant Facility Improvements Project Technical Memorandum AECOM December 3, 2021

TMDL Report for the San Lorenzo River, Soquel Creek, and Aptos Creek Watersheds September 2021

San Lorenzo River and North Coast Watersheds Sanitary Survey Update February 2018 (Kennedy/Jenks Consultants)
https://www.cityofsantacruz.com/home/showpublisheddocument/85117/637605784635270000

2020 Consumer Confidence Report
https://www.cityofsantacruz.com/home/showpublisheddocument/84858/637594518948170000

Constituents of Emerging Concern, August 2016 Monitoring Report
https://www.cityofsantacruz.com/home/showpublisheddocument/85113/637605783033530000

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4.6 PUBLIC SERVICES & UTILITIES

4.6.1 ENVIRONMENTAL SETTING

IN THIS SECTION:

- Regulatory Overview
- Fire Protection Services
- Police Protection Services
- Parks and Recreation
- Schools
- Wastewater Treatment
- Solid Waste Disposal
- Electrical & Natural Gas Utilities

This section provide the environmental setting for each of the public services and/or utilities listed above. Section 4.6.3 of this chapter provides the impact analyses for each of these services.

REGULATORY OVERVIEW

There are a number of state laws and regulations governing the provision of specified services. These are discussed below under the applicable service topic.

Pursuant to State law (Government Code Section 54773 et seq.) a Local Agency Formation Commission (LAFCO) was established in each county to promote the orderly development of local government agencies and efficient provision of services, to guide development away from prime agricultural land and to discourage urban sprawl. Pursuant to State law, LAFCOs must adopt a Sphere of Influence (SOI) for each governmental agency (including special districts), which is the probable physical boundary and service area of a local government. LAFCO is required to review and approve or disapprove governmental boundary change proposals with regards to spheres of influence, annexation, detachment, reorganization and/or extending services of a local agency.

The California Government Code Section 56430 requires LAFCOs to conduct Municipal Services Reviews (MSRs) that describe the municipal services provided by the agencies that are subject to LAFCO authority. MSRs are comprehensive studies designed to collect and analyze information about the governance structures and efficiencies of service providers, to estimate their ability to meet current and future service needs, and to identify opportunities for greater coordination and cooperation between providers. The Santa Cruz LAFCO completed its report in August 2005, and LAFCO approved the countywide service review in December 2007 (Resolution No. 2007-9). The review is a comprehensive overview of public services within Santa

Cruz County and includes the four cities and over 80 special districts providing municipal-type services such as water, wastewater service, fire protection, police protection, recreation and parks and solid waste. Pertinent findings are provided below for each service.

FIRE PROTECTION SERVICES

Regulatory Setting

The Uniform Fire Code published by the International Fire Code Institute and the Uniform Building Code (adopted in California as the California Building Standards Code) published by the International Conference of Building Officials both prescribe performance characteristics and materials to be used to achieve acceptable levels of fire protection. Amendments to the California Building Standards effective in 2008 increased the requirements for defensible space and require more fire-resistant building materials and design than prior codes in areas identified as having severe fire hazards.

The Federal Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390), adopted by Congress in October 2000, requires state and local governments to develop hazard mitigation plans as a condition for federal grant assistance. The City of Santa Cruz adopted its "Local Hazard Mitigation Plan" in September 2007. The detailed five-year plan identifies potential natural and man-made hazards, assesses their likely risk, and includes mitigation methods to reduce risks. The potential hazards identified in the plan include wildfires. Mitigation measures proposed to address these risks generally include prioritized actions that include hazard event planning, emergency prepardedness coordination and education, facility upgrades, monitoring actions and other actions in response to specific hazards. The mitigation plan will be reviewed and updated every five years.

Existing Facilities, Staff and Operations

The City Fire Department provides fire protection and emergency response for all areas within the City limits and maintains mutual aid agreements with other fire districts in the County, UCSC and California Department of Forestry (CDF) to provide fire protection to areas surrounding the City. The City serves the Paradise Park subdivision through an annexation to the service area that was approved by the Local Agency Formation Commission (LAFCO) of Santa Cruz County.

The City of Santa Cruz Fire Department operates out of three fire stations and houses its administrative functions at an office downtown. The three existing City fire stations are: Fire Station #1 at 711 Center Street, Fire Station #2 at 1103 Soquel Avenue, and Fire Station #3 at 335 Younglove Avenue. All facilities meet current building codes, including seismic retrofitting, fire sprinklers, and new electrical systems. The Department also maintains a Marine Rescue Headquarters (Station Four) on the Municipal Wharf.

The Department has five fire engines, one fire truck, and other related vehicles and equipment. The Department addresses its equipment and facilities needs through its planning efforts and budgeting process. The City's Fire Department is funded through the City's General fund.

The Department currently is staffed by 18 full-time firefighters, 12 fire engineers, 13 captains, three battalion chiefs, one fire chief, one fire prevention inspector and one deputy fire marshall, two division chiefs, one EMS program manager, and two administrative staff. Each shift has 15 assigned firefighters. The current level of firefighters represents approximately 0.75 firefighter (less than one) per 1,000 residents. The Fire Department has a minimum staffing standard of 12 firefighters and one battalion chief on duty per day.

The number of service calls received by the fire department in 2009 was approximately 6,850 calls. The majority of the calls are for non-fire emergencies, with about 80% of the calls being for medical assistance. Average response times from each of the three fire stations is approximately 3 to 3½ minutes. The Department's goal is to respond to emergency medical calls in less than five minutes 90% of the time and to fire emergency calls within eight minutes 90% of the time.

The existing number of fire stations and equipment/facilities are considered adequate to provide service throughout the City, except that the Department does not have a Training Facility, the construction of which is included as a recommendation in the Department's "Three Year Strategic Plan, 2009-2011." The Plan also recommends improvements to apparatus bays at Stations One and Three to accommodate new equipment, and investigation of constructing a new fire station at the present Station Two location and relocation of Station Four (Marine Rescue Headquarters). In the long-term the Department would like to relocate its downtown station and administration facilities in a combined facility with a Training Facility (Oliver, Ramos, personal communication, April 2011).

Wildland Fire Hazard

In addition to fires within developed City areas, the City is subject to "wildfires" in open space preserves and parks adjacent to developed areas. Wildfires are typically caused by human activities and are affected by the type and amount of vegetation, weather, fuel and topography. Wildland fire may be defined as any unwanted fire involving outdoor vegetation. The wildland/urban interface refers to development that has occurred in or near open space areas (City of Santa Cruz, September 2007).

Wildland fires present a risk to open space areas within the City of Santa Cruz and to adjacent residential homes. There are five wildland/urban interface areas within the City, including three areas designated as mutual threat zones – Delaveaga Park, Pogonip, and the Arroyo Seco/Meder Canyon (City of Santa Cruz, September 2007). Additional areas of concern for these wildland/urban interface zones include the Arana Gulch greenbelt property and Moore Creek Preserve, as well as Lighthouse Field and other smaller wildland/urban interface areas throughout the City (Ibid.). Figure 4.6-1[1] identifies areas of the City that pose serious wildfire hazards due to vegetation type, vegetation build-up and topographic conditions.

Mutual threat zones are defined as areas where a wildfire would threaten property within the City of Santa Cruz fire service area, as well as property covered by another fire protection

[1] All EIR figures are included in Chapter 7.0 at the end of the EIR (before appendices) for ease of reference as some figures are referenced in several sections.

service. For major emergencies that require more resources than can be provided by a single agency, the City of Santa Cruz, Santa Cruz County, the University of California at Santa Cruz and the State of California have an extensive mutual aid and emergency coordination system. The mutual threat zones are delineated in the Wildland Pre-Suppression Plan, which is used to identify non-State responsibility areas in which any fire is considered a threat to adjacent State responsibility areas. These geographic areas are designated because of the urban development that has occurred along their canyons and the vegetation types that are considered to pose a significant wildfire hazard (City of Santa Cruz, September 2007).

Recent wildland fires in the City of Santa Cruz include the Meder Canyon Fire in 1990, which covered several acres and was consumed in 20 minutes. A number of other wildland fires in the Santa Cruz area including the Santa Cruz Mountains have been a long-standing concern to the City of Santa Cruz. Priorities in the event of a wildfire are life safety, preservation of property and resource conservation (City of Santa Cruz, September 2007). Despite the fact that there has not been a recent wildland fire within the city limits, areas targeted in the City's Hazard Reduction Plan as "likely" to have a wildland fire include the Arroyo Seco/Meder Canyon, DeLaveaga, Pogonip, Moore Creek area and Arana Gulch (Ibid.), although wildland fires can occur in other areas. Increasing use of these areas by residents, transient encampments with fires and young adults exacerbates the risks (Ibid.).

Most wildland fire areas are adjacent to residential or open space areas. Only a few public buildings are immediately threatened by wildland fires. Public buildings that are in threatened areas are the historic Pogonip clubhouse, DeLaveaga Golf Club and associated buildings, 35 schools and day care centers and some park structures. There are eight commercial or industrial structures in the threat zone (City of Santa Cruz, September 2007).

POLICE PROTECTION SERVICES

The City of Santa Cruz Police Department provides crime protection and prevention activities throughout the City, including patrols, response to calls, education and community outreach. Its range of services include patrol, investigations, traffic, parks unit, street crimes unit, gang unit, dive team, hostage negotiation team, tactical team and School Resource office. The Department recently initiated an application for mobile phones/IPADs that allows citizens to download Crime Alerts and crime tips. The City has mutual aid agreements with county law enforcement (Sheriff's Office, Capitola, Scotts Valley, Watsonville, California Highway Patrol, State Parks and UCSC Police Departments).

The Police Department operates out of one police station/headquarters, located in downtown Santa Cruz. The Department is currently staffed by 94 authorized sworn officer positions, of which 88 are filled, 24 non-sworn (civilian) positions, including four community service officers, and three administrative staff. The current staff level represents a per capita ratio of approximately 1.57 sworn police officers per 1,000 city residents. A ratio of 1.5 officers per 1,000 population has been a national accepted minimum standard (Vogel, personal communication, April 2011). The Department has lost approximately ten sworn officers since 2000, and currently is understaffed by at least six officers (Ibid.).

The Department has divided the City into five main beats, and handled 78,132 calls in 2008 and 85,774 calls in 2009. The average response time is four minutes, 22 seconds, which is under the Department's target of four minutes, 30 seconds. Dispatching services are provided through the Santa Cruz Consolidated Emergency Communications Center.

The City of Santa Cruz funds its Police Department through the City's General Fund, grants, fees and service charges. The City also has a special revenue fund to account for state and federal grants received for police programs. The Department' existing facility and vehicles are adequate for the existing population; major capital improvements including replacing the building HVAC with an energy efficient system (Vogel, personal communication, April 2011).

PARKS AND RECREATION

Santa Cruz offers residents and visitors a wide range of parks, open space, beaches, trails, and recreational opportunities. The City has responsibility for management, maintenance and operation of over 1,700 acres of parks and open space lands, and various community/recreational facilities, and oversees development of new parks and improvements within City-owned parks, open space, and community facilities. The City also manages the Heritage Tree Program, Urban Forest Program, as well as maintains street and median landscaping in public rights-of-way.[2] Within the City limits, open space and beaches are also provided on State-owned lands, including three State Park units and the University of California campus. Maintenance operations of existing City-owned parks and recreational facilities are funded from the City's General Fund.

Regulatory Setting

STATE REGULATIONS

The Quimby Act (California Government Code §66477) was passed in 1975 and authorizes cities and counties to pass ordinances requiring developers to set aside land, donate conservation easements, or pay fees for park improvements. This provision of the State Subdivision Map Act enables cities and counties to require the dedication of land and/or payment of in-lieu fees for parks and recreation purposes as a condition of approval of a tentative map or parcel map subdivision. AB 1600 amended the Quimby Act in 1982 to hold local governments more accountable for imposing park development fees. The AB 1600 amendment requires agencies to clearly show a reasonable relationship between the public need for the recreation facility or park land and the type of development project upon which the fee is imposed. Cities and counties are required to show a strong direct relationship, or nexus, between the park fee exactions and the proposed project. Local ordinances must include definite standards for determining the proportion of the subdivision to be dedicated and the amount of the fee to be paid by the developer. AB 2936 was adopted as an amendment to

[2] Heritage trees and urban forest policies and actions are addressed in the BIOLOGICAL RESOURCES (Chapter 4.8) and AGRICULTURAL, FOREST AND MINERAL RESOURCES (Chapter 4.15) sections of this EIR.

the Quimby Act in 2002, and allows counties and cities to spend up to 10% of their Quimby Act fees to prepare master plans for park and recreation facilities every three years.

LOCAL REGULATIONS

Parks and Recreation Facilities Tax. The City imposes a "Parks and Recreation Facilities Tax" (pursuant to Chapter 5.72 of the Municipal Code) on new residential development (including mobile homes) within the City, payable at the time of issuance of a building permit. The collected taxes collected are placed into a special fund, and "shall be used and expended solely for the acquisition, improvement and expansion of public park, playground and recreational facilities in the city" (section 5.72.100). The current fee is $3.00 per square foot of residential building. Projects that have dedicated land or fees in accordance with Municipal Code Chapter 23.28 (described below) are exempt from this tax.

Public Dedications Pursuant to the California Subdivision Map Act. Chapter 23.28 regulates public dedications, including parks and open space, enacted pursuant to the authority granted by the California Subdivision Map Act in accordance with the City General Plan. Land dedication shall be based on two acres/1,000 population for neighborhood parks and 2.5 acres/1,000 population for community parks. The current in-lieu fee is $3.00/square foot for each residential dwelling unit to be constructed in the subdivision. Where the residential dwelling unit square footage is not specified as part of the plans for the project, a fee of $4,780.00 per residential lot is required under the current regulations. Payment shall be at the time of the filing of the final subdivision or parcel map.

Pursuant to section 23.28.020.1 of the City's Municipal Code, dedication of land or payment of fee in lieu thereof, or both, may be a condition of approval of a final subdivision map or parcel map for park or recreational purposes. (Condominium conversions are exempt from dedication requirements.) The dedication shall be for usable open space that is composed of land that offers natural advantages for the type of facilities to serve the subdivision. A fee in lieu of such dedication shall be required, when no portion of the proposed usable open space is planned to be located within the limits of the subdivision. Only the payment of a fee may be required in the case of a subdivision of fifty or fewer parcels. Section 23.28.020.4 requires establishment of a permanent maintenance program for usable open space lands dedicated under these provisions of this title.

