






CENTRAL SAN

70 YEARS AND BEYOND

PROTECTING OUR COMMUNITY AND THE ENVIRONMENT

Comprehensive Wastewater Management Plan

EXECUTIVE SUMMARY

Since 1946, Central Contra Costa Sanitary District (Central San) has provided safe and reliable wastewater collection and treatment for residents in central Contra Costa County. Today we serve over 481,600 residents and 3,000 businesses in 147 square miles. Our services include supplying recycled water for parks and golf courses, providing both commercial and residential recycled water pickup programs, operating a household hazardous waste collection facility and running a sophisticated water quality laboratory. Our core mission is to protect public health and the environment, and our customers can count on us for vital services 24 hours a day, every day.

Central San's infrastructure includes a 1,500-mile collection system and a treatment plant that have been well maintained, but due to their advanced ages, now require replacements and upgrades. Already, the equipment at the plant and in the system have been extended well beyond their typical useful life due to responsible and robust maintenance practices. Some of the collection system facilities are over 100 years old, and many are over 50 years old. The treatment plant facilities were primarily constructed in the 1970s and some are now at the point where maintenance alone cannot maintain reliable performance. These recommended extensive replacement and upgrade projects will provide for continued reliable operation.

"Central San is committed to being an environmental steward, and we are using the latest and most cost-effective technology to optimize our facilities and address the drivers of our wastewater management plan."

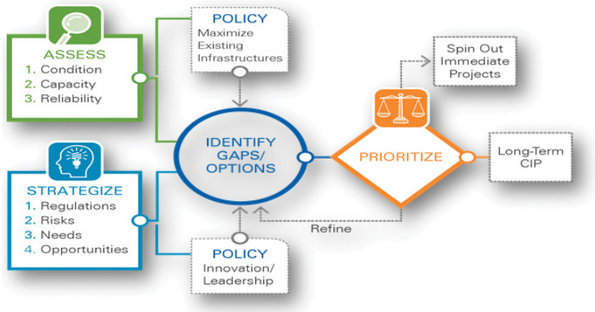
–Roger Bailey, General Manager

In order to plan for the future and lay out a 20-year vision for the replacements and upgrades, Central San commissioned a Comprehensive Wastewater Management Plan (CWMP). The CWMP encompasses a $1.8 billion (2016 dollars), two-decade-long capital improvement program (CIP) for the collection system and treatment plant with $873 million of capital improvements within the first ten years. The recommended projects from the CWMP were separated into four programs including the recycled water system, treatment plant, collection system and general improvements. It also identifies potentially needed improvements for anticipated or pending regulations, but funding for these is not included in the CIP.

We value the input we receive from our customers. Based on focus groups and a customer survey completed in fall 2015, customers are satisfied with Central San's wastewater services and are supportive of recycled water. The majority of customers surveyed (87 percent) supported the management plan and the funding needed to implement replacements and upgrades to Central San's infrastructure.

Our objectives, as identified in the CWMP, are to:

- Preserve, maintain, or replace Central San's assets for the collection system and treatment facilities.
- Meet increasingly stringent federal, state, and Bay Area regulatory requirements for effluent discharges, solids disposal and air emissions.
- Accommodate planned growth in the service area, as identified by cities and unincorporated Contra Costa County.
- Achieve sustainability goals by optimizing energy production and use, while minimizing greenhouse gas emissions.
- Increase recycled water production for current customers, the Concord Community Reuse Project development (at the Concord Naval Weapons Station site), and potentially for neighboring industrial customers.



Key "Drivers" for Long-Term Planning

Aging infrastructure. Repair or replace some equipment and structures to extend their useful lives.

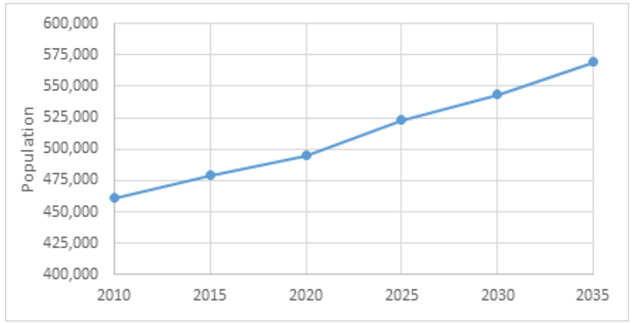
Capacity. Expand the capacity and redundancy (flows and loads) of some equipment and facilities. **Capacity projects are not intended to address or facilitate population growth.*

Regulations. Comply with regulations now and continue to adhere to them as they evolve or become stricter in the future.

Sustainability/Optimization. Optimize existing treatment processes, energy-efficient improvements, recovery of resources from solids processes, production of recycled water for refineries and improvements for service reliability during possible seismic and flooding events.

