MARINA COAST WATER DISTRICT

2019

RECYCLED WATER MASTER PLAN

Draft
(Excluding Capacity Fees)

April 2019

AKEL
ENGINEERING GROUP, INC.

AKEL
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Smart Planning Our Water Resources

April 12, 2019

Marina Coast Water District
2840 4th Avenue
Marina, CA 93933

Attention: Michael Wegley, P.E.
District Engineer

Subject: 2019 Recycled Water Master Plan – Draft Report

Dear Michael:

We are pleased to submit the draft report for the Marina Coast Water District Recycled Water Master Plan. This master plan is a standalone document, though it was prepared as part of the integrated infrastructure master plans for the water, sewer, and recycled master plans. The master plan documents the following:

- Existing distribution system facilities, acceptable hydraulic performance criteria, potential future recycled water demands.
- Development of the District's GIS-based recycled water model.
- Recommendation of improvements to serve future recycled water customers.
- Capital Improvement Program (CIP) with an opinion of probable construction costs and suggestions for cost allocations to meet AB 1600.

We extend our thanks to you; Keith Van Der Maaten, General Manager; Brian True, Senior Civil Engineer; and other District staff whose courtesy and cooperation were valuable components in completing this study.

Sincerely,

AKEL ENGINEERING GROUP, INC.

Tony Akel, P.E.
Principal

Enclosure: Report

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Acknowledgements

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Michael Wegley, District Engineer

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CHAPTER 1 - INTRODUCTION

This chapter provides a brief background of the District's recycled water system, the need for this master plan, and the objectives of the study. Abbreviations and definitions are also provided in this chapter.

1.1 BACKGROUND

The Marina Coast Water District (District) is located approximately 10 miles north of the City of Monterey, 8 miles east of the City of Salinas, and 3 miles south of the City of Castroville (**Figure 1.1**). The District provides potable water service to approximately 36,000 residents, as well as a myriad of commercial, industrial, and institutional establishments. The District entered into an agreement with the Monterey One Water (M1W), formerly known as the Monterey Regional Water Pollution Control Agency, to deliver up to 1,427 acre-feet per year (AFY) of product water from the Advanced Water Treatment Facility (AWTF) north of the City of Marina. This will be delivered through the newly constructed Pure Water Monterey (PWM) delivery pipeline, which also conveys approximately 3,500 AFY of product water to the Seaside Injection Wells project. MCWD will receive water from the PWM pipeline and deliver it to their planned customers through the Regional Urban Water Augmentation Program.

There have been several studies related to the planning, design, and implementation of the AWTF; corresponding pump station, pipeline and storage reservoir; as well as the distribution pipelines connecting to the recycled water users located within the District's service area. These reports served as the roadmap for documenting the hydraulic improvements, and the recommendations for connecting to the Pure Water Monterey transmission main.

Recognizing the importance of planning, developing, and financing system facilities to provide reliable recycled water service to customers within the service area, the District initiated updating elements of the previous studies to reflect current planning and design conditions, and to consolidate the documents into one comprehensive planning document.

1.2 SCOPE OF WORK

Marina Coast Water District approved Akel Engineering Group Inc. to prepare this master plan in November of 2016. This 2019 Recycled Water Master Plan (RWMP) is intended to serve as a tool for planning and phasing the construction of future recycled water distribution system infrastructure. The 2019 RWMP identifies the District's potential recycled water use and recommends improvements necessary to serve potential future recycled water users.

Should planning conditions change, and depending on their magnitude, adjustments to the master plan recommendations might be necessary.

Monterey Bay

Pacific Ocean

Salinas River State Beach

Salinas River National Wildlife Refuge

Fort Ord Dunes State Park

Fort Ord National Monument

Jacks Peak Park

Toro County Park

Marina

Salinas

Seaside

Sand City

Pacific Grove

Monterey

Del Rey Oaks

Carmel By-The-Sea

1

68

183

101

N
W GIS E
S

0 0.5 1 2 Miles

Updated: January 4, 2017

Sources: Esri, USGS, NOAA

File Path: P:\xGIS\GIS_Projects\Marina_Coast_WD\RecycledWater\MCWD_Fig1-1_RLM_010417.mxd

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Legend

- Major Highways
- City Limits
- Urbanized Area
- Protected Open Space
- Rivers/Streams
- Waterbodies

PRELIMINARY

Figure 1.1
Regional Location Map

Recycled Water Master Plan
Marina Coast Water District

MARINA COAST WATER DISTRICT

This master plan included the following tasks:

- Summarizing the District's existing land use conditions
- Documenting growth planning assumptions
- Updating the recycled water system performance criteria
- Projecting future recycled water demands
- Updating and calibrating a new hydraulic model using Geographic Information Systems (GIS) data
- Evaluating the proposed improvements and the improvements necessary to connect to the regional Pure Water Monterey transmission main
- Performing a capacity analysis for major distribution mains
- Recommending a capital improvement program (CIP) with an opinion of probable costs
- Performing a capacity allocation analysis for cost sharing purposes
- Developing a 2019 Recycled Water Master Plan report

1.3 INTEGRATED APPROACH TO MASTER PLANNING

The District implemented an integrated master planning approach and contracted the services of Akel Engineering Group to prepare the following documents:

- Water Master Plan
- Sewer Master Plan
- Recycled Water Master Plan

While each of these reports is published as a standalone document, they have been coordinated for consistency with the various planning documents within the District's service area. Additionally, each document has been cross referenced to reflect relevant analysis results with the other documents.

1.4 PREVIOUS MASTER PLANS

The District does not have a previous master plan for the recycled water system. The intent of this master plan is to document the existing planning and design documents produced as part of the joint Monterey One Water – Marina Coast Water District recycled program, and which is subject to agreements and recycled water allocations. The relevant reports referenced as part of this master plan are included in the following section.

1.5 RELEVANT REPORTS

Multiple special studies have been completed by the District and other agencies evaluating recycled water supply, potential recycled water use, and transmission and distribution system

infrastructure. These reports were referenced and used during this capacity analysis. The following lists relevant reports that were used in the completion of this master plan, as well as a brief description of each document:

- **Pure Water Delivery and Supply Project Agreement Between Monterey Regional Water Pollution Control Agency and Marina Coast Water District, April 2016. (2016 PWD Agreement).** This agreement documents the recycled water supply availability for non-potable reuse under the Regional Urban Water Augmentation Project, as well as the Pure Water Monterey Groundwater Replenishment Project. This agreement documents quantities of water to be delivered and where the deliveries should be provided.

- **Pure Water Monterey Groundwater Replenishment Project Final Engineering Report, September 2016 (2016 PWM FER).** This report summarizes the Pure Water Monterey Groundwater Replenishment Project, which is a water supply project intended to provide purified recycled water for the replenishment of the Seaside Groundwater Basin. Facilities used to convey the recycled water from the treatment facility to the injection site will also be used to provide water to potential District recycled water customers.

- **Regional Urban Water Augmentation MCWD Recycled Water Project Amendment to Basis of Design Report, October 2006.** This document includes discussion on the proposed users, the pipeline alignments and criteria, and the pump station and storage improvements. The demands included in this report are updates to demands previously prepared in the 2003 Regional Urban Recycled Water Distribution Pipeline study prepared by RBF Consulting and the 1996 Monterey Peninsula Reclaimed Water Urban Reuse Feasibility Study prepared by CH2MHill. This report has been updated periodically and served as the basis for the demands included in the master plan.

- **City of Marina General Plan, December 2006, (2006 General Plan).** The City's 2006 General Plan provides future land use planning, and growth assumptions for the planning areas. Additionally, this report establishes the planning horizon for improvements in this master plan.

- **County of Monterey General Plan, October 2010.** The County's 2010 General Plan addresses unincorporated areas of the County and considers the general plans of cities within the County to allow for cooperative planning. The Fort Ord Land Use Plan provided within the County's 2010 General Plan was used to assist in the development of the potential future land use within the District's service area.

- **City of Monterey General Plan, January 2005.** The City's 2005 General Plan provides future land use planning and growth assumptions. These growth assumptions were used to assist in the development of the potential future land use within the District's service area, generally along South Boundary Road.

- **City of Seaside General Plan, August 2004.** The City of Seaside's 2004 General Plan provides future land use planning and growth assumptions. These growth assumptions were used to assist in the development of the potential future land use within the District's service area, generally along General Jim Moore Boulevard south of Inter-Garrison Road.

- **City of Del Rey Oaks General Plan, January 1997.** The City of Del Rey Oaks' 1997 General Plan provides future land use planning and growth assumptions. These growth assumptions were used to assist in the development of the potential future land use within the District's service area, generally along South Boundary Road east of General Jim Moore Boulevard.

- **California State University, Monterey Bay Draft Campus Master Plan, June 2017.** The California State University, Monterey Bay's (CSUMB) Draft Campus Master Plan provides future land use planning and growth assumptions for the exiting campus. These growth assumptions were used to assist in the development of the planned future land use of the CSUMB campus within the District's service area.

- **Fort Ord Reuse Plan, June 1997 (1997 FORP).** The Fort Ord Reuse Plan, prepared by the Fort Ord Reuse Authority, provides future land use planning and development assumptions for lands that are part of the former Fort Ord.

- **Marina Coast Water District 2015 Urban Water Management Plan, (2015 UWMP).** The 2015 Urban Water Management Plan (UWMP) establishes a benchmark per capita water usage and targets in order to achieve higher levels of water conservation for the sustainability of water supply sources. This includes adopting an updated water shortage contingency plan, defining supply sources, addressing supply reliability, and projecting sustainable supply yields and future demands. This report also addresses potential recycled water demands.

- **Marina Coast Water District 2016 Title 22 Engineering Report, November 2016.** This Engineering Report was prepared in accordance with Title 22 of the California Code of Regulations for submittal to the State of California Department of Public Health as well as the Regional Water Quality Control Board as part of the project permitting process. This report describes the facilities initially required to serve recycled water to the recycled water customers.

1.6 REPORT ORGANIZATION

The water system master plan report contains the following chapters:

Chapter 1 - Introduction. This chapter provides a brief background of the District's recycled water system, the need for this master plan, and the objectives of the study. Abbreviations and definitions are also provided in this chapter.

Chapter 2 - Planning Areas Characteristics. This chapter presents a discussion of the planning area characteristics for this master plan and defines the land use classifications. This chapter also provides a description of the expected recycled water service area and historical and projected population.

Chapter 3 - System Performance and Design Criteria. This chapter presents the District's performance and design criteria, which was used in this analysis for evaluating existing and proposed distribution mains, storage reservoirs, and pump stations

Chapter 4 - Existing Recycled Water System. This chapter provides a description of the District's existing recycled water system facilities and the recycled water supply quality.

Chapter 5 - Recycled Water Demands. This chapter summarizes the potential recycled water demands identified within the District's service area, the maximum day and peak hour demands for the potential future users, and demand diurnal patterns.

Chapter 6 - Hydraulic Model Development. This chapter describes the development and calibration of the District's recycled water distribution system hydraulic model. The hydraulic model was used to evaluate the capacity adequacy of the planned users.

Chapter 7 - Evaluation and Proposed Improvements. This section presents a summary of the recycled water system evaluation and identifies improvements necessary to serve future users.

Chapter 8 - Capital Improvement Program. This chapter provides a summary of the recommended recycled water system improvements to accommodate anticipated users within the 2016 PWD Agreement. The chapter also presents the cost criteria and methodologies for developing the capital improvement program. Finally, a capacity allocation analysis, usually used for cost sharing purposes, is also included.

1.7 ACKNOWLEDGEMENTS

Obtaining the necessary information to successfully complete the analysis presented in this report, and developing the long term strategy for mitigating the existing system deficiencies and for accommodating future growth, was accomplished with the strong commitment and very active input from dedicated team members including:

- Keith Van Der Maaten, General Manager
- Michael Wegley, District Engineer
- Kelly Cadiente, Director of Administrative Services
- Derek Cray, Maintenance and Operations Manager
- Brian True, Senior Civil Engineer
- Jaron Hollida, Assistant Engineer
- Andrew Racz, Associate Engineer
- Andy Sterbenz, Consultant

1.8 UNIT CONVERSIONS AND ABBREVIATIONS

Engineering units were used in reporting flow rates and volumes pertaining to the design and operation of various components of the recycled system. Where it was necessary to report values in smaller or larger quantities, different sets of units were used to describe the same parameter. Values reported in one set of units can be converted to another set of units by applying a multiplication factor. A list of multiplication factors for units used in this report is shown on **Table 1.1**.

Various abbreviations and acronyms were also used in this report to represent relevant water system terminologies and engineering units. A list of abbreviations and acronyms is included in **Table 1.2**.

1.9 GEOGRAPHIC INFORMATION SYSTEMS

This master planning effort made extensive use of Geographic Information Systems (GIS) technology, for completing the following tasks:

- Develop the physical characteristics of the hydraulic model (pipes and junctions, wells, and storage reservoirs)
- Calculate and allocating future water demands, based on future developments water use
- Extract ground elevations along the existing and proposed pipelines from available contour maps
- Generate maps and exhibits used in this master plan

Table 1.1 Unit Conversions

Recycled Water Master Plan

Marina Coast Water District

PRELIMINARY

Volume Unit Calculations		
To Convert From:	**To:**	**Multiply by:**
acre feet	gallons	325,851
acre feet	cubic feet	43,560
acre feet	million gallons	0.3259
cubic feet	gallons	7.481
cubic feet	acre feet	2.296×10^{-5}
cubic feet	million gallons	7.481×10^{-6}
gallons	cubic feet	0.1337
gallons	acre feet	3.069×10^{-6}
gallons	million gallons	1×10^{-6}
million gallons	gallons	1,000,000
million gallons	cubic feet	133,672
million gallons	acre feet	3.069
Flow Rate Calculations		
To Convert From:	**To:**	**Multiply By:**
ac-ft/yr	mgd	8.93×10^{-4}
ac-ft/yr	cfs	1.381×10^{-3}
ac-ft/yr	gpm	0.621
ac-ft/yr	gpd	892.7
cfs	mgd	0.646
cfs	gpm	448.8
cfs	ac-ft/yr	724
cfs	gpd	646300
gpd	mgd	1×10^{-6}
gpd	cfs	1.547×10^{-6}
gpd	gpm	6.944×10^{-4}
gpd	ac-ft/yr	1.12×10^{-3}
gpm	mgd	1.44×10^{-3}
gpm	cfs	2.228×10^{-3}
gpm	ac-ft/yr	1.61
gpm	gpd	1,440
mgd	cfs	1.547
mgd	gpm	694.4
mgd	ac-ft/yr	1,120
mgd	gpd	1,000,000

Table 1.2 Abbreviations and Acronyms

Recycled Water Master Plan
Marina Coast Water District

PRELIMINARY

Abbreviation	Expansion	Abbreviation	Expansion
2017 RWMP	2007 Water System Master Plan	gpm	Gallons per minute
AACE International	Association for the Advancement of Cost Engineering	hp	Horsepower
AC	Acre	HGL	Hydraulic grade line
ACP	Asbestos Cement Pipe	HWL	High water level
ADD	Average Day Demand	in	Inch
Akel	Akel Engineering Group, Inc.	LAFCO	Local Agency Formation Commission
CCI	Construction Cost Index	LF	Linear feet
CDPH	California Department of Public Health	MDD	Maximum day demand
cfs	Cubic feet per second	MG	Million gallons
CI	Cast Iron Pipe	MGD	Million gallons per day
CIB	Capital Improvement Budget	MMD	Maximum month demand
CIP	Capital Improvement Program	MPWMD	Monterey Peninsula Water Management District
CSIP	Castroville Seawater Intrustion Project	MRWPCA	Monterey Regional Water Pollution Control Agency
DIP	Ductile Iron Pipe	NFPA	National Fire Protection Association
District/ MCWD	Marina Coast Water District	PHD	Peak hour demand
DU	Dwelling Unit	PRV	Pressure reducing valve
EDU	Equivalent Dwelling Unit	psi	Pounds per square inch
ENR	Engineering News Record	ROW	Right of Way
EPA	Environmental Protection Agency	SCADA	Supervisory Control and Data Acquisition
EPS	Extended Period Simulation	SOI	Sphere of Influence
FORA	Fort Ord Reuse Authority	SVWP	Salinas Valley Water Project
FRC	Facility Reserve Charge	SWRCB	State Water Resources Control Board
ft	Feet	TBD	To be determined
fps	Feet per second	ULL	Urban Limit Line
FY	Fiscal Year	UWMP	Urban Water Management Plan
GIS	Geographic Information Systems	WSMP	Water Master Plan
gpd	Gallons per day	WTP	Water Treatment Plant
gpdc	Gallons per day per capita		

CHAPTER 2 - PLANNING AREA CHARACTERISTICS

This chapter presents a discussion of the planning area characteristics for this master plan and defines the land use classifications. This chapter also provides a description of the expected recycled water service area and historical and projected population.