Pursuant to section 23.28.020.3, natural ravines and natural waterways or other natural areas within the boundaries of a subdivision shall be reserved for public purposes, such as recreation, stormwater disposal, etc., as provided by the General Plan and Coastal Land Use Plan through dedications or easements for public use. Pursuant to section 23.28.040 and in accordance with, the provisions of Article 3.5 of the Subdivision Map Act, the General Plan, and Coastal Land Use Plan, the city shall increase public access to the public natural resources in conjunction with the review of subdivisions of land.

Parks, Community Facilities, and Recreational Programs

The City of Santa Cruz offers a range of neighborhood parks, community/regional parks, community facilities, and recreational programs. Most of these parks, facilities and programs are operated and maintained by the City Parks and Recreation Department. Some facilities

and programs are operated and organized in partnership with community organizations. These parks, facilities and programs provide recreational opportunities for residents and visitors of all ages and interests.

NEIGHBORHOOD AND COMMUNITY/REGIONAL PARKS

Neighborhood Parks. Neighborhood parks serve the recreational needs of those living within the City's primarily residential neighborhood areas. Neighborhood parks provide recreational facilities such as children's play areas, playing fields, basketball and tennis courts, and picnic areas. Some of the City's community garden plots are also located within neighborhood parks. Community garden provide residents with a space to grow small scale vegetable gardens.

The City's standard is to provide neighborhood parks at a ratio of 2.0 acres per 1,000 people. The location of neighborhood parks is ideally within approximately one-half[3] mile of neighborhood areas. There are 23 existing neighborhood parks, as summarized on Table 4.6-1and shown on Figure 4.6-2, which total approximately 57 acres. There are approximately 45 acres of school playing fields, for a total of approximately 102 acres of neighborhood parks within the City. In accordance with the City's existing General Plan, neighborhood park acreages include both City and non-City managed lands such as public school playing fields. The City of Santa Cruz and City School Districts entered into a joint use agreement in 1963 that allow use of selected school playground facilities and indoor facilities to the City and use of City facilities by the school districts..

To meet increasing demand for off-leash dog use, the Parks and Recreation Department has also designated off-leash areas within neighborhood parks throughout the City. These areas may be fenced or designated through signage. The City has designated the following parks as being available to off-leash dog use:

- DeLaveaga Park (service road into Lower DeLaveaga Park): sunrise to sunset.
- Frederick Street Park: off-leash area from sunrise to sunset.
- Grant Street Park: within off-leash area from sunrise to sunset.
- Mitchell's Cove Beach: before 10AM and after 4PM.
- Pacheco Dog off-leash area: fenced area from sunrise to sunset.
- University Terrace Park: fenced off-leash area from sunrise to sunset.

Community Parks. Community Parks are designed to serve the entire community. They are generally larger than neighborhood parks and offer facilities such as athletic fields, group picnic areas, bike and skateboard parks, lawn bowling, bocce ball, community meeting/event facilities, swimming pools, and locations for outdoor special events. The City's standard for community/regional parks is 2.5 acres per 1,000 people. Ideally these parks are located within 1.5 miles of neighborhood areas.

[3] The draft General Plan 2030 indicates neighborhood parks should be within one-half of a mile (about five blocks).

There are six existing community parks, totaling approximately 366 acres within the City as summarized below and on Table 4.6-1, and shown on Figure 4.6-2.

- Depot Park (8.5 acres), which opened in 2005, presently features a full-size soccer field, a plaza/public art area, a wood ramp bike park, picnic areas, children's' play features, the rehabilitated historic Depot building used for community and recreational programs, a trail connection through the park to the beach area, restrooms, and parking lots. The Monterey Bay Marine Sanctuary Visitor Center will be developed within the southern portion of Depot Park, across the street from Monterey Bay and the Municipal Wharf. The Depot Park Master Plan also includes a future site for the Natural History Museum.
- Harvey West Park (55 acres) presently features ball fields, group picnic areas, a children's playground, two outdoor swimming pools, the Clubhouse/Scouthouse, Wagner and Kids cottages, a Park Rangers' facility, restrooms, and parking areas. The park also features trails through the woodlands, including a trail connection to the adjacent Pogonip trail system. In recent years the pool has been closed seasonally due to City budget constraints and most recently has been operated by a private entity on a limited basis.
- Lower DeLaveaga Park (35 acres) presently features two soft ball fields, a large turf area, a bocce ball court, a volleyball court, a children's playground, individual and group picnic areas, restrooms and parking lots. Branciforte Creek flows along the western edge of the park, with the forested hillsides of the DeLaveaga greenbelt property rising along the eastern boundary of the developed park. Trail entrances at the edges of the park connect to the trail system within the DeLaveaga greenbelt.
- DeLaveaga Golf Course (250 acres) is part of DeLaveaga Park and includes a golf course, clubhouse and other open space land used for passive recreation.
- San Lorenzo Park (13 acres) presently features an open turf area along the San Lorenzo River, a duck pond and stage, a lawn bowling facility, a children's' playground, paved trails, and a restroom. The turf area often serves as a location for outdoor special events.
- Ken Wormhoudt Skate Park AY Mike Fox Park (4 acres), located along the San Lorenzo River further to the south, features the Ken Wormhoudt Skate Park and a roller-hockey practice area. The 15,000 square foot concrete skate park includes a full pipe, bowls and street skating features.

Regional Parks. Regional parks serve the recreational needs of a regional population and are 150 acres in size or larger. They offer active and passive recreation with activities and amenities not found in neighborhood and community parks, such as large areas of open space, large picnic facilities, golf courses, lake boating, ball fields, multi-use trails. An accepted national standard for regional parks is 20 acres per 1,000 people. City residents are in close proximity to a number of regional parks, each offering an array of activities. These parks include: DeLaveaga Park (upper) and greenbelt preserves within the City, and nearby Henry Cowell and Wilder Ranch State Parks (see Figure 1-2). State and municipal beaches and the Yacht Harbor also offer recreational opportunities serving the regional community as further discussed below.

TABLE 4.6-1: City Parks and Open Space Lands

TYPE	FACILITY	SIZE (in acres)
Neighborhood Parks		
	▪ Beach Flats Park – 122 Raymond St.	0.3
	▪ Bethany Curve Greenbelt – Delaware to West Cliff	2.6
	▪ Central Park – 301 Dakota St.	0.2
	▪ Derby Park – 509 Woodland Way	3.8
	▪ Frederick Street Park – 168 Frederick Street	4
	▪ Garfield Park – 624 Almar Ave.	1.8
	▪ Grant Park – 150 Grant St.	2.4
	▪ John Franks Park – Marnell St.	0.3
	▪ Laurel Park – 301 Center St.	1
	▪ Lighthouse Neighborhood Park – Lighthouse Ave.	1.7
	▪ Mission Plaza – 103 Emmet St.	1
	▪ Moore Creek Overlook – Cypress St.	0.12
	▪ Lower Ocean Street Park – 258-262 San Lorenzo Blvd.	0.5
	▪ Ocean View Park – 102 Ocean View Ave.	2.5
	▪ Rincon Park – 601 Chestnut St.	0.1
	▪ Poets Park – 200 Raymond St.	0.13
	▪ Rincon Park – 601 Chestnut St.	0.1
	▪ Round Tree Park – 205 Nobel	0.13
	▪ Star of the Sea – Frederick St. & Darwin St.	2.1
	▪ Trescony – Trescony St.	2
	▪ Tyrell Park – Santa Cruz Museum	1.5
	▪ University Terrace – Meder Street	8.5
	▪ West Cliff	14.5
	▪ Westlake Park – Bradley Dr. @ Spring St.	6
	▪ School Playing Fields [1]	44.6
	TOTAL ACRES (rounded)	102
Community Parks [2]		
	▪ Depot Park	8.5
	▪ Harvey West Park	55
	▪ DeLaveaga Park – Lower	35
	▪ DeLaveaga Golf Course	250
	▪ San Lorenzo Park – 137 Dakota St.	13
	▪ Ken Wormhoudt Skate Park at Mike Fox Park	4
	TOTAL ACRES (rounded)	366
Greenbelts & Open Space Lands with Recreational Uses		
	❑ Arana Gulch – Agnes St.	68.9
	❑ Arroyo Seco Canyon – Meder St.	N/A
	❑ DeLaveaga Park – Upper (minus Golf Course)	275
	❑ Jessie Street Marsh	2.29
	❑ Moore Creek Preserve	246
	❑ Neary Lagoon – 100 California St.	44
	❑ Pogonip – 333 Golf Club Drive	640
	TOTAL ACRES (rounded)	1,276

CONTINUED ON NEXT PAGE

TABLE 4.6-1: City Parks and Open Space Lands

TYPE	FACILITY	SIZE (in acres)
City-Owned Beaches		
	❑ Main Street Beach	26.4
	❑ Cowell Beach	4.9
	❑ Wharf	8.2
	❑ Mitchell's Cove	0.4
	❑ Its Beach (west portions)	N/A
	TOTAL ACRES (rounded)	40

[1] School sites are given credit for ¾ of their field acreage at: Santa Cruz & Harbor High Schools; Branciforte and Mission Hill Middle Schools; Bay View, DeLaveaga, Loma Prieta, Gault, Branciforte & Westlake Elementary Schools; Pacific Collegiate School; Holy Cross
[2] Loch Lomond Park (100 Loch Lomond Way, Felton) provides recreational opportunities outside City limits.

Existing Park Deficiencies. The City's desired ratio for neighborhood parks is to provide 2.0 acres of parkland per 1,000 people. Given an estimated current population of 58,982 (California Department of Finance, May 2010), a total of 118 acres of neighborhood parkland would be required to meet this level of service. Presently the City has approximately 102 acres of neighborhood parkland (including school play grounds). Thus, the City would require 16 additional acres of neighborhood parkland to meet the current desired level of neighborhood parks. According to the Parks and Recreation Department, recreational programming of services currently meets the community's demand. However, like many local jurisdictions, Santa Cruz experiences a shortage of athletic fields. At this point, no plans or funding exists to increase the number of facilities. Currently one one-half acre neighborhood park (Lower Ocean) is scheduled for construction. No others are currently programmed.

The City's desired ratio for community parks is to provide 2.5 acres of parkland per 1,000 people. Given the current population, a total of 148 acres of community parkland would be required to meet this level of service. The City presently has approximately 366 acres of community parklands, which exceeds the City's desired ratio.

The City of Santa Cruz is not a regional park agency; therefore, the City does not have a desired ratio for regional parks. The City also does not have a desired ratio for open space, but City does, however, provide a substantial level of open space parkland. Together, Pogonip, Arana Gulch, Upper DeLaveaga, Moore Creek Preserve, and Neary Lagoon total approximately 1,500 acres. This represents a ratio of 27 acres of open space per 1,000 people. (Open space and greenbelt lands are discussed further below.)

COMMUNITY FACILITIES, RECREATIONAL PROGRAMS, AND EVENTS

Community facilities, recreational programs, and special events serve the needs and interests of individuals, neighborhoods, groups, and the community of Santa Cruz. Events, held at community facilities and park, attract both residents and visitors.

Community Facilities. Community Facilities provide locales for public events and reservable spaces for concerts, meetings, classes, and other events. In recent years, the City has

coordinated with community organizations regarding operation of some facilities due to City budget constraints. The City owns and maintains a number of community facilities that support social, recreational and special event programs as described below.

- The Civic Auditorium, dedicated in 1940, is located within downtown Santa Cruz. The auditorium provides space for concerts, expos, and meetings.
- Louden Nelson Community Center, located to the south of downtown adjacent to Laurel Park, serves as a multi-cultural center for classes, theatre, events, and recreational programs. The community center was originally constructed as an elementary school, but was later reopened as a City facility in the 1970s.
- The Beach Flats Community Center, presently operated by a community organization, provides programs and services for residents.
- The Harvey West Park Facilities include a community swimming pool and Clubhouse that offer reservable space for community and private events.
- The City-owned Natural History Museum in located within the Seabright neighborhood, on the edge of Tyrell Park overlooking Monterey Bay. The exhibits and programs are housed in the modified 1915 Carnegie library building. The Natural History Museum is presently operated by the Museum Association. A proposed new location for the museum is included in the Depot Park Master Plan.
- The Surfing Museum, also presently operated by the Santa Cruz Surfing Club Preservation Society, is located within the memorial lighthouse at Lighthouse Point.

A community/environmental education center is proposed for the historic Clubhouse in the Pogonip Master Plan but is presently unfunded.

Recreational Programs. Recreational Programs offered by the City Parks and Recreation Department are designed to be affordable and available to residents and nonresidents of all ages and interests. Activities include a variety of classes and outings, sports leagues, and programs for older adults. Classes and programs are held at various City parks, beaches, and community centers, and at other locations such as schools.

Community Events. Community Events offered by the City include a variety of cultural and recreational events attracting residents and visitors. Events sponsored by the City are often held in cooperation with organizations and private entities. Some of the events which have been sponsored by the Parks and Recreation Department over the years include music/art festivals, chowder cook-offs, and outrigger canoe races. The City Parks and Recreation Department also hosts cultural events in coordination with the Sister Cities Committee.

Community Gardens. Community gardens are public and privately owned lands used for small scale flower and vegetable gardens. These gardens—a specialized type of park—provide the community with food, greenery, and therapeutic and relaxing recreation. The gardens can be created on small, undevelopable parcels of land or as temporary uses on other parcels.

Greenbelt and Open Space Lands

Open space lands provide wildlife habitat, protect natural resources, and offer opportunities for recreation, scenic views, and outdoor/environmental education. The City owns and manages over 1,500 acres of greenbelt and open space lands. The greenbelt properties (Arana Gulch, DeLaveaga, Moore Creek Preserve, and Pogonip) provide large acreages of open space and natural areas encircling the City's urban core. Open space and wetland areas within the City's central area include the San Lorenzo River corridor, Neary Lagoon, and Jessie Street Marsh. Moore Creek (east branch) and Arroyo Seco feature undeveloped canyons within the northwestern area of the City.

