WEST BAY
SANITARY DISTRICT

Bayfront
Recycled Water Facilities Plan
Final Report

Prepared by:

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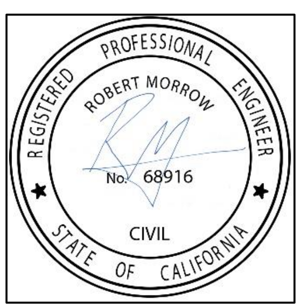

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List of Abbreviations

AAD	average annual demand
AFY	acre feet per year
Cal Water	California Water Service
CEQA	California Environmental Quality Act
City	City of Menlo Park
CWSRF	Clean Water State Revolving Fund
DDW	Division of Drinking Water
District	West Bay Sanitary District
DWR	California Department of Water Resources
EIR	Environmental Impact Report
Facilities Plan	Bayfront Recycled Water Facilities Plan
Ft	feet
ft bgs	feet below groundwater surface
GPM	gallons per minute
GSA	General Services Administration
hp	horsepower
in	inch
IRWM	Integrated Regional Water Management
ISRF	Infrastructure State Revolving Fund
kwh	kilowatt hour
LF	lineal feet
Market Survey	Recycled Water Market Survey
MBR	membrane bioreactor
MDD	maximum day demand
MF	microfiltration
mg/L	milligrams per liter
MGD	million gallons per day
µm	micrometer
mJ/cm^2	millijoule per square centimeter
mm	millimeter
MPMW	Menlo Park Municipal Water
MPN	most probable number
NEPA	National Environmental Policy Act
nm	nanometer
NTU	nephelometric turbidity units
PHD	peak hour demand
Plan	Recycled Water Facility Plan
Project	Recycled Water Project
psi	pounds per square inch
RWQCB	San Francisco Bay Regional Water Quality Control Board
SFPUC	San Francisco Public Utilities Commission

SLAC	Stanford Linear Accelerator Center
SVCW	Silicon Valley Clean Water
SWRCB	State Water Resource Control Board
TDS	total dissolved solids
Title 22	Title 22 California Code of Regulations
TSS	total suspended solids
UF	ultrafiltration
USBR	US Bureau of Reclamation
UV	ultraviolet
UVT	ultraviolet transmittance
UWMP	Urban Water Management Plan
WBSD	West Bay Sanitary District
WRF	water recycling facility
WRFP	Water Recycling Funding Program
WWTP	wastewater treatment plant

Chapter 1 Introduction

1.1 Background

West Bay Sanitary District (WBSD or District) maintains and operates over 200 miles of main line sewer in the City of Menlo Park (City) and portions of the Cities of East Palo Alto, Redwood City, the Towns of Atherton, Woodside and Portola Valley and portions of Unincorporated San Mateo and Santa Clara Counties. The raw wastewater collected by WBSD is conveyed to Silicon Valley Clean Water (SVCW) where the wastewater is treated and discharged or reused. Figure 1 illustrates the WBSD boundaries and the study area.

In 2014, WBSD completed a Recycled Water Market Survey (Market Survey) (RMC, 2014), including preliminary market and recycled water supply assessment and evaluation of three conceptual alternatives to serve recycled water customers to assess overall feasibility of expanding the service area water supply portfolio to include recycled water.

The WBSD decided to further evaluate a satellite treatment plant at Sharon Heights Golf & Country Club and recycled water use at the golf course and other potential customers near the golf course. This evaluation was documented in the Sharon Heights Recycled Water Facilities Plan (RMC, 2015) and WBSD is currently implementing the project to construct a new satellite water reclamation plant to provide recycled water for irrigation at the Sharon Heights Golf & Country Club, herein referred to as the Sharon Heights Recycled Water Project. This Bayfront Recycled Water Facilities Plan (Facilities Plan) evaluates projects identified in the Market Survey in the Bayfront area.

This chapter of the report includes background on the District and the Facilities Plan, documentation of the goals and drivers for considering implementation of a recycled water project in the Bayfront area, discussion of the Plan objectives and approach, description of stakeholder involvement during preparation of the Facilities Plan, and summary of the report organization.

1.2 Facilities Plan Objectives and Approach

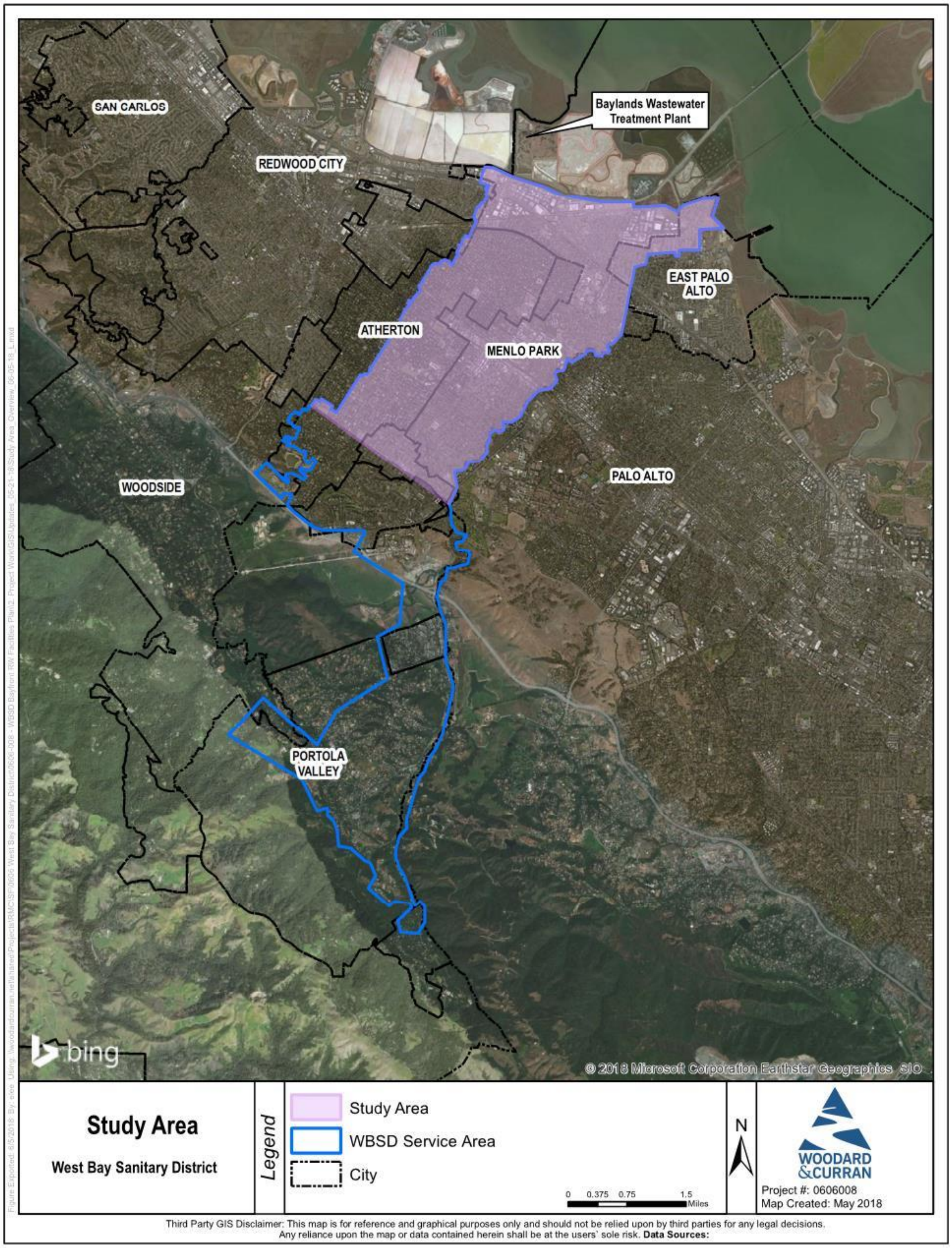
The objectives of this Facilities Plan are:

1. Update and refine the recycled water market assessment in the Bayfront area;
2. Evaluate wastewater diversion locations, supply alternatives, and distribution alternatives;
3. Identify a recommended project, including target customers, planning-level design criteria, and planning-level cost estimate;
4. Prepare an implementation plan for the recommended project, including implementation schedule, construction financing plan and preliminary environmental checklist

1.3 Stakeholder Involvement

During the preparation of this Facilities Plan, stakeholder involvement and outreach focused on individual meetings with the City of Menlo Park, BAWSCA, the County of San Mateo and other potential customers in the Study Area. In addition, the District coordinated with Caltrans and San Mateo County to incorporate the latest available information into the evaluation. Should WBSD decide to move forward with a recycled water project, it would initiate more extensive public involvement – at a minimum, through the environmental review and public project approval process.

Figure 1: Study Area



Chapter 2 Study Area Characteristics

This chapter provides additional background information on the characteristics of the Bayfront study area, including a discussion of water demand and supply and a characterization of the underlying groundwater basin.

2.1 Study Area

The study area for this Facilities Plan is defined as the northwestern section of the WBSD service area, as shown in **Figure 1**. The study area includes the Bayfront area, which has experienced a surge of development in recent years. An increased interest in recycled water has been seen from potential future customers in the Bayfront area that prompted the study of the potential demand for recycled water. The potential recycled water facility would be located at the abandoned WBSD wastewater treatment plant (WWTP) site; hence, the southeastern section of the WBSD service area was not considered for this Report. Potable water in this section of the District's service area is supplied by Menlo Park Municipal Water (MPMW) and California Water Service (Cal Water) as shown in **Figure 2**.

2.1.1 Groundwater Basin Characterization

Most the District's service area overlies the San Mateo Plain groundwater subbasin, as shown on **Figure 3**. The San Mateo subbasin borders the Santa Clara Valley subbasin along its eastern boundary where it follows the county line along San Francisquito Creek. This area is also known as the San Francisquito Cone, San Francisquito Creek subbasin, or San Francisquito Creek alluvial fan.

Currently, San Mateo County is leading development of the San Mateo Plain Groundwater Basin Assessment. The basin is not managed pursuant to a groundwater management plan; although various entities have a formal role in maintaining Basin sustainability. In 2014, the basin was assigned a "Very Low" priority ranking by California Department of Water Resources (DWR), exempting the basin from mandatory compliance with the Sustainable Groundwater Management Act (SGMA). In May 2018, DWR assigned a preliminary "Medium" priority ranking after reassessing basin prioritization. If formally approved, the basin would be required to establish a Groundwater Sustainability Agency by 2020 and develop a Groundwater Sustainability Plan by 2023.

Beneficial uses of the groundwater subbasin include irrigation, public and private drinking water. Of the wells installed within the basin, approximately 90% are solely used for irrigation purposes (RWQCB, 2003). In the area underlying the District's service area, two aquifer systems are present; a shallow aquifer located up to 120 feet below ground surface (ft bgs) and a deeper aquifer located between 200-400 ft bgs (RWQCB, 2003). The densest clustering of wells is within Atherton and Menlo Park, and these wells are typically installed within the deeper aquifer, where the more northern wells are generally installed within the shallow aquifer (RWQCB, 2003). During the 1987-92 drought, over 100 residential wells were installed in the town of Atherton, raising concerns related to overpumping such as land subsidence and salt-water intrusion (USGS, 1997).

Figure 2: Study Area Water Agencies

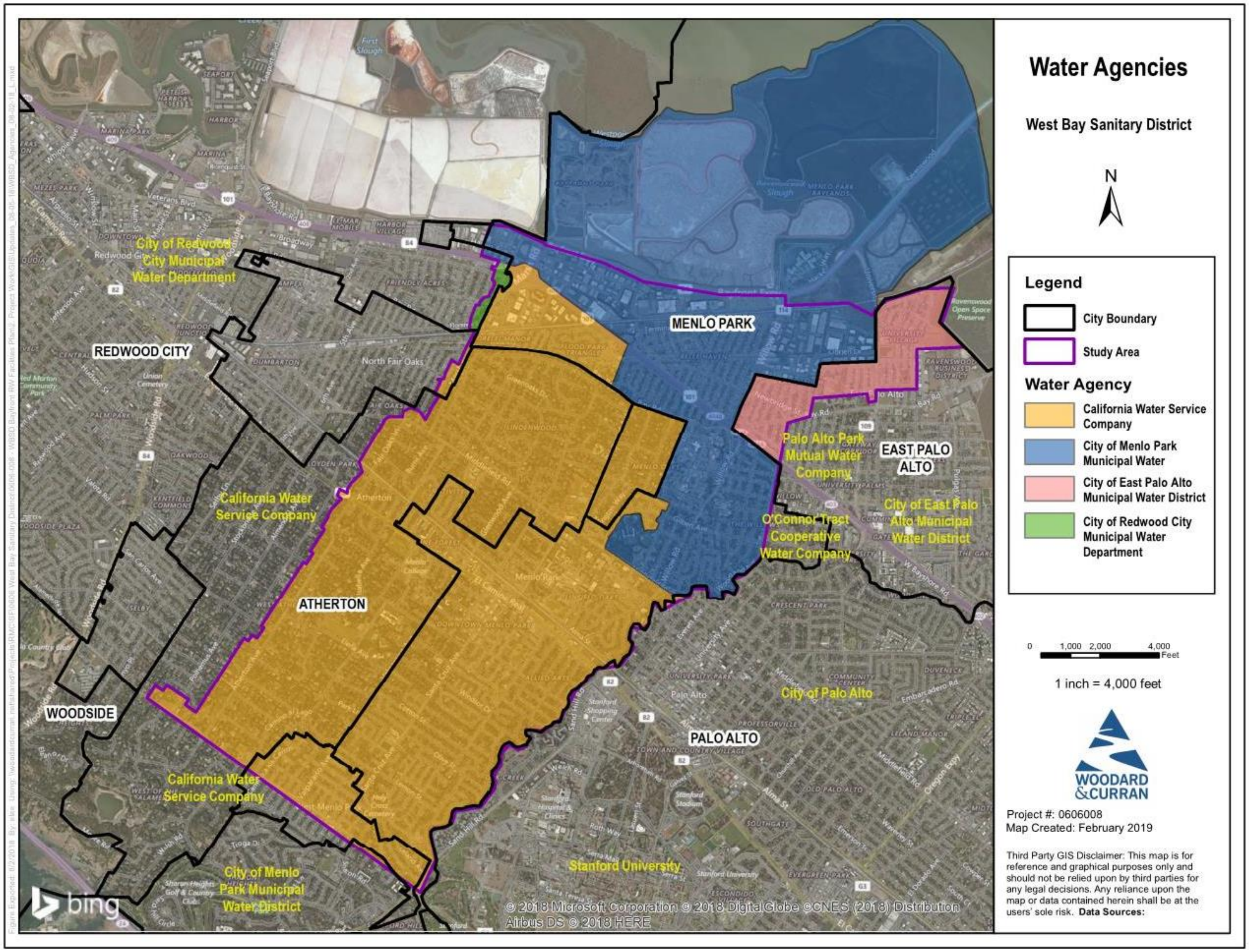
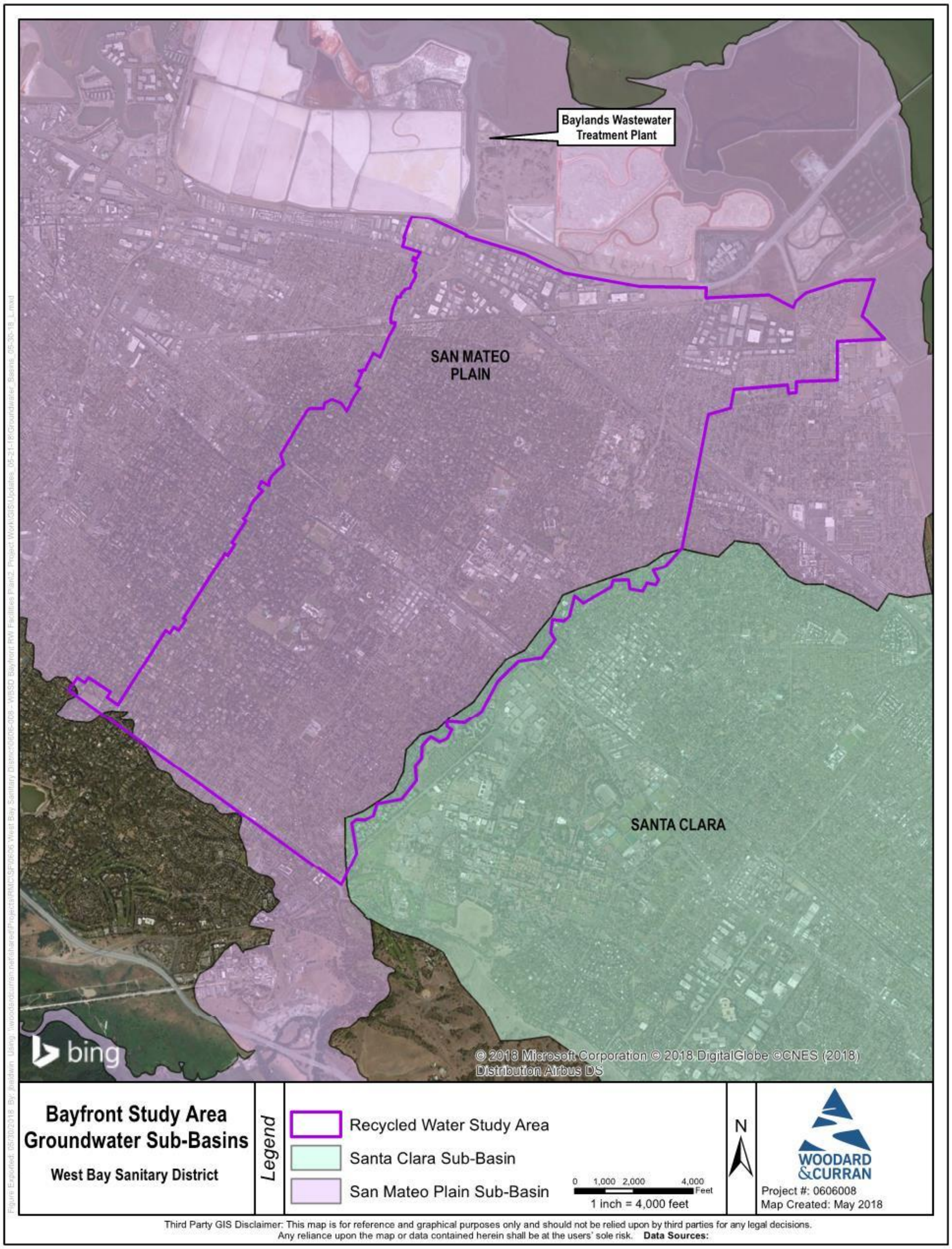


Figure 3: Groundwater Sub-Basins



2.2 Water Demand

Based on the *2015 Urban Water Management Plan for the Menlo Park Municipal Water District* (EKI, 2016a), the population of the City of Menlo Park served by the MPMW is expected to double between 2015 and 2040 from approximately 15,342 to 30,184. In addition to residential growth, the City is anticipating commercial development in the future, and employment in the service area is estimated to increase from 12,443 in 2015 to 32,593 in 2040. **Table 1** includes a summary of the current and projected water demands in the MPMW service area. Projected water demands consider per capita demand reductions and planned growth.

Cal Water serves the Bear Gulch District, which includes Portola Valley, Woodside, Atherton, and portions of Menlo Park, Redwood City, and San Mateo County. Based on the *2015 Urban Water Management Plan, Bear Gulch District* (Cal Water, 2016), population in Cal Water's service area is expected to reach 66,831 in 2040, increasing from an estimated 59,883 in 2015. While Cal Water supplies water to residential, commercial, industrial, and institutional customers, about 87 percent of them are residential customers. Table 1 includes a summary of the current and projected water demands in the Cal Water service area. Expected water savings and estimated growth were considered for projected water demands.

Table 1: MPMW and Cal Water Actual and Projected Water Demands (AFY)

	2015 (Actual)	2020	2025	2030	2035	2040
MPMW	883	1,341	1,403	1,468	1,539	1,614
Cal Water	10,401	14,367	14,378	14,469	14,643	14,811

Source: MPMWD UWMP (EKI, 2016a) and Cal Water UWMP (2016)
AFY Acre-feet per year

2.3 Water Supply

Table 2 and **Table 3** show the actual supply volumes for 2015 and projected supply volumes through 2040 for MPMW and Cal Water, respectively.

Table 2: MPMW Actual and Projected Water Supply (AFY)

	2015 (Actual)	2020	2025	2030	2035	2040
SFPUC	5,002	5,002	5,002	5,002	5,002	5,002

Source: MPMWD UWMP (EKI, 2016a)

Table 3: Cal Water Actual and Projected Water Supplies (AFY)

	2015 (Actual)	2020	2025	2030	2035	2040
SFPUC	28,404	37,430	37,485	37,852	38,354	38,972
Surface Water	437	1,260	1,260	1,260	1,260	1,260
Groundwater	1,312	1,535	1,535	1,535	1,535	1,535
Total	30,153	40,225	40,280	40,647	41,149	41,767

Source: Cal Water UWMP (2016)

Note: Cal Water's SFPUC supply is shared among all three of its districts on the San Francisco Peninsula – the values in this table are totals across all three districts. The supply amounts shown equal the projected demand in each year. Water demand projections in Table 1 are only for the Bear Gulch District.

As shown in the previous tables, MPMW purchases all its water from the San Francisco Public Utilities Commission (SFPUC), while Cal Water's supply for all three of its districts on the San Francisco Peninsula is a combination of mostly water purchased from SFPUC and a small percentage of local surface and groundwater sources. For the Bear Gulch District, about 89 percent of the water is purchased from SFPUC and 11 percent of the water comes from local surface sources in 2015 (Cal Water, 2016).

With increasing water demands forecasted over the next 20 years and the Study Area's dependence on the SFPUC water, adequate water supply for the region is an issue that recycled water could help address.

Since the 1960's, the City's primary source of potable water has been the SFPUC's Hetch Hetchy Regional Water System. The SFPUC system supply is predominantly snowmelt from the Sierra Nevada Mountains, delivered through the Hetch Hetchy aqueducts. The SFPUC wholesales water to MPMW and Cal Water which are the water retailers for the majority of the customers within the City.

The MPMW's and Cal Water's dependence on SFPUC for potable water supplies leads to several potential issues that may be addressed or reduced using recycled water in the City:

- **Water Supply Availability during Average Year.** Per the MPMW's contract with SFPUC, the MPMW has an Individual Supply Guarantee of approximately 4,993 AFY through 2034.
- **Water Supply Reliability during Periods of Drought.** The majority of SFPUC water supplies are surface water and susceptible to drought conditions. Supplying recycled water to non-potable demands would dampen drought impacts on potable water supply.
- **Water Supply Reliability during Service Disruptions.** The majority of SFPUC water supplies are piped in from outside the City's immediate area. The City's exclusive dependence on the SFPUC for potable water leaves the City in a vulnerable position to service disruptions and outages if an event (e.g., earthquake) damages the transmission system. To address this issue, SFPUC undertook the Water System Improvement Program to address reliability, and seismic protection in their system. In addition, recycled water would allow for the use of a local, reliable water supply for non-potable demands in the event of service disruptions.

Chapter 3 Market Assessment

A preliminary recycled water market assessment was conducted as part of the Market Survey (RMC, 2014) that included preliminary definition of the Baylands WWTP Facility project concept in the Bayfront area. The assessment in the Market Survey consisted of three major tasks: preliminary demand assessment, preliminary water supply assessment, and preliminary water quality assessment. For this Facilities Plan, the preliminary recycled water market assessment was refined as follows:

- **Refine customer demand estimates, define demand profiles, and identify other potential customers near Bayfront.** The Market Survey only considered the largest existing potable water customers. Other potential customers (existing and future) in the study area were considered, such as new commercial and residential re-development is planned as part of ConnectMenlo.[1]
- **Confirm/refine the water quality needs**. The Market Survey identified cursory water quality needs based on typical water quality objectives for certain category of customers; this assessment will be refined based on additional monitoring and will consider both planned treated water quality and an identification of customer needs related to water quality.

This refined market assessment will form the basis for evaluating recycled water distribution alternatives. Refinements to potential uses, customers, and recycled water demands discussed in the following sections apply specifically to the development of a satellite treatment plant at the old WBSD Baylands WWTP site and recycled water delivery to potential local customers in the Bayfront area.

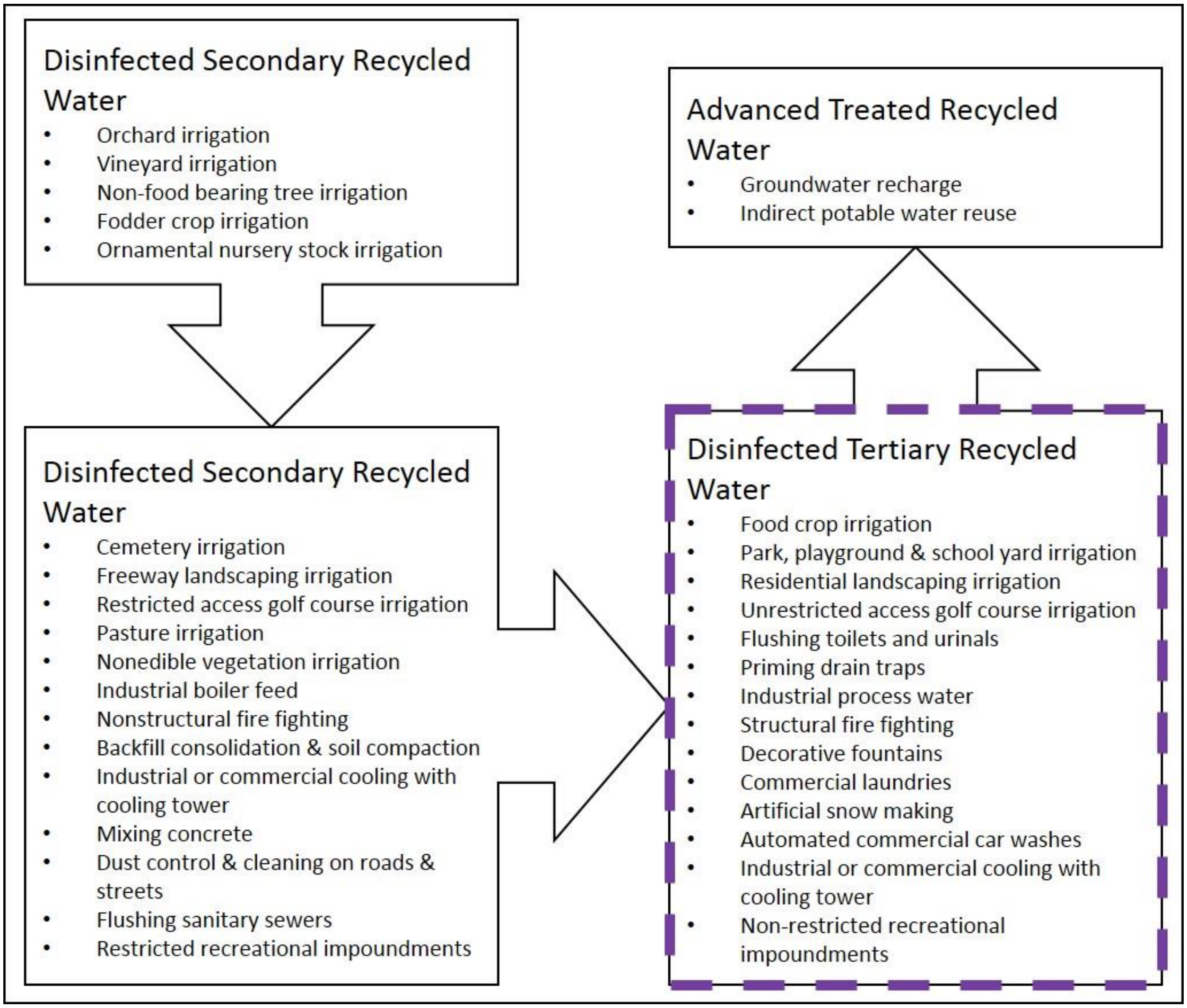
3.1 Potential Recycled Water Uses

A list of potential uses was developed in the Market Survey based on recyclable water uses allowable under Title 22 of the California Code of Regulations (Title 22) with disinfected tertiary recycled water as the target level of treatment. A preliminary database of potential recycled water customers based on the identified uses was developed in the Market Survey. No other uses other than those identified in the Market Survey were considered herein.

Figure 4 includes a list of potential recycled water uses allowed by the State Water Resources Control Board (SWRCB) Department of Drinking Water (DDW) for various levels of treatment, with disinfected tertiary recycled water highlighted as the target level of treatment for this project. Potential uses in WBSD's service area are categorized as irrigation and commercial cooling tower uses.

[1] The 2014-2016 update of the Land Use and Circulation Elements of the City of Menlo Park General Plan, was identified as ConnectMenlo. The City Council identified the area generally between US 101 and the Bay adjoining the Belle Haven Neighborhood, where the transition from traditional industrial uses was well underway, as the primary location for potential change in the city over the coming decades. www.menlopark.org/739/ConnectMenlo

Figure 4: Accepted Treatment Levels for Water Reuse under California's Title 22



Notes:

1. "Disinfected Tertiary Recycled Water" is the category most commonly referred to as recycled water in California under Title 22.
2. This figure does not represent an all-inclusive list of recycled water uses.

3.2 Non-Potable Demand Estimates Approach

Based on discussions with WBSD staff and a review of potable water use records from MPMW and Cal Water, the potential types of recycled water demands within study area were identified as:

- Landscape irrigation at public parks, business parks and schools
- Cooling towers and process water demands at light industrial and commercial facilities
- Toilet and urinal flushing at new commercial buildings.

3.2.1 MPMW and Cal Water

Existing potable water customers were considered for this demand assessment as well as new development described in ConnectMenlo[2], which includes significant new non-residential buildings, residential units,

[2] www.menlopark.org/739/ConnectMenlo

hotels, and landscaped open space – including a new Facebook campus (West Campus). The list of potential customers was developed using the following steps:

1. Estimate average annual potable water use by averaging use from January 2014 through December 2016 based on MPMW and Cal Water potable water meter records. Review significant changes in use between years to identify 3-year average use estimates that may be skewed by one year.
2. Remove potential customers located within ConnectMenlo so that the demands are not counted twice (once by ConnectMenlo and once by individual customer). The ConnectMenlo demand estimates are in Section 3.2.3.
3. Estimate potential recycled water demand by applying a non-potable demand factor to the average annual potable water use based on type of user. Refer to additional explanation below.
4. Refine potential recycled water demand by reviewing aerial images in Google Earth of the customers with high potential recycled water demands to identify turf areas that would alter the initial non-potable demand factor. Apply irrigation demand factor of 3.3 AFY per acre. Refer to the factor derivation below.
5. Demands were also refined based on information provided at meetings with potential recycled water customers, as described in Section 3.2.4.

Note that MPMW and Cal Water meters records were consolidated if the water meter had the same address. When calculating non-potable demands, MPMW meters with "irrigation" account types were kept separate from other meters at the same address since the irrigation meters are dedicated to non-potable uses.

Non-Potable Demand Factor

To determine a preliminary potential non-potable demand for each customer, a non-potable adjustment factor (a percentage) was assigned to each meter class. The non-potable adjustment value was based on an estimate of the portion of the total potable demand that could likely use recycled water. The factors have been developed by Woodard & Curran based on previous experience developing recycled water demand estimates in the Bay Area and throughout California on other recycled water projects. These factors are adjusted on a case by case basis when specific information is available for individual customers. The estimates are summarized by customer type in **Table 4** and include the rationale for each estimate.

Table 4: Potable to Non-Potable Demand Conversion

Customer Type	Recycled Water Potential Percentage
Irrigation(1)	90%
Commercial(2)	25%

Notes:
1. Includes three MPMW classes (Farm irrigation, irrigation commercial, and irrigation/landscape)
2. Includes three MPMW classes (Business, Industrial, Public Authority) and two Cal Water classes (Business and Public Authority)

Irrigation Water Demand

Irrigation water demands were estimated based on the methods describe in 'A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California," published by University of California Cooperative Extension and California Department of Water Resources (2000). This document suggests the following methodology for determining potential irrigation demand:

- Select crop coefficient for cool season turf species from the document.