2.1 STUDY AREA DESCRIPTION

The Marina Coast Water District is located in Monterey County on the west coast of California, south of the City of San Francisco. The District is located approximately 10 miles north of the City of Monterey, 8 miles east of the City of Salinas, and 3 miles south of the City of Castroville. Pacific Coast Highway 1 runs from south to north near the District's western boundary. The District's overall service area currently includes more than 36,000 domestic water and sewer customers and encompasses an area greater than 29,000 acres. Portions of this larger service area will be served by the recycled water system.

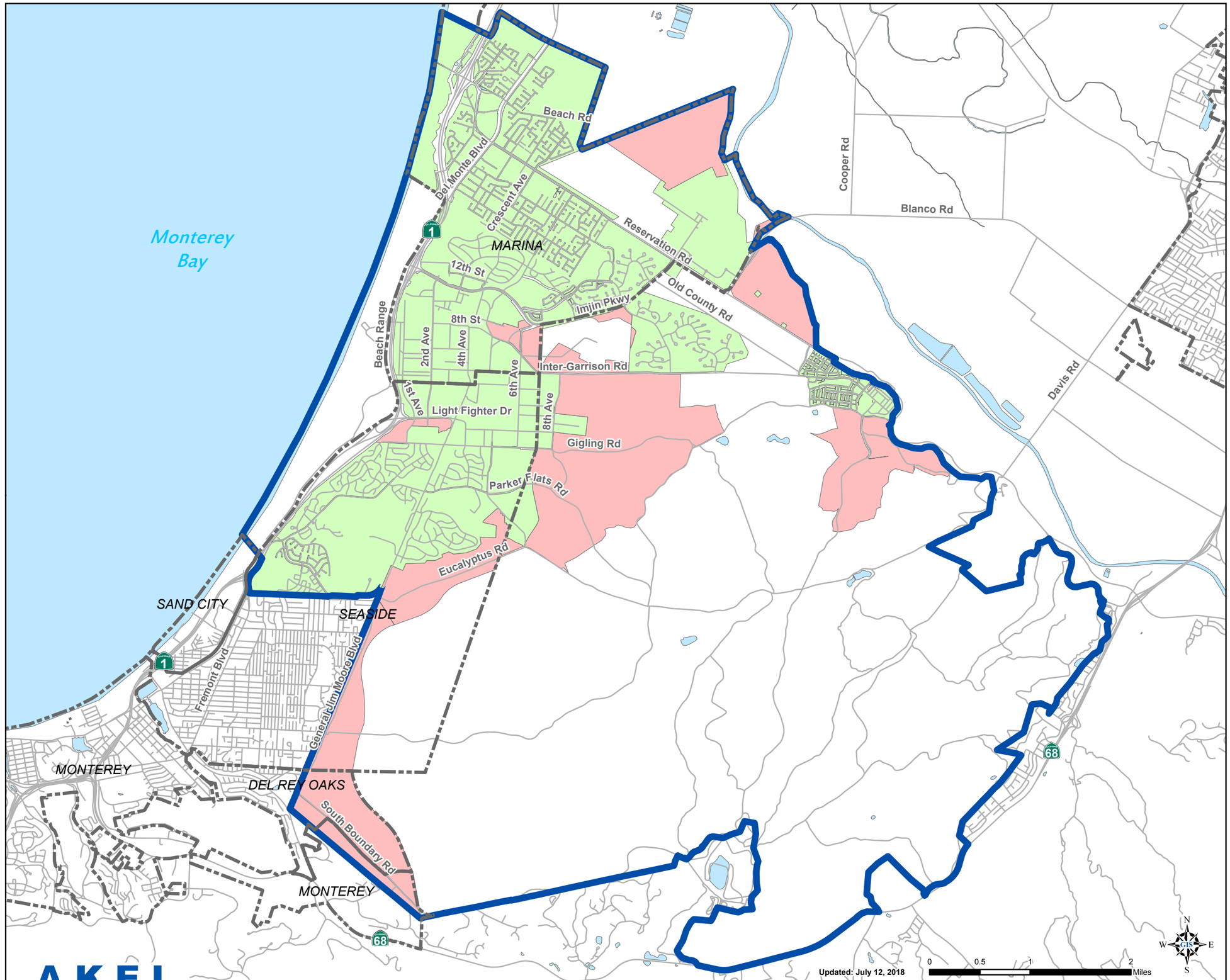
The District service area is generally bound to the north by Marina Green Drive, to the east by Reservation Road, to the west by Pacific Coast Highway 1, and to the south by South Boundary Road. The topography generally slopes downward toward the ocean from west to east, with elevations ranging between 50 feet to more than 400 feet. **Figure 2.1** displays the District's existing service area and the local municipal boundaries.

The recycled water service area is generally defined by users that were initially developed as part of the Pure Water Monterey Project, and which was updated and further defined in the Regional Urban Water Augmentation Project (RUWAP). These studies and agreements identified pipelines, users, cost sharing agreements and projected recycled water deliveries for non-potable reuse customers, as well as indirect potable reuse groundwater projects.

2.2 RECYCLED WATER SERVICE AREA AND LAND USE

The District's recycled water system is planned to service irrigated areas within the District limits for certain land use areas shown on **Figure 2.1**. These areas will consist of parks, medians, schools, golf courses, and other potential users, and which are location within the two distinct regions within MCWD: Central Marina and the Ord Community. While the recycled water lands that are serviced are much smaller than the total service area of MCWD, this section briefly describes the land uses that are within the MCWD service area, and consistent with the Water Master Plan and Sewer Master Plan, which were prepared concurrent to this Plan.

The boundaries and planning area characteristics of these two regions are briefly described in the following sections:



Legend

- Planning Boundary
- Existing Service Area
- Future Study Area
- Municipal Boundaries
- Rivers/Streams
- Waterbodies

PRELIMINARY

Figure 2.1
Planning Area

Recycled Water Master Plan
Marina Coast Water District

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2.2.1 Central Marina Service Area

The Central Marina service area region is within the city limits generally north of Patton Parkway and west of Salinas Avenue. The future development within this service area region is generally comprised of the development of vacant parcels located throughout the city as well as one large area of potential development generally north of Beach Road.

2.2.2 Ord Community Service Area

The Ord Community service area region includes developed, vacant, and designated open space lands within portions of the County of Monterey, City of Del Rey Oaks, City of Marina, City of Seaside, and the City of Monterey within the former Fort Ord.. The potential future development within this area is generally comprised of the redevelopment of the former Fort Ord and new development on currently vacant lands.

For conservative planning purposes the master plan assumes the buildout development of potential developable lands, however the Fort Ord Reuse Authority (FORA) has established limits for growth within the former Fort Ord area, which are briefly summarized as follows:

2.2.2.1 10-Year Development Areas

In addition to outlining improvements, the FORA capital improvement plan specifies the allowable development within the former Fort Ord area. These allowable developments typically represent a portion of the potential developable lands and are summarized on **Table 2.1**.

2.2.2.2 Parker Flats Land Use Swap

The 1997 Fort Ord Installation-Wide Multi-Species Habitat Management Plan (1997 HMP) identified up to 6,300 acres throughout the Fort Ord base that could potentially develop from vegetation and habitat to a municipal-type use. As part of the 1997 HMP, East Garrison development was limited to 200 acres, with the majority of development slated for the Parker Flats are of Fort Ord. In 2002, FORA, the County of Monterey, and Monterey Peninsula College submitted a proposal to modify the 1997 HMP land use, specifically allowing for more development in the East Garrison area, while converting developable lands in Parker Flats to habitat reserve areas. This proposal was submitted as an official Land Swap Agreement (LSA) to the United States Army and the United States Fish and Wildlife Service.

The LSA ultimately allowed for an additional 210 acres of land to be developed at East Garrison, while converting approximately 447 acres of land within Parker Flats to habitat reserve. The Memorandum of Understanding (MOU) for the LSA was signed on October 14, 2003.

The tables and figures included in this Master Plan document the respective land use planning agency General Plan maps, with input from District staff. However, and in adherence to the LSA, developable acreages were adjusted to reflect the most recent planning data, and as provided by FORA staff. This included utilizing FORA GIS information to determine on a parcel by parcel basis what lands are included in the LSA.

Table 2.1 Fort Ord Reuse Authority 10-Year Development Limits

Recycled Water Master Plan

Marina Coast Water District

PRELIMINARY

Development Areas[1]	Residential (du)	Office (sf)	Industrial (sf)	Commercial (sf)	Hotel Rooms
Campus Town Specific Plan					
26 Acre Parcel (Planned)	150	0	0	0	0
Campus Town / 26 Acre (Planned)	0	10,000	30,000	40,000	300
Campus Town / Surplus II (Planned)	0	10,000	40,000	50,000	0
Surplus II (Planned)	238	0	0	0	0
Subtotal	388	20,000	70,000	90,000	300
Cypress Knolls					
Cypress Knolls (Entitled)	712	0	0	0	0
Del Rey Oaks					
Del Rey Oaks (Planned)	691	0	0	0	0
Del Rey Oaks RV Park (Entitled)	0	400,000	0	0	0
Del Rey Oaks RV Park (Planned)	0	0	0	0	550
Subtotal	691	400,000	0	0	550
Dunes Phase 1, 2, & 3					
Dunes Phase 1 (Entitled)	187	69,000	0	80,000	0
Dunes Phase 2 (Entitled)	225	0	0	0	394
Dunes Phase 3 (Entitled)	435	450,000	450,000	0	0
Subtotal	847	519,000	450,000	80,000	394
East Garrison					
East Garrison I (Entitled)	721	68,000	0	34,000	0
Main Gate					
Main Gate	0	0	0	150,000	350
Main Gates (Planned)	145	0	0	0	0
Subtotal	145	0	0	150,000	350
City of Monterey					
Monterey (Planned)	0	721,524	216,276	0	0
Sea Haven					
Sea Haven A (Entitled)	802	0	0	0	0
Seahaven (Entitled)	127	0	0	0	0
Subtotal	929	0	0	0	0
Seaside East					
Seaside East (Planned)	310	30,000	30,000	30,000	0
Seaside Resort					
Seaside Resort (Entitled)	122	0	0	10,000	330
Seaside Resort TS (Entitled)	0	0	0	0	68
Subtotal	122	0	0	10,000	398
UC MBEST					
UC (Planned)	0	680,000	100,000	310,000	0
UC Blanco Triangle (Planned)	240	0	0	0	0
Subtotal	240	680,000	100,000	310,000	0
Development Total					
	5,105	**2,438,524**	**866,276**	**704,000**	**1,992**

AKEL ENGINEERING GROUP, INC.

10/19/2018

Note:

1. Development Areas extracted from Development Forecasts documented in FORA "FY 2018-2019 Capital Improvement Program", Table 6 and Table 7.

2.3 EXISTING AND FUTURE LAND USE

The existing and future land use for the District service area is based on a combination of planning documents that includes the following sources: City of Marina, City of Seaside, City of Del Rey Oaks, City of Monterey, CSU Monterey Bay, County of Monterey, FORA, and District staff. For planning purposes, the various residential and commercial land use types across the multiple jurisdictions within the District service area were consolidated into single residential and commercial categories.

The existing and future land use conditions are graphically summarized on **Figure 2.2** and **Figure 2.3.** It should be noted that **Figure 2.3** also includes the aforementioned Parker Flats – East Garrison LSA boundaries. The existing and future land use acreages, summarized on **Table 2.2**, can be broken down into the following categories:

- **Existing Development:** These acreages represent existing developed lands.
- **Existing Lands - Redeveloped:** These acreages represent existing developed lands expected to redevelop into other land use types under the buildout land use development condition.
- **Existing Development - Unchanged:** These acreages represent the total existing acreages expected to remain under the buildout land use development condition.
- **New Lands - Redevelopment:** These acreages represent lands that have redeveloped from a prior use and into a new respective category.
- **New Development:** These acreages represent gains from the development of existing vacant lands.

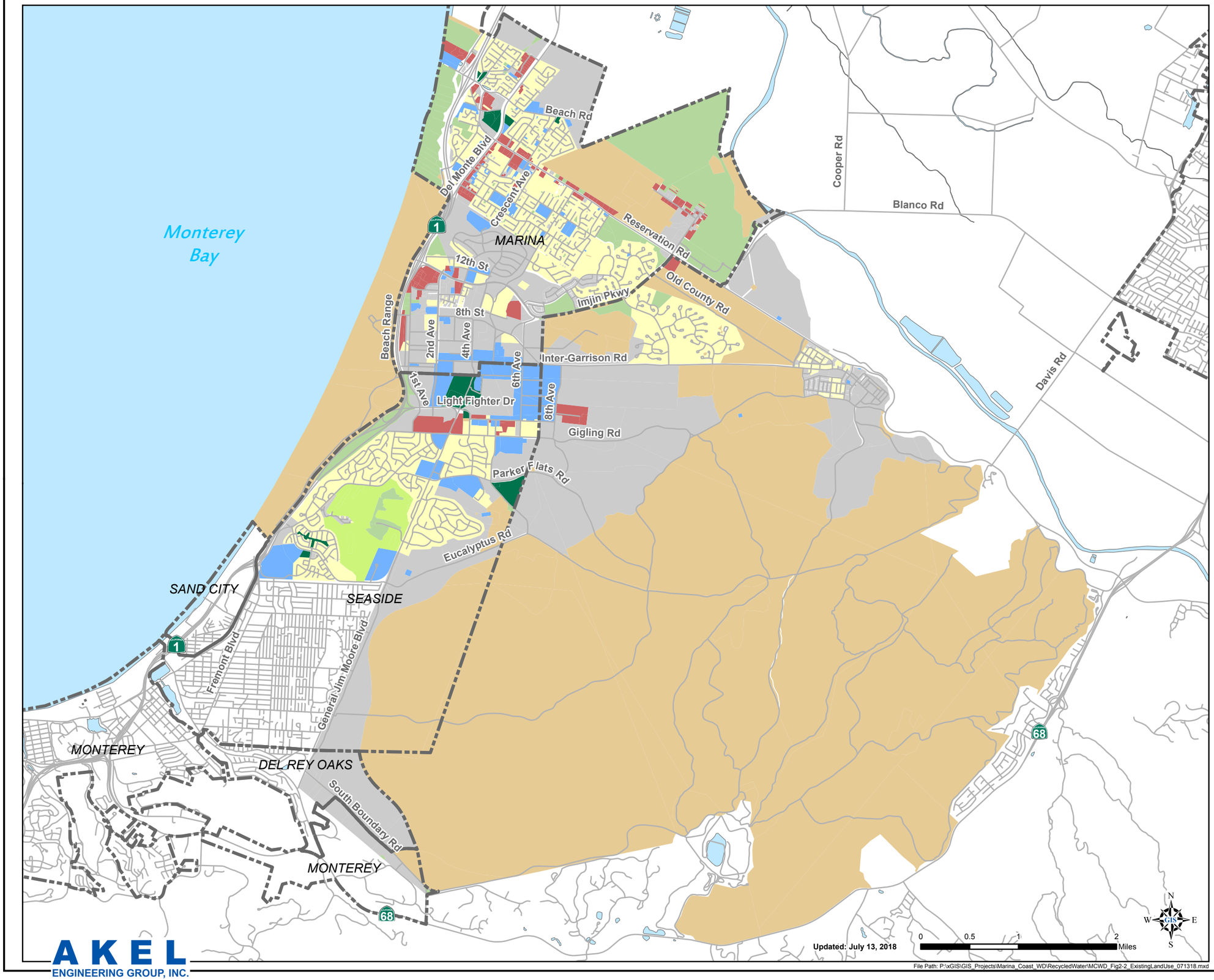
The total existing and future land use acreages are summarized below and shown on **Table 2.2**:

- 4,776 acres of developed lands inside the service area.
- 5,113 acres of undeveloped lands inside the service area.

2.4 HISTORICAL AND FUTURE GROWTH

According to the District's 2015 UWMP the 2015 service area population was approximately 32,375. The District's 2015 UWMP utilized varying annual growth rates and projected a 2035 population of 70,161. For the purpose of this master plan, District staff chose to utilize a set growth rate of 3.0 percent, which results in a 2035 population of 58,473. Assuming 3.0 percent growth, the District service area is not expected to reach the UWMP 2035 population until the year 2041.

Based on the land use estimated in this master plan, there is a population capacity of approximately 83,300 people, which is discussed in detail in Chapter 5. Based on an annual growth rate of 3.0 percent, the District service area will not reach the buildout population until the year 2047. The District's historical and projected population estimates are summarized on **Table 2.3**.