Within the City limits, State-owned lands also provide open space and protect natural resources. State Park units featuring open space include Natural Bridges State Beach (SB) and Lighthouse Field SB. Beyond the City limits to the west and north, Wilder Ranch State Park and Henry Cowell Redwoods State Park provide vast areas of open space. State parks are described in the following "Coastal Recreation" subsection. The University of California campus lands also feature areas of undeveloped open space. Antonelli Pond, a wetland area within the Moore Creek corridor, is owned and managed by the Land Trust of Santa Cruz County.

Management of natural resources and public use within the City's open space areas is guided by master or management plans. These plans provide a long-term vision for each open space area, including guidelines for protecting and enhancing natural and historic resources, and developing trails and other recreational uses.

CITY-OWNED GREENBELT LANDS

In 1979, the City of Santa Cruz identified six properties along the City's boundaries as Greenbelt lands, totaling approximately 1,500 acres. With only DeLaveaga under City ownership at that time, the City embarked on an effort to acquire and protect 1,000 acres over the next 20 years. Today, the City-owned Greenbelt lands include DeLaveaga, Pogonip, Arana Gulch and Moore Creek Preserve. These sites and other natural areas are further described below.

DeLaveaga, located on the City's northeastern boundary, was donated to the City and County as a public park in the late 1800s by Jose Vicente DeLaveaga. Today, the 525-acre upper DeLaveaga is owned and managed by the City of Santa Cruz. (Some parcels, however, are under state ownership as part of the State Armory). Habitat areas within DeLaveaga include oak woodlands, redwood groves, grasslands, coastal prairie, and the west branch of Arana Gulch creek. A Park Master Plan was prepared for DeLaveaga in 1960, which includes a broad range of proposed uses. The plan was not been updated.

Upper DeLaveaga features the municipal DeLaveaga Golf Course and Clubhouse, a disc golf course, an archery range, an approximately 8-mile network of multi-use trails, and parking areas. A gun range, which had been in existence for approximately 50 years, was closed to public use, and the site was remediated after lead contamination was identified. A Golf Course Master Plan was adopted by the City Council in 2003 and identifies improvements to upgrade the existing golf course, including improvements to the golf course, drainage system, and landscaping, and future construction of a new clubhouse.

Pogonip is located approximately one mile north of downtown Santa Cruz between the University of California campus and the San Lorenzo River corridor. This 614-acre greenbelt was acquired by the City in 1989, and features coastal prairie, woodlands, creeks, springs and a reach of the San Lorenzo River known as Sycamore Grove. An adjacent 25-acre parcel, known as the Wavecrest "greenbelt" parcel, was later purchased by the City in 1997. Pogonip, once part of the Cowell Ranch landholdings, was extensively logged and features historic resources associated with the lime production industry (mid-to-late 18th century). The property also includes a rustic clubhouse, constructed in 1911 as part of the Casa del Rey Golf Course. The two-story Craftsman Bungalow style structure and meadow area were later used for polo grounds. Prior to City ownership, the clubhouse was also used as a private social club, but due to its deteriorated condition, the building has been closed since 1993.

The *Pogonip Master Plan,* adopted by City Council in 1998, addresses public access, recreational uses, historic resource rehabilitation and preservation, and natural resource management and protection. The Master Plan includes a trail system, rehabilitation of the historic clubhouse as a community facility, a permanent agricultural garden site for the Homeless Garden Project, and outdoor education areas. Limited parking within the lower and main meadow areas, minimal improvements to the one-lane access road to the clubhouse, and a Ranger facility are also addressed in the Master Plan. Dogs on-leash are allowed, but off-leash dog and off-trail use is prohibited. Specific uses identified in the plan include:

- A 9-mile trail system featuring both unpaved service roads and single-track trails open primarily to pedestrians.
- A multi-use trail (pedestrians, bicycles, horses) connector trail linking Henry Cowell Redwoods State Park, Pogonip and the University of California property.
- Rehabilitation of the historic clubhouse to serve as a staging area for educational programs, a meeting and retreat center, and a site for special events.
- Preservation and interpretation of the historic limekilns, roads and associated features.
- An outdoor education camp in the lower meadow and a nature/education area within Sycamore Grove.
- A permanent garden site for the Homeless Garden Project.

To date, the trail system has been implemented including a multi-use regional trail connection linking State Park lands, Pogonip, and the UC campus open space. Limited rehabilitation of the historic Clubhouse has occurred, but it remains closed to public access and complete rehabilitation for public use is presently unfunded. At present, the parking lots, outdoor education areas, and Homeless Garden agricultural garden have not yet been implemented.

Arana Gulch, totaling 67.7 acres, is situated along the City's eastern boundary, to the north of the Santa Cruz Harbor. Acquired by the City in 1994, this greenbelt property features coastal prairie, riparian and oak woodland, seasonal wetlands, and the lower reaches of Arana Gulch Creek. Historically the property was used for cattle grazing and dairy operations. The current unimproved trail system, much of which existed prior to City ownership as cattle trails or unpaved access roadways, provides pedestrian, bicycle, and on-leash dog use access.

The *Arana Gulch Master Plan,* adopted by the City in 2006 and pending Coastal Commission approval, includes a trail system featuring paved multi-use trails (wheelchair accessible), a new west entrance and bridge spanning Hagemann Gulch, unpaved pedestrian trails, interpretive displays and overlooks. Most of Arana Gulch would continue to remain undeveloped, with a focus on management and protection of the sensitive habitat areas. No on-site parking or restrooms are proposed within the greenbelt property. Specific public use guidelines contained in the Master Plan are outlined below. The Master Plan also identifies three resource management areas for coastal prairie/Santa Cruz tarplant (30.2 acres), riparian and wetland areas, and Hagemann Gulch riparian woodland; resource management guidelines are included in the Master Plan for each of these areas.

- Provide multi-use wheelchair accessible interpretive trails connecting the surrounding neighborhoods to the Upper Santa Cruz harbor.
- Establish a new west entrance at Hagemann Gulch to provide a trail connection between Arana Gulch and the Seabright neighborhood. Provide a multi-use trail and bridge crossing over Hagemann Gulch, featuring an interpretive overlook.
- Provide a pedestrian-only interpretive loop trail encircling the coastal prairie.
- Improve the existing pedestrian trail along the western edge of the Arana Gulch Creek management area.
- Allow dogs on-leash on designated trails. Prohibit off-leash dog use and off-trail use to avoid impacts to tarplant populations and other plant and animal species.

Moore Creek Preserve is located on the western edge of the City, north of Highway 1 and extending to the UCSC campus. This 246-acre natural area, acquired by the City in 1998, features the west branch of Moore Creek, coastal prairie, and oak woodlands. The State of California holds two conservation easements over the property. Numerous threatened and endangered plant and wildlife species have been documented within the Preserve. Historically the property was used for cattle grazing.

The *Moore Creek Preserve Interim Management Plan*, adopted by City Council in 2002, serves as a guide for management of the Moore Creek Preserve until preparation/approval of a long term Park Master Plan for the property. The State of California conservation easements include restrictions on various uses and activities. Existing interim uses include hiking trails (approximately 3 miles), cattle grazing, and study, preservation, enhancement and protection of native species and their habitat. Dogs are prohibited within the Preserve. The interim trail system is based primarily on trails and unpaved service roads which existed prior to City ownership and are largely a result of cattle grazing operations. No onsite parking, public access road, or restroom facilities are included in the Interim Plan. A coastal development permit was approved for construction of a bridge to mitigate existing trail impacts to Moore Creek. The *Interim Management Plan* also identifies three plant community resource management areas and addresses specific management of habitat areas for special status species.

CITY-OWNED WETLANDS AND OTHER OPEN SPACE

The City owns and manages several other open space and wetland areas in the central area of the City. These include the San Lorenzo River, Branciforte Creek, Jessie Street Marsh, and Neary Lagoon. In the northwest area of the City, Arroyo Seco and Moore Creek (east branch) canyons provide undeveloped open space areas through residential areas.

The San Lorenzo Riverway includes the lower reach of the River through central Santa Cruz, along the eastern edge of the downtown south to Monterey Bay. The river has been channelized since the late 1950s, with extensive native tree and shrub planting completed as part of the levee improvement project in the 1990s. Multi-use paved trails exist on the levee on both sides of the river, except for a short segment in the vicinity of the County Building north of Soquel Avenue.

Recreational opportunities include trail use, nature viewing, bird watching, and fishing. Public access is provided by a continuous paved pathway/service road, extending approximately 2.5 miles on each levee from Highway 1 southward, provides public access. A new pedestrian-bicycle path was developed that extends north from the northern edge of the western levee, under Highway 1 and connects to the Tannery Arts Project residences.

Improved public access is addressed in the *San Lorenzo Urban River Plan*. This document is the outcome of a planning process initiated by City Council in 1999 to update plans for the San Lorenzo River, Jessie Street Marsh, and Branciforte Creek. The plan serves as a guide for restoring and managing natural resources, riverfront development, and public access improvements for the lower San Lorenzo River. It includes conceptual ideas to promote river-oriented development, site specific recommendations for public areas along the river, and restoration recommendations.

Neary Lagoon is a City-owned wetland and natural area situated in the central part of the City. Acquired by the City in 1967, the 14-acre lagoon and surrounding riparian and woodland habitat within the management area total 44 acres. Neary Lagoon was originally an oxbow of the San Lorenzo River that was gradually isolated from the main river channel and reduced dramatically in size over the past century.

The Neary Lagoon Management Plan, adopted by City Council in 1992, is a comprehensive guide integrating previous documents prepared. The Management Plan addresses public access and use, hydrology, water quality, vegetation management and habitat restoration, and wildlife and fishery management. Public access includes an interpretive trail system, nature observation areas, interpretive exhibits, and recreational facilities within designated areas. The access is designed to encourage pedestrian use, including wheelchair accessibility. Most of the public use components of the plan have been implemented. Public use guidelines contained in the Management Plan discourage bicycle riding except on designated through trails, and dogs are prohibited within the management area.

Jessie Street Marsh is a City-owned wetland and open space located just to the north of the San Lorenzo River mouth. Historically, Jessie Street Marsh was part of a large tidal estuary open to the San Lorenzo River. After construction of the river levees, the tidal flows were blocked.

Freshwater continues to flow into the marsh area from storm water runoff and springs along the bluff.

The marsh area presently has informal unimproved pathways, with no developed site amenities. A developed trail descends down the bluff from Ocean View Park, along the southern Jessie Street marsh area, to East Cliff Drive. The *Jessie Street Marsh Management Plan*, adopted by the City Council in 1999, was prepared to provide a long-term plan to preserve and enhance the natural resources of the marsh, improve water quality, manage flood waters, and provide appropriate public access. This plan, not yet implemented due to budget constraints, includes recommendations for trails, interpretive signs, overlook and nature viewing areas and improved access to adjacent Ocean View Park to the northeast. An overview of proposed public access management actions:

- Construct a bridge over the marsh channel and a boardwalk adjacent to the marsh plain near Lemos Avenue and Jessie Street.
- Construct footpaths within the upper and lower marsh areas, including a connection to East Cliff Drive.
- Construct a new trail and steps to Ocean View Park and improve the existing trail connection to the adjacent park.
- Construct gates, fencing and install boulders to inhibit inappropriate public access.
- Install interpretive signs to create a nature walk experience.

Branciforte Creek flows along the boundary of Lower DeLaveaga Park and continues southward, under Highway 1, to its confluence with the San Lorenzo River at the southern end of San Lorenzo Park. The lower one-mile reach of Branciforte creek was channelized in a concrete flood control channel in the late 1950s. From approximately Market Street northward, Branciforte Creek remains a natural channel with native riparian vegetation on the stream banks.

Public trail access is provided along sections of the service access road along the channel. The confluence of the creek and the San Lorenzo River is recognized as an important bird watching area and overlook area. Much of the natural channel is located within private residential properties, though public access is provided along the natural creek channel within Lower DeLaveaga Park. The *San Lorenzo Urban River Plan* includes recommendations for enhancing the creek corridor, improving water quality, and providing interpretive signage.

Arroyo Seco Canyon extends from University Terrace Park/Meder Street southward to just north of Mission Street/Highway 1. An intermittent creek, City sewer line and utility access route extend along the bottom of the canyon. The access route, maintained by the City's Public Works Department, is also used as a trail by residents. Private residential parcels extend into the undeveloped canyon.

Moore Creek Canyon (East Branch) extends from the UC campus lands southward, paralleling Western Drive, to its confluence with the west branch of Moore Creek just north of Highway 1. This corridor features an intermittent creek flowing through a steep-sided canyon bordered by residential areas. The east branch corridor includes private and public parcels.

The *Moore Creek Corridor Access and Management Plan* (1987) includes recommendations for public access, land dedication, open space easements, and resource management. The plan's goal is to provide public access in a manner compatible with private property, existing development, and the constraints of the natural setting. Presently, there is limited public access within the eastern Moore Creek Canyon.

STATE-OWNED OPEN SPACE

Two State Park units, Lighthouse Field and Natural Bridges State Beaches, offer open space and recreational opportunities within the City limits. The UC campus also features large open space areas and trails accessible to the public. State Park General Plans are the primary management documents for State Park units.

Lighthouse Field State Beach (SB) is a 36-acre open space situated along Monterey Bay, featuring coastal terrace, ocean cliffs, and Its Beach. The open space features grassland (primarily non-native), willows, Monterey cypress trees, and eucalyptus groves. The State of California acquired the field area and coastline west of Lighthouse Point in 1978. A 30-year agreement between the State/City/County regarding local management and maintenance of Lighthouse Field SB expired and has not been extended. At present, this State Park unit is managed and operated by California State Parks.

The *Lighthouse Field State Beach General Plan* (1984) identifies two zones within the property. The 32-acre Field Zone is designated as a low intensity use area, featuring trails and open space. The Coastal Zone is designated as a moderate to high-intensity use area, featuring coastal access, the Surfing Museum, a restroom and maintenance facility, picnicking, and parking areas. Use is restricted to day use only, with no overnight parking or camping. The parking lots and restroom/maintenance facility that presently exist were developed further to the south, toward Lighthouse Point, than depicted in the General Plan conceptual development diagram. A parking area along Pelton Avenue that is identified in the Plan has not been constructed. This eucalyptus/cypress grove area is now recognized as overwintering Monarch butterfly habitat.