Regulatory Overview

Area Population Growth



Based on projections developed by the Association of Bay Area Governments (ABAG), the population of Central San's service area will continue to steadily increase over the next 20 years at an average rate of less than 1 percent per year. Our facility improvements will include both capacity and infrastructure upgrades to account for additional wastewater and wet weather flows. Wet weather improvements are needed regardless of population growth to provide reliable collection and treatment of wastewater through severe storms.

Regulatory Needs and Recommendations

Current and future regulations surrounding water quality, solids management and air emissions were key drivers for the development of the CWMP and the projects included. Funding has been allocated to help Central San address many of these regulations.

Solids Management

Central San's approach to solids management continues to meet all regulations. We will invest in upgrading our existing facilities to extend their useful life. However, the projections of future solid loads is higher than the permitted limit of the Multiple Hearth Furnaces (MHFs) where solids are currently incinerated and transformed into energy used by the treatment plant. Therefore, we are investing in diversifying our solids handling and resource recovery options. This will ensure we continue to provide reliable solids handling and responsibly recover valuable resources embedded in the solids such as energy or nutrients. This includes replacing the MHFs with anaerobic digestion and newer incineration technology.

"We have made it a priority to plan for future regulations to ensure that Central San is making the right investments for our customers now and in the future."

– Jean-Marc Petit, Director of Engineering and Technical Services

Air Emissions

To meet several current air emissions regulations and anticipated future changes in regulations, we are investing in modern, more efficient air pollution control equipment, updating Central San's treatment plant Health Risk Assessment (HRA), and investigating additional technologies that may be required in the future.

Regulatory Considerations

Nutrient limitations and constituents of emerging concern are not part of any existing regulations, but Central San is working with other agencies and regulators to review the science and perform the studies needed to determine whether or not additional treatment processes will be needed in the future. For now, we are taking them into consideration as we invest in replacing our aging infrastructure. This way we can responsibly plan for enough space to accommodate those technologies and to make sure we can meet future need in a cost effective manner. Potential regulations would require improvements, and the CWMP has made important assumptions on our approach to meet them. However, the cost will not be included in the 20-year CIP until these regulations become more clear and certain.

Nutrient Limitations

Nutrient reduction in wastewater may be a future regulatory requirement, and we are prepared to meet it. Central San is actively engaged with the Bay Area Clean Water Agencies, San Francisco Estuary Institute, and San Francisco Bay Regional Water Quality Control Board to study the role of nutrients in the Bay and to plan for potential nutrient reduction levels and the timing for those nutrient limits.

Constituents of Emerging Concern

Central San is also engaged in research on the increasing levels of microconstituents and other constituents of emerging concern (CECs) that end up in wastewater from personal care products, herbicides and pesticide use, and other consumer products. The impact of these constituents could result in new regulations in the future. While the scope and timing of these regulations are currently uncertain, space at the site has been reserved to accommodate a future CEC treatment system, if required. Future increased levels of treatment may be required as the levels and impacts of chemicals are better understood from emerging research.

Long-Term Planning

Seismic events

In order to prevent any potential long-term disruption of service, there will be further seismic evaluation of major mechanical and electrical equipment throughout the treatment plant and in the utility tunnels. Several seismic retrofit projects for major buildings have been completed, are underway, and are in the CIP over the next 10 years.

Sea Level Rise Protection

Since Central San's service area is primarily inland, sea level rise protection is not a major issue, but it is still an important consideration for some of the facilities. The California Department of Water Resources' standard is to provide protection against a 200-year water level with 3 feet of freeboard, and include allowances for sea level rise due to climate change. Central San has joined with the Contra Costa County Flood Control District to implement a project to raise the levees along Grayson and Walnut Creeks to provide three feet of freeboard, which will protect the site from a 500-year storm event.

Recycled Water System Evaluation

Some of the existing Recycled Water Plant infrastructure is nearing the end of its useful life. In addition, a higher recycled water production capacity will be needed to satisfy the demands for the Concord Community Reuse Project development and for potential future in-plant utility water demands. The plant has been evaluated to identify improvements needed to extend the life of the facilities for at least the next 20 years and to meet recycled water demands through 2035.

Infrastructure Improvements:

- Replace water pumps, flow meters, filter media, the Clearwell liner and cover used to store recycled water, and other controls to help the system operate more efficiently.
- Upgrade or replace the electrical support system for the recycled water, filtration and applied water process areas.
- Replace components of the chemical support systems (sodium hypochlorite and coagulant).