Legend

- Municipal Boundaries

Existing Land Use

- Residential
- Commercial
- Institutional/School
- Open Space
- Designated Open Space
- Park/Sports Field
- Golf Course
- Planned Development Area
- Rivers/Streams
- Waterbodies

PRELIMINARY

Figure 2.2
Existing Land Use

Recycled Water Master Plan
Marina Coast Water District

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Note: Future Land Use based on the following:
- General Plan documents for the following: City of Marina, City of Seaside, City of Del Rey Oaks, CSU Monterey Bay, and County of Monterey
- Fort Ord Reuse Authority planning documents
- Additional review and comments from MCWD staff

Central Marina
Cypress Knolls
Dunes Phase 1, 2, & 3
Main Gate
Campus Town Specific Plan
Seaside Resort
Seaside East
Del Rey Oaks
Monterey
UC MBEST
East Garrison
Sea Haven

Monterey Bay
MARINA
SEASIDE
SAND CITY
MONTEREY
DEL REY OAKS
MONTEREY

Beach Rd
Del Monte Blvd
Crescent Ave
12th St
8th St
Beach Range
2nd Ave
4th Ave
6th Ave
8th Ave
1st Ave
Light Fighter Dr
Inter-Garrison Rd
Gigling Rd
Parker Flats Rd
Eucalyptus Rd
Fremont Blvd
General Jim Moore Blvd
South Boundary Rd
Reservation Rd
Old County Rd
Imjin Pkwy
Cooper Rd
Blanco Rd
Davis Rd

1
68

Updated: March 22, 2019

0 0.5 1 2 Miles

N W GIS E S

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Legend

- Municipal Boundaries
- 10-Year Development Areas
- Parker Flats Land Use Swap

Future Land Use

- Residential
- Commercial
- Industrial
- AirportRunway
- Institutional/School
- Planned Development
- Mixed Use District
- Open Space
- Designated Open Space
- Park/Sports Field
- Golf Course
- Serviced by Others
- Rivers/Streams
- Waterbodies

PRELIMINARY

Figure 2.3
Future Land Use

Recycled Water Master Plan
Marina Coast Water District

MARINA COAST WATER DISTRICT

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Table 2.2 Existing and Future Service Areas

Recycled Water Master Plan
Marina Coast Water District

PRELIMINARY

Land Use Classification	Existing Development			Future Development				Total Development at Buildout of Study Area	Development Outside of Future Study Area	Planning Area Total
	Existing Development	Existing Lands - Redeveloped	Subtotal Existing Development - Unchanged	New Lands - Redevelopment	New Development: Inside Existing Service Area	New Development: Outside Existing Service Area	Subtotal Future Development			
	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)
Residential										
Residential	2,574	-196	2,378	85	1,167	1,033	2,285	4,663	0	4,663
Non-Residential										
Commercial	349	-40	309	21	235	139	395	704	1	705
Park	103	-5	98	103	156	222	481	579	0	579
Institutional	689	-148	541	23	191	58	272	813	1	814
Planned Development Mixed Use District	0	0	0	134	475	726	1,336	1,336	0	1,336
Other										
Bayonet Golf Course	322	-15	307	0	0	0	0	307	0	307
Open Space - Other	438	0	438	46	0	0	46	484	0	484
Designated Open Space[5]	45	0	45	0	0	0	0	45	17,754	17,799
ROW	33	-8	25	0	1	0	1	26	0	26
Airport Runway	224	0	224	0	0	0	0	224	0	0
Parker Flats LU Swap	0	0	0	0	0	709	709	709	0	0
Total										
	4,776	**-412**	**4,364**	**412**	**2,225**	**2,888**	**5,524**	**9,889**	**17,756**	**26,712**

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1/25/2019

Note:

1. Designated Open Space includes lands not planned for development, based on directions from District staff.

Table 2.3 Historical and Projected Population

Recycled Water Master Plan

Marina Coast Water District

PRELIMINARY

Year	Population[1,2]	Annual Growth (%)
Historical Population		
2005	29,477	-
2006	29,154	-1.1%
2007	29,065	-0.3%
2008	29,533	1.6%
2009	29,743	0.7%
2010	30,840	3.7%
2011	31,141	1.0%
2012	31,445	1.0%
2013	31,752	1.0%
2014	32,062	1.0%
2015	32,375	1.0%
2016	33,346	3.0%
2017	34,347	3.0%
2018	35,377	3.0%
Projected Population		
2019	36,438	3.0%
2020	37,531	3.0%
2021	38,657	3.0%
2022	39,817	3.0%
2023	41,012	3.0%
2024	42,242	3.0%
2025	43,509	3.0%
2026	44,815	3.0%
2027	46,159	3.0%
2028	47,544	3.0%
2029	48,970	3.0%
2030	50,439	3.0%
2031	51,952	3.0%
2032	53,511	3.0%
2033	55,116	3.0%
2034	56,770	3.0%
2035	58,473	3.0%
2036	60,227	3.0%
2037	62,034	3.0%
2038	63,895	3.0%
2039	65,812	3.0%
2040	67,786	3.0%
2041	69,820	3.0%
2042	71,914	3.0%
2043	74,072	3.0%
2044	76,294	3.0%
2045	78,583	3.0%
2046	80,940	3.0%
2047	83,368	3.0%

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Note:

1. Population for years 2005 - 2015 extracted from Marina Coast Water District 2015 Urban Water Management Plan
2. Population for years 2016 - 2047 calculated assuming annual growth rate of 3.0% as directed by District staff.

CHAPTER 3 - SYSTEM PERFORMANCE AND DESIGN CRITERIA

This chapter presents the District's performance and design criteria, which was used in this analysis for evaluating existing and proposed distribution mains, storage reservoirs, and pump stations.

3.1 SUPPLY AVAILABILITY

The available recycled water supply for potential users within the District service area is based on supply agreements between M1W (formerly known as the Monterey Regional Water Pollution Control Agency) and the District, known as the Pure Water Delivery and Supply Project Agreement Between Monterey Regional Water Pollution Control Agency and Marina Coast Water District, which was adopted in April 2016 (2016 PWD Agreement). The agreement allocated water supplies for non-potable reuse with the District service area, and includes other uses as follows:

- **Advanced Water Treatment Facility (AWTF) Phase 1:** AWTF Phase 1 includes the expansion of the AWTF facility to produce an additional 600 acre-feet per year (AFY) of purified recycled water to for delivery to Fort Ord Reuse Authority land use jurisdiction members, in addition to the 3,700 AFY of purified recycled water delivery to the Seaside Groundwater Basin, for a total purified water production capacity of 4,300 AFY.

- **Advanced Water Treatment Facility (AWTF) Phase 2:** AWTF Phase 2 includes an additional 827 AFY, for a total delivery of 1,427 AFY, of purified recycled water to for delivery to Fort Ord Reuse Authority land use jurisdiction members, in addition to the 3,700 AFY of purified recycled water delivery to the Seaside Groundwater Basin, for a total purified water production capacity of 5,127 AFY.

Under the 2016 PWD Agreement, MCWD was responsible for the following:

- Securing right-of-way for the transmission main segment that traverses the District's service area.
- Conducting CEQA for the transmission main
- Completing design documents and construction contracts for the transmission main
- Finance, construct and install the transmission main facilities

3.2 STORAGE CRITERIA

The District recently completed the construction of the Blackhorse Reservoir, a 2.0 million gallon (MG) reservoir, and is connected to the transmission main constructed as part of the Pure Water Monterey Project. This storage reservoir is intended to provide operational equalization during peak demand periods or provide a limited source of recycled water supply when the M1W Pump Station in non-operational.

It is generally recommended that storage reservoirs be sized, at a minimum, to meet the difference between maximum day and peak hour demand. If opportunities arise for additional storage, the District may explore the option of providing more large scale storage reservoirs, which are capable providing supplemental supplies during high use periods of the year.

3.3 PRESSURE CRITERIA

Acceptable service pressures within distribution systems vary depending on various criteria and pressure zone topography. It is essential that the water pressure at the point of delivery be maintained within an acceptable range. Low pressures below 30 psi can cause undesirable flow reductions during high use periods, and especially when directly connecting irrigation systems to the recycled water system.

Excessively high pressures can cause delivery components to leak and valve seats to wear out prematurely. Additionally, high service pressures can cause unnecessarily high flow rates, which can result in wasted water. The District criteria for pressures in the recycled water delivery system, shown on **Table 3.1**, are summarized as follows:

- Maximum Delivery Pressure: 100 psi
- Minimum Delivery Pressure: 40 psi

It should be noted that due to the topography between the M1W pump station and the Blackhorse Reservoir, pressures in the transmission main are expected to exceed 100 psi. Therefore, any delivery connections directly connected to the transmission main, or any delivery turnouts intended to serve multiple customers, shall be fitted with a pressure reducing valve to ensure delivery pressure remain within the acceptable range.

3.4 PEAKING FACTORS AND DIURNAL CURVE

Recycled water demands vary seasonally, as they are typically heat dependent irrigation uses. Additionally, special regulations imposed by the Department of Public Health regulate irrigation times allowed for surfaces that may be contacted by people. Thus, irrigation peaking factors can be significant in recycled systems, as many users require the same time period and seasonal use period.

Water use conditions that are of particular importance to the recycled water distribution system include the average day demand (ADD), the maximum day demand (MDD), and the peak hour demand (PHD). The average day demand represents the annual water demand, divided by 365 days, since it is expressed in daily units. The winter demand typically represents the low month water demands and is used for simulating water quality analysis.

Table 3.1 Design and Planning Criteria Summary

Recycled Water Master Plan

Marina Coast Water District

PRELIMINARY

Design Parameter	Criteria
Supply[1]	AWTF Phase 1: Maximum available recycled water supply equal to 600 afy AWTF Phase 2: Maximum available recycled water supply equal to 1,427 afy
Distribution Mains[2]	Distribution mains should be designed to satisfy the following criteria: Maximum Pipeline Velocity: 8.5 ft/s Minimum Pipeline Velocity: 2.0 ft/s Maximum Pipeline Headloss: 8 ft/kft Minimum Acceptable Pipeline Diameter: 4-inch
Pump Stations	Replenish 2.0 MG Reservoir During Off-Demand Periods (15 hours)
Pressure Reducing Valves	PRVs should be designed to meet Peak Hour Demand
Demand Peaking Factors	Maximum Day Demand = 2.5 x Average Day Demand
Service Pressure[3]	Maximum Delivery Pressure 100 psi Minimum Delivery Pressure 40 psi

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2/4/2019

Notes:

1. Source: "Pure Water Delivery and Supply Project Agreement" received from District staff April 7, 2017.
2. Source: 2006 Basis of Design Report, Table 5-1
3. Source: Recycled water operations plan received from District staff January 11, 2018.

3.4.1 Delivery Operations

District criteria stipulate that the use of recycled water for irrigation purposes must not exceed nine hours a day, specifically between the hours 9 PM and 6 AM unless otherwise approved by the district. For planning purposes it is assumed that the future recycled water customers will directly connect to the distribution system and receive the daily demand over a period of nine hours, as summarized on **Figure 3.1**.

It should be noted that some users may receive recycled water deliveries to onsite storage facilities, which would allow recycled water deliveries over a period greater than nine hours. For conservative planning purposes, it was assumed all users will receive deliveries over nine hours.

3.4.2 Maximum Day Demand

The maximum day demand (MDD) is the highest demand that occurs within a 24 hour day during a year and usually occurs during the summer months. This demand condition is typically used to evaluate storage and pumping conditions. Due to the lack of available daily demand data for the future recycled water system customers, a planning factor was assumed to develop the maximum day demands. This factor is generally consistent with previous planning efforts completed by the District and was approved by District staff.

The following equation is then used to estimate the maximum day demand, given the average day demand:

Maximum Day Demand = **2.5** x Average Day Demand

3.4.3 Peak Hour Demand

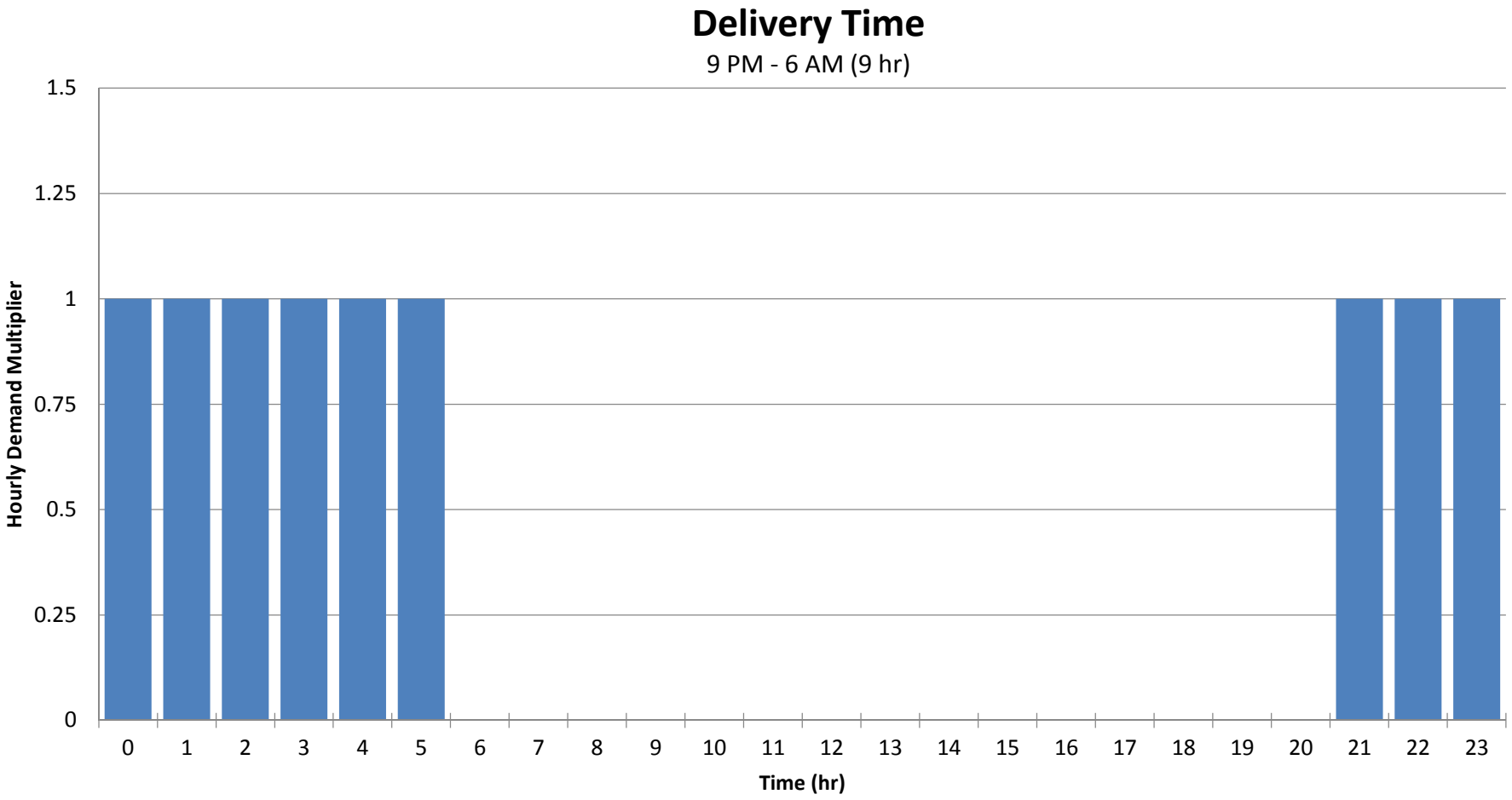
The peak hour demand (PHD) is another high demand condition that is used in the evaluation and design of distribution systems. The peak hour demand is the highest demand that occurs within a one hour period during a year, and is considered to be the largest single measure of the maximum demand placed on the distribution system.

The peak hour demand factor used for planning purposes is based on delivering the daily demand requirement over a period of nine hours. Based on this assumption the peak hour demand can then be calculated using the maximum day demand and the following equation:

Peak Hour Demand = **2.7** x Maximum Day Demand

3.5 TRANSMISSION AND DISTRIBUTION MAIN CRITERIA

Transmission and distribution mains are usually designed to convey the maximum expected flow condition. In municipal water systems, this condition is usually the greater of either the peak hour demand or the maximum day demand plus fire flow. The hydrodynamics of pipe flow create two additional parameters that are taken into consideration when evaluating or sizing water mains: head loss and velocity.



LEGEND

PRELIMINARY

Note: Recycled water delivery hours based on 9 hour delivery schedule specified in "MCWD Recycled Water Project User's Handbook"

December 1, 2017

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Figure 3.1
Proposed Delivery Pattern
Recycled Water Master Plan
Marina Coast Water District

Head loss is a loss of energy within pipes that is caused by the frictional effects of the inside surface of the pipe and friction within the moving fluid itself. Head loss creates a loss in pressure which is undesirable in water distribution systems. Head loss, by itself, is not an important factor as long as the pressure criterion has not been violated. However, high head loss may be an indicator that the pipe is nearing the limit of its carrying capacity and may not have sufficient capacity to perform under stringent conditions.

The pipeline criteria that was used to size and evaluate the recycled water infrastructure is as follows:

- Maximum Headloss: 8 feet per 1,000 feet of pipeline
- Maximum Velocity: 8.5 feet per second
- Minimum Velocity: 2.0 feet per second
- Minimum Acceptable Pipeline Diameter: 4-inches

CHAPTER 4 – EXISTING RECYCLED WATER SYSTEM

This chapter provides a description of the District's existing recycled water system facilities and the recycled water supply quality.