Natural Bridges State Beach (SB) is a 65-acre open space and wetland situated on Monterey Bay, on the western boundary of the City. Primary resources include the natural rock bridge, a beach, Monarch butterfly over wintering habitat, and the Moore Creek wetland. The initial state park acreage was established in 1933, with additional lands acquired later.

Public facilities identified in the *Natural Bridges State Beach General Plan* (1992) include a visitors' center, picnic areas, trails and walkways, restrooms, and day-use parking areas. The main entrance is presently located at the terminus of West Cliff Drive. The plan proposes developing a new main entrance off of Delaware Avenue, which is the location of the original entrance in the 1950s. Two preserves are designated within Natural Bridges State Beach: the Monarch Butterfly Natural Preserve and the Moore Creek Wetland Preserve.

UCSC – the University of California Santa Cruz is a 2,020-acre campus, of which approximately 53% is located within city limits. The campus offers amenities for active and passive recreation on the main campus, and the north and upper campuses currently are undeveloped and in open space. Active recreation facilities include playing fields and a swimming pool. The main campus and recreational facilities are open to the public during daylight hours for walking, bicycling,

and visiting campus facilities, such as the Arboretum and Chadwick Gardens. Trails throughout the campus, designed primarily to provide access to campus facilities, also provide recreational opportunities for walking and hiking. The "Cowell Wilder Regional Trail" (open to hikers, bicyclists and equestrians) is located on the north campus (outside city limits) and provides a connection to between Wilder Ranch State Park to the west and Pogonip and Henry Cowell State Park to the east (University of California Santa Cruz, September 2006 – DEIR, Volume Two).

Trails

Santa Cruz has an extensive trail network, featuring paved and unpaved pathways connecting open space, parks, the coast, downtown, and neighborhood areas. This network includes multi-use trails, some of which are wheelchair accessible, and hiking only trails. Together, the City-owned greenbelt lands, open spaces and coastal pathways provide over 50 miles of trails. In addition, State Parks, the UC campus lands, and the Santa Cruz Harbor offer many more miles of publicly accessible trails. The paths and trails support walking, jogging, hiking, and bicycling. The city and regional trail systems provide not only recreation, but access to and connections between various parks, recreation facilities, and natural and urban areas. Promenades and hiking trails (including those along the Beach/Boardwalk, San Lorenzo River Corridor, Downtown, and West Cliff Drive) provide opportunities to enjoy unique natural and historic areas. The network of walkways, bikeways, and trails will become increasingly important for

The Santa Cruz Circle Trail concept focuses on establishing a continuous trail route through the City's greenbelt lands, along the San Lorenzo River, the coastline and the harbor, to create a continuous pathway encircling the City and linking downtown. Santa Cruz also features several regional trail connections, including the California Coastal Trail and Henry Cowell Redwoods State Park/Pogonip/UCSC/Wilder Ranch State Park regional trail.

The Santa Cruz County Regional Transportation Commission (SCCRTC), in association with other regional agencies, envisions the planning and construction of a Monterey Bay Sanctuary Scenic Trail (MBSST). The MBSST Network will be a multi-use system of bicycle and pedestrian facilities that allows the public to enjoy and experience the Monterey Bay National Marine Sanctuary from the vantage point of the shoreline. The master planning process is in progress, and it is envisioned that some of the recent local coastal trail projects will be part of this network, such as the Wilder Ranch Bicycle and Pedestrian Path, the Watsonville Slough Trails, the Monterey Rail/Trail, and the Monterey Bay Sanctuary Scenic Trail. Specific alignments have not yet been developed in the City of Santa Cruz.

Coastal Recreation

The City's coastline along Monterey Bay, totaling approximately 4.6 miles, is a prime recreational destination for residents and over two-million visitors a year. Coastal recreation offers opportunities for a variety of activities, including: ocean and wildlife viewing; beach/coastside walking, jogging and bicycling; surfing, bodyboarding, swimming, and standup paddling; fishing; kayaking and boating; windsurfing/kiteboarding; sunbathing; and picnicking. Coastal facilities and visitors centers also offer educational opportunities about the coastal and marine environment.

Coastal recreation within the City of Santa Cruz includes City and State beaches, coastal pathways, the Municipal Wharf, Santa Cruz Surfing Museum, Santa Cruz Harbor, and the Boardwalk Amusement Park. Coastal-oriented environmental education facilities include the Seymour Marine Discovery Center at UCSC's Long Marine Laboratory and the future Monterey Bay National Marine Sanctuary Visitors' Center.

CITY BEACHES AND THE MUNICIPAL WHARF

City-owned and managed beaches include Main Beach, Cowells Beach, the western portion of Its Beach, and Mitchell's Cove. Main Beach is a broad expanse of sand extending from the San Lorenzo River mouth west to the Municipal Wharf. Volleyball courts are available on Main Beach. Cowells Beach lies to the west of the wharf, extending to the West Cliff Drive bluff. Both beaches are heavily used by visitors and residents during summer months for sunbathing, wading and swimming. Cowells Beach is also a popular surf break with access from the beach and a stairway along West Cliff Drive. The City of Santa Cruz provides seasonal life guard towers and service on Cowells and Main Beach. Dogs are prohibited by the City on Main Beach and Cowells Beach.

On the coastal bluff along West Cliff Drive, a pedestrian/bicycle path extends from Cowells Beach to Natural Bridges State Beach. Situated along West Cliff Drive, two smaller sandy beaches are accessible by stairways. Its Beach, located to the west of Lighthouse Point, is owned by the City and State. The access stairs are located on State Parks property. Further to the west is Mitchell's Cove, which is open to off-leash dog use during certain hours.

Stairways along the West Cliff Drive pedestrian/bicycle path also provide access to popular surfing breaks, including Steamer Lane and Mitchell's Cove. Stairs are located (east to west) at Pelton Avenue next to the Surfer Statute, Steamer Lane, Its Beach and Mitchells Cove. Other surfing breaks along West Cliff Drive are not accessible by constructed stairways.

Lighthouse Point, owned and managed by the City, features the Surfing Museum which is located within the Abbott Memorial Lighthouse. The Point offers an overlook of the Steamer Lane surfing area and opportunities for viewing sea lions, otters, migrating whales, and marine birds. A grassy area at Lighthouse Point is used for informal play and picnicking, and special events.

The Municipal Wharf, constructed in 1914, extends 2,700 feet into Monterey Bay and separates Main Beach from Cowells Beach. Popular with visitors and residents, the wharf features public walkways, overlooks, seating areas, interpretive exhibits, restaurants, shops, kayak and boat rentals, and parking areas. Nature viewing and fishing are also popular activities.

STATE BEACHES

Seabright Beach is part of the Twin Lakes State Beach park unit. This wide beach extends from San Lorenzo Point southward to the west jetty of the Santa Cruz Harbor. Access to the beach is provided at the end of Cypress Avenue, a stairway at Third Avenue, and from the Harbor. A restroom is located at the Cypress Avenue entrance. Portable lifeguard towers are installed seasonally. The *Twin Lakes State Beach General Plan* (1992) plan proposes a year-round lifeguard facility and a new restroom between Third Avenue and the jetty. Popular activities include sunbathing, wading and swimming, beach walking/jogging, picnicking, and fires within designated rings. Dogs are restricted to on-leash use only.

A sandy cove beach located within Natural Bridges State Beach is popular for sunbathing, wading and swimming, tide pool visitation and surfing. Its Beach (eastern portion) is part of Lighthouse Field State Beach. This small pocket beach varies in size depending on the season and tides. Popular activities include sunbathing, wading and bodyboarding. Dogs are restricted on on-leash use only. The sandy beach area along the Santa Cruz Boat Harbor is owned and managed by the Port District. To the east within the County, the Twin Lakes State Beach also includes smaller sand beaches.

SCHOOLS

Regulatory Setting

Local school districts are empowered under state law to impose school impact fees, which are collected by local governments at the time of building permit issuance. In 1998, the California State Legislature enacted SB 50, which made significant amendments to existing State law governing school fees. SB 50 prohibited state or local agencies from imposing school impact mitigation fees, dedications, or other requirements in excess of those provided in the statute. Government Code Section 65995(e) provides that where payment has been made to a school district in accordance with the school fee program that payment is considered full mitigation for school impacts. The legislation also prohibits local agencies from denying or conditioning any project (including a general plan) based on the inadequacy of school facilities.

Section 23.28.030 of the City's Municipal Code regulates dedication of land as a condition of approval of a final subdivision map in accordance with the provisions of Section 66478 of the Map Act.

Schools and Enrollments

Schools and educational services are provided to City residents by the Santa Cruz City Schools District (SCSD), as well as a number of private schools, for grades K through 12. SCSD is composed of two separate districts: the Elementary District (K-6) and the High School District (7-12), governed by a common board and administration. The Elementary District draws students from the city of Santa Cruz and includes four K-5 schools, one K-6 school and two 6-8 schools serving 2,624 students in grades K-6 (City of Santa Cruz Elementary and High School District, June 2010).

The High School District encompasses much of the northern portion of Santa Cruz County drawing its student population from the communities of: Davenport, Bonny Doon, Scotts Valley, Santa Cruz, Live Oak, Soquel and Capitola. The secondary District includes two middle schools (grades 6-8), three comprehensive schools, a continuation school, an independent studies program and a K-12 home study program with a combined enrollment of 4,217 students (City of Santa Cruz Elementary and High School District, June 2010).

Table 4.6-2 identifies school capacities and projected enrollments. It should be noted that Soquel High School and Delta Charter School are not located within the City. The Branciforte Small Schools campus includes the Alternative Family Education, Ark Independent Studies, Costanoa Continuation School, and Monarch Elementary School. The existing combined

enrollment for the Santa Cruz City Schools is 6,841 students based on data in the District's annual budget (Santa Cruz City Schools, June 2010). Delta Charter Show (grades 9-12, located outside City limits) serves 190 students (Ibid.). The enrollment numbers in Table 4.6-2 were provided by the School District during the preparation of this EIR.

TABLE 4.6-2
School Capacities & Projected Enrollments

School	Capacity	Projected Enrollment
Elementary Schools		
▪ Bay View Elementary	604	*547*
▪ Delaveaga Elementary	641	633
▪ Gault Elementary	480	450
▪ Westlake Elementary	604	584
SUBTOTAL	*2,329*	*2,214*
Middle Schools		
▪ Branciforte Middle	651	471
▪ Mission Hill Middle	690	606
SUBTOTAL	*1,341*	1,077
High Schools		
▪ Harbor High	1,155	995
▪ Santa Cruz High	1,362	1,137
▪ Soquel High	1,447	997
SUBTOTAL	*3,964*	*3,129*
Branciforte Small Schools	*517*	469
TOTAL ALL GRADES	**8,151**	**6,889**

SOURCE: Santa Cruz City Schools

The Santa Cruz City Elementary and High School Districts currently charge school impact fees. In justification studies conducted in 2006, it was indicated that enrollment in the Elementary School District had exceeded its facility capacity of 2,028 students for K-6 grades and would continue to exceed facility capacity through the 2015-16 school year. Similarly, the High School District also had exceeded its facility capacity of 4,638 students for 7-12 grades.

WASTEWATER TREATMENT AND COLLECTION

Regulatory Setting

FEDERAL AND STATE REGULATIONS/REQUIREMENTS

The Clean Water Act (CWA) regulates the discharge of pollutants to waters of the United States from any point source, enacted in 1972. The California State Water Resources Control Board (State Board) and the nine Regional Water Quality Control Boards (RWQCB) have the authority in California to protect and enhance water quality, including administration of the National Pollutant Discharge Elimination System (NPDES) permit program for discharges, storm water and construction site runoff. The discharge of treated wastewater is included in the NPDES program. Wastewater systems are closely regulated for health and environmental

concerns. The RWQCB regulates operations and discharges from sewage systems through the NPDES permit.

Federal, state and local regulations are enforced by the City of Santa Cruz through permitting, monitoring and inspections of Significant Industrial Users (SIU). SIUs are defined in accordance with the Code of Federal Regulations 40 CFR 403.3 (t) as:

- All industrial users subject to Categorical Pretreatment Standards, or
- Any other user that has any one or more of the following characteristics:
  - An average discharge flow of equal to or greater than 25,000 gallons per day of process wastewater to the wastewater treatment facility (WWTF),
  - Contributes a process wastestream which is 5% or more of the average dry weather hydraulic or organic capacity of the WWTF,
  - Has a reasonable potential to adversely affect WWTF operations, or
  - Violates any pretreatment standard or requirement (in accordance with 40 CFR 403.8 (f) (6)) (City of Santa Cruz website: "Industrial Waste Discharge Program").

LOCAL REGULATIONS/REQUIREMENTS

Chapter 16.08 ("Sewer System Ordinance") of the City of Santa Cruz Municipal Code regulates discharge to sanitary sewer and requires that all wastewater be discharged to public sewers, with the exception of graywater as allowed by Municipal Code Chapter 16.08. Septic tanks and cesspools are not allowed within city boundaries except as specified for limited conditions in Chapter 6.20 of the Municipal Code.

The Monterey Bay Unified Air Pollution Control District's Rule 216 requires any entity seeking to obtain an Authority to Construct or a Permit to Operate for a Wastewater or Sewage Treatment facility to obtain a permit from the District. The purpose of this Rule is to ensure that the projected served population of a Wastewater or Sewage Treatment facility is consistent with the Air Quality Plan as approved by the Monterey Bay Unified Air Pollution Control District for addressing the current State Implementation Plan requirements for maintaining federal and state ambient air quality standards.

Wastewater Treatment

OVERVIEW

The City of Santa Cruz owns and operates a regional wastewater treatment facility (WWTF), located on California Street adjacent to Neary Lagoon, that provides secondary level of treatment. The City treats sewage from domestic and industrial sources and discharges the treated effluent into the Pacific Ocean under the provisions of a waste discharge permit (NPDES No. CA0048194) issued by the California RWQCB, Central Coast Region (Order No. R3 - 2005 - 0003). Monterey Bay, into which the region's treated wastewater is disposed, was designated in 1992 as a National Marine Sanctuary. Wastewater influent and effluent characteristics are carefully monitored for compliance with state water quality requirements. The City also participates in a regional receiving water monitoring program with other dischargers in the Monterey Bay area (City of Santa Cruz Water Department, February 2006).