- Select evapotranspiration values reported on CIMIS Reference Evapotranspiration Map – Zone 6 for San Mateo.
- Select average monthly precipitation for San Mateo from Western Regional Climate Center website.
- Choose assumptions for infiltration rate into the vegetation root zone (75 percent), and leaching rate factor through the vegetation root zone (10 percent).

Google Earth and GIS were used to identify irrigated areas of parks, sports fields, golf courses and other landscaped areas. The irrigation demand factor was calculated using the above methodology and was determined to be 3.3 AFY per acre.

3.2.2 Non-Potable Wells

In addition to customers captured in the potable water use records, some customers within the study area use private wells to meet water demands. Typically, these private wells are used for irrigation and therefore correspond with potential recycled water demands. However, data for private wells is largely non-existent or unavailable, therefore in these instances, the project team used Google Earth aerial images to estimate irrigated area for large turf areas that did not show up in the potable water use record databases. Potential recycled water demand was estimated based on the irrigation demand factor of 3.3 AFY per acre.

3.2.3 New Development

The ConnectMenlo Water Supply Evaluation Study (EKI, 2016b) estimates water demands (**Table 5**) for the maximum potential net increase in new development in the Bayfront area (**Figure 5**) as approximately:

- 2.3 million non-residential square feet
- 400 hotel rooms
- 4,500 multi-family residential units
- Two transit centers
- Up to 61 acres of landscaped open space

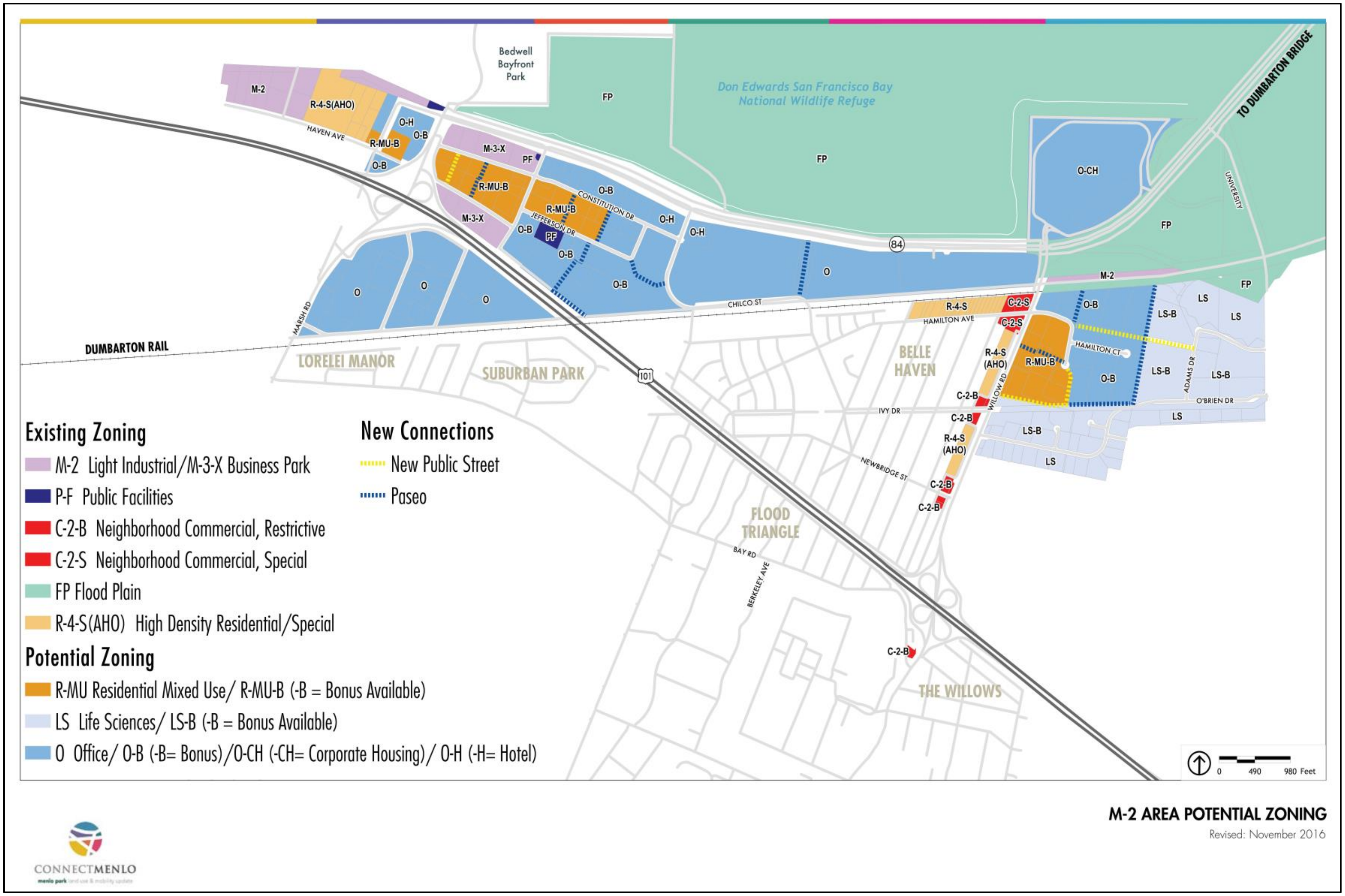
Table 5: ConnectMenlo Water Demand Estimates

Parcel Type	Annual Demand (AFY)
Outdoor Demand Estimate(1)	
Residential	31
Non-Residential	74
Total	**104**
Recycled Water Demand Estimate	**104**
Indoor Demand Estimate(2)	
Office	86
Life Science (R&D)	181
Commercial/Retail	9
Hotel	31
Total	**306**
Non-Potable Factor (e.g., toilet flushing)(3)	33%
Recycled Water Demand Estimate	**101**

Notes:

1. ConnectMenlo Water Supply Evaluation Study, Table 4 (EKI, 2016b)
2. ConnectMenlo Water Supply Evaluation Study, Table 3b (EKI, 2016b)
3. Rough estimate of non-potable use as a percentage of total indoor water use.

Figure 5: ConnectMenlo Land Uses



Source: Menlo Park General Plan & M-2 Area Zoning Update; Ordinance No. 1029 (November 29, 2016)

3.2.4 Customer Meetings

Facebook

Woodard & Curran met with Facebook as part of the 2014 Market Survey and again in July 2017 to refine demand estimates and plans for development in the Bayfront area. Facebook is using onsite treatment at their West Campus and is developing the Prologis site in Menlo Park (at Willow Road and Hamilton Avenue). The demands for the Prologis site are included as part of the ConnectMenlo plan and are incorporated as a potential future demand in this analysis.

Local Developers

Tarlton is planning on redeveloping over 2 million square feet in the Bayfront area adjacent to East Palo Alto over the next 15 years. Other developers working in the area include Sobrato and Bohannon but meetings were not able to be held with these two developers during this study.

General Services Administration/United States Geological Survey

Woodard & Curran met with the General Services Administration (GSA) at the United States Geological Survey (USGS) campus in 2014. The GSA currently has one well onsite which supplies a portion of the water for irrigation. One of the buildings on site has a cooling tower that uses approximately 36,000 gallons per day, with a winter-time use of approximately half of the amount. The GSA would need further water quality information to determine if recycled water use within the cooling tower would be feasible. The GSA utilizes a separate contractor (Northern Management Services Inc.) to manage the irrigation and plantings onsite, and they were at the meeting.

Since the meeting, USGS started plans to move from the campus. Plans for the campus are not known but non-potable irrigation and cooling tower demands are expected into the future once the campus is occupied or re-developed.

Menlo College

Woodard & Curran met with Menlo College in 2014. Menlo College was irrigating turf with a combination of water from Cal Water and two wells - one on campus and one across the street at the athletic fields. Menlo College had plans to expand groundwater pumping. The college also planned to convert turf fields to artificial turf (for both water and maintenance savings). No cooling towers or process water is used on the campus. Menlo College is interested in utilizing recycled water for irrigation if it were to become available to boost their supply portfolio.

3.2.5 Demand Peaking Factors

Facilities for treating and conveying recycled water are sized based on peak demand periods. Two peak flow situations were defined as criteria for development of the recycled water distribution system in the market assessment: maximum day demand (MDD) and peak hour demand (PHD). The average daily demand during the peak demand month of the year is the assumed MDD. PHD is defined as the maximum anticipated flow rate delivered to a customer (in gallons per minute) during MDD conditions. MDD and PHD factors were updated from the market assessment based on use type and are discussed below. Revised MDD and PHD values are presented below and are summarized in **Table 6**.

MDD for irrigation is based on net evapotranspiration data from the Western Regional Climate Center, which shows that July is the peak demand month for the WBSD service area for irrigation customers. The MDD peaking factor is 2.0 times the average annual demand (AAD) based on the estimate irrigation demand in July being twice the AAD. Irrigation-only customers without on-site storage typically operate at night for an 8-hour irrigation period. Therefore, the PHD factor was estimated at 3.0 (24-hour/8-hour irrigation = 3.0).

Table 6: Demand Peaking Factors

Peaking Factors	Type of Use	
	Irrigation	Cooling Tower
AAD to MDD	2.0	1.5
MDD to PHD	3.0	2.0
AAD to PHD	6.0	3.0

3.2.6 Potential Non-Potable Demand Estimate

Potential customers are shown in **Figure 6** and estimated demands are summarized in **Table 7** where recycled water would offset potable water use and **Table 8** where recycled water would offset groundwater use.

Table 7: Potential Recycled Water Customers, Potable Water Offset ($\geq$ 5 AFY)

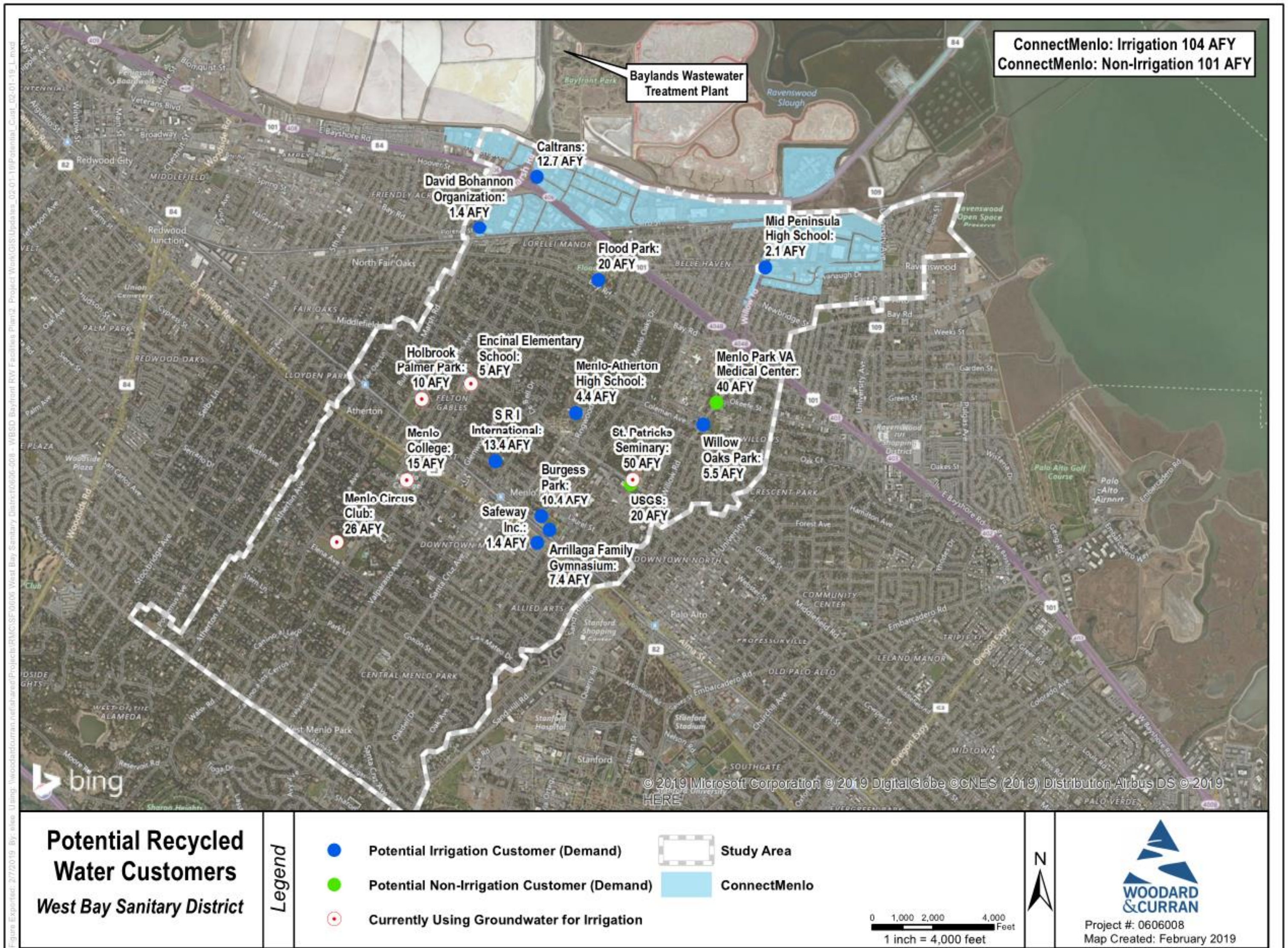
Customer Name	Customer Use Type	Potable Water Demand (AFY)(1)	Non-Potable Demand %(2)	AAD (AFY)	MDD (MGD)(3)
ConnectMenlo	Irrigation	--	--	104	0.186
ConnectMenlo	Multi-Use	--	--	101	0.135
Menlo Park VA Medical Center	Multi-Use	111	Estimate	40	0.071
USGS	Multi-Use	19	Estimate	20	0.036
Flood Park	Irrigation	--	--	20(4)	0.036
S R I International	Irrigation	134	10%	13	0.024
Caltrans	Irrigation	13	100%	13	0.023
Burgess Park	Irrigation	10	100%	10	0.019
Arrillaga Family Gymnasium	Irrigation	7	100%	7	0.013
Willow Oaks Park	Irrigation	6	100%	6	0.010
Other(5)	Irrigation	32	Varies	5	0.009
Total	**--**	**333**	**--**	**319**	**0.525**

MGD Million gallons per day

Notes:

1. Potable water demand is based on meter record for 2014 to 2016.
2. Non-potable demand percentage is based on customer use type.
3. MDD peaking factor is included in Table 6.
4. AAD for Flood Park is based on an estimated irrigated acreage of 6.1 and 3.3 AFY of water per irrigated acre.
5. Customers with demands less than 5 AFY include Mid-Peninsula High School, David Bohannon Organization, and Safeway, Inc.

Figure 6: Potential Recycled Water Customers



Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions. Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:**

Table 8: Potential Recycled Water Customers, Groundwater Offset (≥ 5 AFY)

Customer Name	Customer Use Type	Irrigated Acreage	AAD (AFY)(1)	MDD (MGD)(2)
St. Patrick's Seminary	Irrigation	15.2	50	0.089
Menlo Circus Club	Irrigation	7.9	26	0.046
Menlo College	Irrigation	4.5	15	0.027
Holbrook Palmer Park	Irrigation	3.0	10	0.018
Encinal Elementary School	Irrigation	1.5	5	0.009
Total	**--**	**32.1**	**106**	**0.189**

Notes:

1. AAD for customers without potable demands are based on applying 3.3 AFY per irrigated acre.
2. MDD peaking factor is included in Table 6.

3.3 Groundwater Recharge Potential

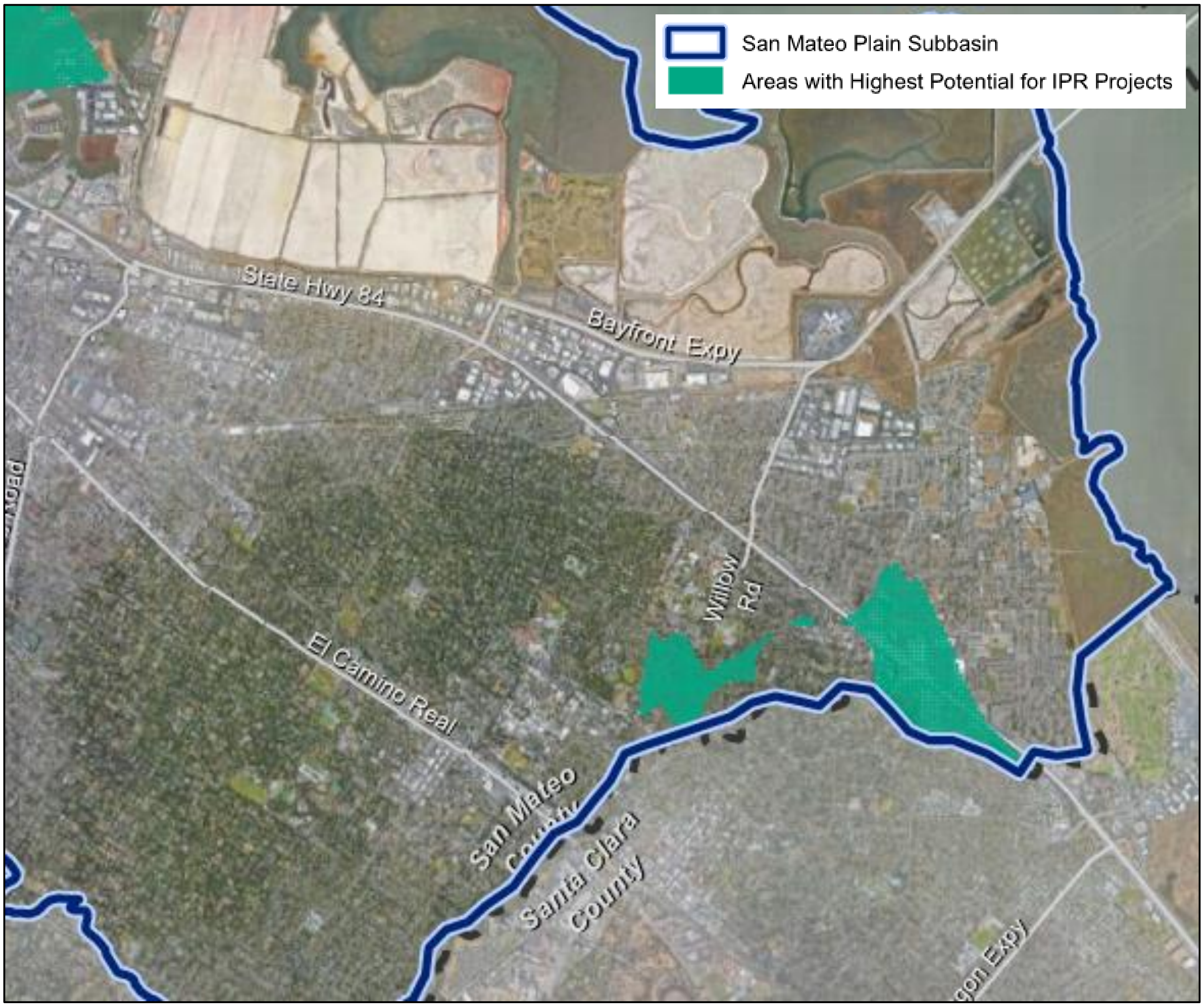
There are two mechanisms for recharging the groundwater basin: utilizing spreading basins which recharge water from the surface through a pond system and using injection wells. Spreading basins have a large footprint due the vast acreage needed to meet discharge rates and for maintenance operations. Land availability is limited within WBSD's service area, therefore spreading basins are not considered feasible at this time.

The alternative to spreading basins are injection wells which have a casing and screen similar to municipal or irrigation wells but inject water rather than extract water from the groundwater basin. Injection wells require a much smaller land footprint since the wellhead facilities are mostly underground, and they can be in small areas such as parks. Injection wells will be further considered as the mechanism for recharging the groundwater basin as the recharge alternative is further explored by the District.

The San Mateo Groundwater Basin Assessment, Preliminary Report (EKI, 2017) states that the groundwater basin is full and surface spreading is not practical due to the high cost of land, relatively tight soils, and current high groundwater levels. The report does not rule out injection, since the method avoids the land and soil issues of surface spreading, but without capacity for aquifer storage as indicated by high groundwater levels, recharge is infeasible without paired extraction.

The San Mateo Groundwater Basin Assessment (EKI, 2018) evaluated an 1,800 AFY groundwater recharge project (Model Scenario 4), including injection approximately 800 AFY in the Bayfront area (Figure 7). The scenario was found to be feasible but the need for the project at this time was not identified. WBSD met with the County of San Mateo and BAWSCA in September 2017 to review the potential for recharge in the Bayfront area and concluded based on the work conducted by the County and the preliminary evaluation of injection conducted by BAWSCA that recharge is not feasible unless coupled with additional groundwater pumping. Therefore, groundwater recharge will not be investigated further at this time but should be considered as the Sustainable Groundwater Management Act (SGMA) is implemented in the area and water purveyors pursue additional water supplies.

Figure 7: Areas of Potential Recharge via Injection



Source: San Mateo Groundwater Basin Assessment (EKI, 2018), Figure 11-3

Chapter 4 Recycled Water Supply Characteristics

This section describes the potential recycled water supplies available for production of recycled water generated in the Bayfront area of the WBSD service area.

4.1 Recycled Water Quality Requirements

Potential irrigation customers have different water quality needs according to their intended use. The following section describes water quality guidelines for landscape irrigation, the primary type of demand within WBSD. The section also describes the recommended level of treatment based on these requirements.

4.1.1 Irrigation Water Quality Requirements

Water quality guidelines for landscape use are well established. **Table 9** characterizes three degrees of restriction (none, slight to moderate, and severe) for use of recycled water in landscaped irrigation based on various water quality constituents (although specific requirements vary depending on the type of plant).

Table 9: Landscape Irrigation Water Quality Comparison

Constituent	Units	Degree of Restriction on Use(1)		
		None	Slight to Moderate	Severe
Salinity				
TDS	mg/L	< 450	450 - 2,000	> 2,000
Specific Ion Toxicity				
Sodium (Na)(2,3)	mg/L	< 70	> 70	
Chloride (Cl)(2,3)	mg/L	< 100	> 100	
Boron (B)	mg/L	< 0.7	0.7 - 3.0	> 3.0
Miscellaneous Effects				
pH	-	6.5 - 8.4		
Total Nitrogen(4)	mg/L	< 5	5 - 30	> 30
Bicarbonate(5)	mg/L	< 90	90 - 500	> 500

Notes:

1. Adapted from Metcalf and Eddy, 2007.
2. Values apply to most tree crops and woody ornamentals which are sensitive to sodium and chloride.
3. With overhead sprinkler irrigation and low humidity (< 30%), sodium or chloride levels greater than 70 or 100 mg/L, respectively, have resulted in excessive leaf adsorption and crop damage to sensitive crops.
4. Total nitrogen should include nitrate-nitrogen, ammonia-nitrogen, and organic-nitrogen. Although forms of nitrogen in wastewater vary, the irrigated plant responds to the total nitrogen.
5. Overhead sprinkling only.

Except for nitrogen, the constituents in Table 9 are not removed by conventional wastewater or tertiary treatment processes. Therefore, recycled water constituent levels are likely to be similar to the source wastewater constituent levels.

4.2 Baylands WWTP Site

WBSD previously owned and operated its own WWTP located adjacent to San Francisco Bay north of Highway 101, referred to herein as the Baylands WWTP site (**Figure 8**). The entire flow from the WBSD collection system converges at the Baylands WWTP site and from there is pumped to SVCW. Structures from the WWTP still exist at the site but are in poor condition and not likely capable for reuse in a new plant. Due to its location relative to the collection system and the availability of land to construct a new treatment plant, the Baylands WWTP is an advantageous location for a new centralized treatment plant that could be used to produce recycled water. The three storage ponds on the west and north side of the site are used for storage during wet weather flows and is referred to as the Flow Equalization and Resource Recovery Facility.

Figure 8: Baylands WWTP Site

4.2.1 Baylands Wastewater Characterization

This section presents preliminary wastewater quality and flow characterization of potential influent wastewater.

Preliminary Wastewater Quality Characteristics

The satellite treatment project requires diversion of wastewater flow from the existing collection system to the new treatment facilities. Four locations in the collection system were measured for water quality and flow (**Figure 9**):

1. 24-in (Flow) and 36-in Sewer (Water Quality)
2. 30-in Sewer (Flow and Water Quality)
3. 54-in Sewer (Flow and Water Quality)
4. 36-in Sewer - combined flows from sites 1, 2, and 3 (Flow and Water Quality)

Table 10 summarizes the average of the sampling results from 18 to 24 sample events (up to 3 times per day for 6 to 8 days) in July 2017.

Figure 9: Flow Monitoring and Quality Locations

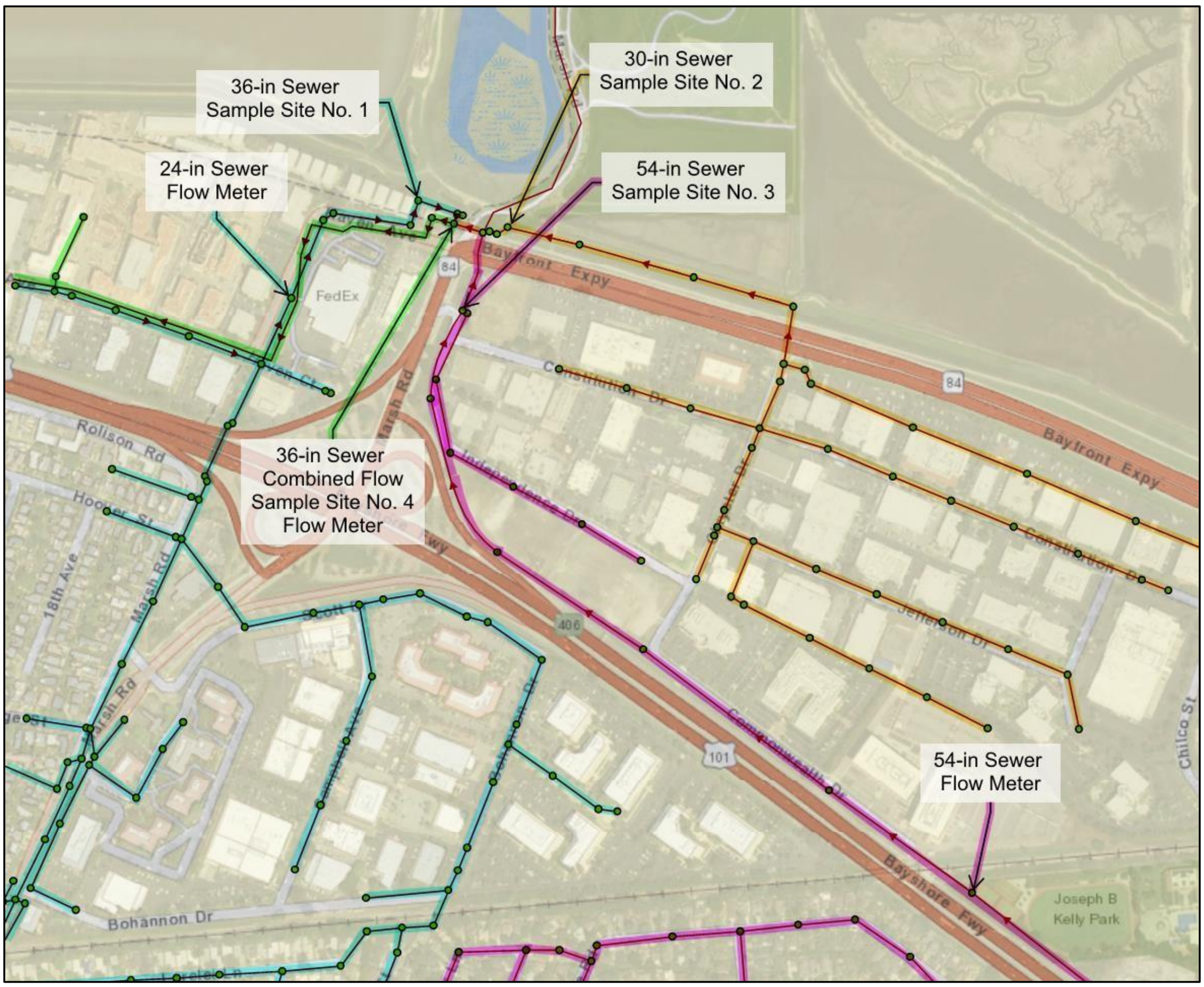


Table 10: Water Quality Sampling Results

Constituent	Unit	Site 1	Site 2[(1)]	Site 3[(2)]	Site 4[(3)]
Total Dissolved Solids	mg/L	413	**840**[(5)]	320	**570**
Sodium	mg/L	76	**172**[(5)]	53	**106**
Chloride	mg/L	103	**300**[(5)]	65	**173**
Boron	mg/L	0.23	0.24	0.22	0.22
Total Nitrogen	mg/L	54	69	62	51
Calcium	mg/L	28	50	18	37
Magnesium	mg/L	12	28	7	19
Biochemical Oxygen Demand	mg/L	154	233	172	156
Total Suspended Solids	mg/L	187	222	199	191
Silica	mg/L	13	13	10	13
Ammonia as NH_3	mg/L	47	57	56	46
Total Kjeldahl Nitrogen	Mg/L	54	69	62	51
Phosphorus	mg/L	6	8	7	6

Notes:
1. Site 2 will receive solids discharges from the Facebook onsite treatment system and Sharon Heights Recycled Water Project. Both plants are under construction.
2. Site 3 will receive periodic high salinity discharges from SLAC National Accelerator Laboratory.
3. Site 4 combines flows from Sites 1, 2, and 3.
4. Bold values fall within the "Slight to Moderate Restrictions" on use for landscape irrigation (Table 9).
5. High salinity in Site 2 is anticipated to be caused by baywater intrusion and could be addressed through pipeline lining if needed.

The preliminary sampling results for Sites 1 and 3 show that TDS, sodium, and chloride concentrations fall within the "No Use Restriction" guidelines for landscape irrigation listed in Table 9, therefore no adverse effects to turf would be anticipated from wastewater collected from Sites 1 and 3. However, Sites 2 and 4 fall within the "Slight to Moderate Restrictions" category and may require site-specific consideration of soil amendments to mitigate the potential effects of salinity. Per the table notes, Site 3 will receive periodic high salinity discharges from SLAC National Accelerator Laboratory so the impact on overall salinity should be evaluated. Also, diversions could temporarily stop while the SLAC discharges pass through since the discharges are scheduled.

Preliminary Wastewater Flows

Flow monitoring was conducted by WBSD in July 2017 for 6 to 29 days at the four sites (Figure 9). **Table 11** summarizes preliminary data for the average flow during the monitoring period, average minimum hourly flow, and average maximum hourly flow. Flow for Site 3 is expected to be reduced by an average of approximately 0.35 MGD in the future due to diversion to the Sharon Heights Recycled Water Project.