4.1 EXISTING RECYCLED WATER SYSTEM INFRASTRUCTURE

The District's existing recycled water system consists of inactive areas of distribution and transmission pipeline that were constructed in anticipation of the delivery of recycled water. The District has required newer developments to install dual pipeline systems, with backflow prevention devices connected to the potable water system in the near term. As recycled water is made available to these developments, the systems will be switched to recycled water delivery, and potable water will only be used during periods of shortfall of recycled water.

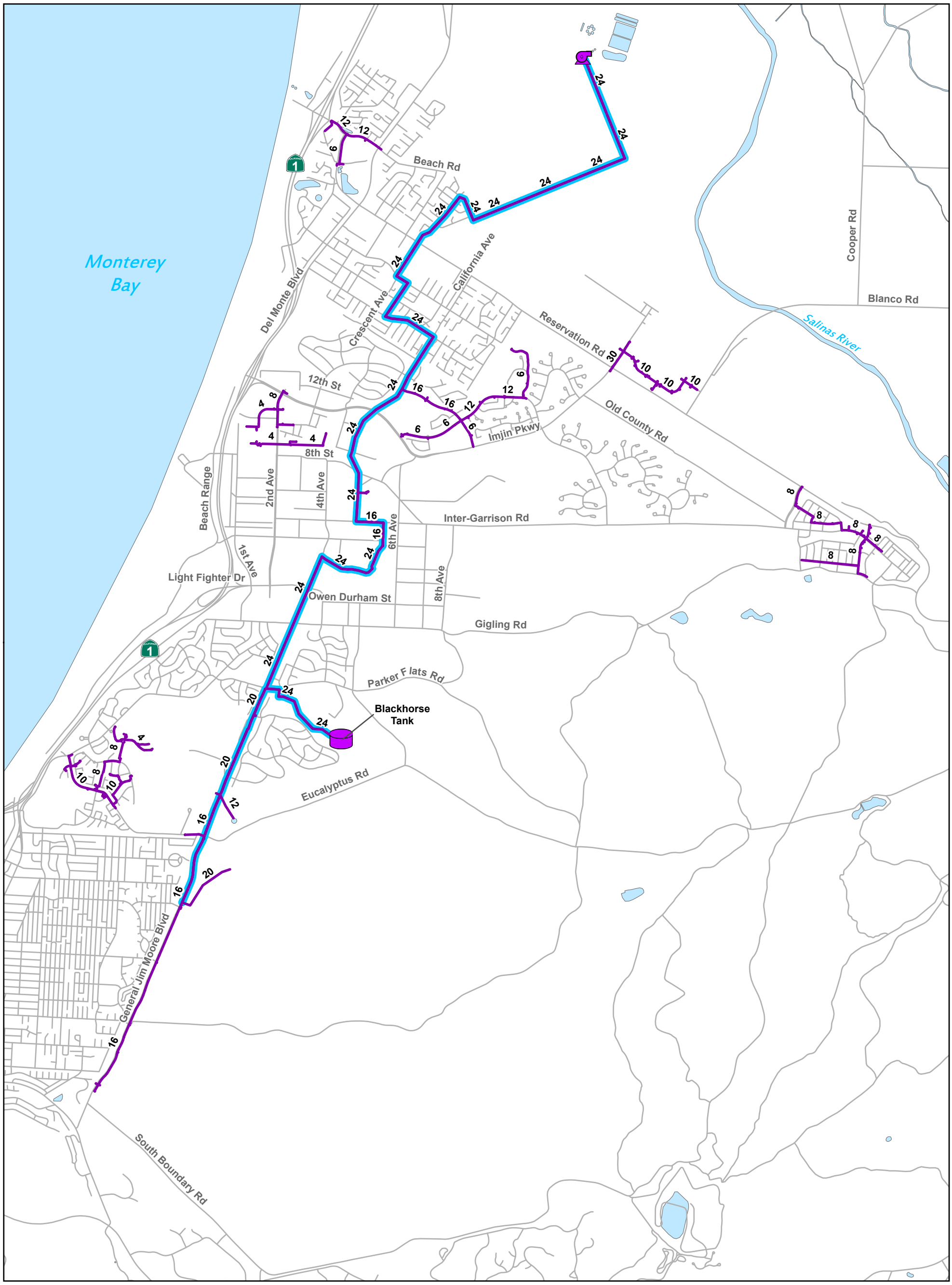
As shown on **Figure 4.1**, the District has constructed recycled water pipelines in proximity to areas of potential recycled water use in anticipation of future recycled water deliveries. Additionally, a portion of the PWM transmission main has been constructed along General Jim Moore Boulevard, generally south of Parker Flats Road.

4.2 SOURCE OF SUPPLY AND WATER QUALITY

As outlined in the 2016 Pure Water Delivery Supply Project Agreement, the District is allocated 600 AFY of initial recycled water supply from Phase 1 of the Pure Water Monterey project, with an increase of 827 AFY as part of Phase 2. Thus, the total agreement allocation of recycled water deliveries are estimated at 1,427 AFY. This supply will be treated at the Advanced Water Treatment Facility (AWTF) at the Monterey One Water (M1W) regional wastewater treatment plant. A pump station will deliver the District's allocated supply to the planned transmission and distribution system.

As part of this Master Plan, GHD performed a water quality review of the existing MCWD and Monterey One Water agreements (**Appendix A**). Their report, in part, summarizes the agreement that Monterey One Water has committed to delivering recycled water to MCWD that meets the applicable standards of water quality in accordance with State of California law, including but not limited to the Title 22 Standards set forth by the California Department of Public Health. As the MCWD municipal uses include landscape irrigation, Title 22 requires that the recycled wastewater meets the minimum disinfected tertiary treatment standards.

It should be noted that, as the recycled water produced at the Monterey One Water WWTP is processed through the Advanced Water Treatment Plant, and thus exceeds the tertiary effluent requirements. This is memorialized in the 2016 PWD Agreement and acknowledged by MCWD and Monterey One Water. The water used for landscape irrigation and other authorized users will meet the regulations consistent with Indirect Potable Reuse at the Seaside Groundwater Injection



Legend

Existing Modeled System

- Tank
- AWTF Pump Station
- Pipes
- PWM Transmission Main
- Streets
- Rivers/Streams
- Waterbodies

PRELIMINARY

Update: March 5, 2019

0 0.25 0.5 1 Mile

N W GIS E S

Figure 4.1
Existing Recycled Water System

Recycled Water Master Plan
Marina Coast Water District

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\Marina_Coast_WD\RecycledWater\MCWD_Fig4-1_ExistingSystem_030519.mxd

Wells. This water meets turbidity requirements such that was quality does not exceed 0.2 NTU more than 5% of the time within a 24 hour period, and does not exceed 0.5 NTU at any time.

4.3 PUMP STATION

Monterey One Water has recently completed the Product Water Pump Station, which was sized to deliver approximately 5.0 million gallons per day at firm capacity via three 1,160 gallon per minute (gpm) pumps. There is a fourth pump at the station that is dedicated as standby capacity. The minimum capacity of the pump station is approximately 833 gpm. This pump station was designed to deliver water directly to the MCWD Blackhorse Reservoir and Groundwater Injection Wells in Seaside, thus the rated head of the pump station is approximately 470 feet.

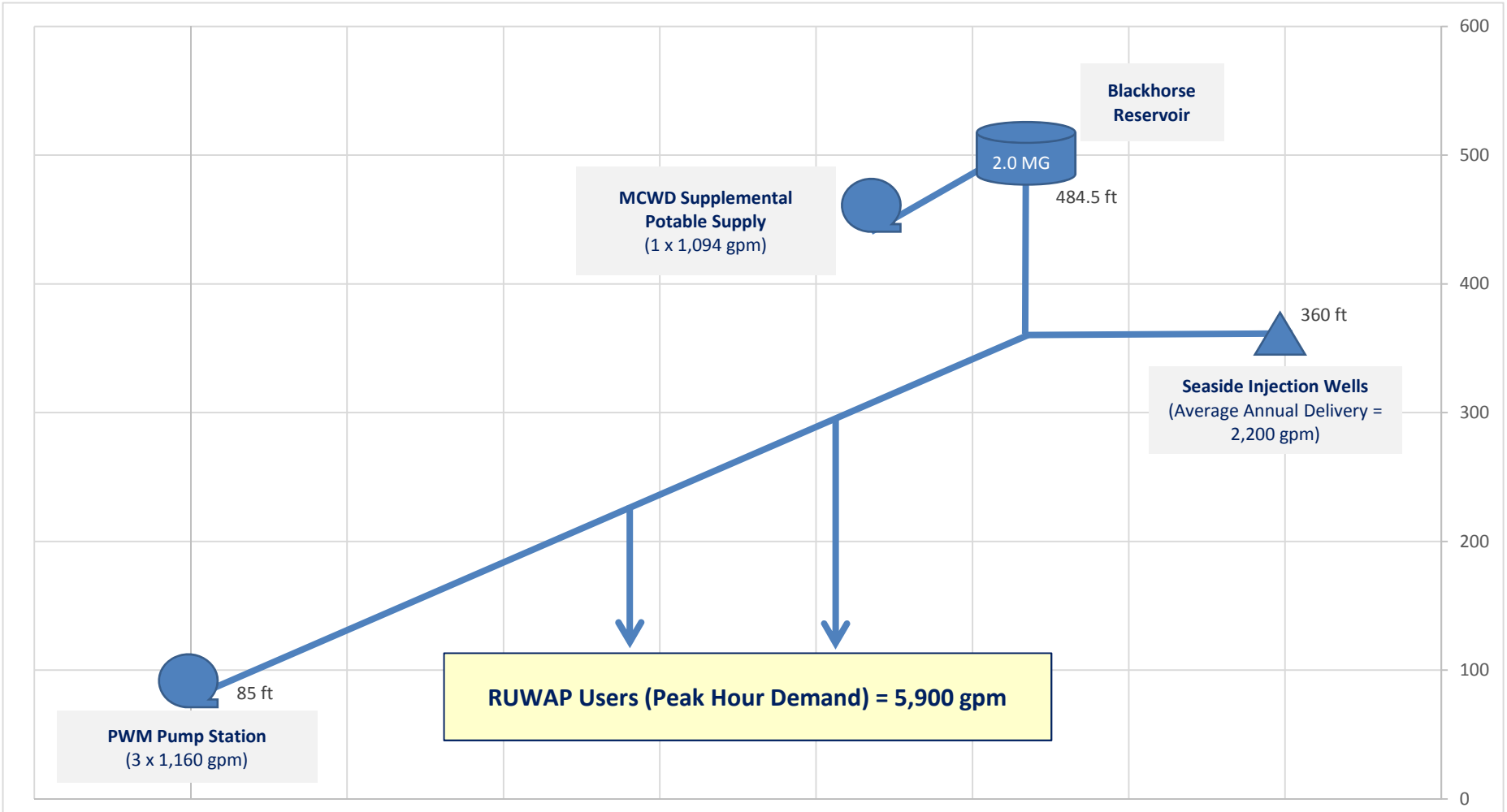
It should be noted that this pump station is designed to meet the average daily demand for the Seaside Groundwater Injection Wells (3,700 AFY) and of the MCWD recycled water demand allocation (1,427 AFY). To supplement the maximum day demands for peak night time irrigation at full buildout of Phase 2 of the MCWD recycled water users, a manual operated potable water connection to the Blackhorse Reservoir was constructed, that is capable of delivering 1,000 gpm to the delivery system. The connection will be supplied by a pump rated at 1,094 gpm and 39 feet of head. A connectivity schematic is shown on **Figure 4.2**, and which documents the interconnectivity between the PWM pipeline and pump station, the RUWAP users, Blackhorse Reservoir, and the Seaside Injection Wells.

4.4 WATER DISTRIBUTION PIPELINES

There are two critical components to the recycled water pipeline network, and which deliver water from the Advanced water Treatment Facility pump station and to the customers: the Pure Water Monterey Delivery Pipeline and the Regional Urban Water Augmentation Project Pipelines. These projects are discussed as follows:

- **Pure Water Monterey Delivery Pipeline:** This pipeline is 24-inches in diameter, with a small portion of constructed 16-inch pipeline, and was recently completed by MCWD as part of the 2016 PWM Agreement. This pipeline, nearly 8-miles in length, traverses the MCWD service area, through Central Marina and the Ord Community, before discharging at the Blackhorse Reservoir and continuing to the Seaside Groundwater Injection Wells. This pipeline capacity was planned for delivery of 3,700 AFY of groundwater injection demand, and 1,427 AFY of MCWD recycled water demand, as part of this Master Plan. The PWM delivery pipeline, consisting of nearly 10 miles of 16, 20, and 24-inch pipe is shown on **Figure 4.1**.

- **Regional Urban Water Augmentation Project (RUWAP):** MCWD has been proactively planning their recycled water delivery network as part of the RUWAP program, and which includes extending recycled water delivery pipelines from the PWM transmission main to the customers. Existing pipelines constructed as part of the RUWAP program are shown on **Figure 4.1** The pipelines were inventoried as part of this Master Plan and documented



LEGEND

- Blackhorse Tank
- Planned Ground Water Recharge
- Pump Stations

PRELIMINARY

February 8, 2019

Figure 4.2
Connectivity Schematic

Recycled Water Master Plan
Marina Coast Water District

AKEL ENGINEERING GROUP, INC.

on Table 4.1. For each pipe diameter, the inventory lists the length in feet, as well as the total length in units of miles. This system has approximately 11.0 miles of pipeline.

4.5 STORAGE RESERVOIRS

Storage reservoirs are typically incorporated in the water system to provide water supply for operation during periods of high demand and for other emergencies. The District recently completed construction on the new 2.0 MG Blackhorse storage reservoir, located east of General Jim Moore Boulevard. This storage reservoir is intended to provide operational storage volume for the recycled water system during peak hour demand periods. The reservoir is 67 feet in diameter and has a floor elevation of 484.5 feet.

As discussed in a previous section, this reservoir is capable of supplemental fill off of the MCWD potable water system via a manual 1,094 gpm pump station at the tank site.

Table 4.1 Existing Recycled Water Pipeline Inventory

Recycled Water Master Plan

Marina Coast Water District

PRELIMINARY

Pipeline Diameter (in)	Length (ft)	Length (mi)	Percent of Total (%)
4	7,276	1.4	6.6%
6	7,914	1.5	7.1%
8	14,201	2.7	12.8%
10	9,862	1.9	8.9%
12	7,193	1.4	6.5%
14	1,658	0.3	1.5%
16	16,651	3.2	15.0%
20	4,433	0.8	4.0%
24	40,290	7.6	36.4%
30	1,334	0.3	1.2%
Total	**110,813**	**21.0**	100.0%

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2/4/2019

Notes:

1. Pipeline information based on CAD drawings provided by District Staff December 14, 2016.

CHAPTER 5 – RECYCLED WATER DEMANDS

This chapter summarizes the potential recycled water demands identified within the District's service area, the maximum day and peak hour demands for the potential future users, and demand diurnal patterns.

5.1 RECYCLED WATER DEMANDS

The following sections document the future recycled water demands for the Pure Water Monterey project and the future RUWAP users.

5.1.1 Pure Water Monterey Project

The total volume of recycled water delivered to the Seaside Groundwater Injection Well site as part of the Pure Water Monterey Project is anticipated to vary seasonally; these seasonal volumes are summarized as follows:

- Average Annual Delivery: 3.1 mgd (3,500 AFY)
- Maximum Winter Delivery: 4.3 mgd
- Minimum Summer Delivery: 1.4 mgd

For evaluation purposes the average annual delivery rate of 3.1 mgd is included in the future system evaluation discussed in a later chapter. This delivery volume is assumed to be delivered concurrently with the RUWAP deliveries.

5.1.2 Regional Urban Water Augmentation Project

The 2006 Recycled Water Basis of Design Report (BODR) incorporates the potential recycled water users identified as part of the 2003 Regional Urban Recycled Water Distribution Pipeline study prepared by RBF Consulting and the 1996 Monterey Peninsula Reclaimed Water Urban Reuse Feasibility Study prepared by CH2MHill. These potential recycled water users were updated in 2015 and generally include landscape irrigation for parkstrips and medians, parks and play fields, schools, and golf courses. Additionally, the list of potential users includes demand estimates for future development, such as planned golf courses and schools.

The 2015 update to the BODR categorizes potential recycled water users into a long-term phasing plan for connecting future users. For the purposes of this master plan, and based on comments revising the phasing of the 2015 timeline for customers to come online, the RUWAP recycled water demands have been separated into three demand tiers and are summarized as follows:

- **Tier 1 (Imminent):** The Tier 1 users are planned for imminent connection to the recycled water system and are shown graphically on **Figure 5.1** and summarized on **Table 5.1**. These users will utilize the entirety of the District's AWTF Phase 1 supply of 600 AFY.