Capacity Improvements:

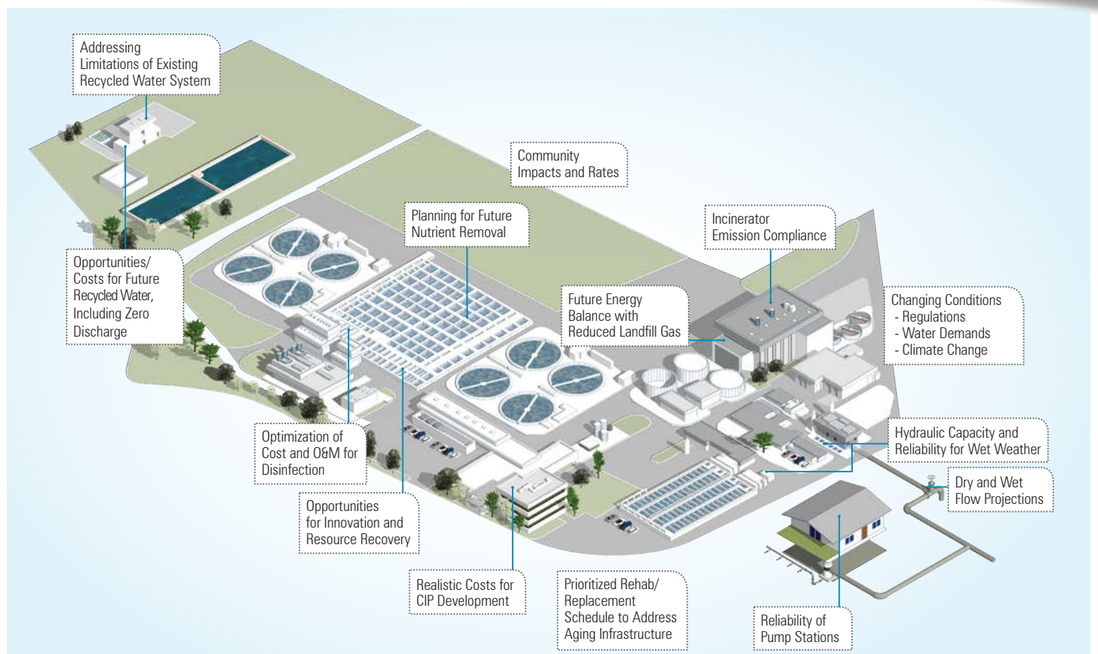
- Optimize filtration performance and capacity by improving water filterability with a filtration pretreatment process.
- Expand disinfection capacity through the addition of a chlorine contact basin.
- Optimize chemical use and increase the capacity of the chemical support systems.

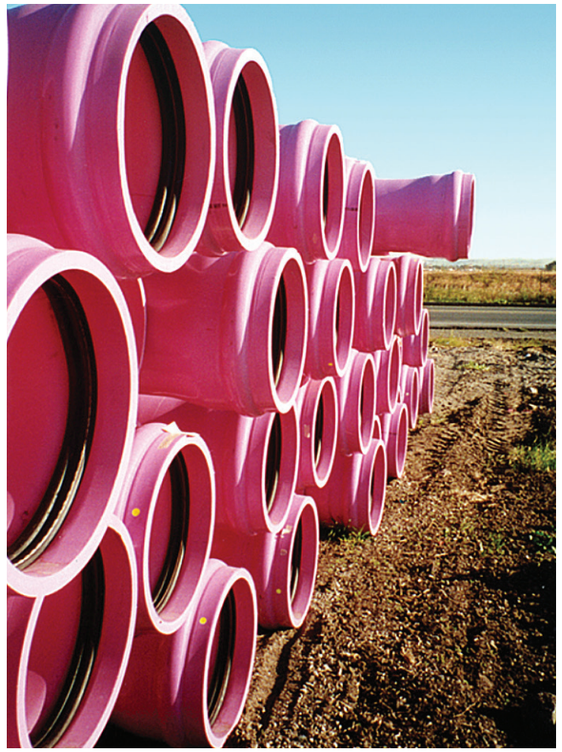
Recycled Water Treatment Alternatives

Central San developed a short list of viable technologies that were combined to form overall treatment alternatives for meeting future nutrient regulations and producing recycled water for area refineries. The top three liquids alternatives were evaluated and selected during a workshop with staff comprised of operations, maintenance and engineering personnel.

Achieving Zero Discharge

One of Central San's long-term goals is to achieve zero liquid discharge to Suisun Bay during the dry weather season. To reach this goal, we are working to maximize the production and use of recycled water by evaluating wholesale recycled water opportunities. There are a number of neighboring water agencies that could serve as potential recycled water wholesale customers in the future.





The Treatment Plant System

Central San's treatment plant is located in Martinez, and it processes approximately 32 million gallons of wastewater each day during the dry season and can see peak flows as high as an estimated 230 million gallons per day during an extreme winter storm. The treatment plant is a conventional air-activated sludge facility that provides primary and secondary treatment of the influent wastewater. The secondary effluent is disinfected using UV lamp technology and the final treated effluent is then conveyed by an outfall pipeline to Suisun Bay. Solids removed by the primary and secondary treatment processes are sent to Multiple Hearth Furnaces (MHFs). The MHFs reduce the solids to ash, which is beneficially reused as a fertilizer amendment by a third party. The energy embedded in the solids is recovered to offset Central San's energy use as waste heat from the furnaces and then converted to steam energy that is used to drive steam turbines, which in turn, drive the aeration blowers that supply air for the activated sludge biological process.