SERVICE AREA

The City of Santa Cruz WWTF serves a population of approximately 130,000 in the cities of Santa Cruz and Capitola and parts of unincorporated Santa Cruz County (see Figure 4.6-3). In addition to the City of Santa Cruz, the WWTF also serves the Santa Cruz County Sanitation District and Community Service Areas (CSA) 10 and 57 as further described below. The City also provides capacity for the City of Scotts Valley to discharge its treated wastewater into the Pacific Ocean via the City's discharge. The City of Santa Cruz accounts for its wastewater system as an enterprise activity, primarily relying on service charges for funding (Local Agency Formation Commission of Santa Cruz County, June 2005).

The Santa Cruz County Sanitation District provides wastewater collection service for the City of Capitola and the unincorporated communities of Aptos, Soquel and Live Oak. The District receives periodic inquiries regarding sewer service in the La Selva Beach area due to septic problems in that area, but that area lies outside its current sphere of influence (Local Agency Formation Commission of Santa Cruz County, June 2005).

County Service Areas 10 and 57 (Rolling Woods and Graham Hill) are also served by the City's WWTP. CSA 57 serves the Woods Cove subdivision off Graham Hill Road; the service area encompasses 0.1 square miles and has a current service population of 14 (7 connections). The area is expected to reach a population of 120 by 2015 as a result of buildout of the approved 60-lot Woods Cove subdivision.[4] CSA 10 serves a portion of the developed Rolling Woods subdivision also located off Graham Hill Road (Local Agency Formation Commission of Santa Cruz County, June 2005).

TREATMENT LEVELS AND PLANT CAPACITY

Treatment Process. The City's WWTF was upgraded in 1998 to provide secondary treatment in order to meet state and federal waste discharge requirements. The City's treatment plant currently produces wastewater of a quality that would be classified as Disinfected Secondary-23. The treatment process consists of a series of steps, including screening, aerated grit removal, primary sedimentation, trickling filter treatment, solids contact, secondary clarification, and ultraviolet disinfection.

The City's treated wastewater is potentially suitable for some agricultural applications and for limited public access irrigation. However, the level of treatment is not sufficient for general irrigation or unrestricted use on playgrounds, parks, schoolyards, etc. Additional treatment above that currently provided would be needed to meet the state public health and safety requirements for these uses. In addition to the treatment upgrades, a distribution system, including pumps, meters, storage facilities, and separate piping would be required to convey the recycled water to customers (City of Santa Cruz Water Department, February 2006).

[4] The Board of Supervisors approved the Tentative Map on November 27, 1996. Subsequent to that, the County did supplemental environmental review to consider the developer's request to change from onsite sewage treatment to a transmission main to the City of Santa Cruz. In September 1998, the County filed a negative declaration and the County approved the revised sewer option on October 20, 1998 (County Application Number 98-0121) (McCormick, Santa Cruz LAFCO, personal communication, October 2009).

Treatment Capacity. The WWTF has a permitted wastewater treatment capacity of 17.0 million gallons per day (mgd) (City of Santa Cruz, 2009). In 2009, the WWTP treated 2.84 billion gallons of wastewater effluent at an average daily rate of 9.2 mgd (Ibid.). Daily dry weather flow averaged 8.5 mgd for June, July and August. With the closure of businesses within the city over the last 10 years (including, Lipton, Wrigley, Salz Tannery, and Texas Instruments), the amount of wastewater treated at the facility has decreased over that time period. Approximately 150 acre-feet per year (0.2 mgd) of treated water is retained for use at the treatment plant (Local Agency Formation Commission of Santa Cruz County, June 2005). The plant also treats excess dry weather flow of approximately ½ mgd from Neary Lagoon, typically from April through October.

The Santa Cruz County Sanitation District has treatment capacity rights of 8 mgd at the City of Santa Cruz WWTF. The City contributes approximately 5.0 mgd with a remaining capacity of 4.0 mgd. The Sanitation District contributes 5.5 mgd with a remaining capacity of 2.5 mgd. Approximately 50% of the wastewater treated at the plant is generated within the City of Santa Cruz. The total remaining treatment plant capacity, therefore, is 7.5 mgd.

WWTF MAINTENANCE & IMPROVEMENTS

The agreement between the Sanitation District and the City stipulates that the District shall pay 8/17 (47%) of the project costs for treatment modifications, while operational and maintenance costs are split in proportion to the total flow, Biological Oxygen Demand (BOD) and Suspended Solids (SS) actually discharged[5] by each agency (Local Agency Formation Commission of Santa Cruz County, June 2005).

The WWTF has been upgraded several times since 1928 when the plant began operations (City of Santa Cruz, 2007-Annual Report). The WWTF was upgraded in 1998 to provide a secondary biological treatment system consisting of trickling filters/solids contact tanks to improve effluent quality and satisfy federal requirements and the California Ocean Plan. According to the City's website[6], other major accomplishments at the WWTF in the last five years include:

- Completion of a photovoltaic system.
- Integration of a 1.3-megawatt cogeneration system into the facility power grid.
- Completion of a Carbon Absorption Odor Control System.
- Implementation of staffing reorganization to optimize plant efficiency.

Treated Effluent Disposal

The treated effluent is disposed into the Monterey Bay via a deep ocean outfall constructed in 1987. The outfall extends 12,250 feet on the ocean bottom and terminates one mile offshore at a depth of approximately 110 feet below sea level. A 1,200-foot diffuser at the end of the

[5] Flows are measured daily and monthly averages are prepared. SS are measured daily and BOD is measured weekly.

[6] http://www.ci.santa-cruz.ca.us/pw/index.html, "Wastewater Treatment Facility."

pipe provides an initial dilution of greater than 139 parts seawater to one part wastewater (City of Santa Cruz Water Department, February 2006).

As previously indicated, the City of Scotts Valley discharges its treated effluent via the City's ocean outfall. The Scotts Valley Wastewater Treatment Plant has a permitted capacity of 1.5 million gpd and treats water to secondary and tertiary levels. Secondarily treated effluent that is not used for recycled water is transmitted via a main to Santa Cruz and discharged to the ocean through the outfall shared with the City of Santa Cruz.

Wastewater Collection

The City of Santa Cruz wastewater collection system serves approximately 15,000 connections. The collection system includes 23. The City maintains over 160 miles of sewer pipeline ranging in size from 6 to 54 inches in diameter. The City has a hydraulic model for the sewer system, and continues to focus on collections system projects that reduce infiltration and inflow into the system (Wolfman, personal communication, April 2011).

The City addresses infrastructure needs during the annual budgeting process. The City's proposed 2011-2012 Capital Improvement Program includes a number of projects for improvements to the wastewater system. In addition to rehabilitation and replacement projects, the CIP includes a number of projects where closed circuit TV will be used to identify problem areas and improve maintenance and repairs. The CIP also includes funding for replacing worn and obsolete equipment, and improving automation at the wastewater treatment plant. The CIP is reviewed and adopted annually (Local Agency Formation Commission of Santa Cruz County, June 2005).

SOLID WASTE DISPOSAL

Regulatory Setting

The City's landfill operation is required to comply with the regulations, plans, and permits required by the California Integrated Waste Management Board and California Regional Water Quality Control Board, California Air Resources Board, and the Monterey Bay Unified Air Pollution Control District.

The California Integrated Waste Management Act of 1989 (AB 939) (Chapter 1095, Statutes of 1989, et seq.) was adopted in an effort to improve planning for solid waste facilities and reduce the volume and toxicity of solid waste that is disposed. The act requires each of the cities and unincorporated portions of counties throughout the State of California to divert 25% by 1995 and 50% by the year 2000 of the solid waste tonnage that was disposed in 1990. It also requires local governments to prepare and implement plans that would improve waste resource management by integrating solid waste management with source reduction, reuse, recycling, and composting measures.

City of Santa Cruz Solid Waste Collection and Disposal

Solid waste collection and disposal, including recycling services, are provided by the City of Santa Cruz to residents, businesses and institutions within the City's boundaries, is provided at the Resource Recovery Facility (RRF), which includes a sanitary landfill, recycling center, greenwaste drop-off area, and Household Hazardous Waste Drop-Off Facility. The City owns and operates this facility, including a Class III sanitary landfill, which is located approximately three miles west of the City off Highway 1 on Dimeo Lane. The site covers 100 acres with 67 acres available for disposal use (Local Agency Formation Commission of Santa Cruz County, June 2005). The City's Resource Recovery Facility (RRF) and Recycling Center is located at the landfill site. The RRF only accepts municipal solid waste and serves as a sorting facility to remove any recyclable or composting materials. The Recycling Center accepts a variety of recyclable materials.

The City's solid waste operations are in full compliance with federal, state, and local air, water and waste regulations for collection vehicles, processing operations, and landfill disposal operations. The City has implemented several best management practices to improve its solid waste services, including a landfill gas collection system that is used to run an engine to produce electricity and use of bio-diesel for collection and landfill equipment to reduce CHG emissions (Local Agency Formation Commission of Santa Cruz County, June 2005).

In the mid-1990s the permitted disposal area of the landfill increased from 40 to 67 acres. The additional acreage was designed with a liner system that meets EPA requirements for new municipal solid waste landfills. The new area replaced the former leachate evaporation ponds, which were cleaned and closed in 1997. The expansion increased the life of the landfill by approximately 30 years at that time, (City of Santa Cruz Department of Planning and Community Development, April 2004), but the lifespan has been increased through additional waste reduction as discussed further below.

Since 1990 the Public Works Refuse Division has focused on maximizing the capacity of the RRF, waste diversion, and implementing environmental improvements to minimize the impacts of the facility to public health and the surrounding environment (City of Santa Cruz Department of Planning and Community Development, April 2004). Major capital improvement projects that have been implemented at the RRF to minimize its impact to the environment include the following:

- Construction of two triple lined leachate collection impoundments.
- Construction of a three-mile leachate pipeline from the landfill to the City's sanitary sewer system.
- Construction of a groundwater cutoff wall downgradient of the landfill's lowest elevation.
- Construction of a freshwater bypass tunnel system to reroute two streams around the landfill.
- Construction of two of the four lined cells planned for the 27-acre expansion area.
- Expansion of the recycling processing facility and conversion to an automated, single-stream processing line.
- Construction of a gas trench wall to prevent offsite migration of landfill gas.

- Improvement of the landfill gas collection and power generation system.
- Improvement of leachate containment and erosion control methods.
- Expansion of environmental monitoring network, including groundwater, soil pore gas, surface water and air quality (City of Santa Cruz Department of Planning and Community Development, April 2004).

The City of Santa Cruz met has met the state-mandated waste diversion goals of 25% of their 1990 waste-streams from landfill disposal by 1995 and 50% by 2000 through community education regarding the three "R"s (i.e. reduce, reuse and recycle) and the implementation of expanded curbside recycling programs. The programs included the collection of most forms of clean paper (e.g. office, junk mail, newspaper, magazines, paper board, and card board), containers (e.g. glass, metal, aluminum, and plastic nos. 1-7), and yard waste materials. The programs also included the diversion and reuse of construction and demolition debris (e.g. concrete rubble, asphalt, and wood) and wastewater treatment plant sludge. In the year 2000, the City established a Zero-Waste goal with the ultimate intention of eliminating the City's need for a landfill (City of Santa Cruz Department of Planning and Community Development, April 2004). As of 2009, the City had achieved a diversion rate of 63-65%, which exceeds the state requirements.

Assuming growth trends similar to the past 10-15 years in the City of Santa Cruz, the RRF has more than adequate capacity to accommodate all municipal solid waste generated by City residents, visitors and businesses. Based on continued waste reduction, annual aerial surveys, and calculations, the landfill is estimated to have capacity through the year 2058 (Arman, personal communication, April 2011). State law requires that facilities begin planning for future waste disposal/reuse facilities at least 15 years in advance of existing landfill closure dates, which would be after the year 2030 and the proposed *General Plan 2030* planning horizon.

Planned programs and improvements include the following as outlined in the *General Plan 2030* Background Report City of Santa Cruz Department of Planning and Community Development, April 2004 include expansion of the waste diversion programs and continued pursuit of operational improvements and efficiencies to increase the life of the landfill. Several capital improvement projects are planned to promote waste diversion, improve the environment, and maintain the landfill's capacity. These include two additional lined landfill cells and improvements at the wastewater treatment plant to enable food wastes to be added to the digesters to generate gas for energy generation. The City recently acquired a 5.5-acre parcel adjacent to the landfill on the south, which will be used for support uses ancillary to the landfill and RRF uses. Specific uses have not been identified, but the property will not be used for landfill disposal operations.

ELECTRICAL & NATURAL GAS UTILITIES

Pacific Gas and Electric Company (PG&E) provides electrical and natural gas service to the City. Incorporated in California in 1905, PG&E is one of the largest combination natural gas and electric utilities in the United States. PG&E and other utilities in the state are regulated by the California Public Utilities Commission (Pacific Gas and Electric Company website, 2011). It currently provides service to approximately 15 million people throughout a 70,000-square-mile service area in northern and central California from Eureka in the north to Bakersfield in the

south, and from the Pacific Ocean in the west to the Sierra Nevada in the east. The service area includes 141,215 circuit miles of electric distribution lines, 18,616 circuit miles of interconnected transmission lines. 42,141 miles of natural gas distribution pipelines and 6,438 miles of transportation pipelines. PG&E and other utilities in the state are regulated by the California Public Utilities Commission (Pacific Gas and Electric Company website, 2011).

The state's per capita electrical use in 2009 was 6,691 kilowatt hour per capita, the lowest of any state in the nation (California Energy Commission website, 2011). Within PG&E's service area, electrical use is projected to increase by approximately 1.22% between 2010 and 2020, which is a lower increase than experienced between 1990 and 2000, but slightly higher than between 2000 and 2010 (California Energy Commission, December 2009). Total efficiency/conservation electricity consumption savings are projected to reach 80,000 gigawatt hours in 2020; the majority of savings from building and appliance standards (Ibid.). State projections indicated that natural gas consumption will increase only minimally during the same time period (Ibid.).