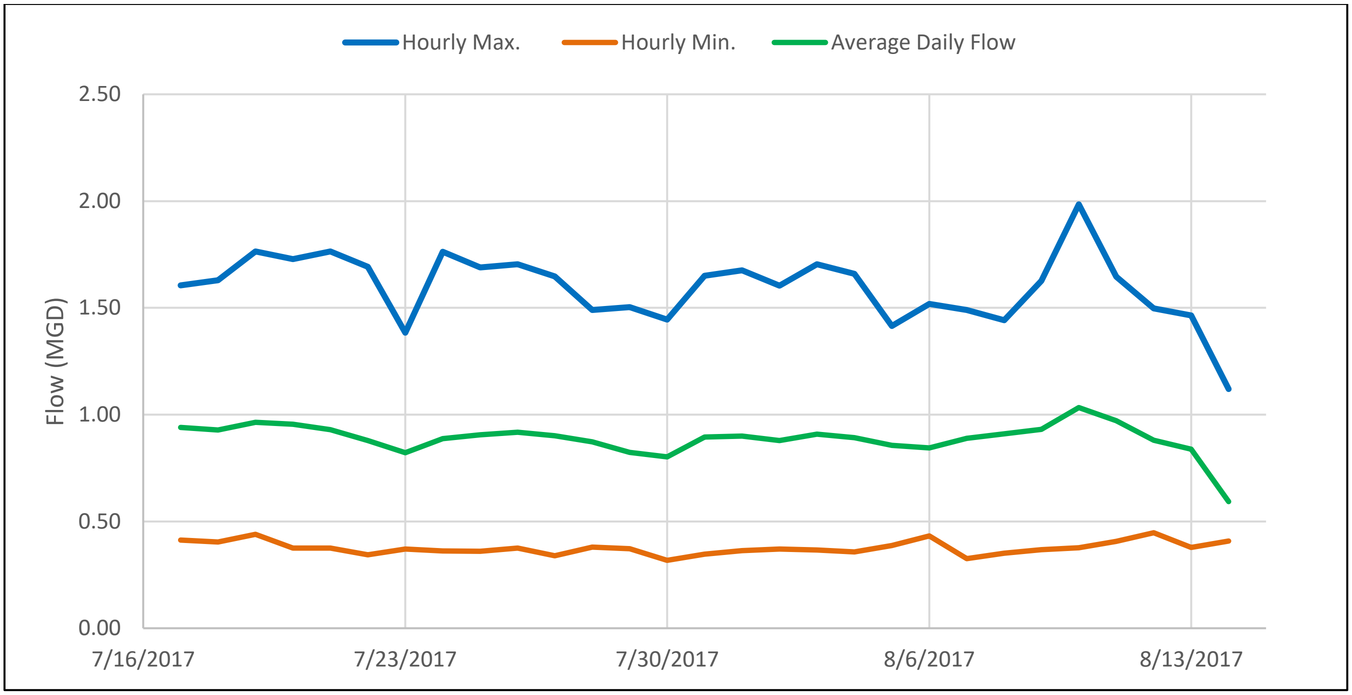
Based on satisfactory water quality and available wastewater flows, Site 1 could meet the identified non-potable demand without the need for blending or salinity reduction treatment. As shown in Table 11 and **Figure 10**, Site 1 maintains minimum flows of roughly 0.9 MGD.

Table 11: Available Wastewater Flows (MGD)

Site	Monitoring Period	Minimum Flow	Average Flow	Maximum Flow
1	7/17 – 8/14	0.3	0.9	2.0
2	7/18 – 8/1	0.5	1.5	4.6
3	7/27 – 8/2	0.3	1.1	1.9
4	7/31 – 8/9	0.7	3.3	11.8

Note: Site 3 flows will be reduced by approximately 0.35 MGD on average due to diversion to the Sharon Heights Recycled Water Project.

Figure 10: Site 1 Flows



4.3 Regional Interties

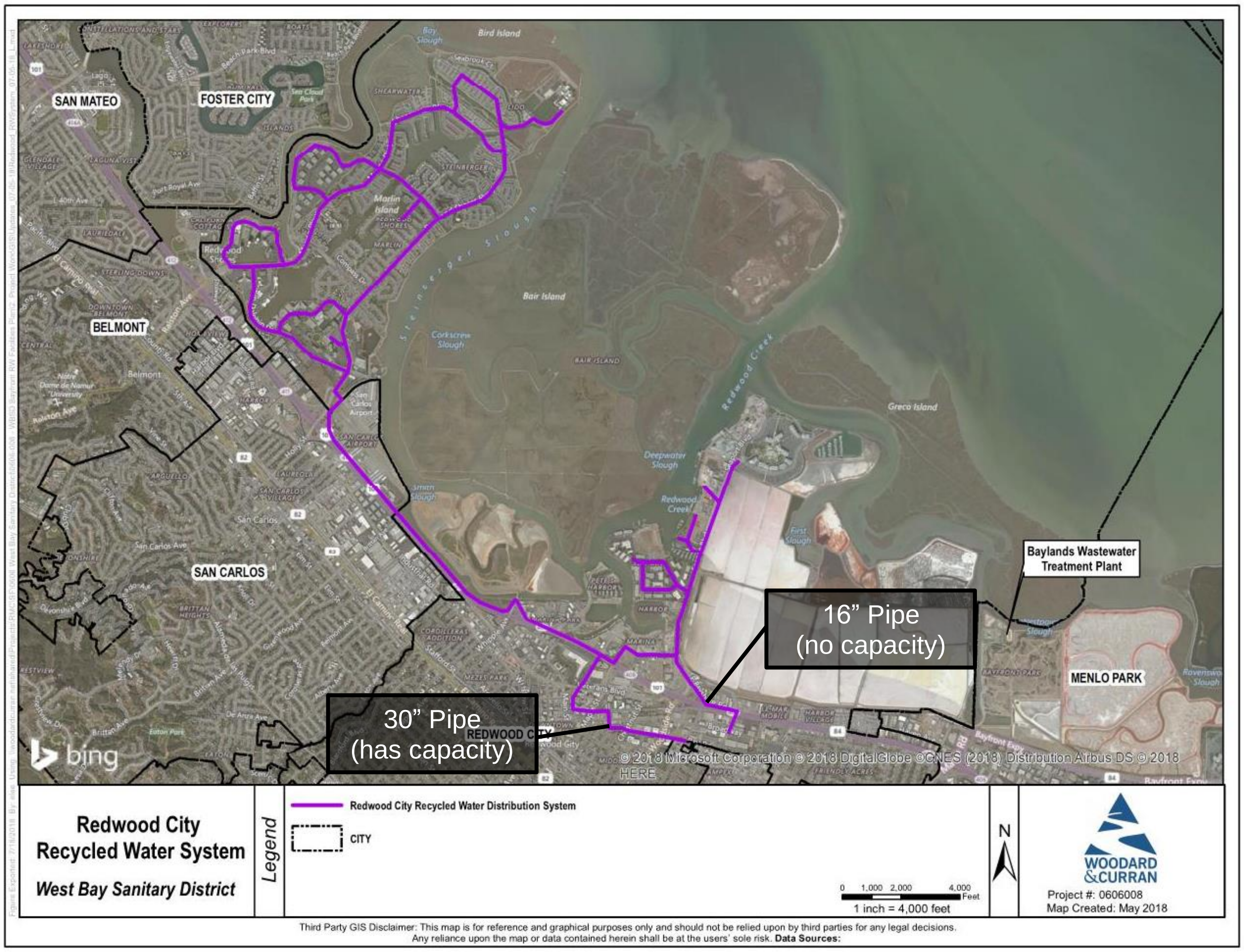
4.3.1 Redwood City

Woodard & Curran met with Redwood City in October 2017 to discuss potential interties between Redwood City and Menlo Park. Redwood City uses disinfected tertiary recycled water from SVCW for distribution in the City's recycled water system. Redwood City delivered 712 AFY of recycled water in 2015 and projects reuse of 1,611 AFY by 2040 (EKI, 2016a). The Redwood City recycled water project has a design capacity of 3,238 AFY (2.9 MGD) and includes the option to export recycled water to neighboring communities (EKI, 2016a).

Redwood City is currently constructing a 16-inch pipeline to the Stanford Redwood City campus and plans to construct a 30-inch pipeline to the Sobrato Redwood City Project at Bay Road and Charter Street (**Figure 11**). Redwood City stated that they have recycled water supply available and conveyance capacity available in the 30-inch pipeline (but not the 16-inch pipeline). Also, total available recycled water supplies from SVCW would increase once the flows that WBSD has "rights" to reuse are included.

The primary issue with recycled water from Redwood City is the high salinity – ranging from 700 mg/L to 900 mg/L of TDS. Many potential irrigation customers would want the TDS concentration reduced to about 450 mg/L (based on Table 9). WBSD could purchase recycled water from Redwood City, reduce salinity, and distribute to non-potable customers within Menlo Park.

Figure 11: Redwood City Recycled Water System



4.3.2 Palo Alto / East Palo Alto

As part of Palo Alto's own recycled water planning efforts, Palo Alto conducted a visioning workshop in March 2018 with WBSD as part of their Northwest County Recycled Water Strategic Plan. Palo Alto described planning efforts, and both agencies brainstormed recycled water alternatives. WBSD made Palo Alto aware of the recycled water feasibility study underway for the Bayfront area. Palo Alto is evaluating service to East Palo Alto as well as use of all of its available recycled water. Palo Alto is not evaluating conveying recycled water to the Menlo Park area at this time but the option has not been ruled out either.

4.4 Stormwater

Stormwater can be treated and reused for various non-potable applications in a similar manner as recycled water from municipal WWTPs. Two potential stormwater sources were identified during development of this Facilities Plan to supplement recycled water: CalTrans and Atherton.

4.4.1 Caltrans

CalTrans currently pumps shallow groundwater and stormwater from the Highway 101 Henderson Underpass (at the railroad crossing near Kelly Park) to the stormwater system that discharges to the slough next to Bedwell Bayfront Park and the Bayfront WWTP site. The nuisance groundwater (seepage water that leaks out onto the highway) is available year-round and therefore would be available during the summer irrigation system. On the other hand, wet season storm flows would not benefit irrigation supplies unless they are stored.

CalTrans does not treat the water so WBSD would need to treat the water for reuse. A grab sample collected on November 19, 2016 had a TDS concentration of 2,100 mg/L, which would require substantial treatment to reach the desired TDS concentration of 450 mg/L (based on Table 9). Therefore, this supply was not considered further.

4.4.2 Atherton

The Town of Atherton is considering constructing a stormwater capture facility at Cartan Fields, located next to Menlo College, to store up to 6 to 10 AF (Atherton, 2018). This stormwater could be treated and reused at the park or other for other non-potable uses in the area.

4.5 Recycled Water Supply Alternatives Summary

The following recycled water supply alternatives were considered and evaluated:

- **Baylands WWTP Site:** Diversion and treatment of raw wastewater at WBSD Baylands WWTP site. The alternative is carried forward for further evaluation.
- **Regional Interties:** Import recycled water from Redwood City or Palo Alto / East Palo Alto. Importing recycled water from Redwood City is being carried forward when combined with treatment to reduce salinity. Importing recycled water from Palo Alto / East Palo Alto was not considered further at this time.
- **Stormwater:** Supplement recycled water supplies with stormwater. Stormwater was not considered further as part of this project because recycled water supplies (over 3 MGD of raw wastewater) far exceed the potential non-potable market demand (up to peak day demand of 1 MGD). Also, the salinity levels in Caltrans water would require significant salinity reduction treatment. The Atherton stormwater capture facility could be a small, standalone project but would not be incorporated into the supplies considered in this plan.

Chapter 5 Treatment Requirements for Reuse

This chapter introduced recycled water treatment requirements for non-potable reuse and discusses salinity reduction treatment options.

5.1 Recycled Water Treatment Requirements

Based on the target uses, the treatment facilities would need to meet Title 22 Disinfected Tertiary Recycled Water requirements. **Table 12** summarizes the water quality requirements which vary depending on the type of filtration technology used.

Table 12: Title 22 Disinfected Tertiary Recycled Water Quality Requirements

Process	Requirement
Filtration Method	
Coagulated(1) and passed through a bed of filter media	Rate does not exceed 5 gallons per minute per square foot of surface area in mono, dual or mixed media gravity, upflow or pressure filtration systems Turbidity of the filtered wastewater does not exceed any of the following: An average of 2 NTU within a 24-hour period; 5 NTU more than 5 percent of the time within a 24-hour period; and 10 NTU at any time
Microfiltration, Ultrafiltration	Turbidity does not exceed any of the following: 0.2 NTU more than 5 percent of the time within a 24-hour period; and 0.5 NTU at any time
Disinfection	
UV	A disinfection process that, when combined with filtration, has been demonstrated to achieve 5-log inactivation of virus The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed a most probable number (MPN) of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any 30-day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 milliliters.

NTU: Nephelometric Turbidity Units

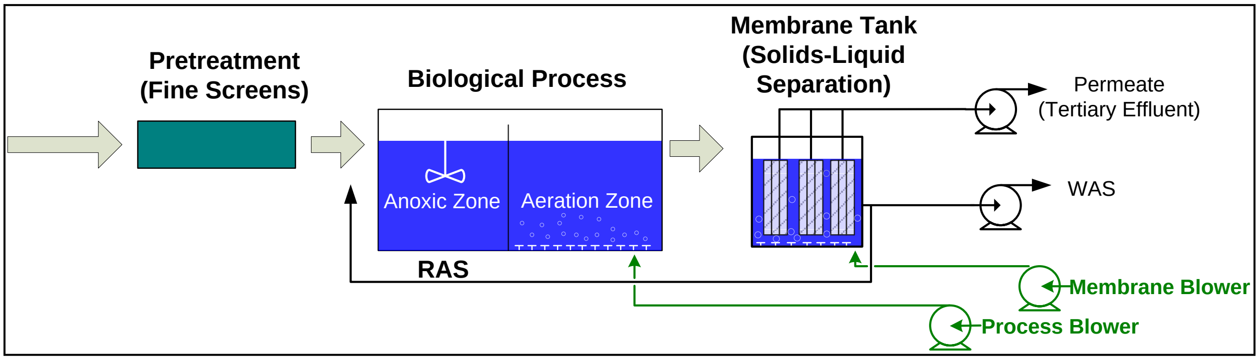
Note:

1. Coagulation need not be used as part of the treatment process provided that the filter effluent turbidity does not exceed 2 NTU, the turbidity of the influent to the filters is continuously measured, the influent turbidity does not exceed 5 NTU for more than 15 minutes and never exceeds 10 NTU, and that there is the capability to automatically activate chemical addition or divert the wastewater should the filter influent turbidity exceed 5 NTU for more than 15 minutes.

5.2 Raw Wastewater Treatment

The satellite treatment facility will need to include influent grit removal and screening to protect downstream equipment in addition to secondary treatment, filtration, and disinfection to meet Title 22 disinfected tertiary recycled water requirements. Based on WBSD's decision to implement a membrane bioreactor (MBR) tertiary treatment process for the Sharon Heights Recycled Water Project, this study is assuming MBR as well. MBR combines secondary treatment with ultrafiltration (UF) or microfiltration (MF) membranes (ranging in size from 0.01 to 0.4 micron) to produce a filtered effluent meeting Title 22 disinfected tertiary recycled water requirements. The secondary biological process of an MBR can be designed to meet a wide range to target water quality requirements including various nutrient water quality objectives (e.g., ammonia, total nitrogen, total phosphorous), and the membranes are provided, in lieu of secondary clarification, to provide solids liquid separation. **Figure 12** shows an example flow diagram for an MBR process.

Figure 12: MBR Process Flow Diagram



MBR facilities are advantageous when land is limited due to their compact footprint and an MBR combines secondary treatment with tertiary filtration, which minimizes facilities to operate. An MBR also eliminates operational issues associated with poor sludge settleability since MBRs do not rely on gravity sedimentation. An MBR has higher capital and operating costs than other common treatment technologies due to membrane maintenance and replacement and creation of a solids stream for disposal from fine screening upstream of the MBR. However, having similar operations as the Sharon Heights Recycled Water Project would simplify training of operators and other operating and maintenance activities as the two facilities would likely share staff.

An MBR membrane can either be a hollow fiber or flat plate membrane. Hollow fiber membrane systems typically require fine screening (2 millimeter (mm) screens or less) at the headworks for large and small debris removal (e.g. hair) that can foul and damage the membranes. The flat plate membranes do not typically require as fine of screen (3 mm or less) because the flat plate screens do not foul as easily. The screening requirements in front of the membranes vary by manufacturer.

MBR systems are typically designed with coarse bubble aeration in the membrane tanks. The purpose of the coarse bubble aeration is to provide agitation at the surface of the membrane and carry solids away from the membrane surface to minimize fouling and increase the permeability of the membrane. The coarse bubble aeration represents an additional aeration/energy demand of the MBR system.

Submerged membranes are subject to organic and inorganic fouling and are maintained by chemical cleaning. Typical chemicals include citric acid and sodium hypochlorite for organic and inorganic fouling, respectively. Maintenance cleaning is performed once to twice per week and includes the backpulse of chemical solution through the membranes. Recovery cleaning is performed one to four times per year and includes soaking the membranes in chemical solution.

The majority of municipal MBR systems in operation in the United States have the membranes submerged in the mixed liquor and permeate is either pulled through the membranes (vacuum pressure) or permeate is pushed through the membranes by gravity. MBR manufacturers with installations in California include SUEZ (formerly GE), Koch Membranes, Ovivo, and Evoqua/Memcor. The specific sizing and operating details of an MBR system vary by manufacturer.

5.2.1 Ultraviolet Disinfection

The Sharon Heights Recycled Water Project selected ultraviolet disinfection (UV) as the disinfection process to minimize the footprint of the facility and minimize chemical transportation and delivery as compared to a chlorine disinfection process. Like with the MBR, having similar disinfection operations as the Sharon Heights Recycled Water Project would simplify training of operators and other operating and maintenance activities as the two facilities would likely share staff.

During UV disinfection, filtered wastewater is passed through a closed vessel with lamps that emit UV light. Viruses and bacteria become deactivated upon exposure to high doses of UV energy at wavelengths between 250-270 nanometers (nm). The required UV design dose varies depending on the type of filtration process. For granular filters or cloth filters, the UV dose is 100 millijoules per square centimeter (mJ/cm^2) and a UV transmittance of 55 percent. For membrane filtration, the design dose is 80 mJ/cm^2 with a UV transmittance of 65 percent.

The most efficient type of UV system is the low-pressure, high intensity system. These systems emit a monochromatic light of 253.7 nm, the most effective wavelength for inactivation of bacteria and viruses. Lamps are typically controlled to generate a UV dose that is paced to the UV transmittance (UVT) through the water and flow rate. Performance of UV systems are usually affected by lamp age, degree of lamp fouling (reduced transmittance of UV light by biofilm, scaling, metal deposits on the lamp sleeve), and UVT. Lamp fouling is typically managed by an automated mechanical or mechanical/chemical cleaning of the UV lamp sleeves. UVT is measured by an on-line monitor, which can be input directly into a control loop and/or SCADA system

Major manufacturers of UV systems are TrojanUV Inc. (Trojan), SUEZ/Degrémont Technologies, and Wedeco Inc./Xylem Inc.. All three manufacturers supply low pressure, high intensity systems and have installations in California. UV systems typically include power distribution centers, system control centers, lamp ballasts, UV lamps and assemblies, interconnecting wiring, and in some cases a building to house the associated instrumentation and controls.

5.3 Salinity Removal Alternatives

If recycled water from Redwood City is conveyed for reuse in the study area instead of a new satellite WRF, the recycled water would require salinity (TDS, chlorides, and sodium) reduction to meet likely customer water quality requirements for irrigation and cooling towers. Therefore, a new treatment plant would require a sidestream reverse osmosis (RO) system to sufficiently reduce dissolve ions to produce recycled water suitable for irrigation and commercial uses. For this Study, 50 percent of the total flow was assumed to be treated to reduce Redwood City recycled water TDS concentration, which ranges from 700 mg/L to 900 mg/L, to 400 mg/L to 500 mg/L to meet common irrigation and cooling tower TDS limits. If this alternative is selected, the range of potential TDS from Redwood City should be further investigated and the target TDS concentration for customers should be confirmed to refine the percentage of sidestream treatment required.

This section describe the RO treatment process components and RO concentrate management options.

5.3.1 Microfiltration/Ultrafiltration

Low pressure membrane filtration (either MF or UF) systems typically serve as pretreatment to minimize RO membrane fouling. Therefore, MF or UF would be the first process in a sidestream RO treatment process. For this application, the recommended MF/UF system would consist of strainers or pre-filters followed by MF/UF pressure vessels.

The intended function of a MF/UF system is to remove suspended solids and colloidal particulates from the process water upstream of the RO process. If left in the process water, these solids could impair the operation of the RO process by organic fouling or plugging of the RO membrane surfaces. The MF/UF system can effectively remove inert particulates, organic particulates, colloidal particulates, pathogenic organisms, bacteria and other particles by the size-exclusion sieve action of the membranes. MF membranes are generally rated with a nominal pore size range of 0.1 to 0.4 µm, whereas, nominal pore size for UF membranes typically range between 0.01 and 0.04 µm.

5.3.2 Reverse Osmosis

RO is the second process in a sidestream RO treatment alternative. For this application, the RO system would include an interprocess tank, RO transfer pumps, cartridge filters, RO feed pumps, and RO treatment vessels.

RO removes dissolved organic constituents, such as taste and odor causing compounds. In most circumstances RO is considered the best available treatment for reducing the total dissolved solids (TDS). The RO treatment process functions by passing the water in the RO feed through a semi-permeable RO membrane, resulting in two effluent flow streams. The first consists of the water that passes through the membrane as permeate. The permeate contains very little TDS and is discharged as treated effluent from the process. The second effluent stream consists of the water that does not pass through the membrane and contains the bulk of the TDS present in the RO feed. This concentrated TDS stream forms the RO concentrate and is discharged as a waste stream.

Equipment suppliers such as SUEZ (formerly GE), Evoqua Water Technologies, and WesTech Engineering Inc. are capable of providing fully integrated packaged UF or MF and RO systems for facilities up to approximately 0.6 MGD (production capacity).

5.3.3 RO Concentrate

RO concentrate production would roughly be up to 0.1 MGD, assuming 50% RO of the maximum MDD of 0.8 MGD (see Section 3.2.6) and 80% RO recovery. The TDS concentration in the RO concentrate would be up to 4,500 mg/L, assuming 900 mg/L in feed water and 80% RO recovery.

There are three primary options for disposing of RO concentrate produced at the Bayfront WWTP site: 1) Discharge to the collection system; 2) Discharge to the adjacent ponds; or 3) Discharge to the adjacent salt ponds. Discharge to the collection is the assumed concentrate management method at this time; however, the other options should be further investigated if RO is included in the recommended project.

Collection System

RO concentrate discharged to the existing collection system would be conveyed to SVCW. The timing of discharge to the sewer could be timed to minimize impacts to WWTP processes and recycled water treatment like WBSD’s approach for discharging brine from SLAC National Accelerator Laboratory.

Bayfront WWTP Site Ponds

The three ponds adjacent to the old Bayfront WWTP (Figure 8) site have a total capacity of 24 million gallons (MG) – Pond 1 has approximately 10 MG capacity, Pond 2 has approximately 10 MG capacity, and Pond 3 has approximately 4 MG capacity. The estimated maximum RO concentrate production of 0.1 MGD would take roughly 100 days to fill Pond 1 and another 100 days to fill Pond 2, excluding evaporation and precipitation. Net surface water evaporation in the area ranges from 0.01 MGD to 0.02 MGD from April to October (using DWR Bulletin 73-79: Evaporation from Water Surfaces in California; Burlingame station). Therefore, evaporation is not enough to remove the RO concentrate water from the Bayfront site but the ponds could be used for storage until there is a better time to discharge to collection system. Also, Pond 1 is used for storage wet weather sewer flows so the pond must be empty during the wet season to continue this use. Part of planned SCVW upgrades includes additional storage at the SCVW WWTP. Once this is implemented, Pond 1 would not need to be reserved for wet weather sewer flows.

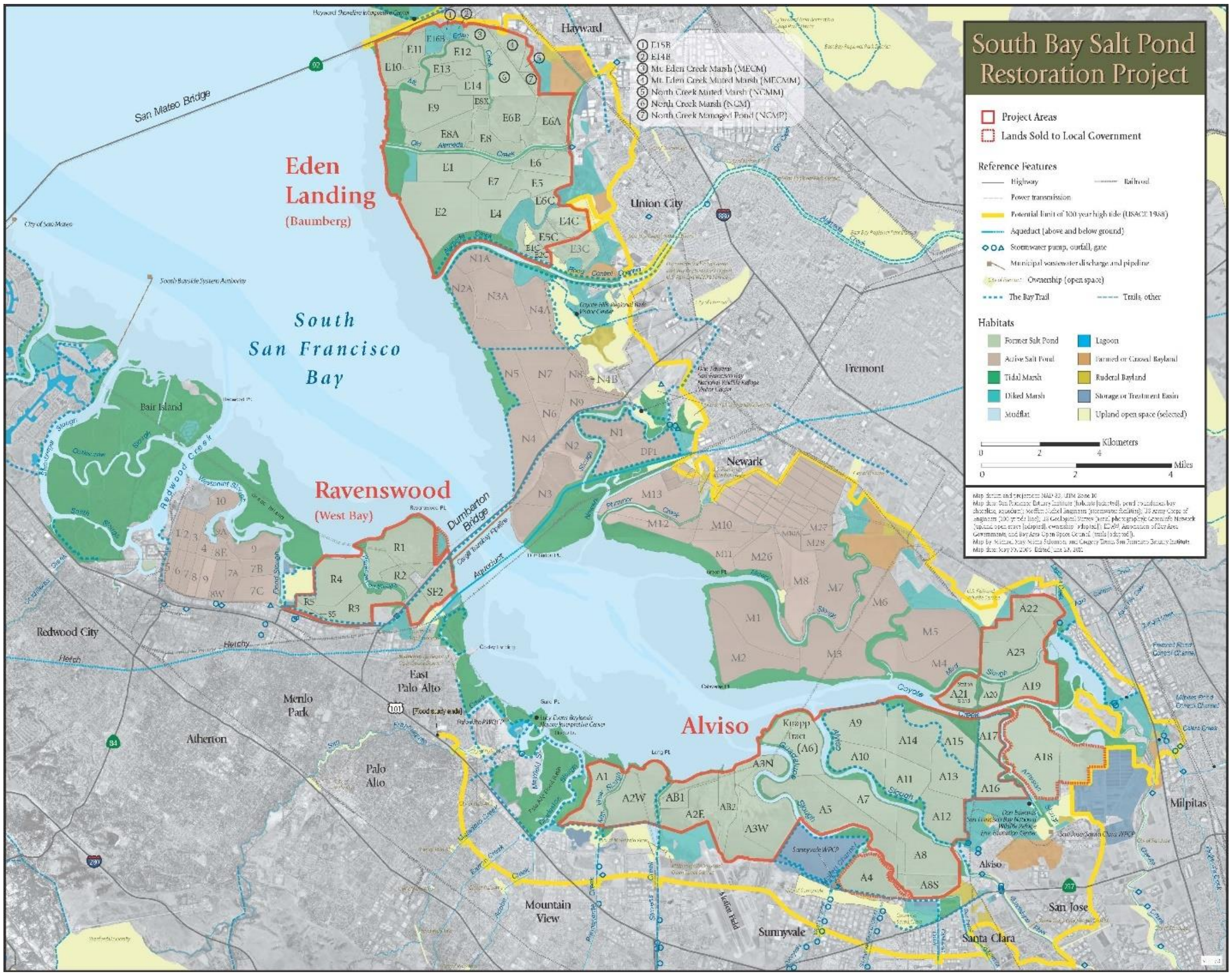
South Bay Salt Pond Restoration Project

Woodard & Curran met with John Bourgeois, Executive Project Manager with the California Coastal Commission, in August 2017 to discuss the potential to serve recycled water to the salt ponds to aid in restoration activities. The group is currently restoring the Ravenswood Project Area salt ponds (**Figure 13**) adjacent to the Bayfront WWTP site.

It was determined that there is not a large demand for recycled water for irrigation of restoration plantings and the project would not be able to pay for recycled water served. However, there is the potential for the horizontal levee project to receive RO concentrate flows and incorporate them into the habitat since plantings on the levees will have a high salt tolerance. The construction schedule is partially dependent on funding so a firm schedule was not available.

Discharge of RO concentrate water to the salt ponds would be preferred depending on the pipeline construction cost, discharge point, and construction conditions.

Figure 13: South Bay Salt Pond Restoration Project (Ravenswood Project Area)



Source: http://www.southbayrestoration.org/maps/Display%20map%20v46.pdf

Chapter 6 Project Alternatives

This Chapter documents the Project recycled water production assumptions, development of project alternatives and the process of determining the Recommended Project.

6.1 Planning and Design Assumptions

Table 13 summarizes design criteria used to size infrastructure for the various alternatives.

Table 13: Facilities Criteria and Hydraulic Criteria

Item	Value	Units/Notes
Pump Stations		
Pump Efficiency	75	%
Pipelines		
Max Velocity for Sizing	5	ft per second
C Coefficient for Headloss	130	Assuming PVC pipe
Max Headloss	5	ft per 1,000 ft
Storage		
Delivery Pressure	70	psi

6.1.1 Cost Estimate Basis

Cost estimates were developed to evaluate and compare the different project alternatives and to support the selection of a recommended alternative. The actual final costs of the project will depend on a variety of factors, including but not limited to actual labor costs, material costs, site conditions, market conditions, project scope, and implementation schedule.

Capital Cost Basis

Capital cost estimates were based on similar recycled water projects, cost quotations from suppliers, and industry publications. The Facilities Plan is a preliminary planning phase project, the provided estimates are considered Class 5 estimates based on the International (AACEI) Recommended Practice No. 56R-08, Cost Estimate Classification System – As Applied for the Building and General Construction Industries (revised December 2012). Class 5 estimates are based on a level of project definition of 0 to 2 percent and are suitable for alternatives analysis. The typical accuracy ranges for a Class 5 estimate is -20 to -50 percent on the low end, and +30 to +100 percent on the high end. In addition, the capital costs include the following contingency and markups:

- Construction Markups: Includes mobilization / demobilization (5%) and, tax on materials (8.75%) where applicable, and contractor overhead and profit (18%)
- Construction Contingency: 30% of raw construction costs to account for unknown or unforeseen construction costs.
- Implementation Allowance: 30% of construction costs for environmental documentation, permits, design, financing, construction management, and engineering services during construction.
- Project Contingency: 5% of project costs to account for the current level of alternative detail.

Estimated costs are referenced to the December 2017 Engineering Construction Cost Index (ENR CCI) for San Francisco 11162.57.

Capital Financing Assumptions

The SWRCB Clean Water State Revolving Fund (CWSRF) offers low interest financing for publicly-owned facilities including recycled water projects. The CWSRF program offers 30-year financing at an interest rate of half the most recent General Obligation Bond rate at time of funding approval. The interest rate has typically ranged from 1.5 percent to 3.0 percent and currently 1.8%. CWSRF financing assumptions used to annualize capital costs are:

- Annual Interest Rate: 2.0%
- Term of Financing: 30 years

The rates for CWSRF financing are adjusted in January every year and change based on the current market conditions, so actual project financing rate will likely differ from the assumption above.

O&M Cost Basis

Operations and Maintenance (O&M) costs are the recurring annual expense to operate and maintain the facilities after construction is completed. The O&M cost elements include items such as power, operation and maintenance labor, and replacement of consumables (instruments, pumps, electrical equipment). The O&M cost estimates for the alternatives are developed based on similar recycled water projects, replacement equipment costs, industry publications, and pumping estimates. A contingency is not applied to O&M costs. **Table 14** summarizes O&M cost assumptions.

Table 14: O&M Cost Assumptions

O&M Costs	Unit	Value
Equipment Consumables	-	2% of Equipment Costs
Electrical Consumables	-	2% of Electrical Costs
Instrumentation Consumables	-	2% of Instrumentation Costs
Pipeline Consumables	-	0.5% of Pipeline Costs
Power Costs	$ per kwh	$0.15
Labor Costs	$ per hour	$120

6.1.2 Unit Costs and Assumptions

Process facilities were preliminary sized, and a preliminary layout was developed to identify area needed for the treatment plant and to develop quantities for the cost estimate (e.g., concrete, excavation, etc.).

Unit costs were developed based on estimates from recent recycled water projects in California, vendor quotes, and RSMeans construction cost data. Pipeline unit costs were developed using Woodard & Curran's pipeline cost estimating tool with inputs specific to the study area. Installed unit costs for different size for PVC pipe are: 6-inch ($132/LF); 8-inch ($144/LF); 10-inch ($166/LF).

Treatment equipment costs were developed based on the following sources:

- **Project specific equipment vendor quotes:** For the major treatment processes, MBR and MF/UF and RO, Woodard & Curran coordinated with vendors (SUEZ for MBR and for UF/RO) to get project-specific budget quotes for the capacities included in the conceptual projects.
- **Previous project experience:** Woodard & Curran has recent project experience planning and designing several aspects of the treatment systems included in the conceptual projects, including MBR, RO, concrete construction, headworks, UV disinfection, pumps, mixers, blowers, and other items.