Treatment Plant Assessment

The treatment plant system contains over 4,200 assets that need to be maintained and monitored for efficient operation. Through site inspections, condition assessments and workshops with Central San's operations and maintenance staff, several aging assets have been identified for replacement or upgrades to more reliable, efficient and modern systems. The plant was primarily built in the late 1970s, and modernizing it will include investing in new technology and addressing increased energy and power demands.

To ensure long-term reliability and efficiency, our assessment has concluded:

- It is not necessary to build a new treatment plant. The plant has a solid foundation and will require primarily mechanical, electrical, and instrumentation improvements to address aging assets that are in poor condition, are unreliable, or are increasingly costly to maintain.
- New solids/energy projects will be developed to ensure Central San is providing reliable solids handling facilities and is investing in sustainable solutions while reducing its energy footprint and general operation and maintenance costs.
- The UV system will be replaced with a new one that is more energy efficient. The current system is 20 years old, is inefficient compared to modern systems, and some of the electrical support infrastructure is becoming increasingly unreliable.
- Improved instrumentation and power monitoring is recommended to help identify other opportunities to reduce energy demands and other operating and maintenance costs.

Treatment Plant Projects Overview

Aging Infrastructure

1. **Filter Plant Improvements:** Replace filter media, underdrains, electrical gear, and support facilities.
2. **Secondary Clarifier Rehabilitation:** Replace clarifier mechanisms and sludge pumps.
3. **UV Replacement:** Replace ultraviolet disinfection system.
4. **Solids Handling Improvements:** Replace centrifuges, cake pumps, and air pollution control equipment.
5. **Fluidized Bed Incinerator:** Replace Multiple Hearth Furnaces (MHFs) at the end of their useful life with a fluidized bed incinerator.
6. **Clearwell Improvements:** Replace clearwell liner and the east cell cover; add west cell cover.

Outfall Improvements

Odor Control Upgrades

Capacity

1. **Filter Plant Expansion:** Add a chlorine contact tank, expand support equipment. Add filter pretreatment upstream of the filters to meet Concord Community Reuse Project Title 22 recycled water demands when they occur. *
7. **Secondary Treatment Hydraulics:** Add secondary clarifiers to increase PHWWF capacity and a mixed liquor splitter structure to evenly split between clarifiers.
8. **UV Hydraulics:** Add low lift pumps to UV channel and a parallel final effluent pipe.
9. **Primary Expansion:** Add two primary sedimentation tanks and a pre-aeration tank to reduce surface overflow rates and improve performance.