State forecasts show a similar electrical and natural gas trend for the PG&E service area with a slightly higher rate of increase in electrical consumption between 2010 and 2020 (1.27%) (California Energy Commission, December 2009). However, the per capita electricity consumption is projected to slightly decline in PG&E's service area due to continued savings from energy efficiency programs (Ibid.). Forecasts show an overall decrease in natural gas consumption over 1990 levels by the year 2020 (Ibid.).

Data developed as part of the preparation of the City's draft "Climate Action Plan" reveals that approximately 290,000,000 kilowatt hours (kWh) of electricity were consumed within the City in 2008 and approximately 18,000,000 therms of natural gas was used. This accounts for municipal, residential and commercial/industrial uses. Nearly 8,000,000 kWh of electricity was generated by renewable sources.

Studies have demonstrated the value and cost-effectiveness of weather-stripping, replacing single pane windows, old appliances and lighting, and increasing insulation in reducing energy use and saving money. Significant energy and cost savings have already been achieved through the implementation of such measures throughout the City of Santa Cruz, although further savings could be achieved (City of Santa Cruz Climate Action Program, September 2010). Over the past 15 years, the combined influences of energy efficiency rebate programs, a public education campaign, and significant increases in energy prices have led to a 22% reduction in energy use within Santa Cruz homes. While this drop in energy use is significant, home energy use in Santa Cruz is again on the rise, but still far below 1996 levels (Ibid.).

In 2007, Santa Cruz became one of the first municipalities in the nation to require new construction to include the adoption of environmentally superior building materials and designs. Builders in Santa Cruz now use best practices for their construction projects that enhance building energy efficiency and water conservation as well as to improve air quality, waste reduction and recycling, and erosion and runoff control. The Green Building Program currently includes residential and commercial development (City of Santa Cruz Climate Action Program, September 2010). Reviews conducted as part of the preparation of the City's draft "Climate Action Plan" indicates that an "award-winning" home under the City's Green Building Program

produces a home that is more efficient than standard homes built in 2008 and almost twice as efficient as homes built in 1990 (City of Santa Cruz, September 2010).

The AMBAG Energy Watch Program is a partnership between AMBAG and PG&E, which seeks to reduce energy use in the Monterey Bay region by providing the resources listed below to eligible PG&E customers.

- Energy assessments and audits;
- Direct installation of energy efficient equipment;
- Technical assistance and financial incentives for energy efficient retrofits in municipal buildings;
- Energy efficiency seminars and training courses in the region; and
- nformation on other PG&E energy efficiency programs and services

Additionally, the Monterey Bay Regional Energy Plan was prepared by AMBAG to update goals and actions Program regarding energy use in the Monterey Bay region. A draft update to the 2006 Plan reported that the Energy Watch Program tracked and reported the following energy savings in 2008 throughout the region: 5,201,582 killowatt hours (kWh) for municipalities; 17,697,292 kWh the hospitality industry; and 1,293,653 kWh for residential uses (AMBAG, 2008).

4.6.2 RELEVANT PROJECT ELEMENTS

PROPOSED GOALS, POLICIES & ACTIONS

The proposed *General Plan 2030* includes goals, policies and actions that address provision of public services. In general, Policies LU1.3 and LU1.4 seek to ensure that facilities and services required by future development are available and that new development pays its proportional share. The Plan also seeks to provide community services and facilities to meet needs of the population (CC2.1) and update and replace facilities (CC2.1.1).

Goals, policies and actions in the following chapters also address specific public services.

- The CIVIC AND COMMUNITY FACILITIES chapter of the draft *General Plan 2030* includes the following four goals addressing public services:

  GOAL CC4 *A sustainable and efficient wastewater system.*

  GOAL CC6 *Minimal solid waste production.*

  GOAL CC7 *A safe and secure community.*

  GOAL CC8 *Excellent educational opportunities and resources.*

These goals address the following public services:

- Wastewater - one goal with three associated policies and eight specific actions;
- Solid Waste Management – one goal with four associated policies and 27 actions;
- Police Protection – one goal with six associated policies and 23 actions ; and
- Schools – two policies with four actions that address school sites and facilities and two additional policies and accompanying actions that address educational programs and safe access to schools.

- The HAZARDS, SAFETY & NOISE chapter of the draft *General Plan 2030* includes two policies and 13 specific actions related to fire protection and safety and provision of emergency access.

- The PARKS, RECREATION AND OPEN SPACE chapter of the draft *General Plan 2030* includes goals, policies and actions that address parks and recreational facilities, open space, trails and recreation programs. This chapter includes three goals with 16 associated policies and 38 specific actions that address parks, open space and recreational facility public services. A fourth goal with policies and actions address recreational programs, activities and events. These goals are identified below. Several policies and actions in other chapters of the proposed General Plan also seek to protect, preserve and/or manage open space and natural areas throughout the City (CD 1.1.3, LU 2.3, LU 3.11 NRC 1.1 river access]).

  GOAL PR1 *Ample, accessible, safe and well-maintained parks, open space, and active recreational facilities.*

  GOAL PR2 *High-quality, affordable recreational programs, activities, events, and services for all.*

  GOAL PR3 *Well managed, clean and convenient public access to open space lands and coastline.*

  GOAL PR4 *An integrated system of citywide and regional trails.*

  The draft plan also strives to maintain park service standards, which call for a neighborhood park at ratio of 2.0 acres per 1,000 population (PR1.3.2) and a community parks ratio of 2.5 acres per 1000 population (PR1.3.3). Service standards are not provided for other public services, although Action CC7.1.7 calls for updating and maintaining police response time standards, while Action CC9.4.2 seeks to provide emergency services at accident or disaster scenes within an average time of 4 minutes or less and within 5 minutes or less 90 percent of the time.

- The NATURAL RESOURCES AND CONSERVATION chapter of the draft *General Plan 2030* includes the following goal with four associated policies and 20 accompanying actions related to energy conservation. Its four policies and accompanying actions would promote reduction of electricity and natural gas consumption, use of renewable

energy sources, and use of energy-efficient lighting, vehicles, and water fixtures and appliances.

GOAL NRC7 *Reduction in energy use, and significant production and use of renewable energy.*

PROPOSED IMPROVEMENTS

The draft *General Plan 2030* includes several policies and actions that address specific improvements or general types of future improvements to public service facilities. Generally, the plan calls for updating and replacing facilities as appropriate (CC2.1.1) and providing community facilities to meet the needs of the City's population (CC2.1). Specific referenced service improvements include maintenance and upgrading the sewer system (CC4.1, CC4.1.1 - CC4.1.3, CC4.1.5); monitoring the wastewater treatment plant capacity to address future needs (CC4.1.8); and exploring the potential for recycling wastewater (CC4.3). The draft Plan the development of a new countywide Emergency Operations Center facility (HZ1.1.5), but a specific location within the City or elsewhere in the county is not identified.

Policy LU4.3 encourages the development and expansion of neighborhood facilities such as parks, schools, daycare centers, and neighborhood commercial services. However, there are no specifically designated new park or school sites. A number of policies promote provision of trails and access to open space lands and the coast (PR4.1 and accompanying actions) with enhancing the recreational value of the San Lorenzo River walkway and East and West Cliff Drive pathways (PR4.1.3) and creating a continuous pathway along the coast by enhancing the physical links between West Cliff and East Cliff Drives and the Beach Promenade (PR4.1.4).

FUTURE DEVELOPMENT POTENTIAL

The *General Plan 2030* Land Use Map and land use designations are largely unchanged from the 1990-2005 General Plan / Local Coastal Program, except for three new mixed use land designations that have been developed and applied to the following major transportation corridors: Mission Street, Ocean Street, Soquel, Avenue, and Water Street. Some of the draft *General Plan 2030* policies and actions support specific types of land uses and/or development, including new mixed-use use districts and/or intensified redevelopment, as summarized in the LAND USE (Chapter 4.1) section of this EIR.

4.6.3 IMPACTS AND MITIGATION MEASURES

CRITERIA FOR DETERMINING SIGNIFICANCE

In accordance with the California Environmental Quality Act (CEQA), State CEQA Guidelines (including Appendix G), City of Santa Cruz plans, policies and/or guidelines, and agency and professional standards, a project impact would be considered significant if the project would:

6a Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or need for new or physical altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

- Fire Protection
- Police Protection
- Schools

6b Increase the use of existing neighborhood and community parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

6c Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

6d Result in wastewater flows exceed sewer line or treatment plant capacity or contribute substantial increases to flows in existing sewer lines that exceed capacity.

6e Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs.

6f Result in the wasteful or inefficient use of energy.

IMPACT ANALYSIS

Based on the significance criteria identified above, the following impact analyses address potential impacts to the City's fire and police services (6a); potential impacts on City park facilities (6b-c); potential impacts on school facilities (6a); potential impacts related to wastewater collection and disposal (6d); potential impacts on landfill capacity (6e); and potential impacts related to energy use (6f).

Potential Future Development & Buildout

Adoption and implementation of the proposed General Plan 2030 would not directly result in increased new development. However, the draft General Plan includes policies and a land use map that support additional development. This potential development, as summarized in the LAND USE (Chapter 4.1) section of this EIR, could result in development of 3,350 residential units, 3,140,000 square feet of commercial, office and industrial development and 300 new hotel

rooms. This level of development could result in an increased population of 8,040 residents and 8,665 new jobs.

The proposed General Plan also includes other policies and actions that could result in development that supports year-round expanded performances, events, and/or visitors. These potential uses include:

- Supporting a downtown performing arts center or expansion of the Civic Center (HA2.2.5),
- Amending the Zoning Ordinance to allow development of arts and cultural facilities in a wide variety of districts (HA2.2.4),
- Supporting Santa Cruz as a year-round conference destination (Policy ED1.4), supporting year-round events (HA3.2.4), and promoting Santa Cruz as a year-round arts destination, and
- Promoting Santa Cruz as a principal retail, cultural, recreational, entertainment and commercial destination in the region (ED1.1).

New development accommodated under the proposed General Plan will result in the demand for public services. The proposed *General Plan 2030* includes goals, policies and actions that address provision of public services. In general, Policies LU1.3 and LU1.4 seek to ensure that facilities and services required by future development are available and that new development pays its proportional share. The Plan also seeks to provide community services and facilities to meet needs of the population (CC2.1) and update and replace facilities (CC2.1.1). The impacts associated with specific services are presented below.

Impact 4.6-1 Fire Protection
Adoption and implementation of the *General Plan 2030* could indirectly result in increased population associated with potential development that could be accommodated by the Plan that would result in increased fire protection and emergency service demands. However, future development and growth would not result in the need to construct new or expanded fire stations. This is considered a *less-than-significant impact*.

According to the City's Fire Department, there are adequate fire protection facilities to serve the projected growth increases associated with implementation of the proposed Draft *General Plan 2030*. No new fire stations or facilities will be needed to maintain acceptable response times and service levels (Oliver, personal communication, April 2011). New development and growth accommodated by the draft plan would not reduce response times or require new or physically altered fire protection facilities that could result in significant physical impacts.

The Department's current need for a Training Facility, however, will continue in the future, and the Department plans to investigate the possibility to consolidate administration and training facilities with future fire station improvements, including potential reconstruction of Fire Station Two and relocation of Fire Station One. No sites have been identified for potential relocation. Fire Station Two is located adjacent to a city-owned, paved, public parking lot. If future

expansion were to occur at this location, there no significant impacts are expected to occur, as the site is within a developed urban area.

The draft plan includes policies and actions that would serve to reduce impacts on the City's Fire Department. Draft Policy HZ1.2 seeks to respond to emergencies rapidly. Specific actions call for annual review of service calls (HZ1.2.1) and response times and making continuous operational improvements to arrive on emergency scenes within an average time of 4 minutes or less and within 5 minutes or less 90 percent of the time (HZ1.2.2). Additionally, Policy HZ1.4 and its five specific actions seek to continue to meet fire safety and firefighting needs with staff training and equipment maintenance (HZ1.4.1), promoting built-in fire extinguishing and alarm systems (HZ1.4.2), ensuring adequate fire flow to new uses (HZ1.4.3), and continued mutual aid services with other agencies (HZ1.4.4, HZ1.4.5). A number of actions also seek to ensure that new development is sited and designed to accommodate facility emergency access and response (HZ1.2.5, HZ1.2.6, HZ1.5.5) and that street widths are adequate to safely accommodate emergency vehicles (M3.2.3). These policies and actions (as summarized on Table 4.6-3) serve to maintain fire department operations and response time and reduce impacts on fire protection services.

TABLE 4.6-3
Proposed General Plan Policies & Actions that Avoid or Reduce Fire Protection Service Impacts

Type of Measure / Action	Policies / Actions
PROVIDE ADEQUATE EMERGENCY RESPONSE & PREPAREDNESS	• Adequate emergency response times: HZ1.2, HZ1.2.1, HZ1.2.2 • Ensure emergency preparedness: HZ1.1; HZ1.1.1 (annually update the Emergency Operations Plan.); HZ1.1.2 (City staff training) • New development design and access to maintain emergency response times with adequate access: HZ1.1.3, HZ1.2.5, HZ1.2.6 • Ensure that street widths are adequate to safely serve emergency vehicles: M3.2.3
PROVIDE ADEQUATE FIRE PROTECTION	• Meet fire safety & firefighting needs: HZ1.4, HZ1.4.1 (staff training and equipment maintenance) • Adequate emergency response times: HZ1.2, HZ1.2.1, HZ1.2.2 • Adequate fire flow: CC3.4.1, HZ1.4.3 • Pre-fire surveys of select buildings: HZ1.2.3 • Fire prevention: HZ1.4.2 (built-in extinguishing & alarm systems), HZ1.5.6 (abatement of hazardous buildings and conditions) • Adequate emergency access in new development: HZ1.2.5, HZ1.2.6, HZ1.5.5 • Promote fire safety & prevention programs: HZ1.5.8
REDUCE WILDLAND FIRE HAZARDS	• Reduce wildfire hazards: HA1.5, HZ1.5.1, • Regulate development siting/design to reduce wildland fires: HZ1.5.3 (setbacks), HZ1.5.4 (fire-resistant/retardant building materials), • Continued mutual aid with other agencies: HZ1.4.4, HZ1.4.5 • Promote fire safety & prevention programs: HZ1.5.8 • Maintain & update wildland interface zones: CD1.4.4

Future growth could result in an indirect increased risk of wildfires in the urban-rural interface and adjacent to the City's greenbelt areas. None of the major vacant sites are within identified fire hazard zones. The City does not have the resources to adequately police and protect greenbelt areas, which increases the frequency of illegal camping that can result in fires in limited access and canyon areas (City of Santa Cruz, September 2007). Despite the fact that there has not been a recent wildland fire within the city limits, residential development into or adjacent to wildland/urban interface areas increases the danger to life and property should a fire occur. Areas targeted as "likely" to have a wildland fire include the Arroyo Seco/Meder Canyon, DeLaveaga, Pogonip, Moore Creek area and Arana Gulch. Increasing use of these areas by residents, transient encampments with fires, and young adults looking for a place to gather exacerbates the risks (Ibid.).