6.1.3 Satellite MBR Alternatives Components

Production and distribution of disinfected tertiary recycled water from raw wastewater diverted from local sewers includes several components:

- Influence conveyance system: Influent pump station, force main, and equalization
- Water recycling facility (WRF): Grit removal, screening, MBR, UV, chlorination
- Waste return pump station and force main
- Recycled water distribution system: storage, pump station, and pipelines

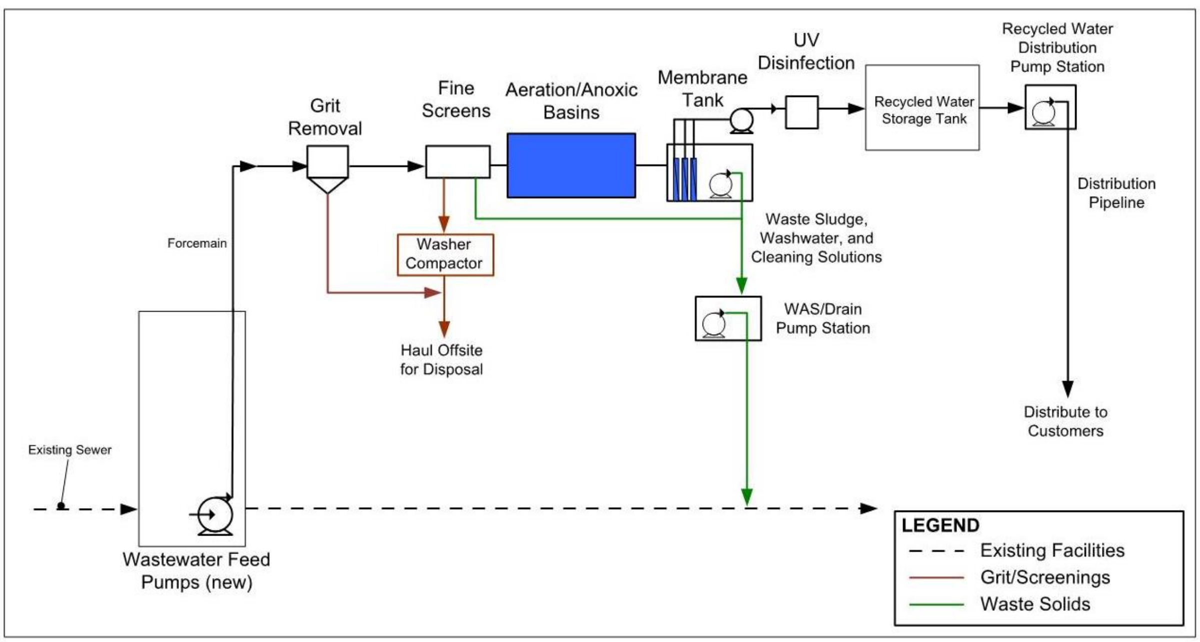
The influent conveyance system (pump station, force main, and equalization) will be sized to provide a constant feed to the new WRF. Raw wastewater would be pumped from a new manhole at Marsh Road and Bayfront Expressway, which would divert flow from the existing 36-inch sewer (at monitoring Site 1 per **Section 4.2.1**) to the satellite treatment plant.

The WRF would be sized to meet the max day demand. Due to seasonal irrigation demands, the facility would operate as a dry weather satellite plant – operating at a constant flow rate over 24 hours a day for 8 months of the year and operate at half capacity for 4 months of wet weather to maintain the biological processes.

Grit and screenings produced at the facility would be washed, compacted, and hauled offsite for disposal. Waste sludge would be discharged by force main to an existing 30-inch sewer main running along the north side of the Bayfront Expressway to be conveyed to SVCW.

The recycled water distribution system would be sized to meet peak hour demand, which typically occurs during an 8-hour period overnight between 10 PM and 6 AM. The peak hour demand exceeds the WRF capacity so recycled water storage would be provided to collect excess supply during periods of low demand so that sufficient supply is available on demand.

Figure 14: MBR Process Schematic



6.1.4 Redwood City & Sidestream RO Alternatives Components

As an alternative to diversion and treatment of raw wastewater at the Baylands WWTP site, conveyance of Redwood City recycled water for use in the study area was considered. This includes construction of a sidestream treatment train including MF or UF and RO for approximately 50 percent of the flow. The primary purpose of the sidestream treatment would be to reduce the salinity levels in the tertiary recycled water produced by Redwood City, as this can be accomplished without treating the full flows. This alternative includes several components:

- Recycled water pipeline from terminus of Redwood City recycled water system at Charter Street and Bay Road to the Baylands WWTP site for further treatment
- Sidestream MF/RO treatment system to reduce recycled water salinity and chlorination to provide a system chlorine residual
- Waste return pump station and force main, that includes RO concentrate
- Recycled water storage, pump station, and pipeline(s)

The recycled water pipeline from Redwood City would be sized in combination with on-site storage at the Baylands WWTP site to provide a constant feed to the RO treatment system. It is assumed that Redwood City would provide a consistent daily supply of recycled water with sufficient pressure to convey recycled water to the Baylands WWTP site. These assumptions must be confirmed with Redwood City.

The RO system would be sized to meet 50% of the max day demand, bypassed recycled water would provide the remaining 50% of demand, and both would be blended in on-site recycled water storage. For the purposes of this Facilities Plan, the RO sidestream treatment facilities were based on the RePAK-50 system by SUEZ. Because the facility would operate seasonally, it is assumed that it would operate at a constant flow rate over 24 hours a day for 8 months of the year and operate at half capacity for 4 months of wet weather to maintain the biological processes.

The proposed treatment process building would be approximately 50-feet by 30-feet based vendor information for an integrated packaged UF and RO system by SUEZ. The treatment process building would house one duty UF train, one duty RO train, and the associated appurtenant facilities (i.e., CIP skids, air compressors, electrical/controls equipment).

Facilities outside of the process building would include UF feed pumps (with strainers), a multi-purpose tank which would serve as interprocess tank as well as function in membrane clean-in-place operations, RO feed pumps (with cartridge filters), chemical storage and feed facility area (with secondary containment), and recycled water storage tank. Plant drainage, UF backwash, and RO concentrate would be discharged by force main to an existing 30-inch sewer main running along the north side of the Bayfront Expressway to be conveyed to SVCW.

6.2 Recycled Water Project Alternatives

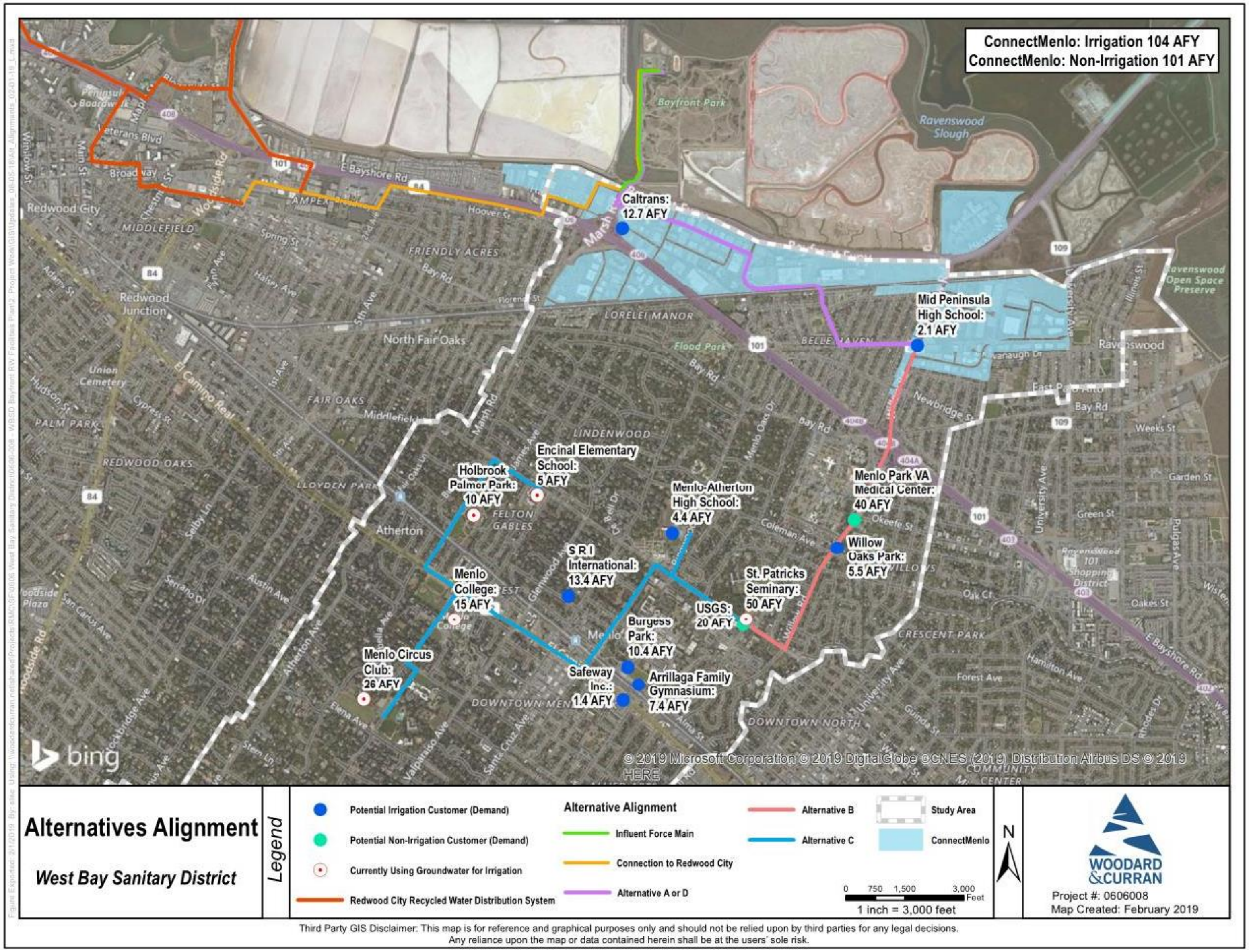
Based on the results from the preliminary analysis of treatment alternatives (satellite MBR or Redwood City recycled water), market assessment, and proximity analysis, four project alternatives were developed and evaluated:

- **Alternative A – Northeast Area:** Focuses on area north of Highway 101, including ConnectMenlo. Recycled water would be produced by a satellite MBR facility.
- **Alternative B – Central Area:** Builds upon Alternative A and extends south of Highway 101 to connect several large customers (Veterans Administration and St. Patrick's Seminary) to the vicinity of Willow Road and Middlefield Road. Recycled water would be produced by a satellite MBR facility.

- **Alternative C – Southwest Area:** Builds upon Alternative B and extends further south and west to irrigation customers surrounding downtown Menlo Park. Recycled water would be produced by a satellite MBR facility.
- **Alternative D – Northeast Area, Redwood City RW:** Would serve the same customers as Alternative A but would import recycled water from Redwood City and treated by an UF/RO treatment system to reduce TDS.

Figure 15 illustrates the four Project Alternatives alignments and potential customers.

Figure 15: Alternatives Alignments



6.2.1 Potential Customers by Alternative

Potential customers for each alternative are shown on Figure 15 and are summarized in **Table 15**, **Table 16**, and **Table 17**.

Table 15: Alternatives A & D Customers

Potential Customer	AAD (AFY)	MDD (MGD)	PHD (GPM)
ConnectMenlo – Indoor	104	0.186	N/A (day)
ConnectMenlo – Outdoor	101	0.135	0.557
Caltrans	12.7	0.023	0.068
Mid-Peninsula High School	2.1	0.004	0.011
Alternative A Total	**220**	**0.35**	**0.64**

Table 16: Alternative B Customers

Potential Customer	AAD (AFY)	MDD (MGD)	PHD (GPM)
Alternative A Total	220	0.35	0.64
St. Patrick's Seminary	50.0	0.089	0.268
Menlo Park VA Medical Center	40.0	0.071	0.107
Willow Oaks Park	5.5	0.010	0.030
USGS	20.0	0.036	0.054
Menlo-Atherton High School	4.4	0.008	0.023
Alternative B Total	**340**	**0.56**	**1.12**

Table 17: Alternative C Customers

Potential Customer	AAD (AFY)	MDD (MGD)	PHD (GPM)
Alternative B Total	340	0.56	1.12
Menlo Circus Club	26.0	0.046	0.139
Menlo College	15.0	0.027	0.080
S R I International	13.4	0.024	0.072
Burgess Park	10.4	0.019	0.056
Holbrook Palmer Park	10.0	0.018	0.054
Arrillaga Family Gymnasium	7.4	0.013	0.040
Encinal Elementary School	5.0	0.009	0.027
Safeway, Inc.	1.4	0.002	0.007
Alternative C Total	**428**	**0.72**	**1.60**

6.2.2 Alternative Facilities

Major facilities for each of the four Project Alternatives are shown on Figure 15 and are summarized in **Table 18**.

Table 18: Alternatives A through D Main Facilities

Component	Units	Alt A	Alt B	Alt C	Alt D
Influent Pump Station					
Design Flow	MGD	0.5	0.8	1.1	0.5(1)
TDH	ft	80	60	80	--
hp per Pump	hp	10	15	20	--
No. of Pumps(2)	each	2	2	2	--
Influent Pipeline					
6” Pipe	LF	4,500	--	--	--
8” pipe	LF	--	4,500	4,500	15,100
Treatment Facilities					
MBR/UV System	MGD	0.4	0.6	0.9	--
UF/RO System	MGD	--	--	--	0.4 UF 0.2 RO
Product Storage	gallons	25,000	150,000	275,000	25,000
Distribution Pump Station					
Design Flow	MGD	0.7	1.2	1.6	0.7
TDH	ft	310	450	570	200
hp per Pump	hp	30	60	100	30
No. of Pumps(2)	-	2	2	2	2
Distribution Pipeline					
6” Pipe	LF	14,200	10,000	21,500	14,200
8” Pipe	LF	--	14,200	10,000	--
10” Pipe	LF	--	--	14,200	--

Notes:

1. Sufficient pressure in the distribution system is assumed such that no influent pump station is needed.
2. The number of pumps includes one duty and one standby pump.

6.3 Alternatives Comparison

6.3.1 Cost Comparison

Table 19 summarizes the costs for the four Project Alternatives.

Table 19: Alternatives Cost Estimate(1)

Item	Alt A	Alt B	Alt C	Alt D
Influent Facilities (Pump Station and Pipeline)	$849,000	$883,000	$916,000	$2,252,000
Treatment Facilities	$6,960,000	$8,266,000	$9,555,000	$3,693,000
Distribution Facilities (Pump Station and Pipeline)	$2,554,000	$4,295,000	$8,307,000	$2,260,000
Raw Construction Cost	$10,363,000	$13,444,000	$18,778,000	$8,205,000
Construction Contingency (30%)	$3,109,000	$4,033,000	$5,633,000	$2,462,000
Total Construction Cost	$13,472,000	$17,477,000	$24,411,000	$10,667,000
Implementation Cost (30%)	$4,042,000	$5,243,000	$7,323,000	$3,200,000
Project Contingency (5%)	$674,000	$874,000	$1,221,000	$533,000
Total Capital Cost	$18,188,000	$23,594,000	$32,955,000	$14,400,000
Annualized Capital Costs(2)	$812,000	$1,053,000	$1,471,000	$643,000
Annual O&M Costs	$507,000	$604,000	$746,000	$426,000
Total Annual Cost	$1,319,000	$1,657,000	$2,217,000	$1,069,000
Recycled Water Yield (AFY)	220	340	428	220
Unit Cost ($/AF)	$6,000	$4,900	$5,200	$4,900(3)
Unit Cost with Recycled Water Purchase Cost ($/AF)	**$6,000**	**$4,900**	**$5,200**	**Up to $7,500(3)**

Notes:
1. Planning level estimate; costs are in January 2018 dollars.
2. Annualized at 30 years, 2.0%
3. Recycled water purchase cost is not included, which could be up to $2,600/AF in addition to a buy-in fee.[3]

6.3.2 Qualitative Comparison

Alternative A and Alternative D serve the same area and customers but have different sources, wastewater from WBSD and recycled water from Redwood City, respectively. The Alternative D unit cost does not include the cost of purchasing recycled water from Redwood City, which could be up to $2,600/AF in addition to a buy-in fee.[4] Although there is a possibility to lower the purchase price with Redwood City, Alternative A would still be expected to have a lower cost. Another advantage of Alternative A over Alternative D is the disposal of waste. Solids from an MBR can be discharged to the existing collection system, while discharge of RO concentrate from Alternative D to the collection system would increase salinity at SVCW or would require coordination with the California State Coastal Conservancy to discharge to the Ravenswood salt ponds. Lastly, the Sharon Heights Recycled Water Project will consist of an MBR

[3] https://www.menlopark.org/DocumentCenter/View/17167/MPMW-Water-System-Master-Plan-2018?bidId=
[4] Ibid.

system like the proposed system for Alternative A. Having similar treatment systems simplifies training of staff and provides the possibility of sharing staff.

Alternative B and C have lower unit costs; however, most of the recycled water demands for these alternatives served would offset private groundwater pumping, as shown in **Table 20**. Customers are less likely to want to convert from existing groundwater uses because of the significantly lower cost of groundwater supplies. Therefore, Alternatives B and C are not recommended until existing groundwater users express an interest in using recycled water or groundwater basin management under SGMA leads to a need to reduce groundwater pumping.

Table 20: Existing Water Sources for Recycled Water Demands

Type of Existing Use	Alt A or D	Alt B	Alt C	Total
Potable Use	220	60	33	**312**
Existing Groundwater Use	--	60	56	**116**
Alternative Subtotal	**220**	**120**	**89**	**428**
		+ Alt A Subtotal: 220	**+ Alt B Subtotal: 340**	
Alternative Total	**220**	**340**	**428**	

6.4 Conclusions

Based on discussions with WBSD, Alternative A was recommended due to the following reasons:

- Alternative A mostly offsets potable water use by MPMW while Alternatives B and C offset mostly independent groundwater users.
- Alternative A includes year-round demand with indoor uses (e.g., cooling towers and toilet flushing).
- Alternative A offers the flexibility to expand in the future and increase capacity and distribution if groundwater users are ultimately delivered recycled water.
- Compared with Alternative D, Alternative A is less expensive when considering recycled water purchase cost and would utilize similar treatment facilities as the Sharon Heights Recycled Water Project. Alternative A does not require purchase of recycled water.

Chapter 7 Recommended Project

This chapter describes the Recommended Recycled Water Project (Recommended Project) and includes target customers, project facilities descriptions, cost estimates, project benefits and an implementation plan (including construction financing plan). Alternative A was chosen as the Recommended Project.

7.1 Facilities

The Recommended Project involves the construction of an influent pump station to divert wastewater from the WBSD collection system, approximately 4,500-LF of influent pipeline, a satellite MBR/UV treatment facility to treat a maximum daily flow of 0.4 MGD, and recycled water distribution system including a recycled water storage tank, recycled water pump station, and approximately 14,200-LF of distribution pipeline to various customers.

The Recommended Project would deliver an estimated total of 220 AFY for irrigation, cooling towers, and other indoor uses. A list of recycled water customers for the Recommended Project and their respective estimated average annual demands is presented in **Table 21**. WBSD has the option to expand the treatment facilities to increase treatment capacity if deemed necessary in the future due to recycled water system expansion or increased demand. This option would allow the potential to connect other customers and expand the recycled water distribution system in the future.

Table 21: Recommended Project, Recycled Water Customers

Customer Name	Customer Use Type	AAD (AFY)	MDD (MGD)	PHD (MGD)
ConnectMenlo – Outdoor	Irrigation	104	0.186	0.557
ConnectMenlo – Indoor	Multi-Use	101	0.135	--(1)
Caltrans	Irrigation	13	0.023	0.068
Mid-Peninsula High School	Irrigation	2	0.004	0.011

Note:

1. PHD is not shown for indoor use since the demand occurs during the daytime utilizing the same distribution pipeline sized to meet the larger irrigation demand that occurs at night.

The Recommended Project would divert wastewater from the 36-in sewer pipeline near the intersection of Bayfront Expressway and Marsh Road and pump the wastewater to the Bayfront satellite treatment facility. The treatment facility includes grit removal and fine screening, biological reactor tanks, MBR treatment system, and UV disinfection. The product water would be stored in a recycled water tank and a distribution pump station would be used to deliver recycled water to customers. Grit and screenings would be collected in a common dumpster and hauled offsite for disposal. The planning-level treatment plant layout for the Recommended Project is illustrated in **Figure 16**.

Distribution from the satellite treatment facility to customers would be through a 6-inch pipeline. Solids produced from the MBR system would be discharged by gravity through a 6-inch pipeline to the existing 30-inch sewer main running along the north side of the Bayfront Expressway to be conveyed to SVCW. Error! Reference source not found. maps the customers for the Recommended Project and major facilities.

Figure 16: Recommended Project, Satellite Treatment Layout

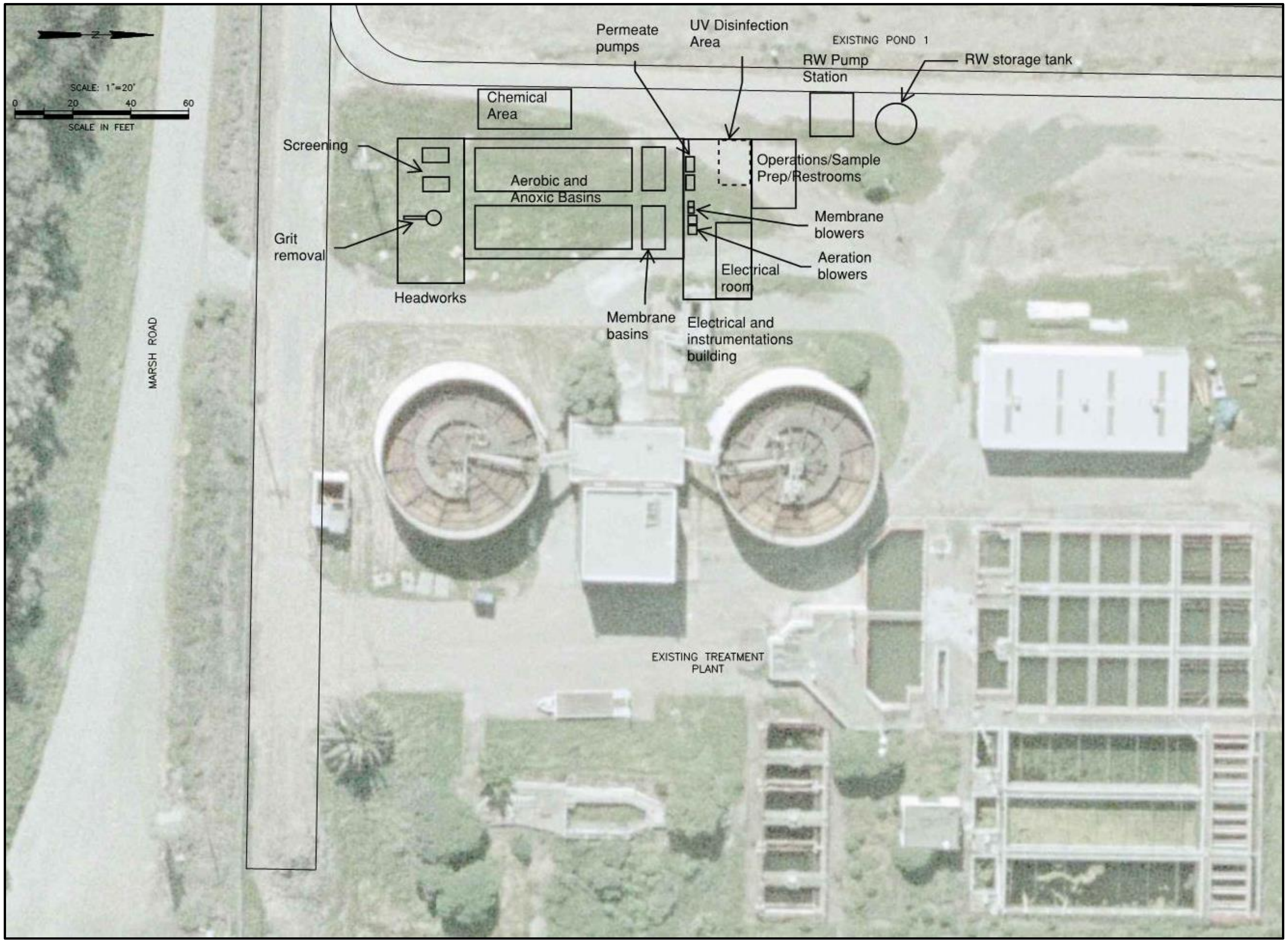
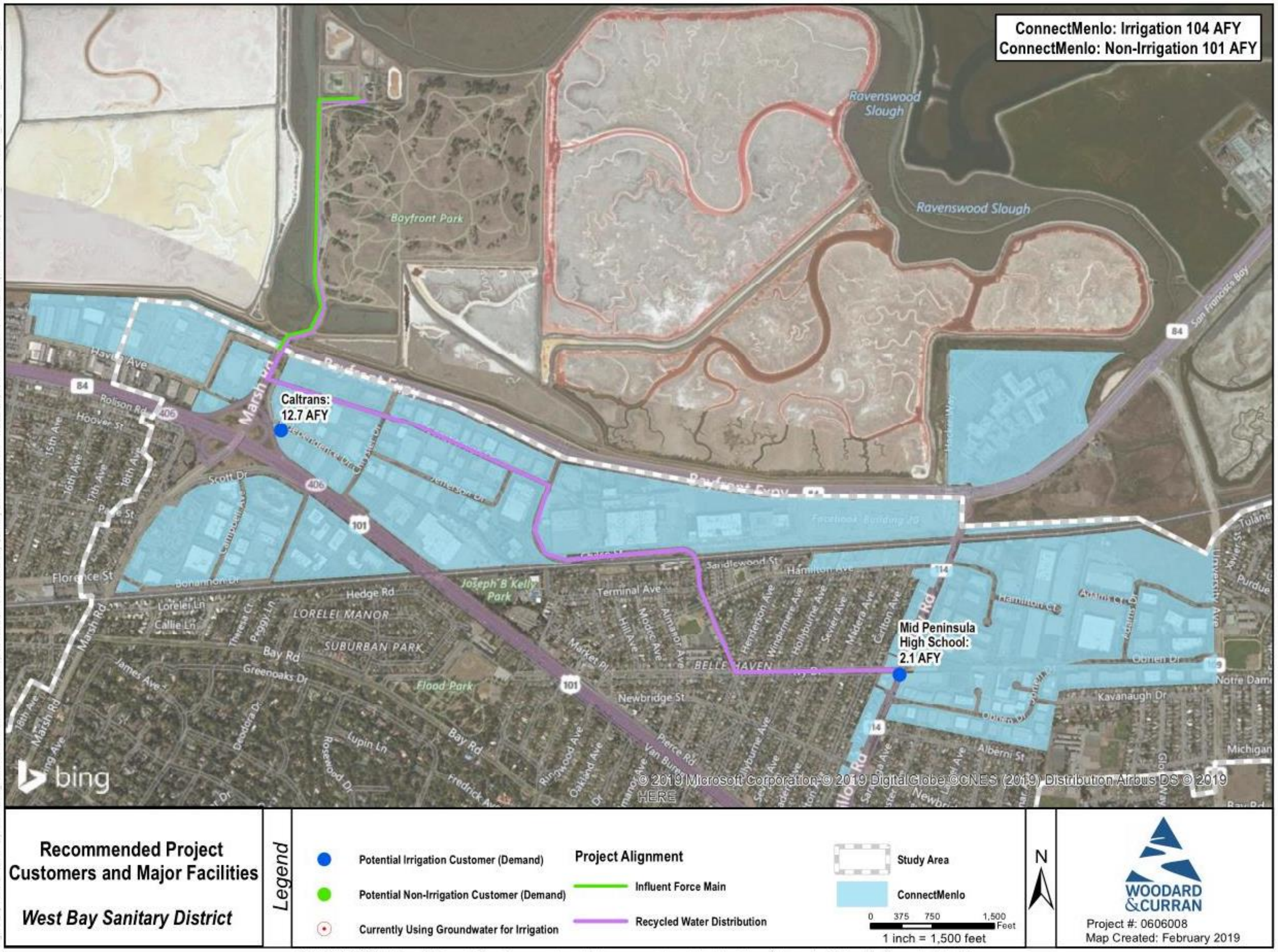


Figure 17: Recommended Project, Potential Customers and Facilities



Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions. Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data Sources:**

A summary of key planning-level design criteria for the Recommended Project's satellite treatment facilities is presented in **Table 22**.

Table 22: Design Criteria for Recommended Project

Component	Value	Units	Notes
Influent Pump Station			
Design Flow	0.5	MGD	Peak hour wastewater flow
No. of Pumps	2	-	1 Duty, 1 Standby
TDH	80	ft	
hp per Pump	10	hp	
Influent Pipeline			
6" Pipe	4,500	LF	
Treatment Facilities			
Grit Removal	0.5	MGD	
Fine Screens	2	mm	
MBR System – Biological Trains	2	-	
MBR System Flow	0.4	MGD	Max day wastewater flow
MBR System – Membrane Tanks	2	-	Two cassettes per tank
UV Disinfection	0.4	MGD	Max day wastewater flow
Recycled Water Storage Tank	25,000	gal	
Solids Discharge Pipeline			
6" Pipe	4,500	LF	
Distribution Pump Station to Customers			
Design Flow	0.7	MGD	Peak hour irrigation demand
No. of Pumps	2	-	1 Duty, 1 Standby
TDH	310	ft	
hp per Pump	30	hp	
Discharge Pressure	70	psi	
Distribution Pipeline			
6" Pipe	14,200	LF	

7.2 Recommended Project Cost Estimate

Table 23 summarizes the estimated cost for the Recommended Project. See **Appendix D** for detailed cost information.

Table 23: Recommended Project Costs

Description	Cost(1)
Influent Facilities (Pump Station and Pipeline)	$849,000
Treatment Facilities	$6,960,000
Distribution Facilities (Pump Station and Pipeline)	$2,554,000
Raw Construction Cost	**$10,363,000**
Construction Contingency (30% of Raw Construction Cost)	$3,109,000
Total Construction Cost	**$13,472,000**
Implementation Cost	$4,042,000
Project Contingency (5% of Total Construction Cost)	$674,000
Total Capital Cost	**$18,188,000**
Annualized Capital Costs(2)	$812,000
Annual O&M Costs	$507,000
Total Annualized Cost	$1,319,000
Estimated Recycled Water Yield (AFY)	220
Unit Cost, Annualized ($/AF)	**$6,000**

Notes:

1. Planning level estimate; costs are in January 2018 dollars.
2. Annualized at 30 years, 2.0%

7.3 Comparison to No Project Alternative (SFPUC Supply)

Without the Recommended Project, MPMW would continue supplying existing demands using SFPUC supply. **Table 24** is a comparison between the Recommended Project and the No Project Alternative (continued use of SFPUC water for irrigation).

Table 24: Recommended Project vs. No Project Alternative

Criteria	Recommended Project	No Project: Continued SFPUC Supply
Summary		
Treatment Facilities	Development of treatment and distribution systems to provide recycled water for irrigation, cooling tower, and indoor dual-plumbing use	Status quo. No additional facilities required.
Water Supply	Recycled water from the Bayfront Satellite Treatment Plant, treated to Title 22 standards for "Disinfected Tertiary Recycled Water"	
Benefits		
Diversifying Water Sources	233 AFY of drought-proof locally controlled water supply for non-potable uses	
Sustainability	Conserves potable water for its highest beneficial use	
Costs		
Capital Cost	$18.2 million (January 2018 dollars)	None
Unit Cost	$6,000/AF (delivered)	$2,654/AF in 2017 to $4,115/AF(1) in 2020 for Menlo Park Potable Water
Other Potential Future Costs or Risks	• Actual demands of future development may change.	• Risk of unavailable supplies during periods of drought • Risk of supply interruption following a catastrophic event (e.g. earthquake) • Risk of additional future cost increases

Note:

1. Source: City of Menlo Park, 2015

Chapter 8 Implementation Plan

8.1 Institutional Needs

Water Rights

No water rights issues were identified. Water Code Section 1210 states that the WWTP owner shall hold the exclusive right to the treated wastewater as against anyone who has supplied the water discharged into the wastewater collection and treatment system, including a person using water under a water service contract, unless otherwise provided by agreement. WBSD will curtail the sewer flow diverted to SVCW by up to 0.4 MGD; however, no formal agreement is required to reduce the flow to SVCW. The flow reduction will result in a slightly reduced flow charge to WBSD.