Regulatory

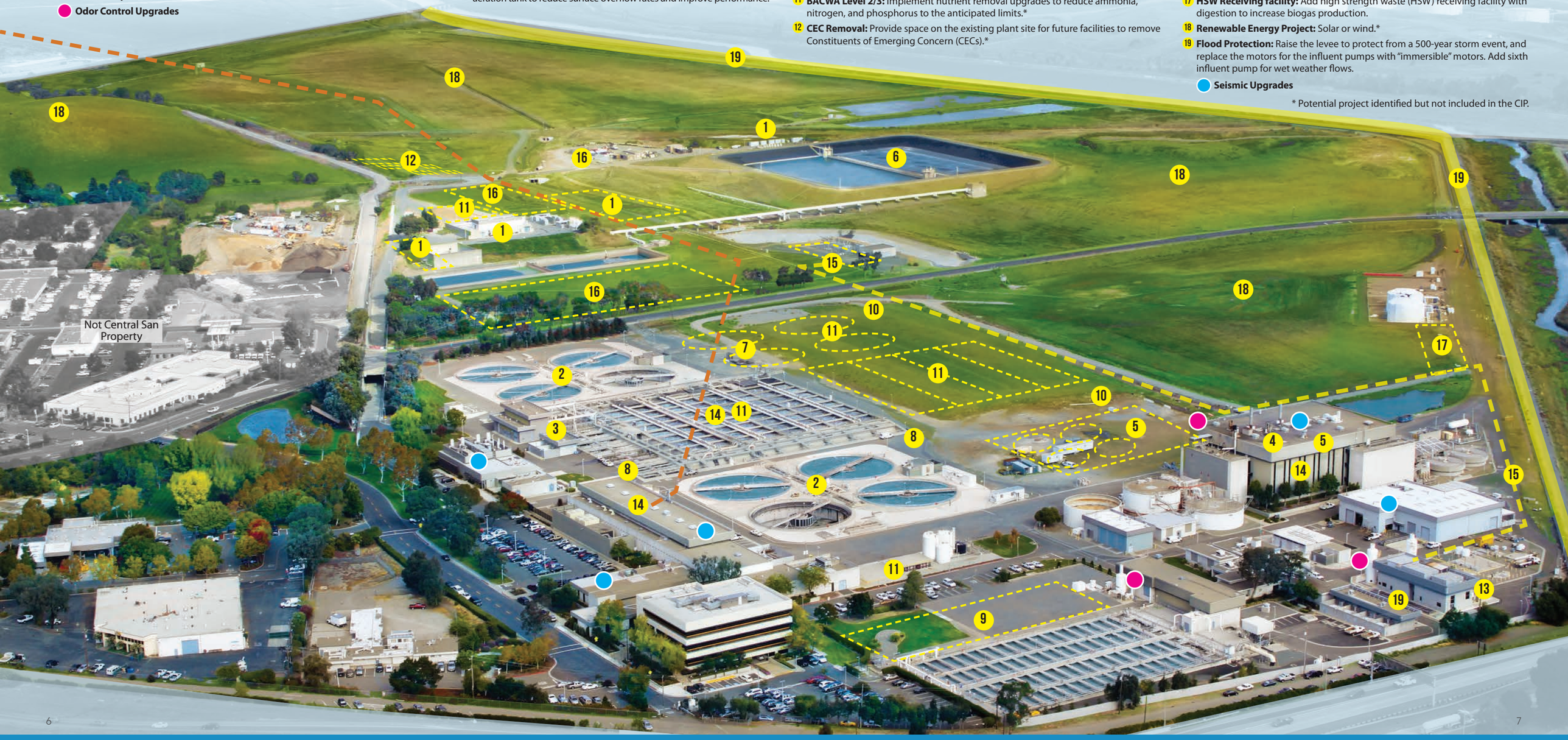
4. **Solids Handling Improvements:** Reduce lime addition, replace air pollution control equipment and ash handling, implement seismic upgrades for the Solids Conditioning Building and MHFs, and improve the sludge blend tank storage operations and mixing.
5. **Solids Handling Upgrades:** Add digesters to reduce the load to the furnaces to prevent exceeding the MHF permitted capacity, and eventual replacement of the MHFs with digesters followed by a fluidized bed incinerator.
10. **Contaminated Soils:** Re-consolidate contaminated soils to wet weather holding basin A-South.
11. **BACWA level 1:** Optimize facilities for nutrient reduction by adding chemically enhanced primary treatment and implementing aeration tank modifications for split flow nitrification.
11. **BACWA Level 2/3:** Implement nutrient removal upgrades to reduce ammonia, nitrogen, and phosphorus to the anticipated limits.*
12. **CEC Removal:** Provide space on the existing plant site for future facilities to remove Constituents of Emerging Concern (CECs).*

Sustainability

13. **Screenings Removal Upgrade:** Add new influent screenings removal and handling facilities to replace the current screenings handling process.
14. **Aeration System Upgrade:** Replace steam blowers with electric blowers, replace ceramic diffusers with membrane diffusers, replace air piping. Convert waste heat recovery steam system into a waste heat to power production system.
15. **Raw Wastewater Diversion and Drain-back System:** Add a raw wastewater pipeline to the wet weather holding basins and a pump station to reliably drain back wastewater from the holding basins.
16. **Refinery Recycled Water Project (20 mgd):** Add membrane bioreactors (MBR), Reverse Osmosis (RO), and UV to produce recycled water for nearby refineries.*
17. **HSW Receiving facility:** Add high strength waste (HSW) receiving facility with digestion to increase biogas production.
18. **Renewable Energy Project:** Solar or wind.*
19. **Flood Protection:** Raise the levee to protect from a 500-year storm event, and replace the motors for the influent pumps with "immersible" motors. Add sixth influent pump for wet weather flows.

Seismic Upgrades

* Potential project identified but not included in the CIP.