Policy HZ1.5 seeks to reduce potential wildfire hazards through regulation of development in and adjacent to fire hazard areas (HZ1.5.2) with adequate siting, design, and emergency access provided by new development to reduce potential hazards and facilitate emergency response (HZ1.5.3, HZ1.5.4, HZ1.5.5). The City of Santa Cruz also has initiated a number of wildfire mitigation programs in recent years including vegetation management programs at DeLaveaga Park and at the Arroyo Seco Canyon areas (City of Santa Cruz, September 2007). The City continues to maintain cooperative agreements to work with the County, UCSC, the California Department of Forestry and other fire protection agencies to collaboratively avoid or minimize the threat from wild-land/urban interface fires. The City's adopted "Local Hazard Mitigation Plan" (City of Santa Cruz, September 2007) also includes the following mitigation strategy to avoid or reduce potential wildfires that have been included in the draft General Plan.

- Cooperative fire protection agreements with other agencies.
- Reduction of fire risk in wildland/urban interface areas through improved vegetation management and appropriate code enforcement.
- Promotion of built-in fire extinguishing and warning fire alarm systems.
- Creation of a proactive (not reactive) hazard abatement program.
- Land use planning to reduce incidence of human caused wildfire.
- Adequate staffing to meet needs of City population and development.
- Fire prevention programs in schools, institutions & commercial buildings.

Conclusion. Adoption and implementation of the proposed *General Plan 2030* would not directly result in new development, but new development accommodated by the plan would result in demands for fire protection services. However, there are adequate fire protection facilities to serve the projected growth increases associated with implementation of the proposed Draft *General Plan 2030*, and no additional equipment or facilities will be needed to maintain acceptable response times and service levels (Oliver, personal communication, April 2011). New development and growth accommodated by the draft plan would not reduce response times or require new or physically altered fire protection facilities that could result in significant physical impacts. Furthermore, the proposed *General Plan 2030* includes goals, policies and actions that set forth measures to avoid and minimize adverse impacts on fire protection services as summarized on Table 4.6-3. With implementation of these proposed policies and actions, as well as implementation of the City's "Local Hazard Mitigation Plan", the

proposed *General Plan 2030*'s indirect impact on fire protection services would be considered less-than-significant.

Mitigation Measures

No mitigation measures are required as a significant impact has not been identified.

Impact 4.6-2 Police Protection
Adoption and implementation of the *General Plan 2030* could indirectly result in increased population associated with potential development that could be accommodated by the Plan that would result in increased police protection service demands. However, future development and growth would not result in the need to construct new or expanded police stations. This is considered a *less-than-significant impact*.

According to the City's Police Department, there are adequate police protection facilities to serve the projected growth increases associated with implementation of the proposed Draft *General Plan 2030*. No additional equipment or facilities personnel will be needed to maintain acceptable response times and service levels (Vogel, personal communication, April 2011). New development and growth accommodated by the draft plan would not reduce response times or require new or physically altered police protection facilities that could result in significant physical impacts.

The draft plan includes policies and actions that would serve to reduce impacts on the City's Police Department. Policy CC7.1 and its specific accompanying actions seek to ensure adequate police training and resources. Specific actions seek to ensure appropriate police staff, stations, equipment and training to meet demands of increased population and tourism (CC7.1) and implement officer training and crime prevention programs (CC7.1.2, CC7.1.3). Additionally, the draft plan seeks to provide and rapid and timely response to emergencies (CC7.1.6, HZ1.2) with updating and maintaining police response time standards (CC7.1.7). Specific actions call for annual review of service calls (HZ1.2.1) and response times and making continuous operational improvements to arrive on emergency scenes within an average time of 4 minutes or less and within 5 minutes or less 90 percent of the time. (HZ1.2.2). A number of policies also seek to reduce police service demand through land use planning and project designs (CC72.5, CC7.2.7). Other actions promote cooperate with other County agencies on public safety and police issues (CC7.3, CC7.3.1, CC7.3.2). Taken together, these policies and actions (as summarized on Table 4.6-4) serve to ensure adequate police department operations and response time and reduce police protection service demand, and, thus, reduce potential impacts on police protection services.

Conclusion. Adoption and implementation of the proposed *General Plan 2030* would not directly result in new development, but new development accommodated by the plan would result in demands for police protection services. However, there are adequate police protection facilities to serve the projected growth increases associated with implementation of the proposed Draft *General Plan 2030*, and no additional

equipment or facilities will be needed to maintain acceptable response times and service levels. New development and growth accommodated by the draft plan would not reduce response times or require new or physically altered police protection facilities that could result in significant physical impacts. Furthermore, the proposed *General Plan 2030* includes goals, policies and actions that set forth measures to avoid and minimize adverse impacts on police protection services as summarized on Table 4.6-4. With implementation of these proposed policies and actions, the proposed *General Plan 2030*'s indirect impact on police protection services would be considered less-than-significant.

Mitigation Measures

No mitigation measures are required as a significant impact has not been identified.

TABLE 4.6-4
Proposed General Plan Policies & Actions that Avoid or Reduce Police Protection Service Impacts

Type of Measure / Action	Policies / Actions
PROVIDE ADEQUATE EMERGENCY RESPONSE & PREPAREDNESS	• Adequate emergency response times: HZ1.2, HZ1.2.1, HZ1.2.2 • New development design and access to maintain emergency response times with adequate access: HZ1.1.3, HZ1.2.5, HZ1.2.6
PROVIDE ADEQUATE POLICE PROECTION	• Ensure appropriate staff (including training), stations, equipment to meet population demands: CC7.1, CC7.1.1, CC7.1.2 • Timely response: CC7.1.6, CC7.1.7, HZ1.2, HZ1.2.1, HZ1.2.2 • Update police response standards: CC7.1.7 • Reduce demand through land use planning & project designs: CC7.2.5, CC7.2.7 • Participate in crime reduction & prevention programs: CC7.1.3, CC7.2.2, CC7.2.3

Impact 4.3 Parks and Recreation
Adoption and implementation of the proposed *General Plan 2030* could indirectly result in increased development and population growth that would result in an indirect demand for parks and recreational facilities. However, the estimated growth would not increase use of parks or recreational facilities such that a substantial physical deterioration would occur. With implementation of proposed policies and actions, in combined with existing regulations, impacts to parks and recreational facilities is considered a *less-than-significant impact*.

The proposed *General Plan 2030* will result in additional development and population growth, resulting in increased demands for park and recreational facilities. The Plan seeks to provide neighborhood parks at a ratio of 2.0 acres per 1,000 residents and to provide community parks at a ratio of 2.5 acres per 1,000 residents. This is the same standard included in the

City's existing General Plan. As previously discussed, the City currently does not meet the desired level of service for neighborhood parks and is deficient by approximately 16 acres. Thus, existing developed neighborhood parks could be considered at capacity use, in general, based on the City's park service standards.

The projected population increase of 8,040 new residents would result in an additional need for 16 acres of neighborhood parks and 20 acres of community parks to meet the proposed park service standard. Under existing conditions and with future growth, a total of 32 additional neighborhood park acres would be required to meet the City's service standard.[7] The City currently has sufficient community park land as summarized on Table 4.6-1.

The *General Plan 2030* does not identify any specific new park and recreation facility sites. Thus, the increased population accommodated by the proposed General Plan would result in an increased use of existing parks and recreational facilities. The largest projected increases in population would be distributed along existing transportation corridors throughout the City and in downtown. Thus, it is anticipated that the increased use of parks and recreational facilities would be distributed throughout existing neighborhood and community parks. A geographically widespread increase in use would not likely result in substantial physical deterioration of specific parks and recreational facilities, although maintenance is an ongoing requirement, including school playgrounds and joint use facilities.

The proposed *General Plan 2030* does not include any goals or policies regarding construction or expansion of a specific park or recreational facility, the construction or expansion of which may result in potentially significant impacts. The draft plan does call for developing new or expanding existing athletic fields (PR1.2.2), and coordinating with local schools to expand park and recreation opportunities. However, specific sites or locations are not identified. As specific park and recreational facility expansion projects are proposed in the future, project-specific environmental analyses will be completed as required to analyze potential significant impacts and provide the appropriate project-level mitigation as may be needed.

The proposed *General Plan 2030* includes a number of policies that serve to mitigate potential impacts to existing parks and recreation facilities as a result of new residential development and population growth accommodated by the draft *General Plan 2030*. The policies, which are summarized on Table 4.6-5, address development of new parks which would lessen the projected increased use of existing parks, as well as, maintenance of existing parks and recreational facilities. The plan seeks to update and modify park system and services to accommodate changes in the population and its recreational need (PR1.1.1). A number of policies and actions seek to provide a system of parks and recreational facilities (PR1.1.1), planning for new parks and facilities (PR1.1.2, PR1.1.4), evaluating and acquiring parks (PR1.1.3, PR3.2 [parcels that provide access to City-owned open space lands]), developing new or expanding existing athletic fields (PR1.2.2), and coordinating with local schools to expand park and recreation opportunities (PR1.2.1, PR1.2.3). To this end, the plan establishes service standards (PR1.3, PR1.3.2, PR1.3.3), seeks to ensure that adequate park land is provided in conjunction with new development (PR1.3.1), and requires park dedication or payment of in-lieu fees from new development (PR1.7, PR1.7.1). Thus, while specific new park locations are not

[7] This is based on an existing population of 58,982 in 2009 and 102 existing acres of neighborhood parks and 366 acres of community parks as summarized on Table 4.6-1.

designated in the proposed *General Plan 2030*, the policies and actions set forth a strategy to plan and acquire additional park lands in the future.

The draft plan also seeks to ensure ongoing maintenance needs are addressed in the development and funding plans for any new or expanded parks, recreational facilities, or open space areas (PR1.3.4, PR1.10). Maintenance of the City's Parks and Facilities tax also is recommended (PR1.9, PR1.91, PR1.9.2).

A number of policies and actions also promote provision of trails and access to open space lands and the coast (PR1.4) with enhancing the recreational value of the San Lorenzo River walkway and East and the West Cliff Drive pathways (PR4.1.3) and creating a continuous pathway along the coast by enhancing the physical links between West Cliff and East Cliff Drives and the Beach Promenade (PR4.1.4).

TABLE 4.6-5
Proposed General Plan Policies & Actions that Reduce Parks Impacts

Type of Measure / Action	Policies / Actions
PLAN & PROVIDE FOR NEW PARKS	• Provide & manage parks: PR1.1 • Develop and maintain city Master Parks Plan: PR1.1.2, Pr1.1.4 (plan for adequate parks and recreation facilities) • Level of Service standards: PR1.3, PR1.3.2, PR1.3.3 • Evaluate lands for small parks: PR1.1.3 • Coordinate with schools to expand parks: PR1.2.1, PR1.2.3 • Examine developing new or expanding existing athletic fields: PR1.2.2 • Development park dedication or in-lieu fees: PR1.7, 1.7.1 • Maintain a Parks and Recreation Facilities excise tax on new construction: PR1.9, PR1.9.1, PR1.9.2 • Acquire parcels that provide access to City-owned open space lands and coast: PR3.2
ENSURE MAINTENANCE & MANAGEMENT	• Ensure ongoing maintenance: PR1.3.4 • Identify maintenance funding sources: PR1.10 • Protect & Manage open space: LU2.3 LU2.3.1, LU2.3.2, LU2.3.3, LU2.3.4 (UCSC), LU3.11 • Greenbelt Management: LU2.3.3, LU3.11.3, NRC6.3
PROVIDE ACCESS TO OPEN SPACE LANDS & COAST	• Assure access to open space lands and coast: PR1.6.5, PR3.1 • Coastal access: PR3.2, PR3.3, PR3.3.5 • Access to river & riparian: NRC1.1, NRC1.1.2
PROVIDE TRAILS	▪ Provide and maintain Integrated trail system: PR4.1, PR4.1.1 ▪ Provide and maintain trails in parks: PR4.2, PR4.2.1, PR4.2.2 ▪ Require development to dedicate trails or easements along planned trail routes: PR4.2.3

Conclusion. Adoption and implementation of the proposed *General Plan 2030* would not directly result in new development, but new development and increased population accommodated by the plan would result in demands for parks and recreational facilities. Increased use of existing parks and school playgrounds is

expected to be spread out throughout the City so that no substantial deterioration would occur at any one facility. With implementation of the proposed *General Plan 2030* goals, policies and actions that set forth measures to avoid and minimize adverse impacts on parks and recreational facilities as summarized on Table 4.6-5, as well as compliance with local regulations, the proposed *General Plan 2030*'s indirect impact on parks and recreational facilities would be considered less-than-significant.

Mitigation Measures

No mitigation measures are required as a significant impact has not been identified.

Impact 4.6-4 Schools
Adoption and implementation of the proposed *General Plan 2030* could indirectly result in increased development and population growth that would generate elementary school student enrollments that could exceed capacity of existing schools. This is considered a *potentially significant impact*.

Future residential development accommodated by the proposed *General Plan 2030* could result in construction of 3,350 new residential units. Based on student generation rates per dwelling unit of 0.273 for grades K-6 and 0.207 for grades 7-12[8], future development and growth could result in the addition of 915 students in grades K-6 and approximately 695 students in grades 7-12 for a total potential increase of 1,610 students by the year 2030.