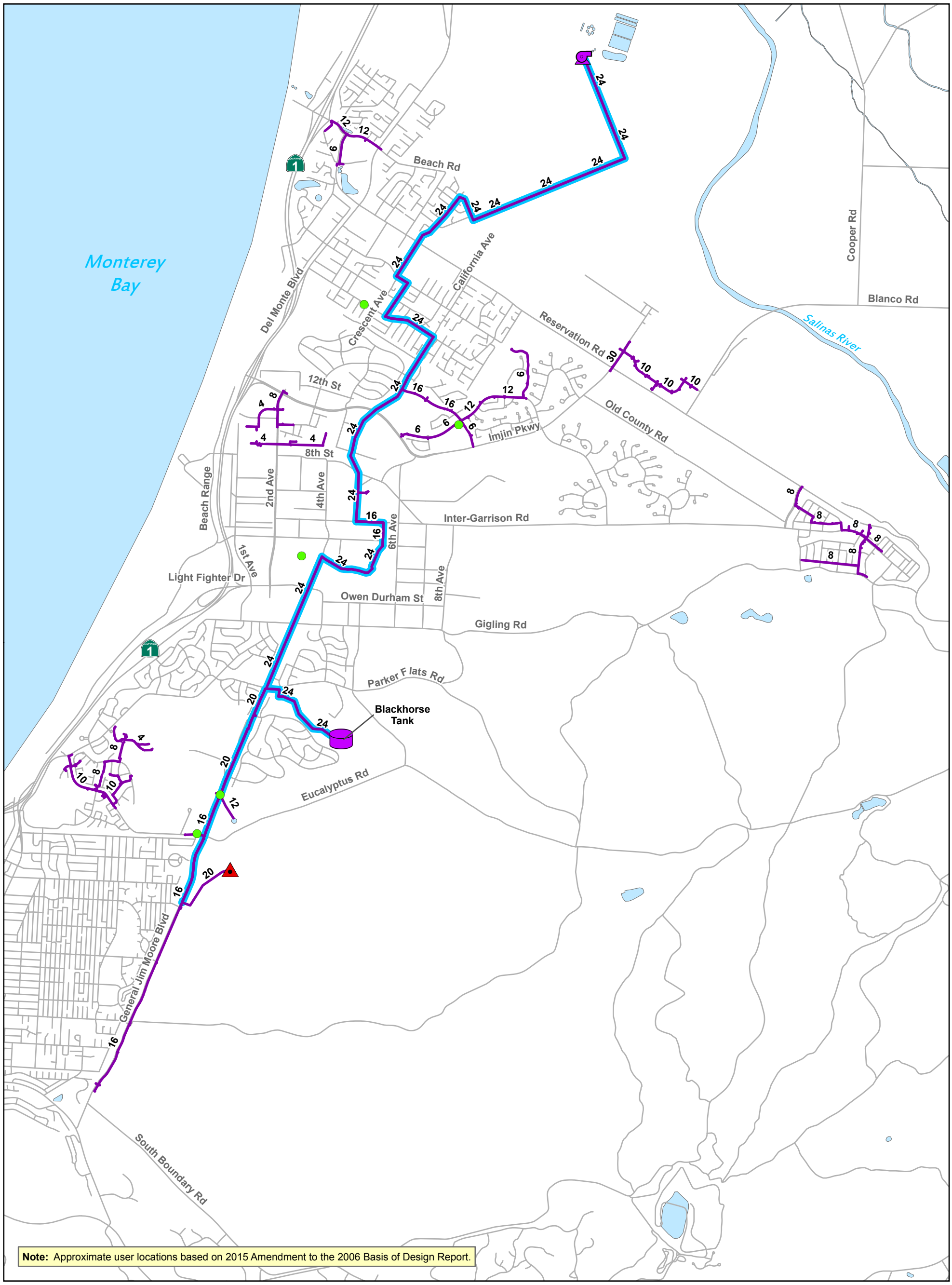

Monterey Bay
Beach Rd
Del Monte Blvd
California Ave
Crescent Ave
Cooper Rd
Blanco Rd
Salinas River
Reservation Rd
Old County Rd
12th St
8th St
Imjin Pkwy
Beach Range
2nd Ave
4th Ave
6th Ave
1st Ave
8th Ave
Inter-Garrison Rd
Light Fighter Dr
Owen Durham St
Gigling Rd
Parker F lats Rd
Blackhorse Tank
Eucalyptus Rd
General Jim Moore Blvd
South Boundary Rd
Note: Approximate user locations based on 2015 Amendment to the 2006 Basis of Design Report.
Legend
Tier 1 Users
Planned Groundwater Recharge Location
Existing Modeled System
Tank
AWTF Pump Station
Pipes
PWM Transmission Main
Streets
Rivers/Streams
Waterbodies
PRELIMINARY
0 0.25 0.5 1 Mile
N
W GIS E
S
Update: March 5, 2019
AKEL ENGINEERING GROUP, INC.
File Path: P:\xGIS\GIS_Projects\Marina_Coast_WD\RecycledWater\MCWD_Fig5-1_FutUsersTier1_030519.mxd
Figure 5.1
Future Users
Tier 1 (Imminent)
Recycled Water Master Plan
Marina Coast Water District
MARINA COAST WATER DISTRICT

Table 5.1 Tier 1 (Imminent) Recycled Water Demands

Recycled Water Master Plan
Marina Coast Water District

PRELIMINARY

Customer Name	Use Location	Use Type	Estimated Annual Usage[1]	Maximum Daily Usage[2]	Delivery Information		
					Delivery Time[3]	Estimated Delivery Flow	
			(afy)	(gpd)	(hours)	(gpd)	(gpm)
Los Arboles	Marina	Play Field	25.6	57,084	9	152,224	106
Marina Heights	Marina - Fort Ord	Landscape	10.0	22,318	9	59,513	41
Bayonet/Blackhorse Golf Course	Seaside	Golf Course	491.4	1,096,613	9	2,924,302	2,031
Fitch School	Seaside	Play Field	11.0	24,552	9	65,473	45
CSUMB - Main Campus	CSUMB	Play Field	69.8	155,674	9	415,131	288
		Subtotal - Tier 1	**607.7**	**1,356,241**		**3,616,644**	**2,512**
Total Recycled Water Demands							
AKEL ENGINEERING GROUP, INC.		**Total - Tier 1**	**607.7**	**1,356,241**		**3,616,644**	**2,512**

3/4/2019

Notes:

1. Customer information and estimated daily usage extracted from Basis of Design Report inventory provided by MCWD staff September 4, 2018.
2. Maximum Daily Usage estimated assuming Maximum Day Demand = 2.5 x Average Daily Usage
3. Delivery Time of 9-hour assumes overnight flow delivery, from 9 PM to 6 AM.

- **Tier 2 (Near Term):** The users planned for service within the near term (5-year) horizon are shown graphically on **Figure 5.2** and summarized on **Table 5.2**. These users will utilize a portion of the District AWTF Phase 2 recycled water allocation of 827 AFY.

- **Tier 3 (Intermediate Term):** These users are planned for the intermediate (10-year) horizon, and are shown graphically on **Figure 5.3** and summarized on **Table 5.3**. These users are planned to utilize the remaining AWTF Phase 2 water supply allocation of 827 AFY. It should be noted that currently identified Tier 3 users exceed the allocation, and thus additional allocation would be required, or portions of these users will be excluded pending the expanded allocation.

- **Tier 4 (Long Term):** These users are planned for the long-term (15-year and beyond) horizon, and are summarized on **Table 5.4**. These users are in excess of the current capacity allocation agreement with M1W, and will require additional recycled water entitlements and improvements prior to service.

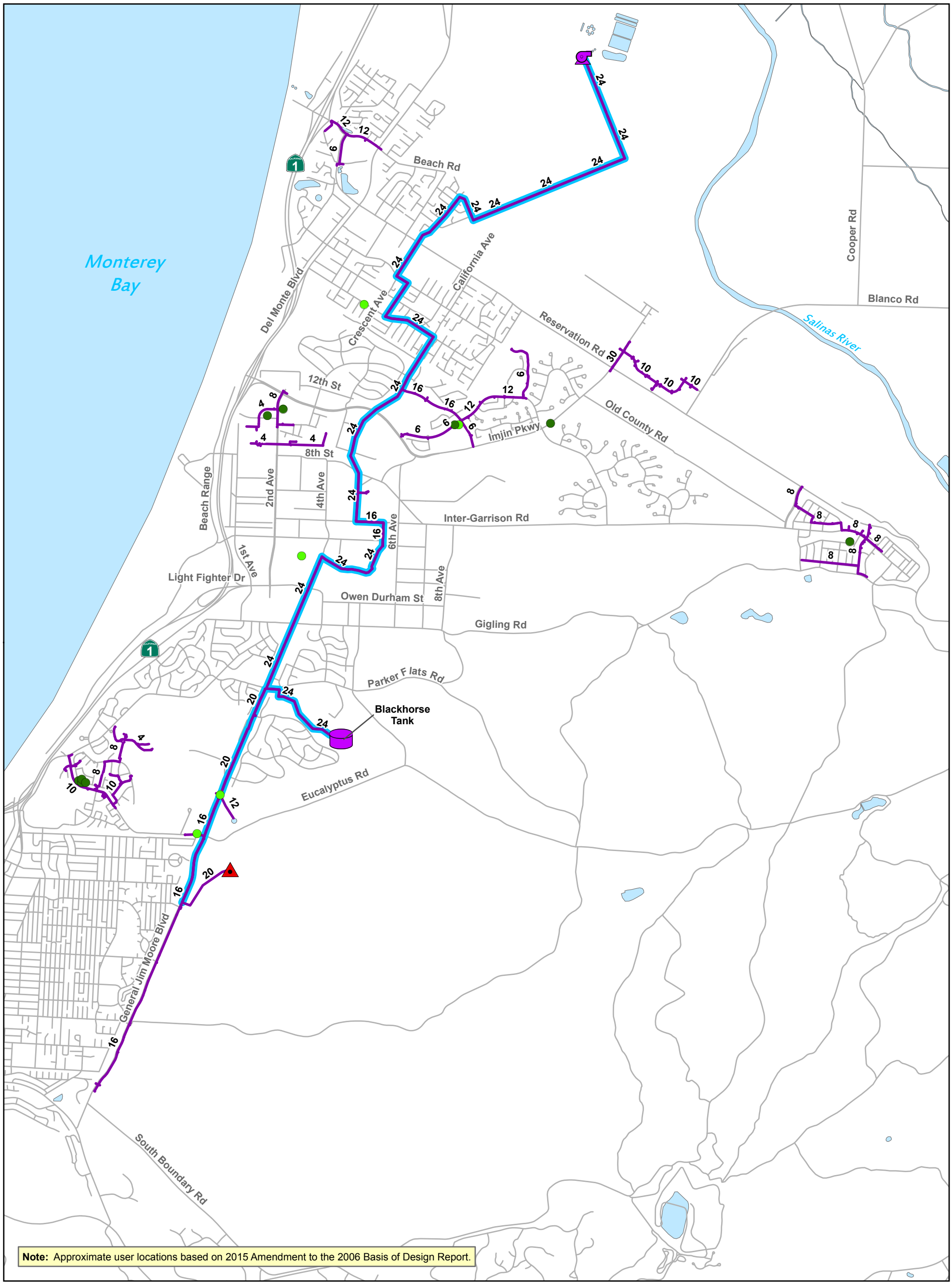
In addition to the average annual usage for each potential recycled water customer, **Table 5.1** through **Table 5.4** include two additional demand conditions that are summarized as follows:

- **Maximum Daily Delivery:** The maximum daily delivery represents the maximum volume of water delivered on the highest demand day of the year. This volume is based on the maximum day peaking factor of 2.5 applied to the average annual usage, as discussed in a previous chapter.

- **Estimated Delivery Flow:** The estimated delivery flow represents the total flow rate required to deliver the maximum daily delivery volume over the 9-hour delivery period.

5.2 DIURNAL DEMAND PATTERNS

As discussed in a previous chapter the District's criteria stipulate that recycled water must be applied between the hours of 9 P.M. and 5 A.M., which results in the application of a user's daily water volume over a nine hour period. Some users receiving recycled water deliveries to onsite storage facilities such as lakes or ponds may be able to receive deliveries over a 24-hour period. However, for evaluation purposes it was assumed that the users currently planned for service with the District's recycled water allocation will operate on a nine hour delivery schedule.


Monterey Bay
Beach Rd
Del Monte Blvd
California Ave
Crescent Ave
Cooper Rd
Blanco Rd
Salinas River
Reservation Rd
Old County Rd
12th St
8th St
Imjin Pkwy
Beach Range
2nd Ave
4th Ave
6th Ave
Inter-Garrison Rd
1st Ave
Light Fighter Dr
Owen Durham St
8th Ave
Gigling Rd
Parker F lats Rd
Blackhorse Tank
Eucalyptus Rd
General Jim Moore Blvd
South Boundary Rd
Note: Approximate user locations based on 2015 Amendment to the 2006 Basis of Design Report.
Legend
Tier 1 Users
Tier 2 Users
Planned Groundwater Recharge Location
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Tank
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Pipes
PWM Transmission Main
Streets
Rivers/Streams
Waterbodies
PRELIMINARY
Update: March 5, 2019
0 0.25 0.5 1 Mile
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AKEL ENGINEERING GROUP, INC.
File Path: P:\xGIS\GIS_Projects\Marina_Coast_WD\RecycledWater\MCWD_Fig5-2_FutUsersTier2_030519.mxd
Figure 5.2
Future Users
Tier 2 (Near Term)
Recycled Water Master Plan
Marina Coast Water District
MARINA COAST WATER DISTRICT

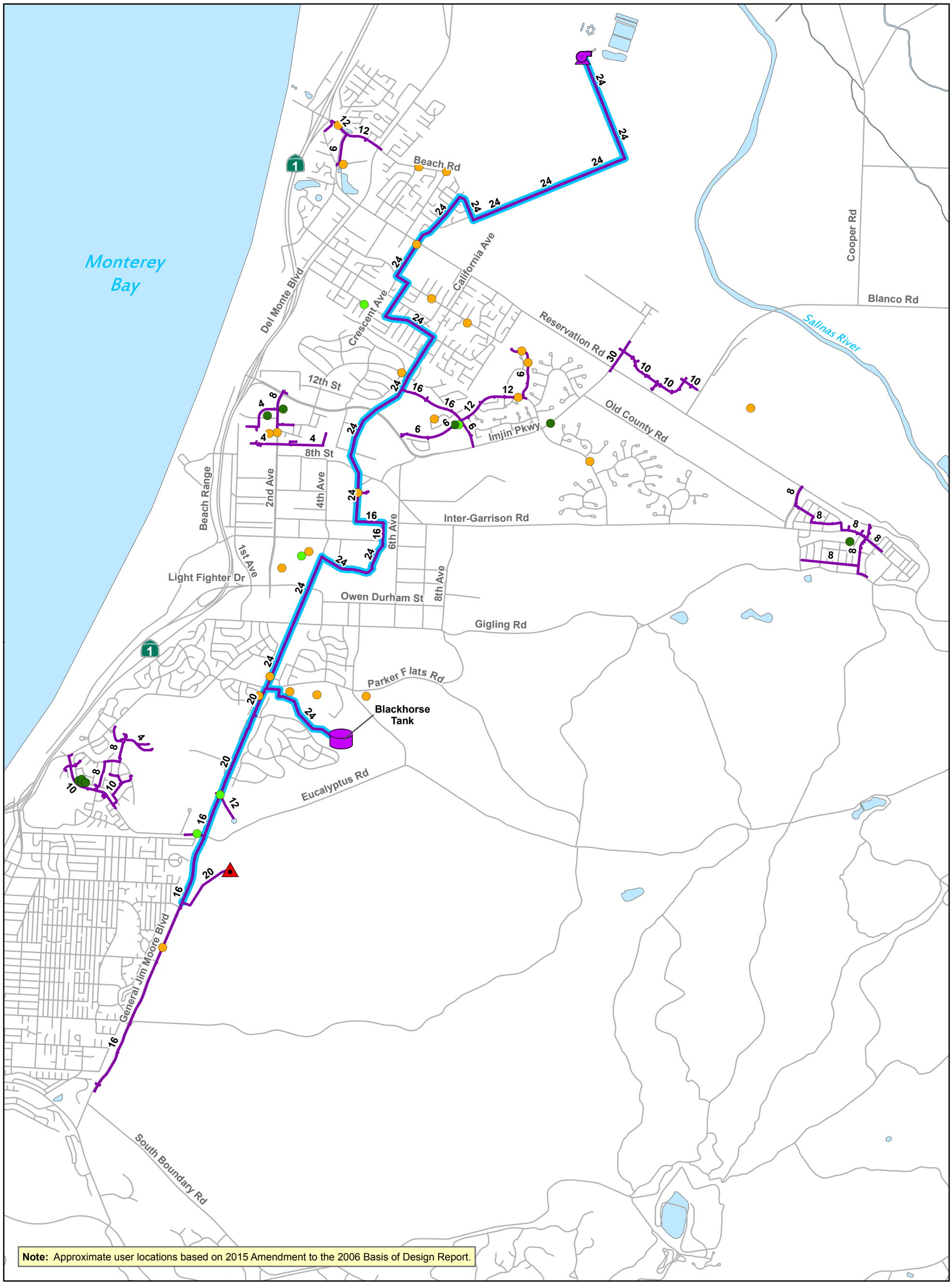
Monterey Bay
Beach Rd
Del Monte Blvd
Crescent Ave
California Ave
Cooper Rd
Blanco Rd
Salinas River
Reservation Rd
Old County Rd
12th St
8th St
Imjin Pkwy
Beach Range
2nd Ave
4th Ave
1st Ave
6th Ave
8th Ave
Inter-Garrison Rd
Light Fighter Dr
Owen Durham St
Gigling Rd
Parker F lats Rd
Blackhorse Tank
Eucalyptus Rd
General Jim Moore Blvd
South Boundary Rd
Note: Approximate user locations based on 2015 Amendment to the 2006 Basis of Design Report.
Legend
Tier 1 Users
Tier 2 Users
Tier 3 Users
Planned Groundwater Recharge Location
Existing Modeled System
Tank
AWTF Pump Station
Pipes
PWM Transmission Main
Streets
Rivers/Streams
Waterbodies
PRELIMINARY
Update: March 5, 2019
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Figure 5.3
Future Users
Tier 3 (Intermediate)
Recycled Water Master Plan
Marina Coast Water District
MARINA COAST WATER DISTRICT