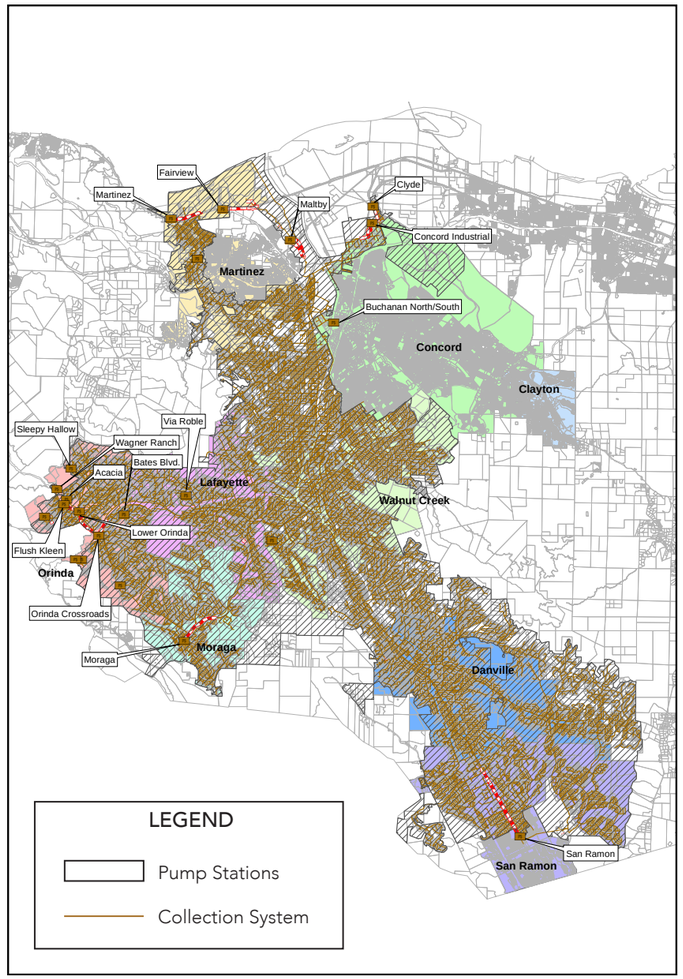
The Collection System

Central San's collection system has over 1,500 miles of gravity sewer pipes, 19 pump stations, 22.8 miles of force mains (pressurized pipes), and roughly 35,000 manholes. Our collection system serves Alamo, Blackhawk, Clyde, Danville, Diablo, Lafayette, Martinez, Moraga, Orinda, Pacheco, Pleasant Hill, Rossmoor, San Ramon, and Walnut Creek. In addition to these communities, Central San also provides wastewater treatment for the City of Concord and Town of Clayton.

Collection System Assessment and Innovation

To better understand existing flow and pipeline conditions and to prepare for future infrastructure needs related to the collection system, Central San is utilizing the following state-of-the art tools:

- A new hydraulic modeling tool (InfoWorks®) to predict flows (including during rain events) in the collection system, evaluate the impacts of new or changing flows on existing pipes, and to ensure pipes are sized adequately.
- A new capital planning tool (InfoMaster®) to prioritize pipeline replacements. With a system that includes 1,500 miles of pipelines, this predictive tool is used to identify which pipes to replace, and when and how many pipes will be replaced over the next 100 years.
- A new CityWorks® computerized maintenance management system (CMMS) and closed circuit television (CCTV) pipe inspection software used to help manage collection system cleaning, inspection, and condition information.
  Also, condition assessments for the pump stations helped to determine priority level for upgrades moving forward.