The existing combined enrollment for the Santa Cruz City Schools is 6,841 students (Santa Cruz City Schools, June 2010). The addition of additional students in the next 20+ years could increase this total by approximately 1,610 students with approximately 915 elementary school students and 695 high school students. There would be adequate high school capacity to accommodate this growth. Elementary school enrollments could exceed school facility enrolments depending on the timing of growth. Discussions with the school district indicated that the level of enrollment likely could be accommodated within existing school facilities, including using Natural Bridges Elementary School, if needed, which is currently leased as a charter school. The School District collects school impact fees that can be used for facility expansion and/or installation of classroom modules. Such expansion, if required, would be located within existing development footprints and would not be expected to result in significant physical impacts.

The proposed *General Plan 2030* includes a number of policies that serve to mitigate potential impacts to existing school facilities as a result of new residential development and population growth accommodated by the draft *General Plan 2030*. The policies, which are summarized in Table 4.5-6, address ensuring and planning for adequate school sites (CC8.2, CC8.2.2) and cooperating with the school district to monitor impacts of housing on elementary school populations (CC8.1.1). The plan also encourages joint-use facilities that combine educational and community uses (CC8.2.1).

[8] Student generation rates were determined in the School Districts' "Developer Fee Justification Study" (October 5, 2006).

Conclusion. Adoption and implementation of the proposed *General Plan 2030* would not directly result in new development, but increased population resulting from development accommodated by the plan could increase student enrollments in grades K-12, which could exceed existing school facility capacities depending on the timing and rate of growth as the increase would not happen all at once. With required payment of school impact fees to fund necessary facility expansion and/or additions, in conjunction with potential reuse of the former Natural Bridges Elementary School if needed, the impact would be mitigated to a less-than-significant level. Potential addition or expansion of school classroom facilities is not expected to result in significant physical impacts due to the location of existing facilities within developed footprints. Implementation of the proposed *General Plan 2030* includes goals, policies and actions also set forth measures to avoid and minimize adverse impacts on school facilities as summarized on Table 4.5-6.

Mitigation Measures

No mitigation measures are required beyond payment of school impact fees that will be collected at the time of issuance of a building permit.

TABLE 4.5-6
Proposed General Plan Policies & Actions that Reduce School Impacts

Type of Measure / Action	Policies / Actions
PLAN FOR SCHOOL SITES	• Ensure and plan for adequate future sites for educational facilities: CC8.2, CC8.2.2 • Monitor impact of housing on elementary school populations: CC8.1.1 •
COORDINATE WITH SCHOOL DISTRICT	• Cooperate with school district : CC8.1.1
MAXIMIZE OPPORTUNITIES & ENCOURAGE JOINT-USE FACILITIES	• Encourage joint-use facilities for educational and community uses: CC8.2.1 • Maximize educational, developmental, and recreational opportunities: CC8.3

Impact 4.6-5 Wastewater Collection & Disposal
Adoption and implementation of the proposed *General Plan 2030* could indirectly result in increased development and population growth that would result in indirect generation of wastewater that could be accommodated by the existing wastewater treatment plant and collection system improvements, as needed and supported in the General Plan. This is considered a *less-than-significant impact*.

Adoption and implementation of the proposed *General Plan 2030* would not directly result in increased population or new development. However, the draft General Plan includes policies and a land use map that support additional development. As indicated above, anticipated development accommodated by the proposed plan could result in an increase in population and employees that would result in increases in wastewater generation.

Wastewater generation can be generally estimated based on water demand. Typically, wastewater flows are derived from water demand. The City Public Works Department generally estimates wastewater flows as a percentage of water use. Based on the water demand rates identified in Table 4.5-4 in the WATER SUPPLY (Chapter 4.5) section of this EIR, this would equate to an average daily wastewater flow increase of approximately 0.55 million gallons as summarized in Table 4.6-7. This amount is well within the remaining treatment plant capacity – both the permitted capacity as well as the City's remaining portion (4.0 mgd). No major sewer line problems or constraints have been identified (Wolfman, personal communication, April 2011), and sewer line replacement would be scheduled in the future as needed.

TABLE 4.6-7
Estimated Project Wastewater Flows

General Plan Use	Amount	Annual Water Demand (MGY)	Average Daily Water Demand (gpd)	Average Daily Wastewater flow (mgd)
Residential - SFD	840 units	60	165,385	0.124
Residential - MFD	2,510 units	64	175,345	0.158
Commercial	1,087,983 sq. ft.	72	197,260	0.158
Hotel Rooms	311 rooms	11	30,140	0.024
Office	1,273,913 sq. ft.	23	63,100	0.055
Industrial	776,926 sq. ft.	9	24,660	0.020
	TOTAL	**239**	**655,890**	**0.539**

Assumes 75% of total residential units (3,350) are multi-family units.
Wastewater generation assumed as 90% of multi-family residential water use, 75% of single-family residential water use, and 80% of non-residential water use.

The Draft *General Plan 2030* includes goals, policies and actions that set forth measures to avoid provide adequate services. Goal CC4 and its three supporting policies and eight accompanying actions seek to maintain a sustainable and efficient wastewater system. These include maintenance and upgrade of the wastewater collection, treatment and disposal systems (CC4.1, CC4.1.1 and CC4.1.3). Periodic updates of wastewater master plans are supported (CC4.1.5), including monitoring treatment plant capacity and development of a plan to address future needs (CC4.1.8). The plan calls for exploring the potential for tertiary treatment and recycling wastewater (CC3.10, CC4.2, CC4.3). Table 4.6-8 summarizes policies that directly or indirectly address wastewater collection or treatment.

Conclusion. Adoption and implementation of the proposed *General Plan 2030* would not directly result in new development, but new development accommodated by the plan would result in increased growth with resulting increases in wastewater generation. However, the City's wastewater treatment plant has adequate capacity to

serve anticipated growth, and with implementation of proposed policies and actions, the collection system will be maintained and upgraded as needed. Thus, there would a less-than-significant impact on wastewater treatment and collection facilities.

Mitigation Measures

No mitigation measures are required as a significant impact has not been identified.

TABLE 4.6-8
Proposed General Plan Policies & Actions that Reduce Wastewater Impacts

Type of Measure / Action	Policies / Actions
ENSURE ADEQUATE PROVISION OF SERVICES	▪ Ensure that facilities and services required by a development are available: LU1.3 ▪ Report annually on the state of City facilities and services: LU1.3.2 ▪ Ensure that new development pays its proportional share of the costs of expanded infrastructure needed to serve new development: LU1.4
WASTEWATER	▪ Provide adequate, environmentally sound wastewater system: CC4.1 ▪ Maintenance, upgrade & planning sewer system: CC4.1, CC4.1.1 - CC4.1.3, CC4.1.5 ▪ Monitor wastewater treatment plant capacity to address future needs: CC4.1.8 ▪ Explore recycling wastewater: CC3.10.1, CC4.2, CC4.3

Impact 4.6-6 Solid Waste Disposal
Adoption and implementation of the proposed *General Plan 2030* could indirectly result in increased development and population growth that would result in indirect generation of solid waste that could be accommodated within the remaining landfill capacity. This is considered a *less-than-significant impact*.

Adoption and implementation of the proposed *General Plan 2030* would not directly result in increased population or new development. However, the draft General Plan includes policies and a land use map that support additional development. As indicated above, anticipated development accommodated by the proposed plan could result in an increase in population and employees that would result in increases in solid waste generation. The City's population is estimated to increase by approximately 8,040 residents due to development and growth accommodated by the proposed plan.

Development and growth accommodated under the proposed plan is estimated to result in a solid waste generation of approximately 20 tons per day based on a per capita rate of 5.0 pounds/day provided by City staff (Arman, personal communication, April 2011). This amount of solid waste could be accommodated within the remaining capacity of the City's landfill, which is on expected to have capacity through the year 2058 (Ibid.).

The Draft *General Plan 2030* includes goals, policies and actions that set forth measures to reduce solid waste generation and promote recycling as summarized on Table 4.6-9, which would further reduce the net increase in solid waste. In particular, Policy CC6.1 seeks to achieve a "zero waste" goal. The City has also achieved a solid waste reduction of 63-65%, which exceeds the state requirement of a 50% reduction by the year 2000. With increasing waste diversion, the landfill capacity has expanded (Arman, personal communication, April 2011).

Conclusion. Adoption and implementation of the proposed *General Plan 2030* would not directly result in new development, but new development accommodated by the plan would result in increased growth with resulting increases in solid waste generation. However, the City's landfill has adequate capacity to serve anticipated growth. Thus, there would a less-than-significant impact on wastewater treatment and collection facilities.

Mitigation Measures

No mitigation measures are required as a significant impact has not been identified.

TABLE 4.6-9
Proposed General Plan Policies & Actions that Reduce Solid Waste Impacts

Type of Measure / Action	Policies
REDUCE SOLID WASTE	• Zero Waste goal: CC6.1 • Reduce recyclable materials at landfill: CC6.4.4, CC6.1.13 (plastic bags), CC6.1.17 & HZ2.1.4 (ban polystyrene foam), CC6.4.4
PROMOTE / SUPPORT RECYLING	• Prepare & implement recycling and reduction plans and incentives to encourage recycling: CC6.1.1, CC6.1.2, CC6.1.3, CC6.1.7 (new development), CC6.1.14 • Provide efficient waste & recycling service: CC6.2, CC6.2.2 • Encourage use of recycled materials: CC6.1.9, CC6.1.10, CC6.1.12, CC6.1.19 (industrial uses) • Require commercial, industrial recycling & waste audits: CC6.1.4, CC6.1.5, CC6.1.6 (cement/asphalt recycling) • Develop food waste & composting program: CC6.1.15, CC6.1.16
LANDFILL MANAGEMENT & PLANNING	• Develop comprehensive operating plan for Resource Recovery Facility: CC6.3, CC6.3.1 • Develop waste management alternatives: CC6.1.18 • Efforts to extend landfill life: CC6.4, CC6.4.2

Impact 4.6-7 Energy Use
Adoption and implementation of the proposed *General Plan 2030* could indirectly result in increased development that would result in indirect energy demands, which would not be wasteful or an inefficient use with implementation of state and local regulations and proposed *General Plan 2030* policies and actions. This is considered a *less-than-significant impact*.

Future development would be accommodated by the draft *General Plan 2030* would result in consumption of electricity and natural gas lighting, heating and cooling of residences and other buildings. Energy use resulting from potential new development was factored into the greenhouse gas emissions calculations as discussed in Appendix E. The calculations show an energy demand of approximately 40,650 megawatt hours and 9,600 therms in 2030 without implementation of energy efficiency measures or standards. This estimated electrical use represents a per capita use of approximately 1,800 kwh per capita, which is below state projections for the PG & E planning area

Overall, the future consumption of electrical and natural gas resources would not represent unnecessary, inefficient, or wasteful use of resources given the implementation of proposed policies that address lighting and energy conservation measures. Several policies in the proposed General Plan promote energy conservation, which could minimize or incrementally reduce the consumption of these resources. Specifically, GOAL NRC7 seeks to reduce energy use with a significant production and use of renewable energy. Its four policies and accompanying actions would promote reduction of electricity and natural gas consumption, use of renewable energy sources, and use of energy-efficient lighting, vehicles, and water fixtures and appliances. A summary of the proposed *General Plan 2030* policies that serve to reduce energy and fossil fuel consumption is presented in Table 4.6-10.

In addition, new structures will be required to be constructed in accordance with specifications contained in Title 24 of the California Code of Regulations and the City's Green Building Regulations. Anticipated changes in state building and energy efficiency requirements to help reduce greenhouse gas emissions will also reduce the rate of energy consumption increases. Such measures have been factored into California energy forecasts which predict an overall reduction in per capita use of electricity due to energy efficiency standards and conservation.

In addition, new structures will be required to be constructed in accordance with specifications contained in Title 24 of the California Code of Regulations and the City's Green Building Regulations. Anticipated changes in state building and energy efficiency requirements to help reduce greenhouse gas emissions will also reduce the rate of energy consumption increases. However, future construction activities would result in the irretrievable commitment of nonrenewable energy resources, primarily in the form of fossil fuels (including fuel oil, natural gas, and gasoline) for automobiles and construction equipment.

Conclusion. Adoption and implementation of the proposed *General Plan 2030* would not directly result in new development, but new development accommodated by the plan would result in increased demand for electric and natural gas services. However, with implementation of local and state regulations, as well as proposed

General Plan 2030 policies and actions, energy-efficient building designs, material and appliances would be incorporated into future developments and energy use would not be considered wasteful or inefficient. Thus, there would a less-than-significant impact related to energy use.

Mitigation Measures

No mitigation measures are required as a significant impact has not been identified.

TABLE 4.6-10
Proposed General Plan Policies and Actions that Reduce Energy Use

Type of Measure / Action	Policies / Actions
ENERGY CONSERVATION AND EFFICIENCY	• Reduce electricity and natural gas use by 20%: NRC7.1.1 • Adopt Model Lighting Ordinance: NRC7.1.2 • Improve energy efficiency in parks: NRC7.1.10 • Continue to install energy efficient systems in park and recreational facilities: NRC7.1.11 • Install energy-efficient street lighting: MC.2.10
PROMOTE RENEWABLE ENERGY	• Increase local use and production of renewable energy:NRC7.1.3 • Require passive heating and cooling in new development: NRC7.1.4 • Require City facilities to increase green electricity: NRC7.1.5
PROMOTE ENERGY EFFICIENT TRANSPORTATION	• Reduce consumption of fuels: NRC7.3.1 • Purchase City vehicles with fuel efficient or alternative fuel systems: NRC7.3.2, NRC7.3.4 • Establish telecommuting for City staff: NRC7.3.3 • Investigate partnerships with UCSC for electric car use: NRC7.3.5 • SEE TABLE 4.4-4 in Chapter 4.4 for policies-actions to reduce auto use.
PROMOTE ENERGY EFFICIENT WATER PROVISION & USE	• Install energy and water efficient appliances: NRC7.4.1 • Require new development to use high efficiency fixtures: NRC7.4.2 • Support gray water collection and reuse: NRC7.4.2, NRC7.4.3
EDUCATION & COORDINATION	• Cooperate with other agencies: NRC7.1.7 • Educate public: NRC7.1.8 • Support legislation on renewable energy: NRC7.1.9

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