Table 5.2 Tier 2 (Near Term) Recycled Water Demands

Recycled Water Master Plan
Marina Coast Water District

PRELIMINARY

Customer Name	Use Location	Use Type	Estimated Annual Usage[1]	Delivery Information			
				Maximum Daily Usage[2]	Delivery Time[3]	Estimated Delivery Flow	
			(afy)	(gpd)	(hours)	(gpd)	(gpm)
Marina Heights	Marina - Fort Ord	Landsacpe	50.0	111,588	9	297,567	207
Median Landscaping	Marina - Fort Ord	Landsacpe	12.9	28,767	9	76,711	53
Dunes on Monterey Bay	Marina - Fort Ord	Landscape	30.0	66,953	9	178,540	124
East Garrison Housing	Monterey County	Landscape	75.6	168,691	9	449,842	312
Hayes School	Seaside	Play Field	5.5	12,276	9	32,736	23
Seaside Highlands	Seaside	Landscape/Play Field	89.7	200,175	9	533,800	371
Soper Field	Seaside	Play Field	8.3	18,414	9	49,105	34
		Subtotal - Tier 2	**271.9**	**606,863**		**1,618,301**	**1,124**
Total Recycled Water Demands							
		Tier 1 Demand Subtotal	**607.7**	**1,356,241**		**3,616,644**	**2,512**
AKEL ENGINEERING GROUP, INC.		**Total - (Tier 1 & 2)**	**879.6**	**1,963,104**		**5,234,944**	**3,635**

3/4/2019

Notes:
1. Customer information and estimated daily usage extracted from Basis of Design Report inventory provided by MCWD staff September 4, 2018.
2. Maximum Daily Usage estimated assuming Maximum Day Demand = 2.5 x Average Daily Usage
3. Delivery Time of 9-hour assumes overnight flow delivery, from 9 PM to 6 AM.

Table 5.3 Tier 3 (Intermediate Term) Recycled Water Demands

Recycled Water Master Plan
Marina Coast Water District

PRELIMINARY

Customer Name	Use Location	Use Type	Estimated Annual Usage[1]	Delivery Information			
				Maximum Daily Usage[2]	Delivery Time[3]	Estimated Delivery Flow	
			(afy)	(gpd)	(hours)	(gpd)	(gpm)
Crumpton School	Marina	Play Field	12.9	28,849	9	76,930	53
Marina Vista School	Marina	Play Field	11.0	24,552	9	65,473	45
Olson School	Marina	Play Field	7.7	17,187	9	45,831	32
Reservation Road Medians	Marina	Landscape	3.0	6,748	9	17,994	12
Marina Landing Shopping	Marina	Landscape	4.7	10,543	9	28,115	20
Tate Park	Marina	Play Field	6.9	15,345	9	40,920	28
Windy Hill Park	Marina	Play Field	4.7	10,435	9	27,826	19
Marina Heights Development	Marina - Fort Ord	Landsacpe	173.4	386,884	9	1,031,692	716
Preston Park	Marina - Fort Ord	Landscape/Play Field	19.6	43,843	9	116,915	81
Future High School	Marina - Fort Ord	Play Field	44.0	98,209	9	261,891	182
Dunes on Monterey Bay	Marina - Fort Ord	Landscape/Play Field	37.2	83,114	9	221,638	154
Equestrian Center	Marina - Fort Ord	Landsacpe	10.0	22,318	9	59,513	41
Future Elementary School	Marina - Fort Ord	Play Field	13.8	30,690	9	81,841	57
CSUMB East Campus	CSUMB	Play field	52.3	116,623	9	310,996	216
CSUMB - Main Campus	CSUMB	Play field	151.2	337,542	9	900,113	625
CSUMB - Other	CSUMB	Landsacpe	37.8	84,345	9	224,921	156
UCMBEST	UCMBEST	Landscape	58.6	130,735	9	348,628	242
Veteran's Cemetery -- PHASE 1	Seaside/Monterey County	Cemetery	42.5	94,889	9	253,036	176
Parkway/Visitor/Retail Areas	Seaside	Landscape	52.9	118,084	9	314,890	219
Shea's Gym Athletic Field	Seaside	Landscape/Play Field	8.3	18,414	9	49,105	34
Stilwell Housing Area	Seaside	Landscape	47.2	105,432	9	281,151	195
Stilwell School	Seaside	Play Field	5.5	12,276	9	32,736	23
Marshall School	Seaside	Play Field	5.5	12,276	9	32,736	23
Chartwell School	Seaside	Play Field	5.5	12,276	9	32,736	23
		Subtotal - Tier 3	**816.2**	**1,821,611**	**9**	**4,857,629**	**3,373**
Cumulative Recycled Water Demands							
		Tier 1 & 2 Subtotal	**879.6**	**1,963,104**		**5,234,944**	**3,635**
		Total - Tier 1, 2, & 3	**1,695.9**	**3,784,715**		**10,092,573**	**7,009**

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3/4/2019

Notes:
1. Customer information and estimated daily usage extracted from Basis of Design Report inventory provided by MCWD staff September 4, 2018.
2. Maximum Daily Usage estimated assuming Maximum Day Demand = 2.5 x Average Daily Usage
3. Delivery Time of 9-hour assumes overnight flow delivery, from 9 PM to 6 AM.

Table 5.4 Tier 4 (Long Term) Recycled Water Demands

Recycled Water Master Plan
Marina Coast Water District

PRELIMINARY

Customer Name	Use Location	Use Type	Estimated Annual Usage[1] (afy)	Delivery Information: Maximum Daily Usage[2] (gpd)	Delivery Information: Delivery Time[3] (hours)	Delivery Information: Estimated Delivery Flow (gpd)	Delivery Information: Estimated Delivery Flow (gpm)
2030 Customers							
Library	Marina	Landscape	1.0	2,232	9	5,951	4
Del Mar School	Marina	Play Field	8.0	17,800	9	47,468	33
Locke Paddon Park	Marina	Landscape	1.0	2,232	9	5,951	4
Vince Di Maggio Park	Marina	Landscape	10.4	23,195	9	61,853	43
Median Landscaping	Marina	Landscape	2.8	6,326	9	16,869	12
Marina Station	Marina	Landscape	39.7	88,563	9	236,167	164
Cypress Knolls	Marina - Fort Ord	Landscape	9.4	21,086	9	56,230	39
Patton School	Marina - Fort Ord	Play Field	11.0	24,552	9	65,473	45
First Tee Golf Course	Seaside	Golf Course	209.2	466,820	9	1,244,854	864
Del Rey Oaks Golf Course	Del Rey Oaks	Golf Course	305.0	680,618	9	1,814,983	1,260
MPC Training Center	Monterey County	Landscape	21.6	48,288	9	128,767	89
Monterey Horse Park	Monterey County	Landscape	75.6	168,691	9	449,842	312
Youth Camp	Monterey County	Play Field	30.3	67,519	9	180,050	125
		Subtotal - Tier 3 (2030)	**725.0**	**1,617,922**		**4,314,459**	**2,996**
2035 Customers							
Marina Golf Course	Marina - Fort Ord	Golf Course	243.8	544,163	9	1,451,102	1,008
UCMBEST	UCMBEST	Landscape	68.8	153,452	9	409,205	284
State Park Wetlands	State Parks	Landscape	4.7	10,543	9	28,115	20
Future Parks	Army	Landscape	37.8	84,345	9	224,921	156
		Subtotal - Tier 3 (2035)	**355.1**	**792,504**		**2,113,343**	**1,468**
Cumulative Recycled Water Demands							
		Tier 1, 2, & 3 Subtotal	**1,695.9**	**3,784,715**		**10,092,573**	**7,009**
		Total - Tier 1, 2, 3, & 4	**2,775.9**	**6,195,141**		**16,520,376**	**11,472**

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3/4/2019

Notes:

1. Customer information and estimated daily usage extracted from Basis of Design Report inventory provided by MCWD staff September 4, 2018.
2. Maximum Daily Usage estimated assuming Maximum Day Demand = 2.5 x Average Daily Usage
3. Delivery Time of 9-hour assumes overnight flow delivery, from 9 PM to 6 AM.

CHAPTER 6 - HYDRAULIC MODEL DEVELOPMENT

This chapter describes the development and calibration of the District's recycled water distribution system hydraulic model. The hydraulic model was used to evaluate the capacity adequacy of the planned users.

6.1 OVERVIEW

Hydraulic network analysis has become an effectively powerful tool in many aspects of water distribution planning, design, operation, management, emergency response planning, system reliability analysis, fire flow analysis, and water quality evaluations. The District's hydraulic model was used to evaluate the capacity adequacy of the existing system and to plan its expansion to service anticipated future growth.

6.2 MODEL SELECTION

The District's hydraulic model combines information on the physical characteristics of the water system (pipelines, pump station, valves, and the storage reservoir) and operational characteristics (how they operate). The hydraulic model then performs calculations and solves series of equations to simulate flows in pipes and calculate pressures at nodes or junctions.

There are several network analysis software products that are released by different manufacturers, which can equally perform the hydraulic analysis satisfactorily. The selection of a software depends on user preferences, the distribution system's unique requirements, and the costs for purchasing and maintaining the software.

The District's does not have a previous model for the combined RUWAP and PWM systems. As part of the PWM design and construction effort, a baseline model was developed in Bentley's WaterGems. As the design report was available, and the District elected to utilize the InfoWater model by Innovyze, the hydraulic model was redeveloped using available design and mapping documents. The model has an intuitive graphical interface and is directly integrated with ESRI's ArcGIS (GIS).

6.3 HYDRAULIC MODEL DEVELOPMENT

Developing the hydraulic model included skeletonization, digitizing and quality control, developing pipe and node databases, and water demand allocation.

6.3.1 Skeletonization

Skeletonizing the model refers to the process where pipes not essential to the hydraulic analysis of the system are stripped from the model. Skeletonizing the model is useful in creating a system that accurately reflects the hydraulics of the pipes within the system, while reducing complexities

of large systems, which will reduce the time of analysis while maintaining accuracy, but will also comply with limitations imposed by the computer program. Due to the small nature of the recycled water system, there was not a need to skeletonize the model.

6.3.2 Pipes and Nodes

Computer modeling requires the compilation of large numerical databases that enable data input into the model. Detailed physical aspects, such as pipe size, pipe elevation, and pipe lengths, contribute to the accuracy of the model.

Pipes and nodes represent the physical aspect of the system within the model. A node is a computer representation of a place where demand may be allocated into the hydraulic system, while a pipe represents the distribution and transmission aspect of the water demand. In addition, reservoir dimensions and capacities, and pump station capacity and design head, and pressure reducing valve settings were also included in the hydraulic model.

6.3.3 Digitizing and Quality Control

The District's existing recycled water distribution system was digitized in GIS using several sources of data and various levels of quality control. The data sources included the District's existing CAD database, and various planning and design documents related to the PWM and RUWAP program.

After reviewing the available data sources, the hydraulic model was developed and verified by District staff. Using the existing GIS version of the system, as well as the existing hydraulic model, this project developed the recycled water system in GIS. Resolving discrepancies in data sources was accomplished by graphically identifying identified discrepancies and submitting it to engineering and public works staff for review and comments. District comments were incorporated in the verified model.

6.3.4 Demand Allocation

Demand allocation consists of assigning recycled water demand values to the appropriate nodes in the model. The goal is to distribute the demands throughout the model to best represent actual system response.

The existing demand distribution was obtained from mapping provided by District staff and demands from the Basis of Design Report. The Basis of Design Report itemized each of the potential users by a numbered identifier and the corresponding mapping had points with the number. Based on that data, each point represented a user, and the corresponding demand was allocated to the nearest recycled water infrastructure in the model.

6.4 MODEL CALIBRATION

The recycled water infrastructure is new and users are in the process of connection to the PWM pipeline. As connections are made, and the system begins to operate under typical demand

loading, and the Seaside Groundwater Injection Wells are utilized, it is recommended that the hydraulic model undergo a calibration effort to accurately reflect the constructed system conditions. The hydraulic model developed as part of this master plan is considered planning level, and reflects the design documents referenced as part of the model development process.

CHAPTER 7 - EVALUATION AND PROPOSED IMPROVEMENTS

This section presents a summary of the recycled water system evaluation and identifies improvements necessary to serve future users.

7.1 OVERVIEW

The hydraulic model was used for evaluating the distribution system and determining the capacity adequacy of the RUWAP pipelines. This included evaluating the existing pipelines to determine if any deficiencies were present, and sizing the connections to the PWM transmission main.

The criteria used for evaluating the capacity adequacy of the recycled water distribution system facilities (transmission mains, storage reservoirs, and booster stations) was discussed and summarized in the System Performance and Design Criteria chapter.

The demands included for the hydraulic model, and used as a part of this master plan evaluation are as follows:

- **Seaside Groundwater Injection Wells:** The groundwater injection facility demand was assumed at average annual usage (approximately 3,500 AFY) during the hydraulic analysis. While the 2016 PWD Agreement stipulates the injection facility may receive a maximum day delivery of up to nearly 4,500 AFY, it is assumed this delivery will occur in months when the District's recycled water demands are lowest.
- **RUWAP Distribution System:** Under the AWTF Phase 1 supply conditions, it is assumed the recycled water distribution system is conveying a peak delivery flow of approximately 2,500 gpm. Under the AWTF Phase 2 supply conditions, it is assumed the recycled water distribution system is conveying a peak delivery flow of approximately 5,900 gpm. These demands are equivalent to the previously allocated 2016 PWD Agreement, and peaked for seasonal usage.

A recycled water supply capacity analysis for the AWTF Phase 1 and AWTF Phase 2 is summarized on Table 7.1. This capacity analysis documents the peak delivery requirements for both AWTF phasing, available pump station supply capacities, and required storage volume from Blackhorse Reservoir. As is shown on Table 7.1 the existing Blackhorse reservoir is appropriately sized to meet the difference between peak delivery demands and the available pumping capacity, which includes the AWTF pump station and the connection to the potable water system.

7.2 PLANNED IMPROVEMENTS

This master plan evaluated the deliveries to the RUWAP identified users, which were included in the 2006 BODR. This report identified the users, quantified their demands, and proposed connection projects to meet the needs of the users. MCWD staff provided the BODR report to

Table 7.1 Recycled Water Capacity Analysis

Recycled Water Master Plan

Marina Coast Water District

PRELIMINARY

	AWTF Phase 1 Supply	AWTF Phase 2 Supply	
Peak Delivery Requirements			
RUWAP Peak Delivery Requirement[1]	2,484	5,908	gpm
Seaside Groundwater Injection Wells[2]	2,174	2,174	gpm
Total Delivery Requirement	4,658	8,081	gpm
Pump Station Supply Capacities			
AWTF Pump Station Firm Capacity (3 x 1,160 gpm)	3,480	3,480	gpm
Potable System Connection	1,000	1,000	gpm
Total Available Pumping Capacity	4,480	4,480	gpm
Capacity Analysis			
Peak Delivery Requirement	4,658	8,081	gpm
Available Pumping Capacity	4,480	4,480	gpm
Supply Required from Storage	**-178**	**-3,601**	gpm
Storage Requirement[3]	**0.10**	**1.94**	MG

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2/1/2019

Notes:

1. RUWAP peak delivery requirements based on the following:
   AWTF Phase 1: Deliver 1,500 AFY (600 AFY x 2.5) over 9 hours
   AWTF Phase 1: Deliver 3,568 AFY (1,427 AFY x 2.5) over 9 hours
2. Delivery requirement equal to average annual volume of 3,500 AFY
3. Volume supplied assumes 9-hour discharge at required flow rate

Akel Engineering Group, Inc, and was incorporated into this master plan. The demands for the recycled water system were integrated into the hydraulic model, and improvements were documented to connect up to 1,427 AFY of average recycled water demands.