WBSD does not currently have an NPDES permit as its wastewater is diverted to SVCW for treatment and discharge to the San Francisco Bay at the Redwood City facility. Water Code Section 1211 requires that before making a change in the point of discharge, place of use, or purpose of use of treated wastewater being discharged to a water body with downstream water rights, the WWTP owner must seek approval from the SWRCB Division of Water Rights, which is accomplished by filing a Petition for Change for Owners of Wastewater Treatment Plants (Petition for Change). The SWRCB must be able to find that the proposed change will not injure other legal customers of water, will not unreasonably harm in-stream uses, and is not contrary to the public interest. Because SVCW is a bay discharger, they do not need a Petition for Change to be filed with the SWRCB due to the change in wastewater discharge volume associated with effluent diverted to the project.

Permitting and Agreements

Several permits were identified as necessary for the implementation of the Recommended Project. Foremost, WBSD would need to obtain a recycled water permit to produce recycled water. WBSD currently operates its sewers under the SWRCB Collection System General Order and will need to obtain an individual Water Reclamation Requirement permit to cover the production of recycled water with the San Francisco Bay Regional Water Quality Control Board for the Bayfront Recycled Water Facility. A Title 22 Engineering Report would be needed to satisfy SWRCB Division of Drinking Water requirements. Standard construction permits including encroachment and air quality permits would also be required. In addition, if MPMW decides to be the recycled water purveyor, MPMW would need to enroll under the State Water Resources Control Board General Order WQ 2016-0068-DDW for permit coverage of the distribution and use of recycled water, and a recycled water purchase agreement between WBSD and the City / MPMW would be required. If MPMW declines to become the purveyor, WBSD would need to apply for a recycled water permit for the production, distribution, and use of recycled water.

Right of Way Acquisition

No right of way acquisition was identified.

8.2 Financing Plan

This section discusses potential funding sources for the Recommended Project and the construction financing plan and associated cash flow over the implementation period. Typically, recycled water projects are financed through a combination of grants, partnerships relative to project benefits, and at times, the CWSRF.

8.2.1 Funding Opportunities

A variety of potential funding opportunities are possible for this project, including the following:

- Integrated Regional Water Management (IRWM) Program Funding

- US Bureau of Reclamation (USBR) WaterSMART: Title XVI Water Reclamation and Reuse Program
- SWRCB CWSRF / Water Recycling Funding Program (WRFP)
- California Infrastructure and Economic Development Bank (I-Bank) Infrastructure State Revolving Fund (ISRF) Program

Each of these funding opportunities is described in further detail in the following sections.

Integrated Regional Water Management (IRWM) Program Funding

The IRWM Program, administered by the DWR, provides planning and implementation grants to prepare and update IRWM Plans and to implement integrated, regional water resources related projects included in IRWM Plans.

Funding is currently available through Proposition 1 (Prop 1), the Water Quality, Supply, and Infrastructure Improvement Act of 2014 which made $510 million available through the IRWM Program Statewide, $65 million for the San Francisco Funding Area (DWR 2016).

IRWM program funding is awarded through a competitive grants program, in which approved IRWM Regions submit application packages for funding multiple projects within their regions. For a project to be eligible for IRWM funding, it must be included in an IRWM Region's IRWM Plan and preferably be ready to be implemented. This project falls within the San Francisco Bay Area IRWM region, and therefore must be included within the Bay Area IRWM Plan to be eligible for IRWM funding. IRWM funding requires a minimum 50% match for the entire grant proposal, which typically includes multiple projects from different sponsors.

To prepare for the upcoming application process, the Bay Area IRWM region will issue a call for projects by the sub-regions. Prior to submitting the projects for consideration by the sub-regions, they must be submitted for inclusion in the Bay Area IRWM Plan. This can be done at any time through submittal to an online database. The Bay Area IRWM Plan was last prepared in 2013; in order to be eligible for the upcoming round of Prop 1 implementation grant funding, the Bay Area IRWM region will undergo an IRWM Plan update. During the update, the call for projects will be conducted, as well as prioritization of projects which can help select which projects should be included in a funding application.

Figure 18 illustrates the steps of the IRWM funding process from project submittal into the Bay Area IRWM Plan to the sub-regional ranking to the final project proposal package. Additional information about the IRWM grant program can be accessed here: https://www.water.ca.gov/Work-With-Us/Grants-And-Loans/IRWM-Grant-Programs/Proposition-1.

Figure 18: Bay Area IRWM Plan Prop 1 IRWM Grant Process

Based on information from DWR, the current schedule for the first round of Prop 1 implementation grant funding is as follows:

- Release of the Draft Proposal Solicitation Package in September 2018;
- Release of the Final Proposal Solicitation Package in late 2018;

- Pre-application workshops in February-July 2019 period; and
- Application due approximately eight weeks after pre-application workshop.

US Bureau of Reclamation (USBR) WaterSMART: Title XVI – Grant Funding

Administered by the USBR, the WaterSMART: Title XVI Water Reclamation and Reuse Program is a grant program that focuses on identifying and investigating opportunities for water reclamation and reuse. Funding is made available for the planning, design, and construction of water recycling treatment and conveyance facilities and structured to cover 25% of the total project costs (up to $20 million), with project proponents contributing 75% or more of total project costs. Proposal requirements include technical and budgetary components, as well as a completed Title XVI Feasibility Study, which must be submitted to USBR for review and approval. While compliance with the National Environmental Policy Act (NEPA) is not required during the proposal phase, it is required prior to the receipt and expenditure of Federal funds. In the past, in order to be eligible for the Title XVI grant program, a project had to be congressionally authorized; however, with the passing of the Water Infrastructure Improvements for the Nation or WIIN Act, a project must only have a USBR-approved Title XVI Feasibility Study to be eligible. USBR typically releases Funding Opportunity Announcements for the Title XVI program on an annual basis. For reference, applications for the most recent solicitation were due July 27, 2018. Typically, a project receives its grant funding allocation through multiple rounds of funding and application solicitations. For example, a project could apply for approximately $4 million each year until the project is constructed and/or its full grant amount is secured.

More information is available from USBR's website here: http://www.usbr.gov/lc/socal/titlexvi.html/.

SWRCB CWSRF/ Water Recycling Funding Program (WRFP)

The SWRCB administers multiple types of recycled water funding depending on availability: recycled water facilities planning grants, construction implementation grants and loans, CWSRF loans, and principal forgiveness. Construction grants and loans specific to recycled water programs fall under the WRFP and follow the Policy for Implementing the CWSRF. One application is submitted to SWRCB for the CWSRF/WRFP programs and SWRCB awards the best financing package possible given availability of funds (i.e., a combination of a low-interest loan, grant funding, and principal forgiveness). With the Facilities Plan in place, WBSD can focus on obtaining grants or low interest loans to cover the construction implementation costs.

Clean Water State Revolving Fund (CWSRF) Program

The SWRCB administers the CWSRF Program. The CWSRF Program offers low-interest loans to eligible applicants for construction of publicly-owned facilities including wastewater treatment, local sewers, sewer interceptors, water reclamation and distribution facilities, and stormwater treatment. Funding under the CWSRF Program is also available for expanded use projects including implementation of nonpoint source projects or programs, and development and implementation of estuary comprehensive conservation and management plans.

The process for securing funds includes submitting a CWSRF application, in addition to additional water recycling project-specific application items. CWSRF loans typically have a lower interest rate than bonds, at half of the General Obligation bond (typically 2.5% to 3%, currently 1.8%) at the time of the Preliminary Funding Commitment. Loans are paid back over 20 or 30 years. Repayment begins one year after construction is complete. Historically, SWRCB has funded projects on a readiness-to-proceed basis; however, SWRCB is currently revisiting the application process and may begin applying scoring criteria (to be determined). SWRCB is currently recommending interested applicants submit a complete (or as close to complete as possible) application by the end of the calendar year for inclusion on the next fiscal year's fundable list of projects. The application consists of General, Technical, Financial and Environmental Packages. The project must comply with the California Environmental Quality Act (CEQA), as well as some federal crosscutters (e.g., Clean Air Act, Federal Endangered Species Act, National Historic Preservation Act), collectively referred to as CEQA-Plus. The draft and final CEQA-Plus documentation must be submitted as part of the project's application, as well as the Notice of Determination and adopting resolution, as applicable.

Historically, SWRCB has offered up to principal forgiveness (i.e., grants) to applicants if the project directly benefits a disadvantaged community or if the project addresses priorities of its Green Project Reserve, including water recycling. Principal forgiveness is dependent upon project details and availability, and is determined after the application is submitted, during review by SWRCB.

More information about the SWRCB CWSRF Program can be found here:
http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/srf_forms.shtml.

Facility Construction Grants

The SWRCB administers a grant program to cover construction of recycled water facilities. Per the SWRCB's WRFP Guidelines adopted on June 16, 2015, a construction grant can cover 35% of eligible construction costs up to $15 million, including construction allowances. Eligible costs include construction allowances which may include engineering during construction, construction management, and contingencies limited to 15% of the construction grant value. To be eligible to receive grant funds, at least a 50% local cost share match must be provided. In the past, WRFP grant funding came from Proposition 1, but the $725 million available for recycled water and desalination projects has been exhausted. It is possible the funding could be replenished through another source in the future, such as Proposition 68, the Parks, Environment, and Water Bond approved in June 2018 or Proposition 3, the California Water Bond that will appear on the California ballot in November 2018.

A CWSRF application would be submitted, and SWRCB would award the project the best package of funding available at the time of financing agreement execution, which could be a combination of a low-interest loan, grant funding, and/or principal forgiveness.

Infrastructure State Revolving Fund (ISRF) Program – I-Bank

The ISRF Program provides low-interest loan financing to public agencies for a wide variety of infrastructure projects such as water supply, parks and recreation facilities, sewage collection and treatment, and water treatment and distribution projects. Funding is available in amounts up to $25 million with loan terms up to 30 years. The interest rate is set at the time the loan is approved. Eligible applicants include cities, counties, special districts, assessment districts, joint powers authorities, and nonprofit organizations. Applicants must demonstrate project readiness and feasibility to complete construction within two years after I-Bank loan approval. Additionally, eligible projects must promote economic development and attract, create, and sustain long-term employment opportunities. There is no required match; however, there is a one-time origination fee of 1% of the ISRF financing amount or $10,000, whichever is greater. Applications are accepted on continuous basis. The I-Bank recommends applications be submitted upon completion of design, as construction must begin within six months of the I-Bank's loan commitment.

More information about the ISRF Program can be found here: http://www.ibank.ca.gov/infrastructure-state-revolving-fund-isrf-program/.

8.2.2 Funding Opportunity Summary

There are multiple options to pursue outside funding. **Table 25** summarizes the funding opportunities described in **Section 8.2.1** deadlines and current grant amounts.

Table 25: Summary of Funding Opportunities

Opportunity	Application Dates	Grant Amounts
DWR IRWM Grant Program – Prop 1	~April 2019	Prop 1: $65 M available for the San Francisco Funding Area for water recycling projects
USBR Title XVI – Construction Grants	Unknown	Up to 25% of construction cost with a maximum of $20 M for federal funds
SWRCB CWSRF & WRFP	On-going	Grant funding currently exhausted, but more may become available in the future; principal forgiveness may be available; low-interest loans with current interest rate of 1.8% available
I-Bank ISRF Loans	On-going	$25 M at variable interest rates (statewide)

8.2.3 Construction Financing and Cash Flow

Figure 19 demonstrates cash flow over the implementation period of the recommended project. Costs were summarized as part of **Chapter 7**, and the unit cost for water at this feasibility is $6,000/AF. As grants and loans become available to the Recommended Project, rates and charges will be refined. Figure 19 is an example cash flow chart.

Figure 19: Cash Flow Chart

	Year	2020				2021				2022			
Design / Construction Items	**Quarter**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
CEQA Plus	**$269,000**			$67,250	$67,250	$67,250	$67,250						
SRF Funding	**$134,000**			$33,500	$33,500	$33,500	$33,500						
Preliminary Design	**$807,000**	$201,750	$201,750	$201,750	$201,750								
Engineers Report and RW Permit	**$134,000**			$33,500	$33,500	$33,500	$33,500						
Final Design/Procurement Package	**$1,345,000**					$336,250	$336,250	$336,250	$336,250				
Construction/Startup & Commission	**$14,154,000**									$3,538,500	$3,538,500	$3,538,500	$3,538,500
Construction Management / ESDC	**$1,345,000**									$336,250	$336,250	$336,250	$336,250
Total	**$18,188,000**	**$201,750**	**$201,750**	**$336,000**	**$336,000**	**$470,500**	**$470,500**	**$336,250**	**$336,250**	**$3,874,750**	**$3,874,750**	**$3,874,750**	**$3,874,750**

Notes: Cash flow analysis does not consider the financing costs, which would be paid back over a period longer than project implementation.

8.3 Preliminary Environmental Review

All public projects in California must comply with the CEQA. If a project is not exempt, CEQA provides for the preparation of an Initial Study to analyze whether the project would have a significant impact upon the environment. A Negative Declaration/Mitigated Negative Declaration could be issued if the analysis in the Initial Study determines that the project or action, as proposed or as proposed with specific mitigation measures, would not have a significant impact upon the environment. If the analysis in the Initial Study determines that the project or action has the potential to result in a significant impact(s) to the environment, then an Environmental Impact Report (EIR) would need to be prepared to further address such impacts. If the Initial Study determines that impacts can be reduced to less than significant levels with implementation of mitigation measures, then a Mitigated Negative Declaration can be prepared, and is a shorter process than preparation of an EIR. Based on a preliminary review, it is likely that the District can a prepare a Mitigated Negative Declaration for the project, but would be confirmed during the Initial Study phase when preliminary designs for the project are available. In addition to CEQA, a project is subject to National Environmental Policy Act (NEPA) if it is jointly carried out by a federal agency, requires a federal permit, entitlement, or authorization, requires federal funding, and/or occurs on federal land. The SWRCB SRF loan program (see the following **Section 8.2.1** for further discussion) is partially funded by the U.S. Environmental Protection Agency and, as a result, requires additional environmental documentation beyond CEQA – but not as extensive as NEPA – that is referred to as "CEQA-Plus."

Included herein as **Appendix E** is a preliminary evaluation of expected environmental impacts from implementation (construction and operation) of the Recommended Project. The topics described in the preliminary evaluation are further explored in the Initial Study.

8.4 Engineering, Design, and Construction Activities

The new facilities for the Recommended Project were presented in **Section 7.1**. This section discusses the effort needed to develop and implement the capital improvement projects identified for the Recommended Project, including advanced water treatment facilities, conveyance pump stations, pipelines, and recycled water storage.

Pre-Design Report

Detailed facilities plans would be prepared for all the new facilities identified for the project, including facilities layouts for the advanced water treatment facilities, conveyance pump stations, pipeline alignments, and recycled water storage. The plans would also include revised capital and O&M cost estimates based on vendor quotes and proposals. During pre-design, the conceptual design developed in this report would be further developed, and assumptions would be updated, validated and documented. The draft pre-design report is anticipated to take approximately six months.

Final Design

Following preliminary design, design packages would be prepared for the advanced water treatment facilities. Design for the conveyance pump stations and pipelines could proceed independently of the advanced water treatment facility design. The advanced water treatment facilities design is expected to be completed within six to ten months. A bid package (after permitting is completed) could be prepared in two months.

Bidding/Contract Award, Construction, and Startup

Bidding and contract award would commence once the bid package is complete. These tasks are assumed to take three months. The bidding and contract award period is defined as starting from when the bid package is sent for advertisement to the day that the notice to proceed to the contractor is issued. Construction of the advanced water treatment facilities, conveyance pump stations, and conveyance pipelines is anticipated to take one year. The startup period and final approvals of the advanced water treatment facilities and overall project are anticipated to take three months.

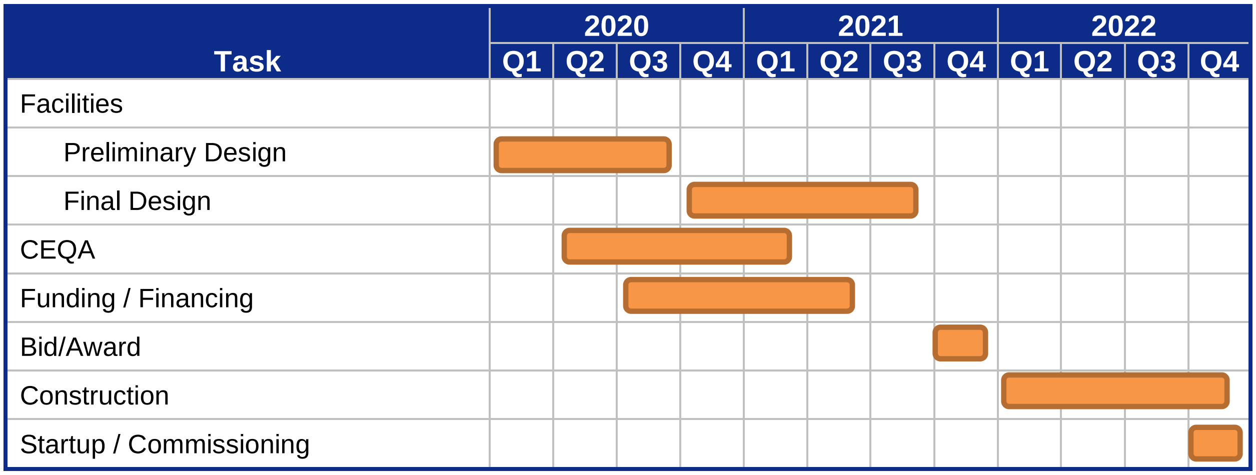
8.5 Implementation Schedule

The overall implementation plan for the Recommended Project is shown on **Figure 20**. Full implementation of the project is anticipated to take approximately 3 years. In summary, all the preliminary studies required to further refine the project need to be completed in order to: 1) prepare the Engineering Report for DDW; 2) initiate environmental documentation; and 3) refine project cost estimates. The environmental documentation should be done in parallel with the Engineering Report.

From a project funding and financing perspective, CEQA certification is the critical path for gaining preliminary approval for grant funding and low-interest loans from the SWRCB. From a project start-up perspective, the Engineering Report approval is the critical path for acquiring a recycled water permit from the San Francisco Bay Regional Water Quality Control Board (RWQCB), which is needed prior to start of operations. CEQA certification is also needed before the RWQCB can issue the tentative permit.

Design of the infrastructure improvements would continue after completion of the relevant preliminary studies in coordination with CEQA and permitting efforts. Applications for funding and stakeholder/public outreach efforts would occur over the lifetime of the project.

Figure 20: Implementation Schedule for Recommended Project



Chapter 9 Conclusion

The possibility of a Bayfront Recycled Water Facility was first presented in the WBSD 2014 Recycled Water Facilities Plan, which identified the Sharon Heights Recycled Water Project as the recommended alternative. Increasing interest in recycled water from potential customers in the Bayfront has led to the preparation of the Bayfront Recycled Water Facilities Plan to reassess and update potential demands and alternatives to serve the area.

Of the four alternatives presented herein, a recommended alternative has been identified as feasible to serve recycled water to the northeast area of WBSD's service area. Customers include new commercial and residential re-development planned as part of ConnectMenlo, Caltrans, and Mid-Peninsula High School. The ConnectMenlo area customers will include indoor use for dual-plumbing systems with demands largely outside of the peak irrigation season and hours and year-round demands. The City and WBSD have been working together to evaluate potential recycled water projects. The City has expressed support for the recycled water project and is open to the possibility of becoming the recycled water purveyor for the Bayfront recycled water project. However, if the City decides to decline this role, WBSD would still be interested to proceed with the Bayfront Recycled Water Facility Project and become both the producer and purveyor of recycled water.

The Bayfront Recycled Water Facility and Sharon Heights Recycled Water Project will support the statewide water conservancy efforts by providing a reliable source of water and offsetting potable water use within the Menlo Park Municipal Water Service area, offsetting demand in the SFPUC Hetch Hetchy water system. However, the economics of the Bayfront project will require securing outside funding (e.g. grant funding or new development contributions) to lower the estimated unit cost ($6,000/AF) to an acceptable level.

The project has the ability to expand in the future if additional non-potable use is desired or if recharge with recycled water is desired in support of groundwater management. Now that a recommended project has been identified, WBSD is continuing coordination with the City to determine next steps in project planning.

Chapter 10 References

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Appendix A - Sewer Water Quality Data

Table A-1: Sewer Water Quality Data at B16001 – Sample Site 1, 36-inch Trunk Line

Constituent	Units	7/17/2017	7/18/2017	7/19/2017	7/20/2017	7/22/2017	7/23/2017	7/24/2017	All Data Average
Boron	mg/L	<0.21	ND	ND	<0.23	<0.22	ND	ND	**<0.21**
Calcium	mg/L	36	25	27	27	29	30	24	**28**
Magnesium	mg/L	12	11	13	10	11	13	11	**12**
Sodium	mg/L	68	61	63	80	93	67	100	**76**
Ammonia as NH_3	mg/L	45	43	45	48	49	55	48	**47**
Bicarbonate	mg/L	270	280	290	290	290	340	300	**290**
Biochemical Oxygen Demand	mg/L	210	120	120	110	180	190	140	**150**
pH	su	7.24	7.25	7.31	7.30	7.33	7.30	7.32	**7.29**
Specific Conductance (EC)	umhos/cm	830	800	840	940	1010	940	1080	**920**
Total Dissolved Solids	mg/L	380	370	390	470	460	380	440	**410**
Total Suspended Solids	mg/L	270	150	130	210	290	160	110	**190**
Silica, Dissolved	mg/L	15	13	15	12	13	12	12	**13**
Bicarbonate Alkalinity as $CaCO_3$	mg/L	220	230	240	240	240	280	240	**240**
Carbonate Alkalinity as $CaCO_3$	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Hydroxide Alkalinity as $CaCO_3$	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Total Alkalinity as $CaCO_3$	mg/L	220	230	240	240	240	280	240	**240**
Total Kjeldahl Nitrogen	mg/L	54	43	49	56	58	64	55	**54**
Total Nitrogen	mg/L	54	43	49	56	58	64	55	**54**
Phosphorus, Total	mg/L	7.0	5.1	6.5	6.7	6.1	6.3	6.6	**6.3**
Sodium Adsorption Ratio-Adj RNa	N/A	2.94	2.87	2.81	3.77	4.36	2.99	4.74	**3.5**
Chloride	mg/L	84	80	83	120	140	67	150	**100**
Nitrate as N	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Nitrate as NO_3	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Nitrite as N	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Nitrite as NO_2	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**

Notes:
Samples were taken over 24 hours and composited into three time frames or time slots: time slot 1 from 00:00 to 08:00; time slot 2 from 08:00 to 16:00; and time slot 3 from 16:00 to 00:00. Results presented are averages.
"<" = Average includes at least one concentration reported as not detected. Not detected results were set equal to the RL for averaging.
"ND" = all results reported as not detected.

Table A-2: Sewer Water Quality Data at B15046 – Sample Site 2, 30-inch Trunk Line

Constituent	Units	7/19/2017[1]	7/25/2017	7/26/2017	7/27/2017	7/28/2017	7/29/2017	7/30/2017	All Data Average
Boron	mg/L	<0.21	<0.23	0.25	0.23	0.22	0.23	<0.22	**<0.23**
Calcium	mg/L	56	27	50	57	63	46	57	**50**
Magnesium	mg/L	29	8.4	30	32	35	30	33	**28**
Sodium	mg/L	140	62	210	190	190	200	200	**170**
Ammonia as NH_3	mg/L	42	48	63	66	63	52	57	**57**
Bicarbonate	mg/L	350	280	340	380	430	310	370	**350**
Biochemical Oxygen Demand	mg/L	120	230	320	320	210	210	190	**230**
pH	su	7.22	7.16	7.02	7.20	7.20	7.21	7.23	**7.17**
Specific Conductance (EC)	umhos/cm	1400	780	1870	1970	1900	1830	1900	**1680**
Total Dissolved Solids	mg/L	810	300	850	1020	970	920	1010	**840**
Total Suspended Solids	mg/L	150	210	250	220	130	200	380	**220**
Silica, Dissolved	mg/L	17	11	13	13	15	11	13	**13**
Bicarbonate Alkalinity as $CaCO_3$	mg/L	290	230	280	310	350	260	300	**290**
Carbonate Alkalinity as $CaCO_3$	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Hydroxide Alkalinity as $CaCO_3$	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Total Alkalinity as $CaCO_3$	mg/L	290	230	280	310	350	260	300	**290**
Total Kjeldahl Nitrogen	mg/L	53	82	76	74	62	61	70	**69**
Total Nitrogen	mg/L	53	82	76	74	62	61	70	**69**
Phosphorus, Total	mg/L	7.0	9.9	8.2	9.3	7.9	6.7	8.9	**8.3**
Sodium Adsorption Ratio-Adj RNa	N/A	4.35	3.05	6.72	6.14	5.77	6.45	6.06	**5.56**
Chloride	mg/L	240	58	370	380	360	390	290	**300**
Nitrate as N	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Nitrate as NO_3	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Nitrite as N	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**
Nitrite as NO_2	mg/L	ND	ND	ND	ND	ND	ND	ND	**ND**

Notes:

Samples were taken over 24 hours and composited into three time frames or time slots: time slot 1 from 00:00 to 08:00; time slot 2 from 08:00 to 16:00; and time slot 3 from 16:00 to 00:00. Results presented are averages.

"<" = Average includes at least one concentration reported as not detected. Not detected results were set equal to the RL for averaging.

"ND" = all results reported as not detected.

(1) No sampling for time slot 1

Table A-3: Sewer Water Quality Data at C15009 – Sample Site 3, 54-inch Trunk Line

Constituent	Units	7/27/2017	7/28/2017	7/29/2017	7/30/2017	7/31/2017	8/1/2017	All Data Average
Boron	mg/L	<0.2	ND	<0.2	<0.22	<0.21	<0.21	**<0.21**
Calcium	mg/L	21	17	17	15	18	18	**18**
Magnesium	mg/L	7.4	7.0	7.4	6.3	6.6	9.1	**7.3**
Sodium	mg/L	68	40	44	52	67	46	**53**
Ammonia as NH_3	mg/L	55	69	50	53	52	55	**56**
Bicarbonate	mg/L	280	320	260	250	260	270	**270**
Biochemical Oxygen Demand	mg/L	220	220	140	150	140	160	**170**
pH	su	7.10	7.36	7.15	7.35	7.23	7.29	**7.25**
Specific Conductance (EC)	umhos/cm	910	800	700	740	760	770	**780**
Total Dissolved Solids	mg/L	380	300	280	330	330	300	**320**
Total Suspended Solids	mg/L	220	130	230	210	220	180	**200**
Silica, Dissolved	mg/L	9.2	11	10	9.4	9.3	10	**9.8**
Bicarbonate Alkalinity as $CaCO_3$	mg/L	230	260	220	210	210	220	**220**
Carbonate Alkalinity as $CaCO_3$	mg/L	ND	ND	ND	ND	ND	ND	**ND**
Hydroxide Alkalinity as $CaCO_3$	mg/L	ND	ND	ND	ND	ND	ND	**ND**
Total Alkalinity as $CaCO_3$	mg/L	230	260	220	210	210	220	**220**
Total Kjeldahl Nitrogen	mg/L	60	67	51	62	68	61	**61.5**
Total Nitrogen	mg/L	60	67	51	62	68	61	**61.5**
Phosphorus, Total	mg/L	7.0	7.4	6.4	7.1	7.4	7.2	**7.07**
Sodium Adsorption Ratio-Adj RNa	N/A	3.54	2.32	2.41	2.99	3.71	2.38	**2.89**
Chloride	mg/L	96	47	48	66	69	62	**65**
Nitrate as N	mg/L	ND	ND	ND	ND	ND	ND	**ND**
Nitrate as NO_3	mg/L	ND	ND	ND	ND	ND	ND	**ND**
Nitrite as N	mg/L	ND	ND	ND	ND	ND	ND	**ND**
Nitrite as NO_2	mg/L	ND	ND	ND	ND	ND	ND	**ND**

Notes:
Samples were taken over 24 hours and composited into three time frames or time slots: time slot 1 from 00:00 to 08:00; time slot 2 from 08:00 to 16:00; and time slot 3 from 16:00 to 00:00. Results presented are averages.
"<" = Average includes at least one concentration reported as not detected. Not detected results were set equal to the RL for averaging.
"ND" = all results reported as not detected.

Table A-4: Sewer Water Quality Data at B15041 – Sample Site 4, 36-inch Trunk Line

Constituent	Units	7/31/2017	8/1/2017	8/2/2017	8/3/2017	8/4/2017	8/5/2017	8/6/2017	8/7/2017	All Data Average
Boron	mg/L	<0.20	ND	ND	0.23	0.22	ND	<0.21	<0.20	**<0.21**
Calcium	mg/L	30	38	31	46	46	41	33	31	**37**
Magnesium	mg/L	13	17	15	22	26	24	17	17	**19**
Sodium	mg/L	84	89	85	120	150	120	100	100	**110**
Ammonia as NH_3	mg/L	50	46	52	48	42	31	48	47	**46**
Bicarbonate	mg/L	300	290	330	360	300	260	300	280	**300**
Biochemical Oxygen Demand	mg/L	120	160	150	160	150	80	170	260	**160**
pH	su	7.12	7.10	7.13	7.23	7.08	7.14	7.22	7.19	**7.15**
Specific Conductance (EC)	umhos/cm	960	1060	1070	1300	1430	1100	1050	1200	**1150**
Total Dissolved Solids	mg/L	460	470	480	610	750	630	580	580	**570**
Total Suspended Solids	mg/L	330	210	130	210	150	51	170	280	**190**
Silica, Dissolved	mg/L	11	10	11	14	16	15	14	15	**13**
Bicarbonate Alkalinity as $CaCO_3$	mg/L	250	240	270	290	240	220	250	230	**250**
Carbonate Alkalinity as $CaCO_3$	mg/L	ND	ND	ND	ND	ND	ND	ND	<5	**<5**
Hydroxide Alkalinity as $CaCO_3$	mg/L	ND	ND	ND	ND	ND	ND	ND	<5	**<5**
Total Alkalinity as $CaCO_3$	mg/L	250	240	270	290	240	220	250	230	**250**
Total Kjeldahl Nitrogen	mg/L	60	56	53	50	49	32	53	53	**51**
Total Nitrogen	mg/L	60	56	53	50	49	32	53	53	**51**
Phosphorus, Total	mg/L	6.6	6.2	6.1	6.0	5.1	3.2	5.8	5.6	**5.6**
Sodium Adsorption Ratio-Adj RNa	N/A	3.73	3.48	3.55	4.35	4.80	4.01	3.96	4.08	**4.00**
Chloride	mg/L	120	140	130	200	280	193	140	180	**170**
Nitrate as N	mg/L	ND	ND	ND	ND	ND	ND	ND	<0.2	**<0.2**
Nitrate as NO_3	mg/L	ND	ND	ND	ND	ND	ND	ND	<1	**<1**
Nitrite as N	mg/L	ND	ND	ND	ND	ND	ND	ND	<0.2	**<0.2**
Nitrite as NO_2	mg/L	ND	ND	ND	ND	ND	ND	ND	<1	**<1**

Notes:
Samples were taken over 24 hours and composited into three time frames or time slots: time slot 1 from 00:00 to 08:00; time slot 2 from 08:00 to 16:00; and time slot 3 from 16:00 to 00:00. Results presented are averages.
"<" = Average includes at least one concentration reported as not detected. Not detected results were set equal to the RL for averaging.
"ND" = all results reported as not detected.