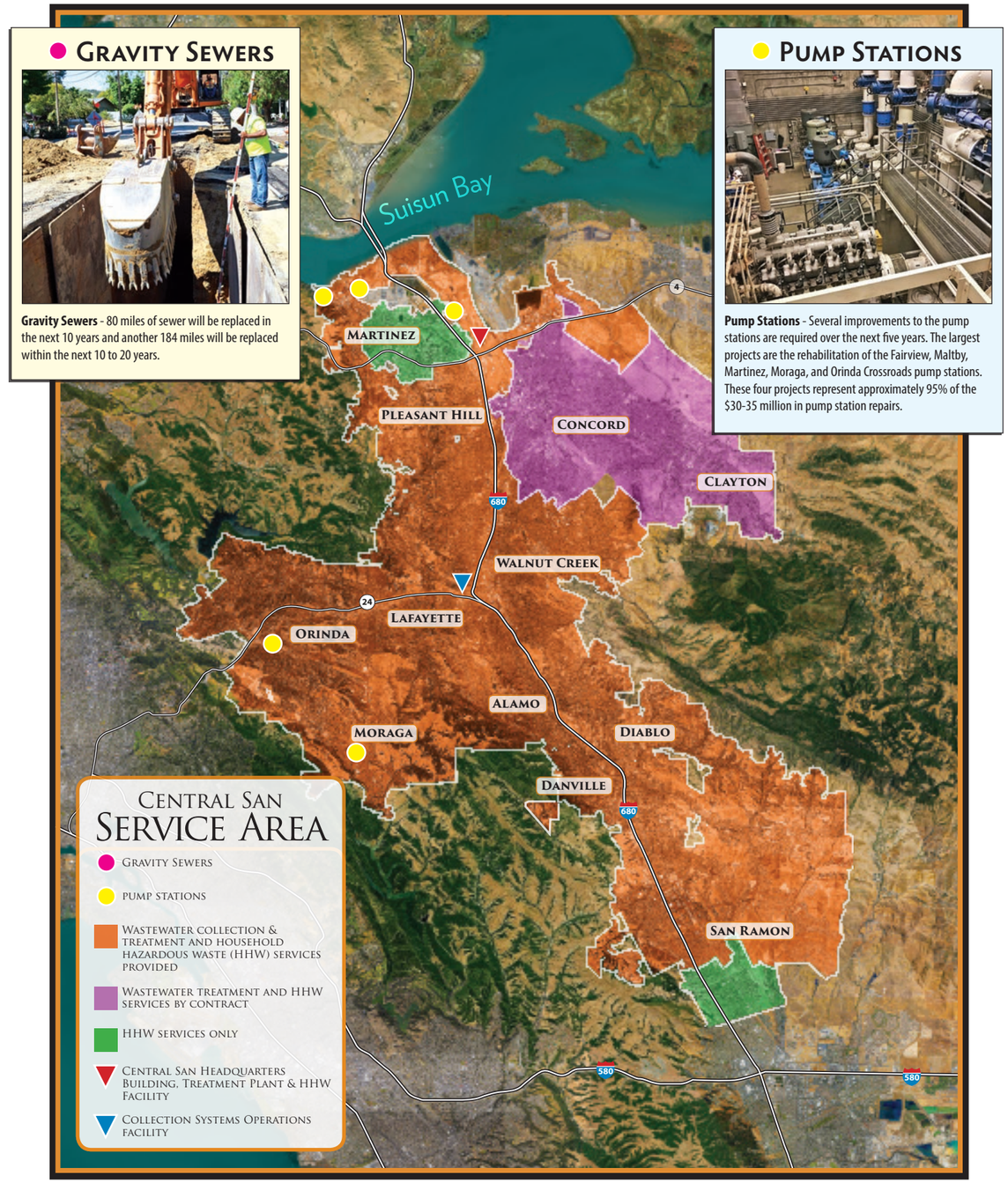


Map of the existing collection system

The Future of the Collection System

The new projects to upgrade and improve the collection system address the management planning drivers and greatly benefit Central San's customers. Our Capital Improvement Program (CIP) includes gravity sewer wet weather capacity relief improvements to 12 areas throughout the service area within the next 10 years and another 8 areas within the next 10 to 20 years. No improvements were needed for existing pipelines to accommodate planned growth in the service area. An extension of the existing collection system and some improvements to pump stations may be required in North Concord to accommodate future flows from the Concord Community Reuse Development; however, those project costs are not included in the CIP. The CIP also includes improvements to gravity sewers and pump stations to extend their useful lives.

Collection System Projects Overview



The Collection System (Continued)

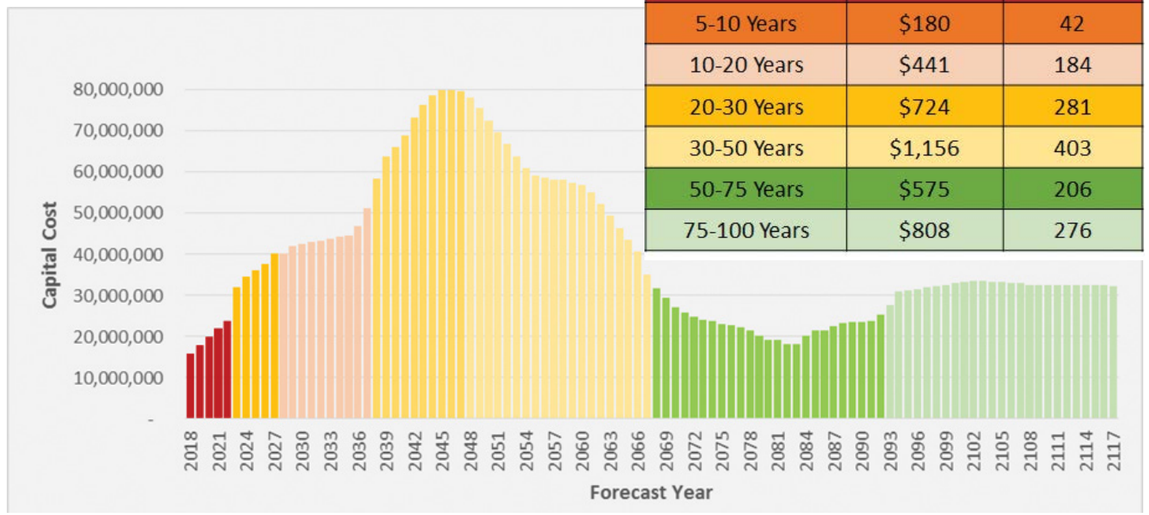
In an effort to continually improve service reliability, Central San is working to reduce sanitary sewer overflows (SSOs) for the collection system. We are addressing this through pipeline cleaning, inspection and renovation. We are currently replacing less than 0.5 percent per year of our total owned pipelines and plan to increase toward one percent per year over the next ten years, focusing on the highest risk pipelines.

CCTV inspections have been successful and will continue to be used on over 150 miles of pipeline per year. We will also be investing more in the inspection of large diameter pipes that are costly to repair or replace and force mains, which are difficult to take out of service.

However, sometimes cleaning is more cost effective than replacing a pipe. We will continue our maintenance practice of cleaning over 800 miles of pipe per year.