The improvement recommendations are shown on **Figure 7.1**, and documented on **Table 7.2**. A discussion of the pipeline and pressure reducing valve improvements are included in the following sections.

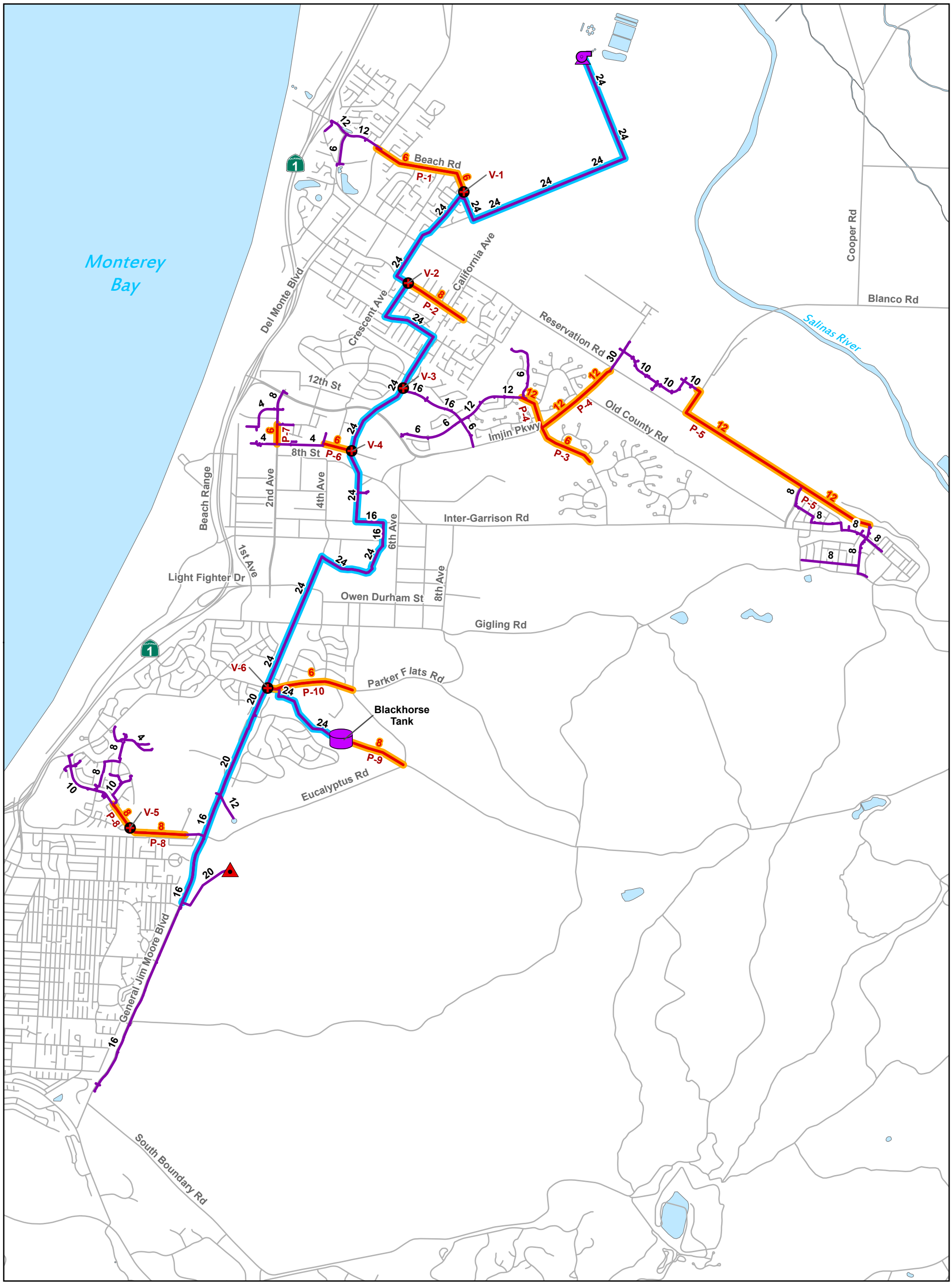
7.2.1 Pipeline Improvements

This section documents pipeline improvements within the Marina Coast recycled water service area.

- **P-1**: Construct a new 6-inch pipeline in Beach Road from Del Monte to Crescent Avenue.
- **P-2:** Construct a new 8-inch pipeline in Carmel Avenue from Vaughn Avenue to Crumpton Lane.
- **P-3:** Construct a new 6-inch pipeline in Abrams Road from Imjin Parkway to Bunker Hill Drive.
- **P-4:** Construct a new 12-inch pipeline in Abrams Road and Imjin Parkway from MacArthur Drive to Reservation Road.
- **P-5:** Construct a new 12-inch pipeline in Reservation Road from Blanco Road to East Garrison.
- **P-6:** Construct a new 12-inch pipeline in 9th Street from Sea Glass Avenue to 5th Avenue.
- **P-7:** Construct a new 6-inch pipeline in 2nd Avenue from 10th Street to 9th Street.
- **P-8:** Construct a new 8-inch pipeline in Coe Avenue from Pacific Crest Drive to Paralta Avenue.
- **P-9:** Construct a new 8-inch pipeline in the future right-of-way from Blackhorse Reservoir to Eucalyptus Road. It should be noted that this pipeline includes demands from the potential City of Seaside First Tee Golf Course Project. Service of this golf course will require further hydraulic analysis pending finalized delivery location and may require the construction of an additional pump station.
- **P-10:** Construct a new 8-inch pipeline in Normandy Road from General Jim Moore Boulevard to the Veteran's Cemetery.

7.2.2 Pressure Reducing Valves

This section documents pressure reducing valve improvements for the recycled water distribution system. It should be noted that for planning purposes this evaluation assumed a minimum



Legend

- Planned Groundwater Recharge Location

Future Improvements

- Valves
- Distribution Pipelines

Existing Modeled System

- Tank
- AWTF Pump Station
- Pipes
- PWM Transmission Main

- Streets
- Rivers/Streams
- Waterbodies

PRELIMINARY

Update: March 5, 2019

0 0.25 0.5 1 Mile

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AKEL ENGINEERING GROUP, INC.

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Figure 7.1
Future Recycled Water System

Recycled Water Master Plan
Marina Coast Water District

MARINA COAST WATER DISTRICT

Table 7.2 Schedule of Improvements

Recycled Water Master Plan
Marina Coast Water District

PRELIMINARY

Improvement No.	Improv. Type	Alignment	Limits	Improvement Details			
Distribution Pipeline Improvements				Existing Diameter (in)	New/Parallel/ Replace	Diameter (in)	Length (ft)
P-1	Pipeline	Beach Rd	From Del Monte to Crescent Ave	-	New	6	4,000
P-2	Pipeline	Carmel Ave	From Vaughn Ave to Crumpton Ln	-	New	8	2,500
P-3	Pipeline	Abrams Dr	From Imjin Rd to Bunker Hill Dr	-	New	6	2,300
P-4	Pipeline	Abrams Rd, Imjin Rd	From MacArthur Dr to Reservation Rd	-	New	12	4,875
P-5	Pipeline	Reservation Road	From Blanco Rd to East Garrison	-	New	12	9,100
P-6	Pipeline	9th St	From Sea Glass Ave to 5th Ave	-	New	6	1,050
P-7	Pipeline	2nd Ave	From 10th St to 9th St	-	New	6	750
P-8	Pipeline	Coe Ave	From Pacific Crest Dr to Paralta Ave	-	New	8	1,500
P-9	Pipeline	Future ROW	From Blackhorse Reservoir to Eucalyptus Rd	-	New	8	2,550
P-10	Pipeline	Normandy Rd	From General Jim Moore Blvd to Parker Flats Rd	-	New	6	3,250
Valve Improvements				New/Replace	Prelminary Size (in)		
PRV-1	PRV	Intersection of Beach Rd and Crescent Ave		New	4		
PRV-2	PRV	Intersection of Carmel Ave and Vaughn Ave		New	4		
PRV-3	PRV	California Ave s/o 3rd Ave		New	6		
PRV-4	PRV	Intersection of 9th St and 5th Ave		New	4		
PRV-5	PRV	Intersection of Coe Ave and Buttercup Blvd		New	4		
PRV-6	PRV	Intersection of General Jim Moore Blvd and Normandy Rd		New	4		

pressure reducing valve size of 4-inches. However, District staff may evaluate reduced valve sizes during design of the distribution system when peak delivery requirements are finalized.

- **PRV-1**: Construct a new 4-inch pressure reducing valve at the intersection of Beach Road and Crescent Avenue.
- **PRV-2**: Construct a new 4-inch pressure reducing valve at the Intersection of Carmel Avenue and Vaughn Avenue.
- **PRV-3**: Construct a new 6-inch pressure reducing valve at California Avenue south of 3rd Avenue.
- **PRV-4**: Construct a new 4-inch pressure reducing valve at the intersection of 9th Street and 5th Avenue.
- **PRV-5**: Construct a new 4-inch pressure reducing valve at the intersection of Coe Avenue and Buttercup Boulevard.
- **PRV-6**: Construct a new 4-inch pressure reducing valve at the intersection of General Jim Moore Boulevard and Normandy Road.

7.3 LONG-TERM SUPPLY AND DELIVERY NEEDS

This section is intended to address the potential long-term supply and delivery needs for the MCWD recycled water system. This includes impacts to the recycled water supply from Monterey One Water, and potential for future expansion of the MCWD recycled water system.

7.3.1 Long-Term Recycled Water Supply and Demand

The District is currently entitled to approximately 1,427 AFY under the 2016 PWD Agreement. This agreement is satisfied under 2 phases of expansion at the Advanced Water Treatment Facility for Monterey One Water, and under the Phase 1 demands for the RUWAP. According to the 2019 Sewer Master Plan (2019 SMP), the District averages approximately 1,200 AFY discharge of flow to the Central Marina outfall, and an additional 950 AFY at the Ord Community outfall. The total discharge of approximately 2,150 AFY exceeds the current recycled water agreement allocation of 1,427 AFY. Additionally, as development occurs within the MCWD service area, the 2019 SMP anticipates flows will increase to approximately 5,600 AFY at buildout.

As discussed in the GHD report, MCWD has adopted development code that requires the installation of recycled water pipelines to serve all recreational and common irrigated open space areas within new developments, subject to the Monterey County Department of Environmental Health and State Department of Public Health approval. The City of Seaside has adopted even more stringent requirements, which stipulate that residential front yards require plumbing for potential future recycled water, in addition to recreational and common areas. As sewer flows are expected to increase, and MCWD has committed to using recycled water as an in-lieu source of

supply, it is recommended that the District continue to explore opportunities to increase their recycled water entitlements at the Monterey One Water Advanced Water Treatment Plant.

7.3.2 Impacts to Recycled Water Infrastructure

Currently, the District's recycled water infrastructure was designed and has been constructed in accordance with the PWM and RUWAP findings. As flows continue to increase to the Monterey One Water Treatment Plant, and the need for supplemental water supply increases, the District should continue to explore the expansion of its recycled water facilities. This will likely include an agreement similar to the 2016 PWD Agreement, and include the following:

- Construction of additional advanced water treatment capacity at the treatment plant
- Construction of additional pumping capacity at the Product Water Pumping Facility
- Construction of new pipeline conveyance and storage facilities to meet the additional demand needs

It should be noted that the BODR identified demands that exceed the current MCWD entitlements, and thus there is a current market for additional supplemental recycled water. If additional entitlements are secured and new facilities are constructed to deliver recycled water to MCWD users, it is recommended that additional capacity be constructed in the new booster station at the Product Water Pumping Facility.

7.3.3 Groundwater Injection Barrier Project

As part of ongoing efforts to mitigate seawater intrusion in the groundwater aquifers from which the District's existing domestic water wells supply the potable water system, the District has reviewed the possible construction of groundwater injection facilities in the Central Marina service area. This project is currently in the conceptual phase and would potentially include the expansion of the AWTF, a new AWTF booster pump station, pipelines from the transmission facilities to the injection site, and multiple monitoring wells.

CHAPTER 8 – CAPITAL IMPROVEMENT PROGRAM

This chapter provides a summary of the recommended recycled water system improvements to accommodate anticipated users within the 2016 PWD Agreement. The chapter also presents the cost criteria and methodologies for developing the capital improvement program. Finally, a capacity allocation analysis, usually used for cost sharing purposes, is also included.

8.1 COST ESTIMATE ACCURACY

Cost estimates presented in the CIP were prepared for general master planning purposes and, where relevant, for further project evaluation. Final costs of a project will depend on several factors including the final project scope, costs of labor and material, and market conditions during construction.

The Association for the Advancement of Cost Engineering (AACE International), formerly known as the American Association of Cost Engineers has defined three classifications of assessing project costs. These classifications are presented in order of increasing accuracy: Order of Magnitude, Budget, and Definitive.

- **Order of Magnitude Estimate.** This classification is also known as an “original estimate”, “study estimate”, or “preliminary estimate”, and is generally intended for master plans and studies.

  This estimate is not supported with detailed engineering data about the specific project, and its accuracy is dependent on historical data and cost indexes. It is generally expected that this estimate would be accurate within -30 percent to +50 percent.

- **Budget Estimate.** This classification is also known as an “official estimate” and generally intended for predesign studies. This estimate is prepared to include flow sheets and equipment layouts and details. It is generally expected that this estimate would be accurate within -15 percent to +30 percent.

- **Definitive Estimate.** This classification is also known as a “final estimate” and prepared during the time of contract bidding. The data includes complete plot plans and elevations, equipment data sheets, and complete specifications. It is generally expected that this estimate would be accurate within -5 percent to + 15 percent.

Costs developed in this study should be considered “Order of Magnitude” and have an expected accuracy range of **-30 percent** and **+50 percent**.

8.2 COST ESTIMATE METHODOLOGY

Cost estimates presented in this chapter are opinions of probable construction and other relevant costs developed from several sources including cost curves, Akel experience on other master planning projects, and input from District staff. Where appropriate, costs were escalated to reflect the more current Engineering News Records (ENR) Construction Cost Index (CCI).

This section documents the unit costs used in developing the opinion of probable construction costs, the Construction Cost Index, the land acquisition costs, and markups to account for construction contingency and other project related costs.

8.2.1 Unit Costs

The unit cost estimates used in developing the Capital Improvement Program are summarized on **Table 8.1**. Recycled water pipeline unit costs are based on length of pipes, in feet. Storage reservoir unit costs are based on capacity, per million gallons (MG). Pump Station costs are based on an equation that replaces the pump curve.

The unit costs are intended for developing the Order of Magnitude estimate and do not account for site specific conditions, labor and material costs during the time of construction, final project scope, implementation schedule, detailed utility and topography surveys for reservoir sites, investigation of alternative routings for pipes, and other various factors. The capital improvement program included in this report accounts for construction and project-related contingencies as described in this chapter.

8.2.2 Construction Cost Index

Costs estimated in this study are adjusted utilizing the Engineering News Record (ENR) Construction Cost Index (CCI), which is widely used in the engineering and construction industries.

The costs in this Recycled Water Master Plan were benchmarked using a 20-City national average ENR CCI of 11,089 reflecting a date of June 2018.

8.2.3 Construction Contingency Allowance

Knowledge about site-specific conditions for each proposed project is limited at the master planning stage; therefore, construction contingencies were used. The estimated construction costs in this master plan include a **48.5 percent** contingency allowance to account for unforeseen events and unknown field conditions.

Table 8.1 Unit Costs

Recycled Water Master Plan
Marina Coast Water District

PRELIMINARY

Pipelines	
Pipe Size (in)	**Cost**[2] ($/lineal foot)
6	$107
8	$142
12	$213
16	$256
18	$276
20	$316
24	$346
30	$383
36	$451

Pump Stations	
Estimated Pumping Station Unit Cost ($/gpm), where Q is equal to the total station capacity in gpm	
Construct New Pump Station	Unit Cost ($/gpm) = 191.99 x $e^{-0.0001 \times Q}$
Upgrade Existing Pump Station	Unit Cost ($/gpm) = 160.97 x $e^{-0.00008 \times Q}$

Pressure Reducing Valves	
Size (in)	**Cost** ($)
PRV	$73,000

Storage Reservoirs[2]	
≤1.0 MG	$2.92
1.1 MG-3.0 MG	$2.33
3.1 MG - 5.0 MG	$1.68
> 5 MG	$1.25

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3/1/2019

Notes:

1. Construction costs estimated using June 2018 ENR CCI of 11,089
2. Tank costs were adjusted to reflect recent construction for a 1.5 MG tank, as provided by District staff on 2/7/2019.

8.2.4 Project Related Costs

The capital improvement costs also account for project-related costs, comprising of engineering design, project administration (developer and District staff), construction management and inspection, and legal costs. The project related costs in this master plan were estimated by applying an additional **25 percent** to the estimated construction costs.