Table A-5: Caltrans Stormwater Grab Sample Sewer Water Quality Data

Constituent	Units	11/19/2016
Boron	mg/L	0.530
Calcium	mg/L	170
Magnesium	mg/L	120
Sodium	mg/L	410
Ammonia as N	mg/L	ND
Bicarbonate as HCO_3	mg/L	640
Biochemical Oxygen Demand	mg/L	ND
pH	su	7.7
Conductivity	umhos/cm	3500
Total Dissolved Solids	mg/L	2100
Total Suspended Solids	mg/L	ND
Bicarbonate Alkalinity as HCO_3	mg/L	640
Carbonate Alkalinity as CO_3	mg/L	ND
Hydroxide Alkalinity as OH	mg/L	ND
Total Alkalinity as $CaCO_3$	mg/L	525
Total Kjeldahl Nitrogen	mg/L	0.18
Total Nitrogen	mg/L	2.4
Ortho Phosphate as P	mg/L	0.067
Chloride	mg/L	720
Nitrate as N	mg/L	2.2
Nitrite as N	mg/L	ND

Table B-1: Average Hourly Flow (MGD) at Site 1, 24-in Haven Avenue[(1)]

Time	11/28/2017	11/29/2017	11/30/2017	12/1/2017	12/2/2017	12/3/2017	12/4/2017
0:00	1.14	0.85	0.95	1.10	1.16	0.93	0.97
1:00	0.79	0.78	0.71	0.86	1.01	0.84	0.85
2:00	0.72	0.65	0.74	0.65	0.76	0.71	0.60
3:00	0.62	0.55	0.52	0.44	0.61	0.63	0.44
4:00	0.48	0.42	0.42	0.40	0.53	0.51	0.37
5:00	0.44	0.38	0.37	0.42	0.49	0.37	0.35
6:00	0.45	0.39	0.40	0.41	0.46	0.33	0.37
7:00	0.62	0.62	0.59	0.53	0.56	0.33	0.59
8:00	1.08	1.06	1.14	1.14	0.76	0.53	1.17
9:00	1.43	1.60	1.55	1.36	1.10	0.88	1.71
10:00	1.45	1.56	1.59	1.47	1.56	1.38	1.78
11:00	1.61	1.77	1.53	1.54	1.64	1.59	1.75
12:00	1.56	1.68	1.51	1.57	1.47	1.47	1.70
13:00	1.29	1.51	1.36	1.54	1.57	1.51	1.60
14:00	1.27	1.46	1.27	1.45	1.48	1.45	1.53
15:00	1.30	1.46	1.31	1.46	1.44	1.42	1.52
16:00	1.24	1.26	1.17	1.24	1.28	1.34	1.36
17:00	1.08	1.13	1.22	1.32	1.22	1.34	1.29
18:00	1.12	1.28	1.15	1.26	1.30	1.36	1.24
19:00	1.36	1.27	1.20	1.38	1.34	1.31	1.24
20:00	1.39	1.28	1.38	1.35	1.38	1.42	1.48
21:00	1.29	1.38	1.19	1.25	1.19	1.39	1.48
22:00	1.39	1.35	1.29	1.34	1.22	1.34	1.46
23:00	1.16	1.24	1.17	1.27	1.00	1.22	1.24

Notes:
(1) Flow monitored at 15-minute intervals. Data averaged to hourly values.

Table B-2: Average Hourly Flow (MGD) at Site 3, 54-in Commonwealth Drive[(1)]

Time	11/28/2017	11/29/2017	11/30/2017	12/1/2017	12/2/2017	12/3/2017	12/4/2017
0:00	1.27	1.31	1.31	1.24	1.17	1.03	1.29
1:00	1.03	1.00	1.05	0.99	0.93	0.90	0.92
2:00	0.82	0.79	0.77	0.77	0.74	0.73	0.73
3:00	0.62	0.62	0.62	0.59	0.53	0.55	0.50
4:00	0.47	0.44	0.50	0.49	0.45	0.42	0.41
5:00	0.40	0.41	0.44	0.39	0.41	0.33	0.33
6:00	0.39	0.42	0.41	0.33	0.37	0.27	0.34
7:00	0.44	0.45	0.43	0.45	0.37	0.29	0.40
8:00	0.87	0.81	0.84	0.84	0.42	0.33	0.88
9:00	1.66	1.68	1.58	1.65	0.73	0.66	1.63
10:00	1.90	1.88	1.85	1.91	1.27	1.07	1.90
11:00	1.89	1.87	1.85	1.90	1.76	1.58	1.89
12:00	1.73	1.77	1.78	1.82	1.81	1.73	1.74
13:00	1.59	1.58	1.64	1.68	1.78	1.75	1.58
14:00	1.49	1.42	1.48	1.57	1.65	1.68	1.44
15:00	1.40	1.39	1.49	1.44	1.57	1.51	1.32
16:00	1.32	1.27	1.38	1.36	1.49	1.45	N/A
17:00	1.27	1.16	1.29	1.22	1.35	1.40	N/A
18:00	1.27	1.15	1.25	1.18	1.37	1.37	N/A
19:00	1.31	1.25	1.30	1.26	1.42	1.46	N/A
20:00	1.48	1.45	1.49	1.41	1.44	1.54	N/A
21:00	1.64	1.59	1.64	1.39	1.37	1.62	N/A
22:00	1.66	1.61	1.63	1.34	1.25	1.61	N/A
23:00	1.53	1.51	1.48	1.24	1.14	1.45	N/A

Notes:
(1) Flow monitored at 15-minute intervals. Data averaged to hourly values.

Appendix B - Flow Monitoring Data

Figure B-1: Daily Flows, July 16 through August 14, 2017 – Site 1

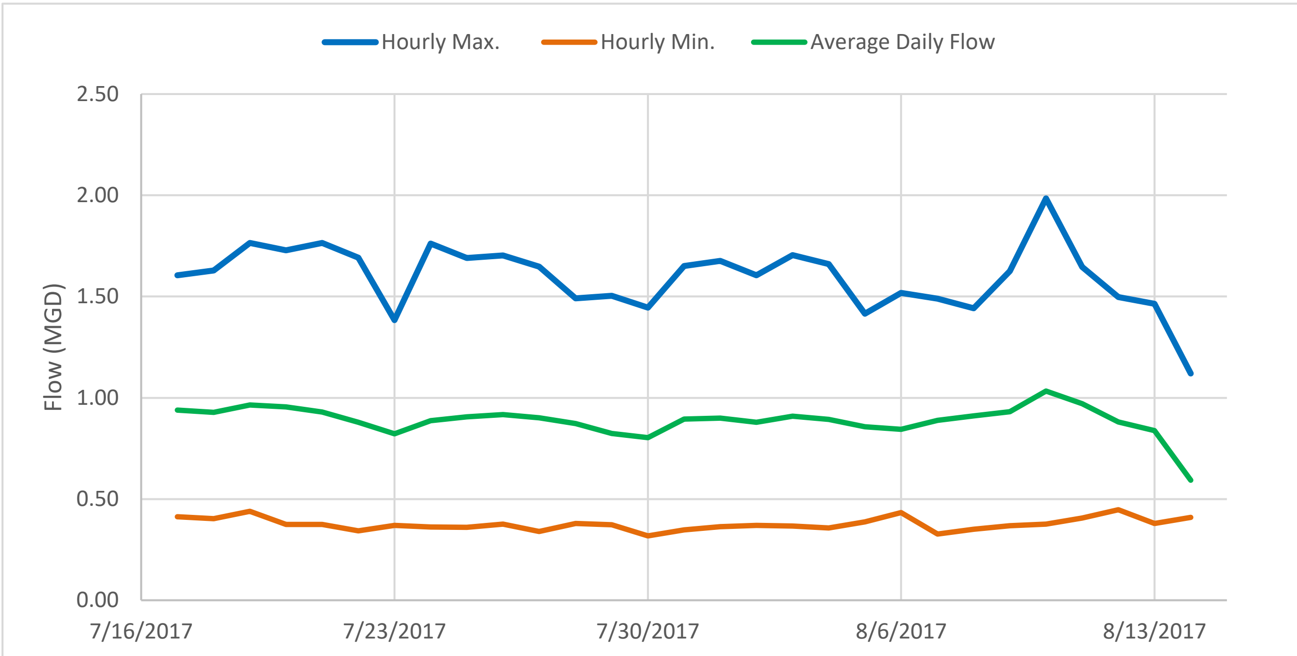


Figure B-2: Average Hourly Flow, November 28 through December 4, 2017 – Site 1

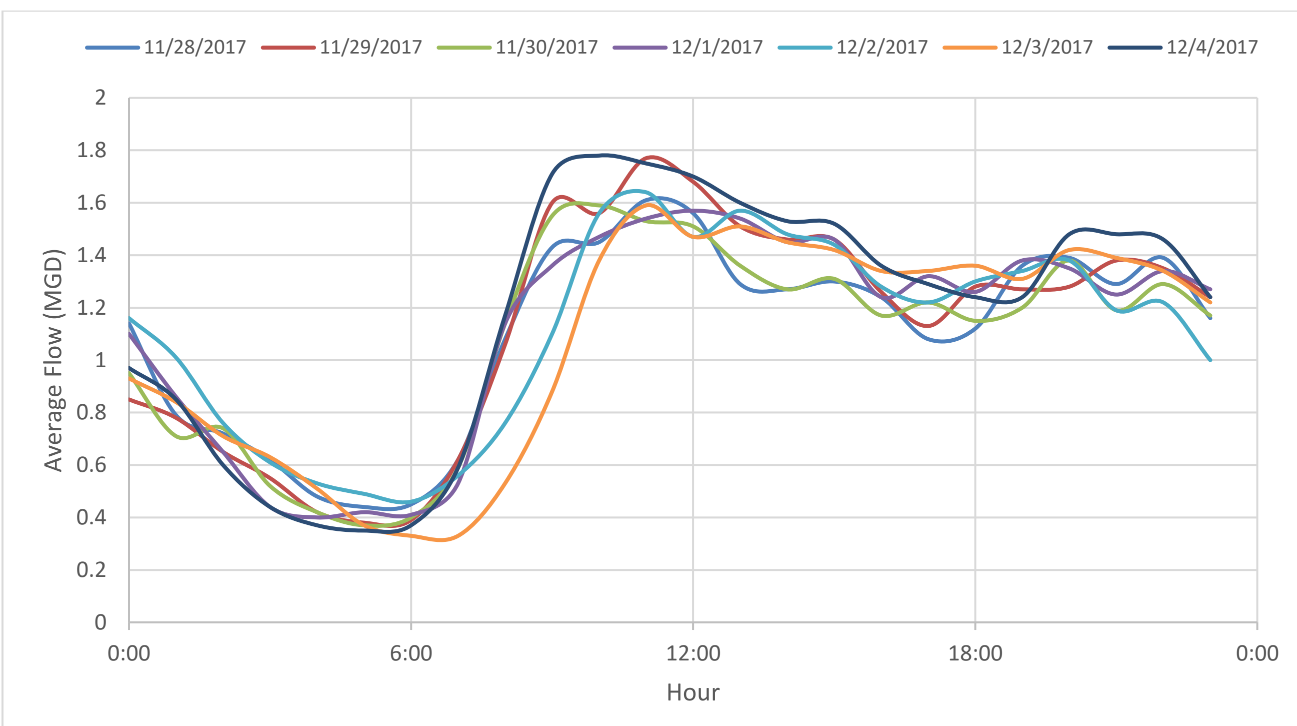


Figure B-3: Daily Flows, July 27 through August 1, 2017 – Site 3

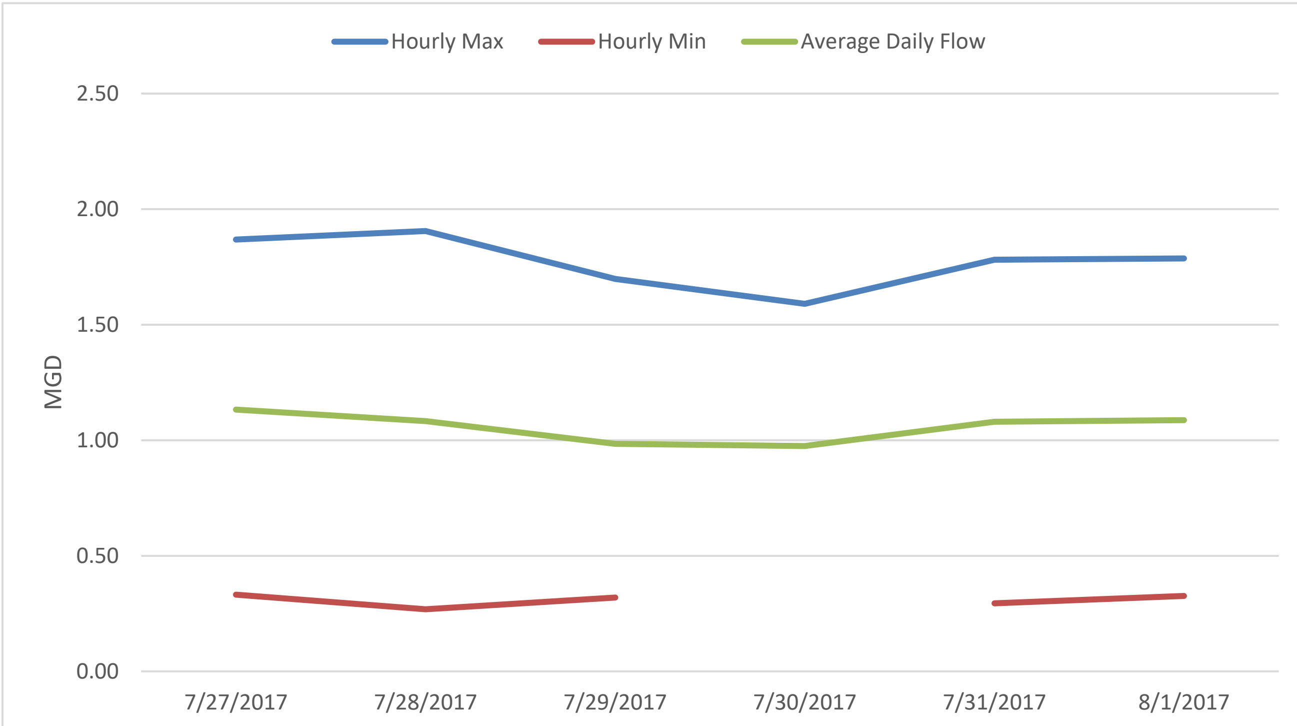
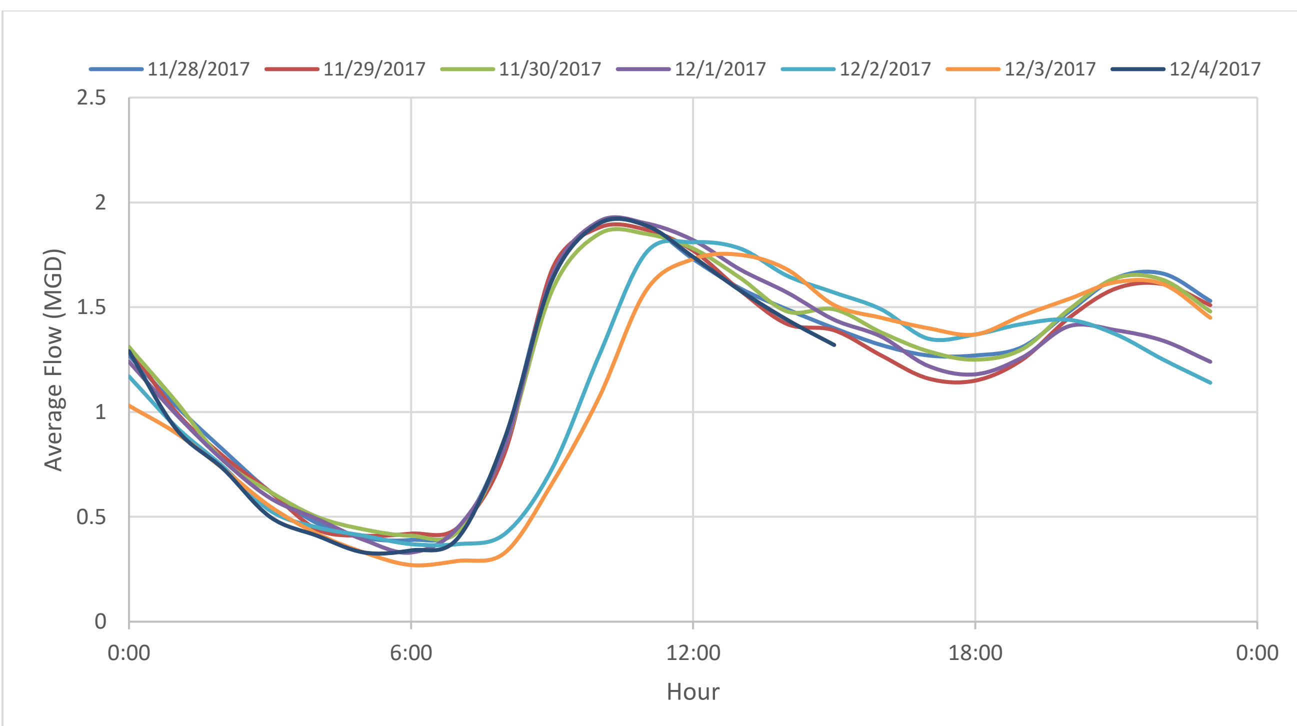


Figure B-4: Average Hourly Flow, November 28 through December 4, 2017 – Site 3



Appendix C - Project Alternative Cost Estimates

WOODARD & CURRAN

Project: **Bayfront RW Facilities Plan**

Estimate Type: Conceptual Design

Alternative	A	B	C	D
Description	0.4 MGD MBR; North of 101 / ConnectMenlo	0.6 MGD MBR; Extend South to Central Area	0.9 MGD MBR; Extend South near Downtown	Alt A w/ Redwood City RW & RO
Capital Costs				
Influent Facilities	$ 849,000	$ 883,000	$ 916,000	$ 2,252,000
Treatment Facilities	$ 6,960,000	$ 8,266,000	$ 9,555,000	$ 3,693,000
Distribution Facilities	$ 2,554,000	$ 4,295,000	$ 8,307,000	$ 2,260,000
Subtotal Raw Construction Cost	**$ 10,363,000**	**$ 13,444,000**	**$ 18,778,000**	**$ 8,205,000**
Construction Contingency	$ 3,109,000	$ 4,033,000	$ 5,633,000	$ 2,462,000
Base Construction Cost	**$ 13,472,000**	**$ 17,477,000**	**$ 24,411,000**	**$ 10,667,000**
Implementation Costs	$ 4,042,000	$ 5,243,000	$ 7,323,000	$ 3,200,000
Project Contingency	$ 674,000	$ 874,000	$ 1,221,000	$ 533,000
Total Estimated Capital Cost	**$ 18,188,000**	**$ 23,594,000**	**$ 32,955,000**	**$ 14,400,000**
Annual Costs				
Annual Cost of Consumables	$ 78,000	$ 88,000	$ 101,000	$ 24,000
Annual Cost of Power	$ 130,000	$ 192,000	$ 297,000	$ 102,000
Annual Cost of Chemicals	$ 49,000	$ 74,000	$ 98,000	$ 50,000
Annual Labor Costs	$ 250,000	$ 250,000	$ 250,000	$ 250,000
Total Annual O&M	**$ 507,000**	**$ 604,000**	**$ 746,000**	**$ 426,000**
Annualized Capital Costs				
Annualized Capital Costs	$812,000	$1,053,000	$1,471,000	$643,000
Total Annual O&M	$507,000	$604,000	$746,000	$426,000
Total Annualized Cost	**$1,319,000**	**$1,657,000**	**$2,217,000**	**$1,069,000**
Project Unit Costs				
Recycled Water Yield (AFY)	220	340	428	220
Project Unit Cost ($/AF)	**$6,000**	**$4,900**	**$5,200**	**$4,900**

Notes:

1. Estimated costs are referenced to the January 2018 ENR CCI for Palo Alto: 12014.72.
2. Annualized cost are based on a State Revolving Fund financing of 30 years at 2.0% interest rate.
3. Alt D excludes the purchase price of recycled water from Redwood City.

Project:	**Bayfront RW Facilities Plan**	Date:	July 1, 2018
Alternative:	**A - 0.4 MGD MBR**	Project Number:	0606008
Annual Demand	220 AFY	Prepared by:	EL
MBR Capacity	0.4 MGD	Checked by:	CDB
Estimate Type:	Conceptual Design		

Process Cost Summary by Division

Spec. Division	Subtotal	Notes
2 - Sitework	$ 5,295,000	
3 - Concrete	$ 564,000	
4 - Masonry	$ 114,000	
5 - Metals	$ 197,000	
11 - Equipment	$ 2,322,000	
13 - Special Construction	$ 246,000	
15 - Mechanical	$ 464,000	
16 - Electrical	$ 697,000	
17 - I&C	$ 464,400	
RAW CONSTRUCTION COST	**$ 10,363,000**	
Construction Contingency	$ 3,109,000	30%
BASE CONSTRUCTION COST	**$ 13,472,000**	
Implementation Cost	$ 4,042,000	30%
Project Contingency	$ 674,000	5%
TOTAL PROJECT COST	**$ 18,188,000**	

Spec. Division / Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
2 - Sitework						**$ 5,295,000**	
Influent Facilities Mobilization/Demobilization			$ 771,000		10%	$ 78,000	
Treatment Facilities Mobilization/Demobilization			$ 6,327,400		10%	$ 633,000	
Distribution Facilities Mobilization/Demobilization			$ 2,321,000		10%	$ 233,000	
Influent Pump Station						**$ 100,000**	
Sitework Allowance			1	LS	$ 100,000	$ 100,000	
Influent Pipeline						**$ 595,000**	
6" Pipe, From collection system	6	in	4,500	LF	$ 132	$ 595,000	
Treatment Facilities						**$ 1,769,000**	
Site Clearing			1.0	LS	$ 10,000	$ 10,000	Roughly 0.5 ac; West of clarifiers
Excavation for Treatment Structure			2,000	CY	$ 35	$ 71,000	70 ft x 45 ft x 13 ft, 1:1 excavation
Excavation for Effluent Pump Station			40	CY	$ 35	$ 2,000	25 ft x 25 ft x 1.5 ft, 1:1 excavation
Offhaul			2,100	CY	$ 11	$ 23,000	Assumes all excavation is offhauled
Dewatering			1	LS	$ 150,000	$ 150,000	Engineer's estimate
Structural Piles			5,200	SF	$ 172	$ 893,000	Includes treatment and storage facilities
Landscaping Allowance & Misc site work			1	LS	$ 25,000	$ 25,000	
6" Pipe, Solids discharge to existing sewer	6	in	4,500	LF	$ 132	$ 595,000	
Waste Disposal Pump Station							
Distribution Pump Station						**$ 10,000**	
Sitework Allowance			1	LS	$ 10,000	$ 10,000	
Distribution Pipeline						**$ 1,877,000**	
To Customers	6	in	14,200	LF	$ 132	$ 1,877,000	
3 - Concrete						**$ 564,000**	
Influent Pump Station						**$ 16,000**	
Slab			20	CY	$ 800	$ 16,000	12 in thick
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 540,000**	
Treatment Structure Slab			300	CY	$ 800	$ 240,000	Includes treatment facilities, E/I&C building, chemical storage area slabs, and RW storage tank slabs; 12 in thick
Treatment Structure Walls			300	CY	$ 1,000	$ 300,000	18 ft height, 1.5 ft thick, 250 ft perimeter
Distribution Pump Station						**$ 8,000**	
Slab			10	CY	$ 800	$ 8,000	12 in thick
Distribution Pipeline						**$ -**	
4 - Masonry						**$ 114,000**	
Influent Pump Station						**$ -**	
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 114,000**	
CMU Blocks			3000	SF	$ 38	$ 114,000	15 ft height, 200 ft LF of walls. Includes E/I&C building
Distribution Pump Station						**$ -**	
Distribution Pipeline						**$ -**	
5 - Metals						**$ 197,000**	
Influent Pump Station						**$ -**	
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 197,000**	
Metal Canopy			1200	SF	$ 110	$ 132,000	Covers membrane basins and chemical area
CMU Building Roofing			1700	SF	$ 38	$ 65,000	Covers E/I&C building
Distribution Pump Station						**$ -**	
Distribution Pipeline						**$ -**	

Spec. Division / Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
11 - Equipment						**$ 2,322,000**	
Influent Pump Station						**$ 40,000**	
Pumps	10	hp	2	EA	$ 20,000	$ 40,000	1 duty + 1 standby. Includes allowance for installation.
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 2,162,000**	
Grit Removal			1	LS	$ 173,000	$ 173,000	Includes allowance for installation
Screens and Washer Compactor			1	LS	$ 547,000	$ 547,000	Includes allowance for installation
MBR Package	0.4	MGD	1	LS	$ 762,000	$ 762,000	Includes membrane cassettes, master control panel, process pump skid, membrane air scour blowers, membrane cleaning systems. Concrete reactors not included.
MBR Equipment Installation			1	LS	$ 390,000	$ 390,000	50% of equipment cost
UV Disinfection			1	LS	$ 150,000	$ 150,000	1 duty + 1 standby. Includes allowance for installation.
Waste Disposal Pump Station	10	hp	2	EA	$ 20,000	$ 40,000	1 duty + 1 standby. Includes allowance for installation.
Chemical Allowance			1	LS	$ 100,000	$ 100,000	
Distribution Pump Station						**$ 120,000**	
Pumps	30	hp	2	EA	$ 60,000	$ 120,000	1 duty + 1 standby. Includes allowance for installation.
Distribution Pipeline						**$ -**	
13 - Special Construction						**$ 246,000**	
Recycled Water Storage			1	EA	$ 246,000	$ 246,000	25,000 gallons
15 - Mechanical						**$ 464,000**	
Piping, Valve, Fitting, Supports Allowance			$ 2,322,000		20%	$ 464,000	20% of Division 11 (Equipment)
16 - Electrical						**$ 697,000**	
Influent Pump Station	Electrical Allowance				30%	$ 12,000	30% of Division 11 (Equipment)
Influent Pipeline	Electrical Allowance				30%	$ -	30% of Division 11 (Equipment)
Treatment Facilities	Electrical Allowance				30%	$ 649,000	30% of Division 11 (Equipment)
Distribution Pump Station	Electrical Allowance				30%	$ 36,000	30% of Division 11 (Equipment)
Distribution Pipeline	Electrical Allowance				30%	$ -	30% of Division 11 (Equipment)
17 - I&C						**$ 464,400**	
Influent Pump Station	I&C Allowance				20%	$ 8,000	20% of Division 11 (Equipment)
Influent Pipeline	I&C Allowance				20%	$ -	20% of Division 11 (Equipment)
Treatment Facilities	I&C Allowance				20%	$ 432,400	20% of Division 11 (Equipment)
Distribution Pump Station	I&C Allowance				20%	$ 24,000	20% of Division 11 (Equipment)
Distribution Pipeline	I&C Allowance				20%	$ -	20% of Division 11 (Equipment)

ANNUAL O&M COSTS	Amount	Unit	Value	Cost	
Consumables			**Total Consumables**	**$ 78,000**	
Equipment Consumables	$ 2,322,000		2%	$ 47,000	2% of Equipment
Electrical Consumables	$ 697,000		2%	$ 14,000	2% of Electrical
Instrumentation Consumables	$ 464,400		2%	$ 10,000	2% of Instrumentation
Pipeline Consumables	$ 1,368,500		0.5%	$ 7,000	0.5% of Pipeline
Power Costs			**Total Power**	**$ 130,000**	
WW Pump Station	61,040	kwh	$ 0.15	$ 10,000	
Headworks Screen					
Grit Screw	6,532	kwh	$ 0.15	$ 1,000	
Grit Conveyor	544	kwh	$ 0.15	$ 90	
Headworks Screen	980	kwh	$ 0.15	$ 150	
MBR					
Permeate Pumps	15,888	kwh	$ 0.15	$ 3,000	
Recirculation Pumps	87,827	kwh	$ 0.15	$ 14,000	
Denitrification Pumps	19,295	kwh	$ 0.15	$ 3,000	
Membrane Blowers	65,323	kwh	$ 0.15	$ 10,000	
Process Blowers	97,985	kwh	$ 0.15	$ 15,000	
Anoxic Mixers	81,654	kwh	$ 0.15	$ 13,000	
Air Compressors	32,662	kwh	$ 0.15	$ 5,000	
UV	75,686	kwh	$ 0.15	$ 12,000	
Effluent Pumping					
To Customers	236,176	kwh	$ 0.15	$ 36,000	
Chemicals					
Hypochlorite Dosing	6,532	kwh	$ 0.15	$ 1,000	
Citric Acid Dosing	272	kwh	$ 0.15	$ 50	
Site Electrical	43,800	kwh	$ 0.15	$ 7,000	
Chemicals			**Total Chemicals**	**$ 49,000**	
Hypochlorite	660	gal	$ 1	$ 700	
Citric Acid	110	gal	$ 4	$ 500	
Caustic	105	dry ton	$ 450	$ 48,000	
Labor Costs			**Total Labor**	**$ 250,000**	
Total # Operators	1	number			
Average Annual Hours per operator	2080	hrs/yr			
Total Operators per year	2080	Total hrs	$ 120	$ 250,000	
			TOTAL ANNUAL O&M COSTS	**$ 507,000**	

Project:	**Bayfront RW Facilities Plan**	Date:	July 1, 2018
Alternative:	**B - 0.6 MGD MBR**	Project Number:	0606008
		Prepared by:	EL
		Checked by:	CDB
Annual Demand	340 AFY		
MBR Capacity	0.6 MGD		
Estimate Type:	Conceptual Design		

Process Cost Summary by Division

Spec. Division	Subtotal	Notes
2 - Sitework	$ 7,477,000	
3 - Concrete	$ 744,000	
4 - Masonry	$ 114,000	
5 - Metals	$ 252,000	
11 - Equipment	$ 2,665,000	
13 - Special Construction	$ 326,000	
15 - Mechanical	$ 533,000	
16 - Electrical	$ 800,000	
17 - I&C	$ 533,000	
RAW CONSTRUCTION COST	**$ 13,444,000**	
Construction Contingency	$ 4,033,000	30%
BASE CONSTRUCTION COST	**$ 17,477,000**	
Implementation Cost	$ 5,243,000	30%
Project Contingency	$ 874,000	5%
TOTAL PROJECT COST	**$ 23,594,000**	

Spec. Division / Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
			$12,220,000			$ 1,224,000	
2 - Sitework						**$ 7,477,000**	
Influent Facilities Mobilization/Demobilization			$ 802,000		10%	$ 81,000	
Treatment Facilities Mobilization/Demobilization			$ 7,514,000		10%	$ 752,000	
Distribution Facilities Mobilization/Demobilization			$ 3,904,000		10%	$ 391,000	
Influent Pump Station						**$ 100,000**	
Sitework Allowance			1	LS	$ 100,000	$ 100,000	
Influent Pipeline						**$ 596,000**	
6" Pipe, From collection system	8	in	4,500	LF	$ 132	$ 596,000	
Treatment Facilities						**$ 2,347,000**	
Site Clearing			1.0	LS	$ 10,000	$ 10,000	Roughly 0.5 ac; West of clarifiers
Excavation for Treatment Structure			3,000	CY	$ 35	$ 107,000	90 ft x 60 ft x 13 ft, 1:1 excavation
Excavation for Effluent Pump Station			40	CY	$ 35	$ 2,000	25 ft x 25 ft x 1.5 ft, 1:1 excavation
Offhaul			3,100	CY	$ 11	$ 33,000	Assumes all excavation is offhauled
Dewatering			1	LS	$ 150,000	$ 150,000	Engineer's estimate
Structural Piles			8,300	SF	$ 172	$ 1,425,000	Includes treatment and storage facilities
Landscaping Allowance & Misc site work			1	LS	$ 25,000	$ 25,000	
6" Pipe, Solids discharge to existing sewer	6	in	4,500	LF	$ 132	$ 595,000	
Waste Disposal Pump Station							
Distribution Pump Station						**$ 10,000**	
Sitework Allowance			1	LS	$ 10,000	$ 10,000	
Distribution Pipeline						**$ 3,200,000**	
To Customers	8	in	14,200	LF	$ 132	$ 1,878,000	
To Customers	6	in	10,000	LF	$ 132	$ 1,322,000	
3 - Concrete						**$ 744,000**	
Influent Pump Station						**$ 16,000**	
Slab			20	CY	$ 800	$ 16,000	12 in thick
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 720,000**	
Treatment Structure Slab			400	CY	$ 800	$ 320,000	Includes treatment facilities, E/I&C building, chemical storage area slabs, and RW storage tank slabs; 12 in thick
Treatment Structure Walls			400	CY	$ 1,000	$ 400,000	18 ft height, 1.5 ft thick, 320 ft perimeter
Distribution Pump Station						**$ 8,000**	
Slab			10	CY	$ 800	$ 8,000	12 in thick
Distribution Pipeline						**$ -**	
4 - Masonry						**$ 114,000**	
Influent Pump Station						**$ -**	
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 114,000**	
CMU Blocks			3000	SF	$ 38	$ 114,000	15 ft height, 200 ft LF of walls. Includes E/I&C building
Distribution Pump Station						**$ -**	
Distribution Pipeline						**$ -**	
5 - Metals						**$ 252,000**	
Influent Pump Station						**$ -**	
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 252,000**	
Metal Canopy			1700	SF	$ 110	$ 187,000	Covers membrane basins and chemical area
CMU Building Roofing			1700	SF	$ 38	$ 65,000	Covers E/I&C building
Distribution Pump Station						**$ -**	
Distribution Pipeline						**$ -**	