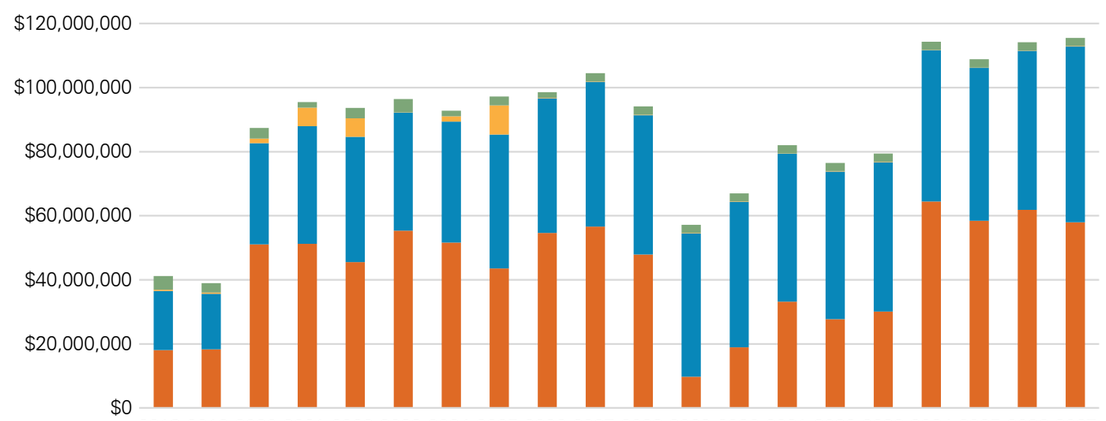
100-Year Sewer Rehabilitation & Replacement Forecast

Period	Cost ($M)	Mileage
0-5 Years	$99	38
5-10 Years	$180	42
10-20 Years	$441	184
20-30 Years	$724	281
30-50 Years	$1,156	403
50-75 Years	$575	206
75-100 Years	$808	276

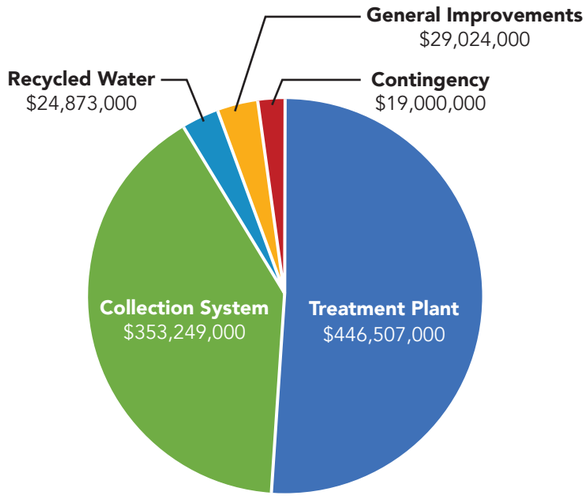


Capital Improvement Plan

The Comprehensive Wastewater Management Plan encompasses a $1.8 billion (2016 dollars) 20-year capital improvement program (CIP) for the collection system and treatment plant, with $873 million of capital improvements within the first ten years. These short-term and long-term investments in our systems align with our mission to always protect public health and the environment and maintain the excellent service levels our customers expect from Central San.

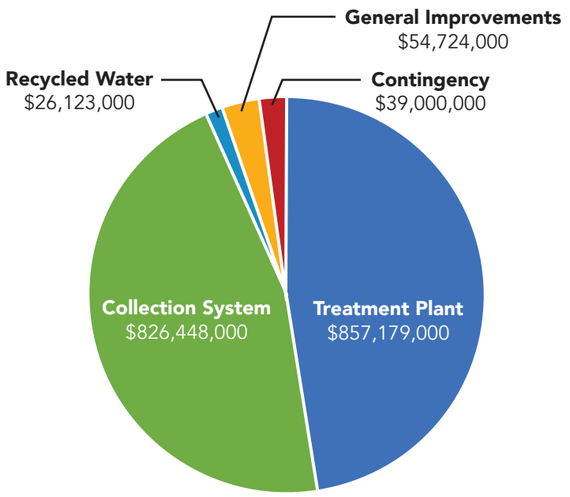


10-Year CIP



Total 10-year CIP $872,653,000

20-Year CIP



Total 20-year CIP $1,803,474,000

Innovation for the Future

The CWMP has identified proven technologies that can be utilized to meet future nutrient limits, wholesale recycled water needs and technologies for solids handling and resource recovery. These technologies are essential for ensuring Central San has a plan in place if we need to replace those systems. However, we recognize the industry is rapidly changing and that emerging and innovative technologies may offer improved life cycle costs and/or reduced footprint requirements, so we are also investing in applied research to continue to explore the best available options for Central San.

Central Contra Costa Sanitary District

Protecting Public Health and the Environment