Spec. Division / Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
11 - Equipment						**$ 2,665,000**	
Influent Pump Station						**$ 60,000**	
Pumps	15	hp	2	EA	$ 30,000	$ 60,000	1 duty + 1 standby. Includes allowance for installation.
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 2,365,000**	
Grit Removal			1	LS	$ 173,000	$ 173,000	Includes allowance for installation
Screens and Washer Compactor			1	LS	$ 547,000	$ 547,000	Includes allowance for installation
MBR Package	0.6	MGD	1	LS	$ 870,000	$ 870,000	Includes membrane cassettes, master control panel, process pump skid, membrane air scour blowers, membrane cleaning systems. Concrete reactors not included.
MBR Equipment Installation			1	LS	$ 440,000	$ 440,000	50% of equipment cost
UV Disinfection			1	LS	$ 175,000	$ 175,000	1 duty + 1 standby. Includes allowance for installation.
Waste Disposal Pump Station	15	hp	2	EA	$ 30,000	$ 60,000	1 duty + 1 standby. Includes allowance for installation.
Chemical Allowance			1	LS	$ 100,000	$ 100,000	
Distribution Pump Station						**$ 240,000**	
Pumps	60	hp	2	EA	$ 120,000	$ 240,000	1 duty + 1 standby. Includes allowance for installation.
Distribution Pipeline						**$ -**	
13 - Special Construction						**$ 326,000**	
Recycled Water Storage			1	EA	$ 326,000	$ 326,000	150,000 gallons
15 - Mechanical						**$ 533,000**	
Piping, Valve, Fitting, Supports Allowance			$ 2,665,000		20%	$ 533,000	20% of Division 11 (Equipment)
16 - Electrical						**$ 800,000**	
Influent Pump Station	Electrical Allowance				30%	$ 18,000	30% of Division 11 (Equipment)
Influent Pipeline	Electrical Allowance				30%	$ -	30% of Division 11 (Equipment)
Treatment Facilities	Electrical Allowance				30%	$ 710,000	30% of Division 11 (Equipment)
Distribution Pump Station	Electrical Allowance				30%	$ 72,000	30% of Division 11 (Equipment)
Distribution Pipeline	Electrical Allowance				30%	$ -	30% of Division 11 (Equipment)
17 - I&C						**$ 533,000**	
Influent Pump Station	I&C Allowance				20%	$ 12,000	20% of Division 11 (Equipment)
Influent Pipeline	I&C Allowance				20%	$ -	20% of Division 11 (Equipment)
Treatment Facilities	I&C Allowance				20%	$ 473,000	20% of Division 11 (Equipment)
Distribution Pump Station	I&C Allowance				20%	$ 48,000	20% of Division 11 (Equipment)
Distribution Pipeline	I&C Allowance				20%	$ -	20% of Division 11 (Equipment)

ANNUAL O&M COSTS	Amount	Unit	Value	Cost	
Consumables			**Total Consumables**	**$ 88,000**	
Equipment Consumables	$ 2,665,000		2%	$ 54,000	2% of Equipment
Electrical Consumables	$ 800,000		2%	$ 16,000	2% of Electrical
Instrumentation Consumables	$ 533,000		2%	$ 11,000	2% of Instrumentation
Pipeline Consumables	$ 1,369,500		0.5%	$ 7,000	0.5% of Pipeline
Power Costs			**Total Power**	**$ 192,000**	
WW Pump Station	64,629	kwh	$ 0.15	$ 10,000	
Headworks Screen					
Grit Screw	6,532	kwh	$ 0.15	$ 1,000	
Grit Conveyor	544	kwh	$ 0.15	$ 90	
Headworks Screen	980	kwh	$ 0.15	$ 150	
MBR					
Permeate Pumps	24,938	kwh	$ 0.15	$ 4,000	
Recirculation Pumps	87,827	kwh	$ 0.15	$ 14,000	
Denitrification Pumps	19,295	kwh	$ 0.15	$ 3,000	
Membrane Blowers	97,985	kwh	$ 0.15	$ 15,000	
Process Blowers	146,977	kwh	$ 0.15	$ 23,000	
Anoxic Mixers	81,654	kwh	$ 0.15	$ 13,000	
Air Compressors	32,662	kwh	$ 0.15	$ 5,000	
UV	113,530	kwh	$ 0.15	$ 18,000	
Effluent Pumping					
To Customers	515,017	kwh	$ 0.15	$ 78,000	
Chemicals					
Hypochlorite Dosing	6,532	kwh	$ 0.15	$ 1,000	
Citric Acid Dosing	272	kwh	$ 0.15	$ 50	
Site Electrical	43,800	kwh	$ 0.15	$ 7,000	
Chemicals			**Total Chemicals**	**$ 74,000**	
Hypochlorite	1155	gal	$ 1	$ 1,200	
Citric Acid	165	gal	$ 4	$ 700	
Caustic	160	dry ton	$ 450	$ 72,000	
Labor Costs			**Total Labor**	**$ 250,000**	
Total # Operators	1	number			
Average Annual Hours per operator	2080	hrs/yr			
Total Operators per year	2080	Total hrs	$ 120	$ 250,000	
			TOTAL ANNUAL O&M COSTS	**$ 604,000**	

Project:	**Bayfront RW Facilities Plan**	Date:	July 1, 2018
		Project Number:	0606008
Alternative:	**C - 0.9 MGD MBR**	Prepared by:	EL
		Checked by:	CDB
Annual Demand	428 AFY		
MBR Capacity	0.9 MGD		
Estimate Type:	Conceptual Design		

Process Cost Summary by Division

Spec. Division	Subtotal	Notes
2 - Sitework	$ 11,869,000	
3 - Concrete	$ 824,000	
4 - Masonry	$ 114,000	
5 - Metals	$ 351,000	
11 - Equipment	$ 3,067,000	
13 - Special Construction	$ 406,000	
15 - Mechanical	$ 613,000	
16 - Electrical	$ 921,000	
17 - I&C	$ 613,400	
RAW CONSTRUCTION COST	**$ 18,778,000**	
Construction Contingency	$ 5,633,000	30%
BASE CONSTRUCTION COST	**$ 24,411,000**	
Implementation Cost	$ 7,323,000	30%
Project Contingency	$ 1,221,000	5%
TOTAL PROJECT COST	**$ 32,955,000**	

Spec. Division / Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
			$17,069,400			$ 1,708,600	
2 - Sitework						**$ 11,869,000**	
Influent Facilities Mobilization/Demobilization			$ 832,000		10%	$ 84,000	
Treatment Facilities Mobilization/Demobilization			$ 8,686,400		10%	$ 869,000	
Distribution Facilities Mobilization/Demobilization			$ 7,551,000		10%	$ 756,000	
Influent Pump Station						**$ 100,000**	
Sitework Allowance			1	LS	$ 100,000	$ 100,000	
Influent Pipeline						**$ 596,000**	
6" Pipe, From collection system	8	in	4,500	LF	$ 132	$ 596,000	
Treatment Facilities						**$ 2,927,000**	
Site Clearing			1.0	LS	$ 12,000	$ 12,000	Roughly 0.6 ac; West of clarifiers
Excavation for Treatment Structure			4,000	CY	$ 35	$ 142,000	105 ft x 65 ft x 13 ft, 1:1 excavation
Excavation for Effluent Pump Station			40	CY	$ 35	$ 2,000	25 ft x 25 ft x 1.5 ft, 1:1 excavation
Offhaul			4,100	CY	$ 11	$ 44,000	Assumes all excavation is offhauled
Dewatering			1	LS	$ 150,000	$ 150,000	Engineer's estimate
Structural Piles			11,400	SF	$ 172	$ 1,957,000	Includes treatment and storage facilities
Landscaping Allowance & Misc site work			1	LS	$ 25,000	$ 25,000	
6" Pipe, Solids discharge to existing sewer	6	in	4,500	LF	$ 132	$ 595,000	
Waste Disposal Pump Station							
Distribution Pump Station						**$ 10,000**	
Sitework Allowance			1	LS	$ 10,000	$ 10,000	
Distribution Pipeline						**$ 6,527,000**	
To Customers	10	in	14,200	LF	$ 166	$ 2,363,000	
To Customers	8	in	10,000	LF	$ 132	$ 1,323,000	
To Customers	6	in	21,500	LF	$ 132	$ 2,841,000	
3 - Concrete						**$ 824,000**	
Influent Pump Station						**$ 16,000**	
Slab			20	CY	$ 800	$ 16,000	12 in thick
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 800,000**	
Treatment Structure Slab			500	CY	$ 800	$ 400,000	Includes treatment facilities, E/I&C building, chemical storage area slabs, and RW storage tank slabs; 12 in thick
Treatment Structure Walls			400	CY	$ 1,000	$ 400,000	18 ft height, 1.5 ft thick, 380 ft perimeter
Distribution Pump Station						**$ 8,000**	
Slab			10	CY	$ 800	$ 8,000	12 in thick
Distribution Pipeline						**$ -**	
4 - Masonry						**$ 114,000**	
Influent Pump Station						**$ -**	
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 114,000**	
CMU Blocks			3000	SF	$ 38	$ 114,000	15 ft height, 200 ft LF of walls. Includes E/I&C building
Distribution Pump Station						**$ -**	
Distribution Pipeline						**$ -**	
5 - Metals						**$ 351,000**	
Influent Pump Station						**$ -**	
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 351,000**	
Metal Canopy			2600	SF	$ 110	$ 286,000	Covers membrane basins and chemical area
CMU Building Roofing			1700	SF	$ 38	$ 65,000	Covers E/I&C building
Distribution Pump Station						**$ -**	
Distribution Pipeline						**$ -**	

Spec. Division / Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
11 - Equipment						**$ 3,067,000**	
Influent Pump Station						**$ 80,000**	
Pumps	20	hp	2	EA	$ 40,000	$ 80,000	1 duty + 1 standby. Includes allowance for installation.
Influent Pipeline						**$ -**	
Treatment Facilities						**$ 2,587,000**	
Grit Removal			1	LS	$ 173,000	$ 173,000	Includes allowance for installation
Screens and Washer Compactor			1	LS	$ 547,000	$ 547,000	Includes allowance for installation
MBR Package	0.9	MGD	1	LS	$ 987,000	$ 987,000	Includes membrane cassettes, master control panel, process pump skid, membrane air scour blowers, membrane cleaning systems. Concrete reactors not included.
MBR Equipment Installation			1	LS	$ 500,000	$ 500,000	50% of equipment cost
UV Disinfection			1	LS	$ 200,000	$ 200,000	1 duty + 1 standby. Includes allowance for installation.
Waste Disposal Pump Station	20	hp	2	EA	$ 40,000	$ 80,000	1 duty + 1 standby. Includes allowance for installation.
Chemical Allowance			1	LS	$ 100,000	$ 100,000	
Distribution Pump Station						**$ 400,000**	
Pumps	100	hp	2	EA	$ 200,000	$ 400,000	1 duty + 1 standby. Includes allowance for installation.
Distribution Pipeline						**$ -**	
13 - Special Construction						**$ 406,000**	
Recycled Water Storage			1	EA	$ 406,000	$ 406,000	275,000 gallons
15 - Mechanical						**$ 613,000**	
Piping, Valve, Fitting, Supports Allowance			$ 3,067,000		20%	$ 613,000	20% of Division 11 (Equipment)
16 - Electrical						**$ 921,000**	
Influent Pump Station	Electrical Allowance				30%	$ 24,000	30% of Division 11 (Equipment)
Influent Pipeline	Electrical Allowance				30%	$ -	30% of Division 11 (Equipment)
Treatment Facilities	Electrical Allowance				30%	$ 777,000	30% of Division 11 (Equipment)
Distribution Pump Station	Electrical Allowance				30%	$ 120,000	30% of Division 11 (Equipment)
Distribution Pipeline	Electrical Allowance				30%	$ -	30% of Division 11 (Equipment)
17 - I&C						**$ 613,400**	
Influent Pump Station	I&C Allowance				20%	$ 16,000	20% of Division 11 (Equipment)
Influent Pipeline	I&C Allowance				20%	$ -	20% of Division 11 (Equipment)
Treatment Facilities	I&C Allowance				20%	$ 517,400	20% of Division 11 (Equipment)
Distribution Pump Station	I&C Allowance				20%	$ 80,000	20% of Division 11 (Equipment)
Distribution Pipeline	I&C Allowance				20%	$ -	20% of Division 11 (Equipment)

ANNUAL O&M COSTS	Amount	Unit	Value	Cost	Notes
Consumables			**Total Consumables**	**$ 101,000**	
Equipment Consumables	$ 3,067,000		2%	$ 62,000	2% of Equipment
Electrical Consumables	$ 921,000		2%	$ 19,000	2% of Electrical
Instrumentation Consumables	$ 613,400		2%	$ 13,000	2% of Instrumentation
Pipeline Consumables	$ 1,369,500		0.5%	$ 7,000	0.5% of Pipeline
Power Costs			**Total Power**	**$ 297,000**	
WW Pump Station	137,775	kwh	$ 0.15	$ 21,000	
Headworks Screen					
Grit Screw	6,532	kwh	$ 0.15	$ 1,000	
Grit Conveyor	544	kwh	$ 0.15	$ 90	
Headworks Screen	980	kwh	$ 0.15	$ 150	
MBR					
Permeate Pumps	41,141	kwh	$ 0.15	$ 7,000	
Recirculation Pumps	87,827	kwh	$ 0.15	$ 14,000	
Denitrification Pumps	19,295	kwh	$ 0.15	$ 3,000	
Membrane Blowers	137,179	kwh	$ 0.15	$ 21,000	
Process Blowers	205,768	kwh	$ 0.15	$ 31,000	
Anoxic Mixers	81,654	kwh	$ 0.15	$ 13,000	
Air Compressors	32,662	kwh	$ 0.15	$ 5,000	
UV	170,294	kwh	$ 0.15	$ 26,000	
Effluent Pumping					
To Customers	978,274	kwh	$ 0.15	$ 147,000	
Chemicals					
Hypochlorite Dosing	6,532	kwh	$ 0.15	$ 1,000	
Citric Acid Dosing	272	kwh	$ 0.15	$ 50	
Site Electrical	43,800	kwh	$ 0.15	$ 7,000	
Chemicals			**Total Chemicals**	**$ 98,000**	
Hypochlorite	1540	gal	$ 1	$ 1,600	
Citric Acid	220	gal	$ 4	$ 900	
Caustic	210	dry ton	$ 450	$ 95,000	
Labor Costs			**Total Labor**	**$ 250,000**	
Total # Operators	1	number			
Average Annual Hours per operator	2080	hrs/yr			
Total Operators per year	2080	Total hrs	$ 120	$ 250,000	
			TOTAL ANNUAL O&M COSTS	**$ 746,000**	

Project:	**Bayfront RW Facilities Plan**	Date:	July 1, 2018
		Project Number:	0606008
Alternative:	**D - 0.4 MGD UF / 0.2 MGD RO**	Prepared by:	EL
		Checked by:	RM
Annual Demand (AFY))	220 AFY		
RO Capacity (MGD)	0.2 MGD		
Estimate Type:	Conceptual Design		

Process Cost Summary by Division

Spec. Division	Subtotal	Notes
2 - Sitework	$ 5,616,000	
3 - Concrete	$ 113,000	
11 - Equipment	$ 910,000	
13 - Special Construction	$ 1,202,000	
15 - Mechanical	$ 182,000	
16 - Electrical	$ 91,000	
17 - Instrumentatio and Controls	$ 91,000	
Raw Construction Cost	**$ 8,205,000**	
Construction Contingency	$ 2,462,000	30%
Total Construction Cost	**$ 10,667,000**	
Implementation Cost	$ 3,200,000	30%
Project Contingency	$ 533,000	5%
Total Capital Cost	**$ 14,400,000**	

Spec. Division / Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
2 - Sitework						**$ 5,616,000**	
Mobilization/Demobilization			$ 5,600,000		10%	$ 560,000	
Redwood City Recycled Water							
Sitework Allowance			1	LS	$ 50,000	$ 50,000	
Influent Pipe	8	inches	15,100	LF	$ 132	$ 1,997,000	
Treatment Facilities							
Site Clearing and Grubbing			1	LS	$ 50,000	$ 50,000	Engineer's estimate
Utility Improvements			1	LS	$ 50,000	$ 50,000	Engineer's estimate
Lighting and Security Allowance			1	LS	$ 50,000	$ 50,000	Engineer's estimate
Dewatering Allowance			1	LS	$ 150,000	$ 150,000	Engineer's estimate
Structural Piles			2,030	SF	$ 166	$ 337,000	
Waste Discharge Pipe	4	inches	4,500	LF	$ 108	$ 486,000	
Recycled Water Distribution							
Sitework Allowance			1	LS	$ 10,000	$ 10,000	
Distribution Pipe	6	inches	14,200	LF	$ 132	$ 1,876,000	
3 - Concrete						**$ 113,000**	
Treatment Facilities Slab on Grade			81	CY	$ 800	$ 65,000	
Walls			20	CY	$ 1,000	$ 20,000	
Precast Wet Well			1	LS	$ 20,000	$ 20,000	
Disbtribution Pump Station Slab			10	CY	$ 800	$ 8,000	
11 - Equipment						**$ 910,000**	
Treatment Facilities							
UF/RO Equipment Package			1	LS	$ 500,000	$ 500,000	
Equipment Installation	50%		1	LS	$ 250,000	$ 250,000	50% of equipment costs
Waste Disposal Pump Station	10	HP	2	EA	$ 20,000	$ 40,000	1 duty + 1 standby, submersible pumps
Recycled Water Distribution							
RW Distribution Pumps	30	HP	2	EA	$ 60,000	$ 120,000	1 duty + 1 standby, vertical turbine
13 - Special Construction						**$ 1,202,000**	
Treatment Process Building			1,650	SF	$ 125	$ 206,000	Pre-Engineered Structure
Recycled Storage Tank			1	LS	$ 246,000	$ 246,000	25,000 gallons
Highway 101 Trenchless Crossing			1	LS	$ 750,000	$ 750,000	
15 - Mechanical						**$ 182,000**	
Piping, Valve, Fitting, Supports Allowance		$910,000			20%	$ 182,000	20% of Division 11
16 - Electrical						**$ 91,000**	
Electrical Allowance		$910,000	1	LS	10%	$ 91,000	10% of Division 11 UF/RO package includes Electrical
17 - I&C						**$ 91,000**	
I&C Allowance		$910,000	1	LS	10%	$ 91,000	10% of Division 11 UF/RO package includes I&C
ANNUAL O&M COSTS							
Consumables						**$ 24,000**	
Equipment Consumables	2%		1	LS	$ 20,000	$ 20,000	2% of Division 11
Electrical Consumables	2%		1	LS	$ 2,000	$ 2,000	2% of Division 16
Instrumentation Consumables	2%		1	LS	$ 2,000	$ 2,000	2% of Division 17
Power Costs						**$ 102,000**	
Influent Pumps							
UF/RO Equipment Package			832,200	kWh	$ 0.09	$ 75,000	
Plant Drainage Pumps			130,699	kWh	$ 0.09	$ 12,000	
RW Distribution Pumps			163,374	kWh	$ 0.09	$ 15,000	
Chemical Costs						**$ 50,000**	
Annual Chemical Allowance			1	LS	$ 50,000.00	$ 50,000	
Labor						**$ 250,000**	
Full Time Equivalents			1	people			
Total Annual Hours per Year			2,080	Labor Hc	$ 120	$ 250,000	
TOTAL ANNUAL O&M COSTS						**$ 426,000**	

Appendix D - SWRCB WRFP Storage Calculations Sheets

Alternatives A and D - Minimum Recycled Water Storage Estimate

Table D-AD1: Treatment plant operational supply and demand summary

	Operational Flow		
Hr	Supply GPM	Demand GPM	Storage Gallons
1	2	3	4
1	0	0	10500
2	278	297	9347.469247
3	278	297	8194.938493
4	278	297	7042.40774
5	278	297	5889.876986
6	278	0	10500
7	278	0	10500
8	278	285	10106.30034
9	278	285	9712.600685
10	278	285	9318.901027
11	278	285	8925.20137
12	278	285	8531.501712
13	278	285	8137.802055
14	278	285	7744.102397
15	278	285	7350.40274
16	278	285	6956.703082
17	278	285	6563.003425
18	278	285	6169.303767
19	278	0	10500
20	278	0	10500
21	278	297	9347.469247
22	278	297	8194.938493
23	278	297	7042.40774
24	278	297	5889.876986
25	278	297	4737.346233
26	278	297	3584.815479
27	278	297	2432.284726
28	278	297	1279.753973
29	278	297	127.2232192
30	278	0	10500
31	278	0	10500
32	278	285	10106.30034
33	278	285	9712.600685
34	278	285	9318.901027
35	278	285	8925.20137
36	278	285	8531.501712
37	278	285	8137.802055
38	278	285	7744.102397
39	278	285	7350.40274
40	278	285	6956.703082
41	278	285	6563.003425
42	278	285	6169.303767
43	278	0	10500
44	278	0	10500
45	278	297	9347.469247
46	278	297	8194.938493
47	278	297	7042.40774
48	278	297	5889.876986
49	278	297	4737.346233
50	278	297	3584.815479
51	278	297	2432.284726
52	278	297	1279.753973
53	278	297	127.2232192
54	278	0	10500
55	278	0	10500
56	278	285	10106.30034
57	278	285	9712.600685
58	278	285	9318.901027
59	278	285	8925.20137
60	278	285	8531.501712
61	278	285	8137.802055
62	278	285	7744.102397
63	278	285	7350.40274
64	278	285	6956.703082
65	278	285	6563.003425
66	278	285	6169.303767
67	278	0	10500
68	278	0	10500
69	278	297	9347.469247
70	278	297	8194.938493
71	278	297	7042.40774
72	278	297	5889.876986

Figure D-AD1: Hourly Supply and Demand

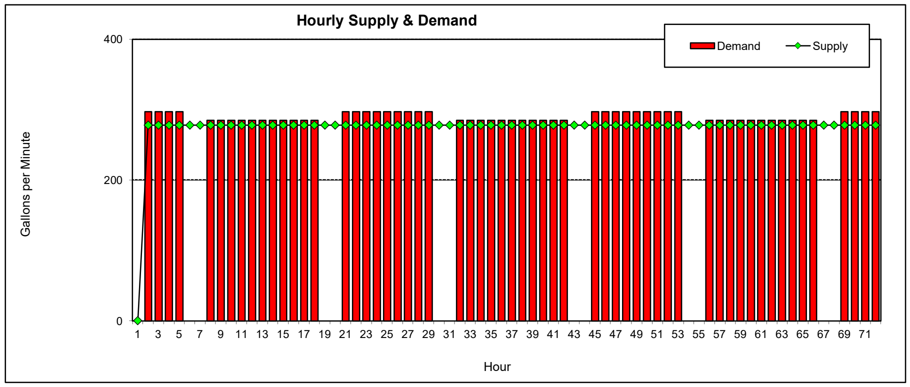
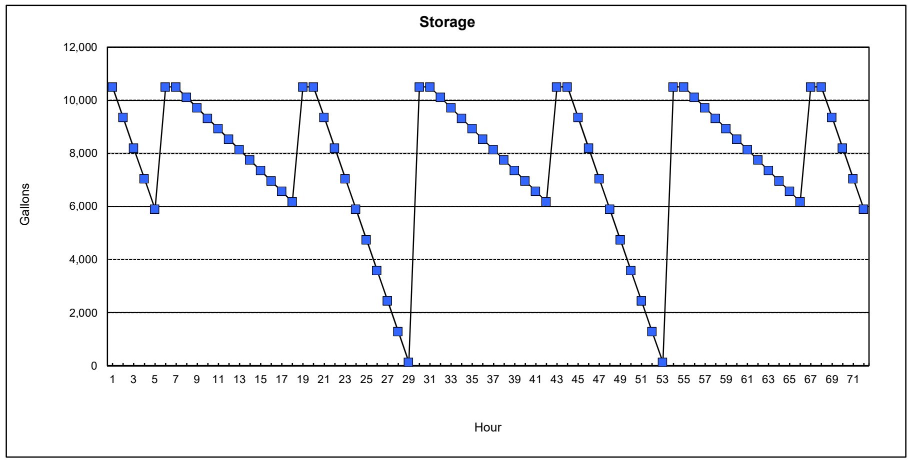


Figure D-AD2: Water Storage by hour (gallons)



Remarks:

(a) Current wastewater average flow estimated at 1.1 MGD
(b) Projected treatment plant flow same as wastewater flow
(c) Maximum amount to be pumped, limited by treatment capacity of 0.4 MGD
(d) Projected demand includes irrigation, cooling tower, and indoor dual plumbing demand
(e) No other projected demands are included
(f) Maximum amount to be treated and pumped, limited by tertiary treatment capacity of 0.4 MGD
(g) Calculations based on starting with full storage at hour 1
(h) Wastewater flows are always above 0.4 MGD, so no diurnal variation of wastewater supply is needed.

Table D-AD2: Project summar

SUMMARY		
Amount of storage used:	10,373	Gallons
Amount of potable used:	0	Gallons
Based on-		
Treatment capacity of:	0.40	MGD
Pumping capacity of:	278	GPM
Supply/Demand Ratio of:	1.15	GPM

Alternative B - Minimum Recycled Water Storage Estimate

Table D-B1: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	0	0	134000
2	417	632	121100.7638
3	375	632	105681.5275
4	313	632	86542.2913
5	278	632	65303.05507
6	278	0	81983.05507
7	382	0	104903.0551
8	417	340	109501.5712
9	417	340	114100.0873
10	417	340	118698.6034
11	417	340	123297.1195
12	417	340	127895.6355
13	417	340	132494.1516
14	417	340	134000
15	417	340	134000
16	417	340	134000
17	417	340	134000
18	417	340	134000
19	417	0	134000
20	417	0	134000
21	417	632	121100.7638
22	417	632	108201.5275
23	417	632	95302.2913
24	417	632	82403.05507
25	417	632	69503.81884
26	417	632	56604.5826
27	375	632	41185.34637
28	313	632	22046.11014
29	278	632	806.8739041
30	278	0	17486.8739
31	382	0	40406.8739
32	417	340	45005.39
33	417	340	49603.9061
34	417	340	54202.42219
35	417	340	58800.93829
36	417	340	63399.45438
37	417	340	67997.97048
38	417	340	72596.48658
39	417	340	77195.00267
40	417	340	81793.51877
41	417	340	86392.03486
42	417	340	90990.55096
43	417	0	116010.551
44	417	0	134000
45	417	632	121100.7638
46	417	632	108201.5275
47	417	632	95302.2913
48	417	632	82403.05507
49	417	632	69503.81884
50	417	632	56604.5826
51	375	632	41185.34637
52	313	632	22046.11014
53	278	632	806.8739041
54	278	0	17486.8739
55	382	0	40406.8739
56	417	340	45005.39
57	417	340	49603.9061
58	417	340	54202.42219
59	417	340	58800.93829
60	417	340	63399.45438
61	417	340	67997.97048
62	417	340	72596.48658
63	417	340	77195.00267
64	417	340	81793.51877
65	417	340	86392.03486
66	417	340	90990.55096
67	417	0	116010.551
68	417	0	134000
69	417	632	121100.7638
70	417	632	108201.5275
71	417	632	95302.2913
72	417	632	82403.05507

Figure D-B1: Hourly Supply and Demand

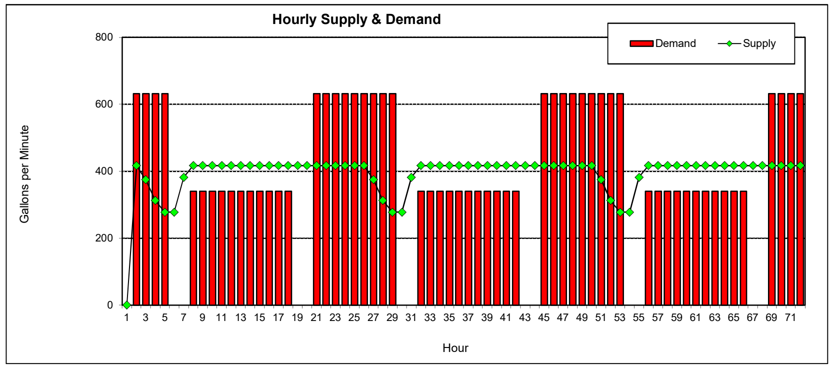


Figure D-B2: Water Storage by hour (gallons)

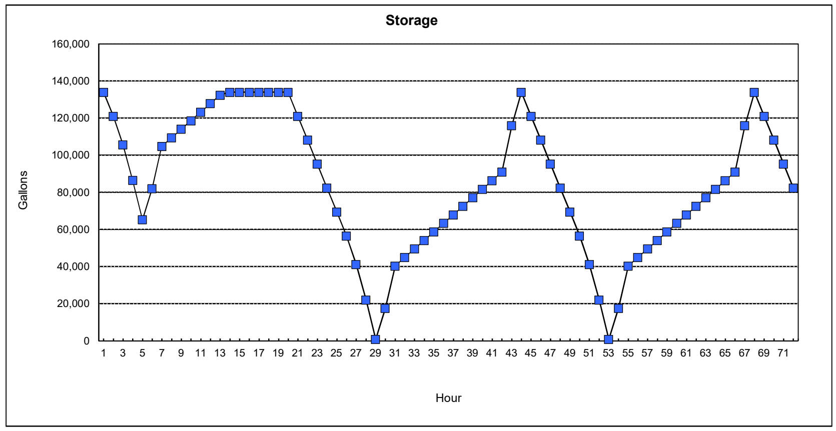


Table D-B2: Project summary

SUMMARY		
Amount of storage used:	133,193	Gallons
Amount of potable used:	0	Gallons
Based on-		
Treatment capacity of:	0.60	MGD
Pumping capacity of:	417	GPM
Supply/Demand Ratio of:	1.02	GPM

Remarks:

(a) Current wastewater average flow estimated at 1.1 MGD
(b) Projected treatment plant flow same as wastewater flow
(c) Maximum amount to be pumped, limited by treatment capacity of 0.6 MGD
(d) Projected demand includes irrigation, cooling tower, and indoor dual plumbing demand
(e) No other projected demands are included
(f) Maximum amount to be treated and pumped, limited by tertiary treatment capacity of 0.6 MGD
(g) Calculations based on starting with full storage at hour 1
(h) Wastewater flows are less than 0.6 MGD between 3 AM and 7 AM, so diurnal variation of wastewater supply was considered

Alternative C - Minimum Recycled Water Storage Estimate

Table D-C1: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply GPM	Demand GPM	Storage Gallons
1	2	3	4
1	0	0	248000
2	479	962	219046.5182
3	375	962	183853.0363
4	313	962	144939.5545
5	278	962	103926.0726
6	278	0	120606.0726
7	382	0	143526.0726
8	625	340	160604.5887
9	625	340	177683.1048
10	625	340	194761.6209
11	625	340	211840.137
12	625	340	228918.6531
13	625	340	245997.1692
14	625	340	248000
15	625	340	248000
16	625	340	248000
17	625	340	248000
18	625	340	248000
19	625	0	248000
20	625	0	248000
21	625	962	227806.5182
22	625	962	207613.0363
23	625	962	187419.5545
24	625	962	167226.0726
25	576	962	144092.5908
26	479	962	115139.1089
27	375	962	79945.62705
28	313	962	41032.14521
29	278	962	18.66335616
30	278	0	16698.66336
31	382	0	39618.66336
32	625	340	56697.17945
33	625	340	73775.69555
34	625	340	90854.21164
35	625	340	107932.7277
36	625	340	125011.2438
37	625	340	142089.7599
38	625	340	159168.276
39	625	340	176246.7921
40	625	340	193325.3082
41	625	340	210403.8243
42	625	340	227482.3404
43	625	0	248000
44	625	0	248000
45	625	962	227806.5182
46	625	962	207613.0363
47	625	962	187419.5545
48	625	962	167226.0726
49	576	962	144092.5908
50	479	962	115139.1089
51	375	962	79945.62705
52	313	962	41032.14521
53	278	962	18.66335616
54	278	0	16698.66336
55	382	0	39618.66336
56	625	340	56697.17945
57	625	340	73775.69555
58	625	340	90854.21164
59	625	340	107932.7277
60	625	340	125011.2438
61	625	340	142089.7599
62	625	340	159168.276
63	625	340	176246.7921
64	625	340	193325.3082
65	625	340	210403.8243
66	625	340	227482.3404
67	625	0	248000
68	625	0	248000
69	625	962	227806.5182
70	625	962	207613.0363
71	625	962	187419.5545
72	625	962	167226.0726

Figure D-C1: Hourly Supply and Demand

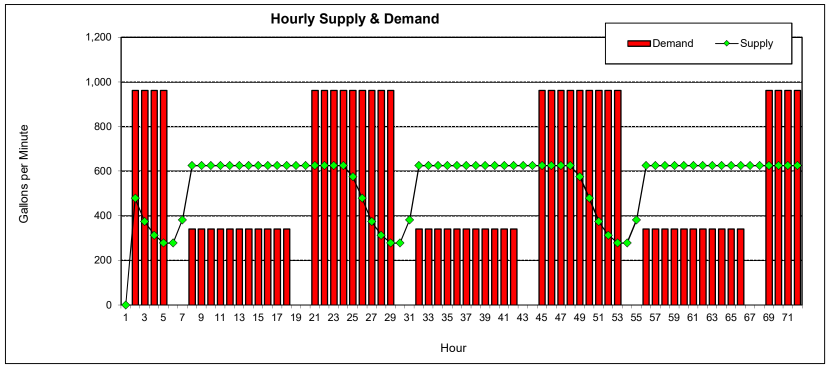
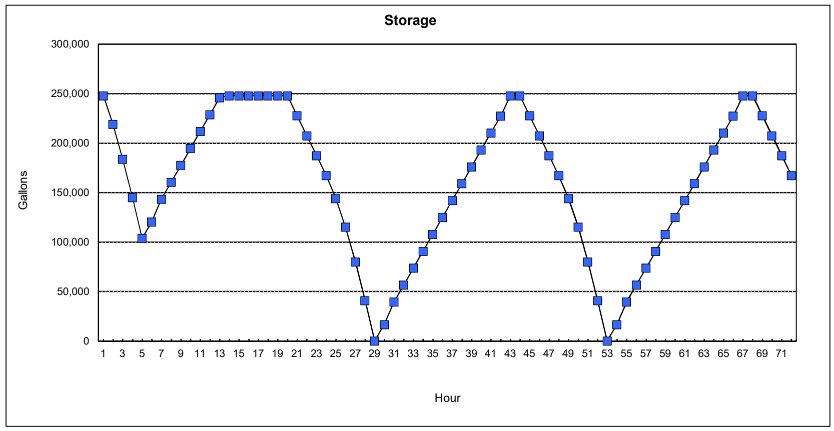


Figure D-C2: Water Storage by hour (gallons)



Remarks:

(a) Current wastewater average flow estimated at 1.1 MGD
(b) Projected treatment plant flow same as wastewater flow
(c) Maximum amount to be pumped, limited by treatment capacity of 0.9 MGD
(d) Projected demand includes irrigation, cooling tower, and indoor dual plumbing demand
(e) No other projected demands are included
(f) Maximum amount to be treated and pumped, limited by tertiary treatment capacity of 0.9 MGD
(g) Calculations based on starting with full storage at hour 1
(h) Wastewater flows are less than 0.6 MGD between 1 AM and 7 AM, so diurnal variation of wastewater supply was considered

Table D-C2: Project summary

SUMMARY		
Amount of storage used:	247,981	Gallons
Amount of potable used:	0	Gallons
Based on-		
Treatment capacity of:	0.90	MGD
Pumping capacity of:	625	GPM
Supply/Demand Ratio of:	1.08	GPM

Appendix E - Environmental Checklist

Introduction

The purpose of this preliminary evaluation is to identify expected environmental impacts from implementation (construction and operation) of the West Bay Sanitary District's (WBSD) Recycled Water Recommended Project. In addition, this analysis is intended to help the City determine the level of environmental documentation that will be needed at the next stage of California Environmental Quality Act (CEQA) environmental review. The environmental topics discussed in this document are based on Appendix G of the CEQA Guidelines. The anticipated environmental impacts are identified for each resource area. The level of significance for each resource area uses CEQA terminology as specified below:

- No Impact (NI);
- Less than Significant (LTS);
- Less than Significant Impact with Mitigation Incorporation (LTSM); and
- Potentially Significant Impact (PS).

Project Description

Chapter 7 of the Recycled Water Facility Plan provides a discussion of the Recycled Water Recommended Project (Proposed Project). The figures in that section identify the locations of the proposed facilities within the Bayfront area.

For the purposes of this preliminary analysis, it is assumed that construction activities would involve grading, excavation, erection of facilities, installation of pipelines using open-trench construction, and backfilling. Typical construction equipment would be used, including but not limited bulldozers, backhoes, water trucks, dump trucks, excavators, and concrete trucks. Construction activities would likely last for one year overall but would be less for each component (e.g., treatment facilities and the proposed pipeline segments). Details of the construction scenarios will be developed as the project progresses into design and will be evaluated in more depth in the upcoming environmental analysis.

The following preliminary analysis is based on the current understanding of the project construction and operation as described Chapter 7 of the Recycled Water Facility Plan. This analysis shows that the majority of the impacts would be less than significant. Where potential significant impacts are anticipated, they would be reduced to less than significant with implementation of mitigation measures that will be further developed during the CEQA process. No significant, unavoidable impacts have been identified.

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Aesthetics		
Adverse effect on a scenic vista	NI	• There are no designated scenic vistas, scenic corridors or scenic highways in the project vicinity. Interstate-280 is a state-designated scenic highway. but it is located over 5 miles to southwest of the proposed Bayfront satellite treatment facility site. • Demolition of existing facilities and construction of all proposed facilities would temporarily alter the visual quality of the affected area due to the presence of construction equipment. Long-term the new satellite treatment facility and storage tank would likely be visible from the northwestern portion of Bedwell Bayfront Park but would not substantially degrade the existing visual character of the site or surroundings. The new structures would be one story and would be designed to blend in with the existing WBSD facilities onsite. Installation of minor landscaping including trees, if acceptable, and/or aesthetic architectural treatments would further help reduce visual impacts of the new treatment facility. Visual impacts would be less than significant with incorporation of mitigation measures. • The satellite treatment facility would be a minor new source of light in the immediate area but would have not affect day or nighttime views. Proposed pipelines would ultimately be buried underground and out of sight. No significant impacts on views would be expected.
Substantial damage to scenic resources, including trees, rock outcroppings or historic buildings within a state scenic highway	NI	
Substantial degradation of the existing visual character or quality of the site and its surroundings	LTSM	
Creation of a new source of substantial light or glare which would adversely affect day or nighttime views in the area	LTS	
Agricultural and Forestry Resources		
Conversion of Prime Farmland, Unique Farmland or Farmland of Statewide Important (Farmland) or conflict with existing zoning for agricultural use of a Williamson Act contract	NI	• The proposed pipelines and satellite treatment facilities are located within a combination of residential, light industrial and Public/Quasi Public land use designations as depicted on the City of Menlo Park General Plan Land Use Designations map. There are no Farmlands or forestry resources within the Study Area.
Loss of forest land or conversion of forest land to non-forest land or change in the existing environment which could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use	NI	

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Air Quality		
Conflict with or obstruction of implementation of the applicable air quality plan or cumulative considerable net increase of any criteria pollutant for which the project region is nonattainment	LTSM	• Construction activities would generate dust and criteria pollutant emissions that could, but are not expected to, exceed Bay Area Air Quality Management District (BAAQMD) standards. These emissions have not yet been quantified. • Excavation and hauling trips could generate criteria pollutant emissions that exceed BAAQMD thresholds and result in a potentially significant impact. Mitigation measures could include implementation of dust control measures, sequencing (phasing) work to reduce daily emissions (including preconstruction grading to prepare the site), and/or requiring contractors to implement best available control technology for construction equipment. Air quality modeling would be conducted during the next stage of CEQA review to confirm this conclusion. • Operation of the Proposed Project is expected to generate minimal emissions from chemical delivery truck trips and operation of the satellite treatment facility. Based on the number of truck trips and existing assumptions, operational-related air quality impacts are anticipated to be less than significant. • The pipeline alignments would be located near the Bedwell Bayfront Park, Beechwood School, Belle Haven Elementary School, Menlo Park Senior Center, Sequoia Belle Haven senior housing, Menlo Park Child Development Center, and residential neighborhoods of the Belle Haven neighborhood. There are no hospitals or other potential sensitive receptors in the proximity to the project. Given the short duration of construction, and mitigation measures that would be implemented as described above to reduce dust, sensitive receptors at the schools and at nearby residences are not expected to be exposed to substantial pollutant concentrations. • Potential objectionable odors may occur at the treatment facility during operation. However, biological basins would be constructed below grade, with covers at grade level for odor control. With this mitigation measure in place, and the relatively small size of the treatment facility, impacts from operation are expected to be less than significant. • There is also potential for some objectionable odors during construction (e.g., diesel fuel), but these would be temporary in nature and considered less than significant.
Violation of any air quality standard or substantial contribution to an existing or projected air quality violation	LTSM	
Exposure of sensitive receptors to substantial pollutant concentrations	LTS	
Creation of objectionable odors affecting a substantial number of people	LTSM	
Biological Resources		
Effects on candidate, sensitive, or special status species or sensitive habitat	LTSM	• Results from previous California Natural Diversity Database (CNDDB) searches for locations of known observations of Federal and State-listed sensitive species and

<table>
<tr><th>Environmental Topics</th><th>Expected Impact</th><th>Discussion of Major, Potential Environmental Effects</th></tr>
<tr><td>Substantial interference with the movement of fish or wildlife species, their or native wildlife nursery sites</td><td>LTS</td><td rowspan="4">habitats in the project area revealed that special status species such as the Salt marsh harvest mouse and California least tern have been previously mapped in the slough area adjacent to the pipeline alignment along Marsh Road (City of Menlo Park, General Plan, Open Space/Conservation, Nosie and Safety Element, 2013). However, no biological resource surveys been completed for this preliminary environmental analysis. No United States Fish and Wildlife Service (USFWS) critical habitat occurs in and around the Proposed Project (USFWS critical habitat map accessed 07/30/18). Future coordination and confirmation with the USFWS should be conducted.
• Information on wetlands, creeks, and/or other water bodies was derived from the USFWS National Wetland Inventory Digital Database (accessed 07/03/18). The Bayfront WWTP project site is not mapped as a sensitive natural community or wetland habitat, and has limited vegetation on site. However, nearby trees and shrubs may provide habitat for birds and other common species. The pipeline alignments along Marsh Road are adjacent to a narrow slough area (connected on the south to the Westpoint Slough) and is mapped as estuarine and marine wetland</td></tr>
<tr><td>Substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service</td><td>LTSM</td></tr>
<tr><td>Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act</td><td>LTSM</td></tr>
<tr><td>Conflict with any local plans, policies or ordinances protecting biological resources</td><td>LTSM</td></tr>
</table>

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Conflict with provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan or other approved local, regional or state habitat conservation plan	LTSM	habitat on the USFWS National Wetland Inventory database. A biological field reconnaissance survey of the satellite treatment plant site and pipeline alignments would be needed as part of the CEQA process to identify the specific biological resources within and adjacent to the Proposed Project. Implementation of mitigation measures (such as restriction on the timing of construction and construction fencing to stay out of adjacent estuarine and marine habitat areas) would likely reduce any biological resource impacts to less than significant. • Operation of the Proposed Project is not expected to result in any significant impacts on special-status aquatic resources. Potential impacts to aquatic biological resources from the Proposed Project would be less than significant, and no additional mitigation would be required. • There are no creeks in or near the Study Area. However, the Atherton Channel parallels Marsh Road and drains to the Bayfront Canal. Portions of the Atherton Channel flow in an underground conduit. The north-south pipeline alignments along Marsh Road could require crossing of the channel and/or canal. A jurisdictional delineation would be required to determine if any portion of the channel or canal is considered a water of the U.S. or water of the State. Impacts to federal or state jurisdictional waters, (e.g. wetlands or other aquatic habitats) require permits under the Clean Water Act Sections 404 and 401 and the California Department of Fish and Game Code Section 1600. Compliance with state and federal permit conditions, including implementation of any required compensatory mitigation would reduce any impacts to state or federally protected wetlands and other aquatic habitats to less than significant. If construction of channel crossings is conducted using methods such as jack and bore or horizontal directional drilling (HDD), impacts to the channel and or canal would be avoided and no federal or state permits would be required. • The remaining pipeline alignments would be constructed within existing roadway ROWs. The proposed satellite treatment plant would be constructed within the property boundary of the existing Bayfront WWTP. These facilities are not expected to impact natural habitats nor interfere with wildlife movement. • The Bayfront WWTP property is located adjacent to, but not within, the Menlo Park East Palo Alto Baylands Priority Conservation Area (PCA). This PCA is identified for “Natural Landscapes/Regional Recreation” with benefits to terrestrial and aquatic ecosystems, water supply and quality and recreation (Source: https://abag.ca.gov/priority/conservation, accessed 02/1/19). The satellite treatment plant would be located on the Bayfront WWTP property which is already developed and contains no natural habitat. The Proposed Project would not be expected to affect

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
		future plans for natural resources protection and public recreation..
Cultural Resources		
Alteration of or damage to cultural resources (i.e., historical and archaeological resources, including human remains, and paleontological resources)	LTSM	• No cultural resources study or records search through the Northwest Information Center for the California Historical Research Information System, or reconnaissance survey were conducted as part of this preliminary analysis. • The Cultural Resources Inventory Report has not yet been conducted but would be completed as part of future CEQA review. Because of the potential for unrecorded cultural resources sites to be found during excavation activities, impacts to cultural resources would be considered significant. However, mitigation measures are available to reduce potential impacts to less than significant levels.
Geology, Soils and Seismicity		
Exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic risks or landslides	LTSM	• Proposed facilities are not habitable structures. • The City of Menlo Park is located adjacent to the San Andreas Fault. There are no Alquist-Priolo Earthquake Fault Zones that have been mapped within Menlo Park (California Geological Survey [CGS] EQ Zapp mapping tool, accessed 07/31/18), and the potential for ground rupture is considered low (City of Menlo Park General Plan 2013). None of the Proposed Project components would cross a known fault line or otherwise expose people or structures to ruptures of a known fault. However, there is potential for exposure to ground shaking, and therefore, the project would be subject to design and construction regulations compliant with the latest California Building Code. This compliance would reduce the risks associated with seismic activities to less than significant levels. • The Proposed Project treatment plant site and pipeline alignments are not located within a landslide zone (CGS EQ Zapp mapping tool, accessed 07/31/18), so there
Substantial soil erosion or the loss of topsoil	LTSM	
Exposure of people or structures to unstable or expansive soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposals systems where sewers are not available	LTS	

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
		are expected risks associated with landslides. • Liquefaction mapping from the CGS's EQ Zapp mapping tool (accessed 7/31/18) shows that the proposed project area (including the treatment plant site and pipeline alignments) are within a liquefaction zone. Compliance with applicable codes, regulations and standards as well as the recommendations in a project-specific geotechnical study would reduce risks from liquefaction to less than significant. • Soil erosion is possible during construction, particularly due to grading activities at the treatment facility site. Implementation of typical Best Management Practices (BMPs) and the required Storm Water Pollution Prevention Plan (SWPPP) would reduce the potential risk for soil erosion or loss. Additional mitigation measures may be required to reduce the risk of soil loss during grading or other construction activities. • The Proposed Project pipelines would not affect the stability of the geologic unit or soil, or result in on- or off-site landslides, lateral spreading, subsidence, or collapse. The grading and excavation required for the treatment facility could create the potential for collapse but with proper engineering and compliance with all applicable codes and regulations, as well as the recommendations of a site-specific geotechnical investigation, potential impacts would be reduced to less than significant. • Portions of the Study Area are located in clay loam soils, which have some potential for expansion. Mitigation measures, including preparation of a geotechnical study and implementation of its recommended measures, would reduce the potential for unstable soils to adversely affect the Proposed Project. • The Proposed Project includes wastewater treatment for non-potable reuse but does not include septic-related waste. Sewers are available in the project vicinity for waste, including waste from the treatment processes.
Greenhouse Gas Emissions		
Generation of greenhouse gas emissions that may have a significant impact on the environment	LTSM	• Air quality modeling has not been conducted for the proposed Project. Operation of the treatment facility (including chemical trip deliveries) is expected to generate greenhouse gas emissions but is not anticipated to exceed BAAQMD thresholds. Air quality modeling would be conducted in the next stage of CEQA review to confirm the results. • The Proposed Project is not expected to conflict with any adopted plan, policy or regulations to reduce emissions of greenhouse gases.
Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases	NI	
Hazards and Hazardous Materials		

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Creation of a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials; or accident involving the release of hazardous materials into the environment	LTSM	• Construction would not require the long-term routine transport, use, or disposal of hazardous materials. However, hazardous materials and substances such as diesel fuel would be transported to, handled and used at the construction sites and could present a hazard to the public or the environment through their accidental release. The Mid Peninsula High School, Belle Haven Elementary School, and Beechwood School are located within one-quarter mile of the proposed pipeline alignment.. With mitigation, such as the preparation and implementation of a Health and Safety Plan and a Hazardous Materials Management and Spill Prevention Plan and Control Plan, potential impacts would be reduced to less than significant. • Operation of the treatment facility would require the long-term routine transport and use of hazardous materials and substances for treatment, cleaning, and other operation and maintenance purposes. Chemicals that would be transported to and/or from, and used at, the proposed treatment facility may include anionic or nonionic emulsion polymer, lubrication oils, grease, sodium hypochlorite, aqueous ammonia, ferric chloride, sodium bisulfite, antiscalent, carbon dioxide, carbonic acid, caustic soda, citric acid, fluorosilicic acid, and lime. All of the chemical facilities would be stored in double containment to ensure protection in the event of an accidental spill, and the depth of the tanks relative to the surrounding terrain would afford extra protection in the event of an accidental spill. Although no schools, residences, hospitals or senior centers are located within one-quarter mile of the satellite treatment facility, impacts associated with the accidental release of hazardous materials could be considered potentially significant. However, with the mitigation
Emission or handling of hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.	LTSM	
Located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5	LTSM	
Located within two miles of a public airport or private airstrip and result in a safety hazard for people residing or working in the project area.	NI	
Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan	LTSM	

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Exposure of people or structures to significant risk of loss, injury or death involving wildland fires	NI	measures described above and compliance with the City's Emergency Operation Plan, the risk of hazardous materials release is low, and potential impacts would be reduced to less than significant. • Based on a review of the California Department of Toxic Substances Control's (DTSC's) EnviroStor database (accessed 07/31/18), the satellite treatment plant and pipelines would not be located on or near a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 (Cortese List). • The Study Area does not include any airports. The nearest airport to the Study Area is in the City of Palo Alto, approximately three miles southeast of the pipeline alignment and over four miles from the satellite treatment plant site. Additionally, the San Carlos Airport is located over four miles to the northwest of the satellite treatment plant and pipeline alignments. As such, the Proposed Project would not expose people residing or working in the area to safety hazards. • Construction activities for the proposed influent and waste disposal pipelines may require temporary lane or road closures that could impede emergency responses. Mitigation Measures, such as a Traffic Management Plan would be required, and would address any potential interference with emergency response and/or evacuation plans, and would reduce these impacts to less than significant. • The Study Area is not at risk of wildland fires; therefore, there would be no impact for risks associated with wildland fires and fires in urban-wildland interface areas.
Hydrology and Water Quality		
Violation of water quality standards or waste discharge requirements or degrade water quality	LTSM	• Excavation, grading, and construction activities associated with construction of the Proposed Project could result in exceedance of water quality standards from soil disturbance and potential sedimentation and erosion if not properly controlled. It could also cause exceedances in the event of an accidental fuel or hazardous materials leak or spill. The California General Permit for Construction Activities Associated with Stormwater Discharges (Construction General Permit) requires the preparation and implementation of a SWPPP which must be prepared before construction begins. The SWPPP includes specifications for BMPs to be implemented during construction to
Substantial depletion of groundwater supplies or interference with groundwater recharge	LTSM	
Substantial alteration of the existing drainage pattern of the site or area	LTSM	

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Creation of contribution of runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff	LTS	control sediment and other construction-related pollutants in stormwater discharges from the site. • The Proposed Project would be designed and operated in accordance with the applicable requirements of California Code of Regulations Title 22 and any other local legislation that is currently effective or may become effective as it pertains to recycled water. • Salts and nutrients are a potential concern because recycled water could conceivably add measurable quantities of salts and/or nutrients and cause a drinking water quality objective to be exceeded if assimilative capacity did not otherwise exist. Adherence of the Proposed Project to all appropriate Title 22 requirements would ensure that potential impacts to public health or groundwater quality would be less than significant. Thus, no mitigation measures are required. • The Proposed Project does not include groundwater pumping or recharge and would have no impact to aquifer volumes or groundwater table levels.
Substantially degrade water quality	LTSM	
Placement of housing within a 100-year flood hazard area, or structures within a 100-year flood hazard area which would impede or redirect flood flows	NI	
Exposure of people or structures to a significant risk or loss, injury or death involving flooding.	NI	

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Inundation by seiche, tsunami or mudflow	LTS	• The Proposed Project would not alter the course of a stream or river. • The Proposed Project could temporarily alter the drainage of the Study Area during construction and excavation activities, which could result in additional sedimentation and erosion if mitigation measures are not incorporated to reduce these potential impacts. Additionally, installation of facilities at the treatment facility site could create additional runoff, sedimentation, and erosion during operation due to the grading needed at the site and the increased impermeable surface area. Installation of appropriate drainage (stormwater) facilities and erosion control at the site may be necessary to accommodate additional stormwater flows and reduce the potential for localized siltation/erosion and flooding, respectively. The inclusion of design elements to address runoff would ensure that impacts during operation of the Proposed Project would be less than significant. • The Proposed Project would not construct housing; therefore, it would have no impact related to placing housing within a 100-year flood zone. • The Proposed Project is located in a 100-year flood zone (Zone AE) as designated by the Federal Emergency Management Agency's Flood Insurance Rate Map.. • The Proposed Project would not expose people to risks of flooding, dam, or levee failure. The satellite treatment facility is the only component of the Proposed Project that would require staffing long-term, and would be designed in accordance with applicable flood zone requirements.. • There are no large enclosed water bodies in the Study Area that would be subject to seiche. Coastal low-lying areas in the City of Menlo Park may be affected by tsunamis, however, the WBSD Bayfront WWTP project site is located just outside the tsunami inundation zone as depicted in the City of Menlo Park's Open Space/Conservation, Noise and Safety Element of the General Plan (May 2013). Additionally, the project does not include construction or operation of habitable structures that could result in loss of human life. Therefore, impacts from seiche, tsunamis, and mudflows are expected to be less than significant.
Land Use and Planning		
Physically divide an established community	NI	• The Proposed Project is located within public ROWs and within the WBSD Bayfront

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Conflict with any applicable land use plan, policy or regulation of an agency with jurisdiction over the Project adopted for the purpose of avoiding or mitigating an environmental effect	LTS	WWTP property line. The treatment facility site is landlocked by other land uses so development on this land would not divide the existing community. • The Proposed Project would be constructed within the existing WBSD Bayfront WWTP (for the satellite treatment facility) and public ROWs (pipelines). Construction of the pipeline can be located in public ROW with approval of an encroachment permit from the City. Acquisition of the permit and compliance with its conditions would ensure that the Project would not conflict with any applicable land use plan, policy or regulation and impacts would be less than significant.
Conflict with any applicable HCP or NCCP	NI	
Mineral Resources		
Loss of availability of a known mineral source	NI	• There are no active mining or mineral resource extraction occurring within the Study Area.
Noise		
Exposure of persons to or generation of noise levels in excess of standards or excessive groundbourne vibration	LTSM	• Construction of the Proposed Project would involve the use of heavy equipment that could create noise substantially above existing ambient noise levels. It also has the potential to generate noise in excess of relevant local noise regulations although the timeframe for construction activities would be regulated by the municipal noise ordinance. Mitigation measures, such as limiting vibration to under appropriate thresholds for structures and people, would be needed to reduce potential short-term construction-related noise impacts to less than significant. • Once constructed, the pipelines are not a source of long term noise in the Study Area. • Operation of the satellite treatment facility would generate long-term noise, primarily from the pump station and the additional truck trips required for delivery of materials necessary for operation which could be audible to some visitors of the Bedwell Bayfront Park. However, the noise-generating components of the treatment facility would be enclosed in buildings, which would reduce project noise levels. Additionally, given that , the treatment facility is not located near other sensitive noise receptors (such as schools, hospitals), and that the existing noise environment is dominated by traffic noise along the 101 freeway, long term project-generated noise would be less than significant. • There are no airports or airstrips within the vicinity of the Proposed Project.
Substantial permanent or periodic increase in ambient noise levels in the project vicinity	LTSM	
Exposure of persons residing or working within the vicinity of a private airstrip or public use airport to excessive noise levels	NI	
Population and Housing		
Induction of substantial population growth in an area either directly or indirectly	LTS	• The Proposed Project would not directly induce population growth because it would not produce additional water supply, but instead replaces imported supply (purchased

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Displacement of substantial numbers of existing people or housing	NI	water) with a more desirable (locally-produced) water. • The Proposed Project would not displace existing housing or people.
Public Services		
Substantial adverse physical impacts to public services including but not limited to fire and police protection, schools and parks	NI	• The Proposed Project would involve the production and delivery of recycled water to meet existing demand, and disposal of wastewater produced by the treatment process. It would not increase the use of or demand for public services (e.g., schools, parks, police, fire, or other public facilities).
Recreation		
Substantial physical deterioration of park facilities	NI	• The Proposed Project would create recycled water that could be used to offset potable water use atexisting parks and schools but would not cause a deterioration of any park facilities. • The Proposed Project would not result in an increase in the use of existing parks or other recreational facilities.
Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment	NI	
Transportation/Traffic		
Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system	LTSM	• The Proposed Project would be constructed within public ROWs and WBSD property. For the pipelines, open trench construction would be employed except at sensitive crossings, if any, where trenchless methods would be used. The assumed 30-foot construction footprint for the pipelines may require closure of some traffic lanes, thus temporarily reducing roadway capacities. • Construction activities could result in a short-term increase in traffic congestion on local streets in the Study Area due to temporary lane closures during construction of the influent, disposal and distribution pipelines. Mitigation measures, such as development and implementation of a Traffic Control Plan, would be required to reduce traffic-related impacts of potential temporary lane closures. There may be traffic impacts related to increased truck traffic during construction of the treatment facility, but no road closures are anticipated for this component of the Proposed Project. • The Proposed Project would not affect air traffic patterns and would be located
Conflict with applicable congestion management program	LTSM	
Changes in air traffic patterns, resulting in substantial safety risks	NI	
Substantially increase hazards due to a design feature (e.g. sharp curves or dangerous intersections) or incompatible uses	LTS	
Inadequate emergency access or parking capacity	LTSM	

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities	LTSM	sufficiently far from an airport or airstrip to avoid creating a substantial air traffic safety risk. • The Proposed Project would not create or substantially increase a traffic hazard due to a design feature. The roadway ROWs excavated for pipelines may temporarily be reconfigured to accommodate construction activities but would be restored to preconstruction conditions upon project completion. • Lane closures and other potential traffic impacts resulting from construction of the Proposed Project pipelines would have potential to impede emergency response to those areas, or to areas accessed via those routes. Mitigation Measures, such as the development and implementation of a Traffic Control Plan, would reduce these temporary impediments to less than significant. • Upon completion, the Proposed Project would not conflict with adopted policies, plans, or programs regarding alternate transportation, nor would it decrease the safety of these facilities. Mitigation measures, such as development and implementation of a Traffic Control Plan, would reduce potential impacts to less than significant.
Utilities and Service Systems		
Exceedance of wastewater requirements of the applicable Regional Water Quality Control Board	LTSM	• The Proposed Project would convey wastewater currently conveyed to the Silicon Valley Clean Water (SVCW) treatment facility to the WBSD system for advanced treatment and reuse. Solids produced from the satellite treatment plant MBR system would be conveyed to SVCW for disposal. Based on the project size and relatively small contribution of solids to the collection system, it is not anticipated that SVCW will need to amend its NPDES permit issued by the San Francisco Bay Regional Water Quality Control Board (RWQCB). • The Proposed Project would not cause SVCW to exceed the RWQCB wastewater treatment requirements, and the SVCW NPDES permit would not need to be amended prior to implementation of the Proposed Project. • The Project proposes the construction of a satellite treatment facility and influent and disposal pipelines for advanced treatment of wastewater for reuse as irrigation. It does not require the expansion of existing wastewater treatment facilities and helps reduce the use of local water supply. • The Proposed Project would require additional on-site drainage facilities at the satellite treatment facility site. The Proposed Project would increase the amount of impervious surface at the site, increasing total stormwater runoff to some degree. The project would include a storm water runoff collection system to capture and treat
Expansions of, or construction of new water, wastewater, or stormwater facilities cause significant environmental effects or physical deterioration of a public facility due to increased use as a result of the project	LTS	
Sufficient water supplies or capacity to serve the project	NI	
Adequate wastewater treatment capacity to serve the project	NI	
Have sufficient capacity at a landfill to accommodate the project's solid waste disposal needs and compliance with statues and regulations related to solid waste	LTSM	

Environmental Topics	Expected Impact	Discussion of Major, Potential Environmental Effects
Comply with federal, state and local statues and regulations related to solid waste	NI	storm water within the treatment facility. Additional mitigation measures to reduce the potential effects could include improvements to the existing stormwater storage system, as needed. • The Proposed Project would augment the City's capacity to serve the region's water supply demand. • The main contributor to solid waste (soil) generated by the Proposed Project would be the excavation and disposal of soil from construction of the treatment facility site and pipelines. Solid waste (soil) generated by the Proposed Project would likely be hauled offsite. Mitigation measures, such as maximizing reuse of excavated soil to the extent possible, including use as backfill for the pipelines, or identifying an alternate disposal site and/or construction timing should the identified landfill not be able to accommodate all of the waste, would reduce this potential impact to less than significant. Solid waste would be disposed of in accordance with all applicable federal, state, and local statutes and regulations.
Mandatory Findings of Significance		
Substantial environmental degradation (e.g., reduction of sensitive habitat, endangered plant or animal species, or cultural resources,	LTSM	• Mitigation measures are anticipated to reduce potential biological and cultural impacts to less than significant. • Most of the potential impacts from the Proposed Project would occur during the construction phase. While all potential impacts of the Proposed Project would likely be mitigated to less than significant, there is potential for cumulatively considerable impacts in combination with other past, present, and probable future projects. This is most likely to occur in relation to air quality emissions, and the potential to contribute to greenhouse gas emissions. Further analysis of the potential cumulatively considerable impacts would be required to determine if additional mitigation measures would be necessary to reduce these potential cumulative impacts to less than significant. • The potential impacts with the greatest potential adverse effects on humans and human health include air quality and traffic and transportation. Mitigation measures that address potential impacts would reduce impacts to humans to less than significant.
Contribution to cumulative impacts	LTSM	
Substantial adverse effects on human beings.	LTSM	

Note: PS = Potentially significant; LTSM = Less than Significant with Mitigation Incorporation; LTS = Less than Significant; NI = No Impact.