8.3 CAPITAL IMPROVEMENT PROGRAM

The Capital Improvement Program costs for the projects identified in this master plan for mitigating existing system deficiencies and for serving anticipated future growth throughout the District are summarized on **Table 8.2**.

Each improvement was assigned a unique coded identifier associated with the improvement type and is summarized graphically on **Figure 8.1**. The estimated construction costs include the baseline costs plus **48.5 percent** contingency allowance to account for unforeseen events and unknown field conditions, as described in a previous section. Capital improvement costs include the estimated construction costs plus **25 percent** project-related costs (engineering design, project administration, construction management and inspection, and legal costs).

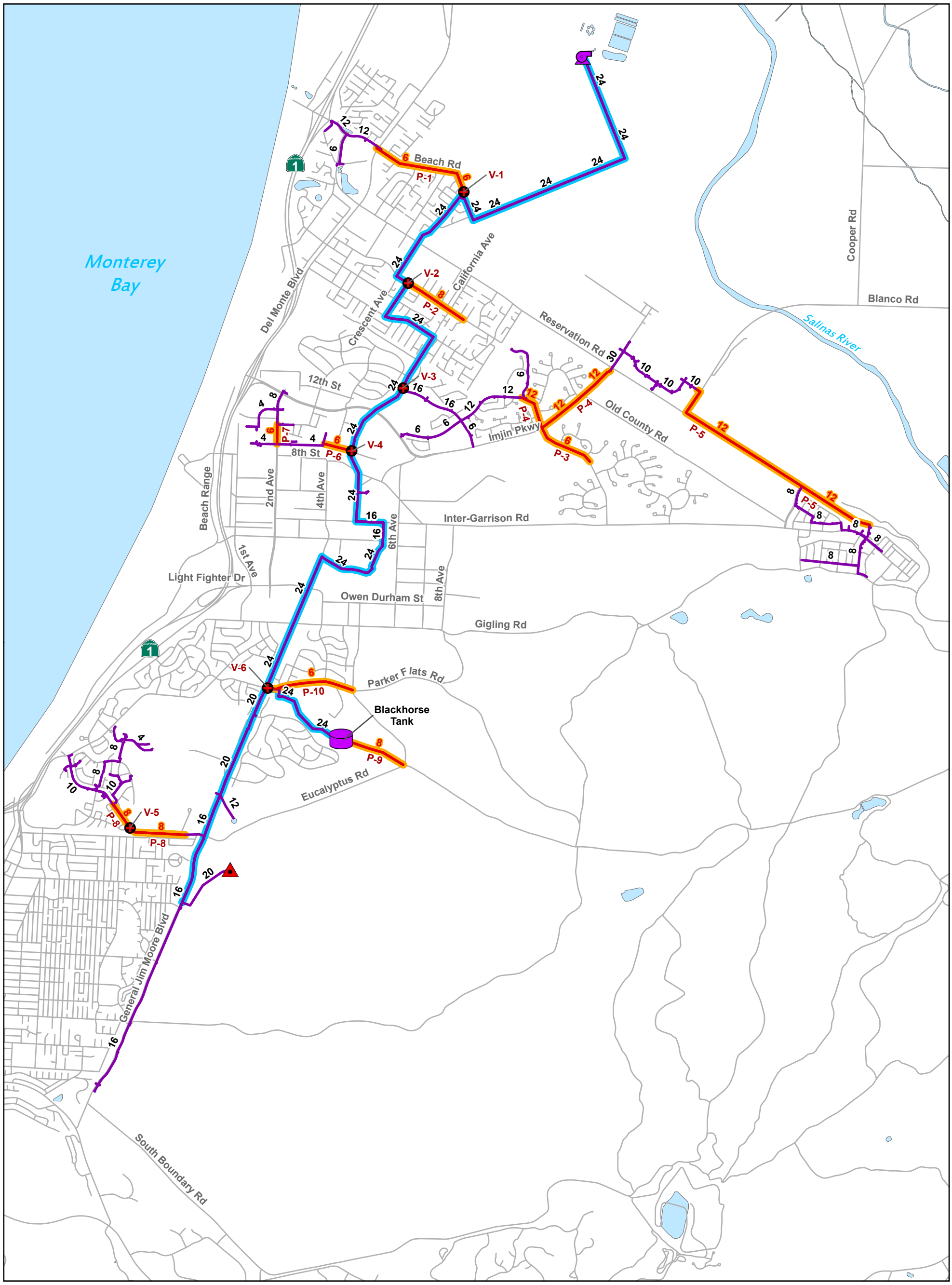
The AWTF pump station, PWM transmission mains, and Blackhorse reservoir were recently constructed and are subject to a cost sharing agreement with Monterey One Water, and as such, they are included in the Capital Improvement Program table at this time. The costs shown on **Table 8.2** were provided by District staff and are assumed to include any associated planning contingencies.

8.3.1 Recommended Cost Allocation Analysis

Cost allocation analysis is needed to identify improvement funding sources, and to establish a nexus between development impact fees and improvements needed to service growth. In compliance with the provisions of Assembly Bill AB 1600, the analysis differentiates between the project needs of servicing existing users and for those required to service anticipated future developments. The cost responsibility is based on model parameters for existing and future land use, and may change depending on the nature of development. **Table 8.2** lists each improvement, and separates the cost by responsibility between existing and future users.

8.3.2 Construction Triggers

Construction triggers for the users are generally based on the Phase of the Advanced Water Treatment Facility, and thus have been included accordingly in **Table 8.2**. It should be noted that District staff have been proactively constructing recycled water pipeline, and many of the users require a connection to the PWM transmission main, with distribution piping in place. Thus, it is recommended that as the AWTF upgrades are completed, the pipeline connections be completed thereafter.



Legend

- Planned Groundwater Recharge Location
- **Future Improvements**
  - Valves
  - Distribution Pipelines
- **Existing Modeled System**
  - Tank
  - AWTF Pump Station
  - Pipes
  - PWM Transmission Main
- Streets
- Rivers/Streams
- Waterbodies

PRELIMINARY

Update: March 5, 2019

0 0.25 0.5 1 Mile

N W GIS E S

Figure 8.1
Capital Improvement Program

Recycled Water Master Plan
Marina Coast Water District

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\Marina_Coast_WD\RecycledWater\MCWD_Fig8-1_CapitalImp_030519.mxd

Table 8.2 Capital Improvement Program

Recycled Water Master Plan
Marina Coast Water District

PRELIMINARY

Improv. No.	Improv. Type	Alignment	Limits	Improvement Details				Infrastructure Costs		Baseline Construction Cost	Estimated Construction Cost[1]	Capital Improvement Cost[2]	Suggested Cost Allocation				Cost Sharing	
								Unit Cost ($/unit)	Infr. Cost ($)	($)	($)	($)	Existing Users	Future Users	Central Marina	Fort Ord Community	Central Marina	Fort Ord Community
Distribution Pipeline Improvements[3]				Existing Diameter (in)	New/Parallel /Replace	Diameter (in)	Length (ft)											
P-1	Pipeline	Beach Rd	From Del Monte to Crescent Ave	-	New	6	4,000	107	428,000	428,000	635,600	794,500	0%	100%	100%	0%	794,500	0
P-2	Pipeline	Carmel Ave	From Vaughn Ave to Crumpton Ln	-	New	8	2,500	142	355,000	355,000	527,200	659,000	0%	100%	100%	0%	659,000	0
P-3	Pipeline	Abrams Dr	From Imjin Rd to Bunker Hill Dr	-	New	6	2,300	107	246,100	246,100	365,500	456,900	0%	100%	0%	100%	0	456,900
P-4	Pipeline	Abrams Rd, Imjin Rd	From MacArthur Dr to Reservation Rd	-	New	12	4,875	213	1,038,375	1,038,400	1,542,100	1,927,700	0%	100%	0%	100%	0	1,927,700
P-5	Pipeline	Reservation Road	From Blanco Rd to East Garrison	-	New	12	9,100	213	1,938,300	1,938,300	2,878,400	3,598,000	0%	100%	0%	100%	0	3,598,000
P-6	Pipeline	9th St	From Sea Glass Ave to 5th Ave	-	New	6	1,050	107	112,350	112,400	167,000	208,800	0%	100%	0%	100%	0	208,800
P-7	Pipeline	2nd Ave	From 10th St to 9th St	-	New	6	750	107	80,250	80,300	119,300	149,200	0%	100%	0%	100%	0	149,200
P-8	Pipeline	Coe Ave	From Pacific Crest Dr to Paralta Ave	-	New	8	1,500	142	213,000	213,000	316,400	395,500	0%	100%	0%	100%	0	395,500
P-9	Pipeline	Normandy Rd	From Blackhorse Reservoir to Eucalyptus Rd	-	New	8	2,350	142	333,700	333,700	495,600	619,500	0%	100%	0%	100%	0	619,500
P-10	Pipeline	Normandy Rd	From General Jim Moore Blvd to Parker Flats Rd	-	New	6	2,350	107	251,450	251,500	373,500	466,900	0%	100%	0%	100%	0	466,900
				Subtotal - Distribution System Improvements					**4,996,525**	**4,996,700**	**7,420,600**	**9,276,000**					**1,453,500**	**7,822,500**
Pressure Reducing Valve Improvements				New/Replace	Size (in)													
PRV-1	PRV	Intersection of Beach Rd and Crescent Ave		New	4				73,000	73,000	108,500	135,700	0%	100%	100%	0%	135,700	0
PRV-2	PRV	Intersection of Carmel Ave and Vaughn Ave		New	4				73,000	73,000	108,500	135,700	0%	100%	100%	0%	135,700	0
PRV-3	PRV	California Ave s/o 3rd Ave		New	6				73,000	73,000	108,500	135,700	0%	100%	0%	100%	0	135,700
PRV-4	PRV	Intersection of 9th St and 5th Ave		New	4				73,000	73,000	108,500	135,700	0%	100%	0%	100%	0	135,700
PRV-5	PRV	Intersection of Coe Ave and Buttercup Blvd		New	4				73,000	73,000	108,500	135,700	0%	100%	0%	100%	0	135,700
PRV-6	PRV	Intersection of General Jim Moore Blvd and Normandy Rd		New	4				73,000	73,000	108,500	135,700	0%	100%	0%	100%	0	135,700
				Subtotal - Pressure Reducing Valve Improvements					**438,000**	**438,000**	**651,000**	**814,200**					**271,400**	**542,800**

Table 8.2 Capital Improvement Program

Recycled Water Master Plan

Marina Coast Water District

PRELIMINARY

Improv. No.	Improv. Type	Alignment	Limits	Improvement Details	New/Replace	Pipe Length (ft)	Infrastructure Costs: Unit Cost ($/unit)	Infrastructure Costs: Infr. Cost ($)	Baseline Construction Cost ($)	Estimated Construction Cost[1] ($)	Capital Improvement Cost[2] ($)	Suggested Cost Allocation: Existing Users	Future Users	Central Marina	Fort Ord Community	Cost Sharing: Central Marina	Fort Ord Community
Pump Station and AWTF Improvements[4,5]																	
PS-1	New Pump Station and AWTF	M1W Regional Wastewater Treatment Plant									9,210,000	0%	100%	5%	95%	460,500	8,749,500
				Subtotal - Pump Station and AWTF Improvements				**0**	**0**	**0**	**9,210,000**					**460,500**	**8,749,500**
Planned RUWAP Improvements[4,5]																	
TM-1	Pipeline	Various	From AWTF Pump Station to Blackhorse Reservoir	New 24" Pipeline				-	-	-	-						
Blackhorse Tank	Tank	Existing Water System Tank D-1 Site		New 2.0 MG Storage Tank		-		-	-	-	-						
				Subtotal - Planned RUWAP Improvements				**-**	**-**	**-**	**10,620,000**	0%	100%	5%	95%	**531,000**	**10,089,000**
Groundwater Injection Barrier Project[6,7]																	
GIB	Various	Includes AWTF expansion, injection facilities, distribution pipelines, and other miscellaneous improvements						-	-	-	-						
				Subtotal - Groundwater Injection Barrier Project				**-**	**-**	**-**	**20,000,000**	69%	31%	53%	47%	**10,600,000**	**9,400,000**
Total Costs																	
				Distribution Pipeline Improvements				**4,996,525**	**4,996,700**	**7,420,600**	**9,276,000**					**1,453,500**	**7,822,500**
				Pressure Reducing Valve Improvements				**438,000**	**438,000**	**651,000**	**814,200**					**271,400**	**542,800**
				Pump Station and AWTF Improvements				**0**	**0**	**0**	**9,210,000**					**460,500**	**8,749,500**
				Planned RUWAP Improvements				**-**	**-**	**-**	**10,620,000**					**531,000**	**10,089,000**
				Groundwater Injection Barrier Project				**-**	**-**	**-**	**20,000,000**					**10,600,000**	**9,400,000**
				Total - Recycled Water System Improvements				**5,434,525**	**5,434,700**	**8,071,600**	**49,920,200**					**13,316,400**	**36,603,800**

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5/28/2019

Notes:

1. Estimated Construction costs include 48.5 percent of baseline construction costs to account for unforeseen events and unknown field conditions, and for Contractor's overhead and profit, general conditions, and sales tax, consistent with 2007 Water Master Plan.
2. Capital Improvement Costs also include an additional 25 percent of the estimated construction costs to account for administration, construction management, and legal costs.
3. Distribution pipeline improvemnents consist of improvements necessary to connect existing distribution infrastructure to planned transmisison pipeline. This does not include cost for improvements necessary to connect potential users directly to the planned transmission pipeline.
4. Improvement cost based on information received from District staff January 15, 2019.
5. Suggested cost center cost allocation based on estimated recycled water demands within each cost center.
6. Improvement cost based on information received from District staff May 28, 2019.
7. Suggested cost center cost allocation based on near-term water demands documented in the in-progress Water Master Plan, which includes the buildout of Central Marina and near-term development limits of the Fort Ord Community.

APPENDICES

APPENDIX A

Recycled Water System Evaluation

Recycled Water System Evaluation

Marina Coast Water District

GHD | 2235 Mercury Way, Suite 150, Santa Rosa, California

11140005 | January 9, 2017

Marina Coast Water District

Recycled Water System

Project No. 11140005

Prepared for:

AKEL ENGINEERING GROUP, INC.
7433 N. First Street, #103
Fresno, CA 93720

Prepared by:

Luke Philbert
Project Engineer

Reviewed by:

Matt Winkelman, P.E.
Principal

2235 Mercury Way, Suite 150
Santa Rosa, CA 95407
(707) 523-1010

January 9, 2017

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Table Index

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1. Objective

This document provides a report of the following:

- Historic and projected recycled water availability from the Monterey One Water (M1W) Wastewater Treatment Plant (WWTP).
- An evaluation of the availability and quantity and quality compared to the Marina Coast Water District (MCWD) customer needs.
- An evaluation for the impacts of improvements to the M1W WWTP and the Pure Water Monterey Project.

2. Recycled Water System

2.1 Historic and Projected Recycled Water Availability from the M1W WWTP

MCWD collects wastewater in its two wastewater collection systems serving the City of Marina and the Ord Community, and conveys it to an interceptor pipeline operated by M1W, formerly the Monterey Regional Water Pollution Control Agency (MRWPCA). The wastewater is then conveyed to the M1W Regional Treatment Plant (RTP) north of Marina. In 2015, MCWD contributions to the RTP were about 11%. The RTP has an average dry weather flow design treatment capacity of 33.200 acre feet per year (AFY) and a peak wet weather design capacity of 84,700 AFY, with an outfall ultimate wet weather capacity of 91,000 AFY. The RTP currently receives and treats approximately 18,000-19,000 AFY[1]. Currently, 100% of wastewater flow is available for Ag users from the M1W RTP during the summertime.

Wastewater is treated to secondary treatment standards at the M1W RTP facilities and effluent not designated for further treatment and recycling is discharged via an ocean outfall. Effluent designated for further treatment is conveyed to the onsite Salinas Valley Reclamation Plant (SVRP) that currently produces about 14,000 AFY of tertiary-treated recycled water meeting the standards of Title 22 of the California Code of Regulations. The recycled water is delivered to the Castroville Seawater Intrusion Project (CSIP) where it is used for irrigating farmland in the greater Castroville area thereby reducing demands on Salinas Valley groundwater and retarding seawater intrusion in that area. In 2015, 14,250 acre-feet of tertiary-treated water was delivered for crop irrigation. While MCWD has senior rights to recycled water through its agreement with the M1W, MCWD does not currently use recycled water within its two service areas.[2] The M1W regional treatment plant is shown in Figure 1, relative to the MCWD service areas.

[1] Pure Water Monterey Groundwater Replenishment Project. Final Engineering Report. Nellor Environmental Associates, Inc., Trussel Technologies Inc., Todd Groundwater. Revised November 2017.

[2] MCWD was the first agency to contract for recycled water with M1W, preceding subsequent contracts by others for recycled water supply.

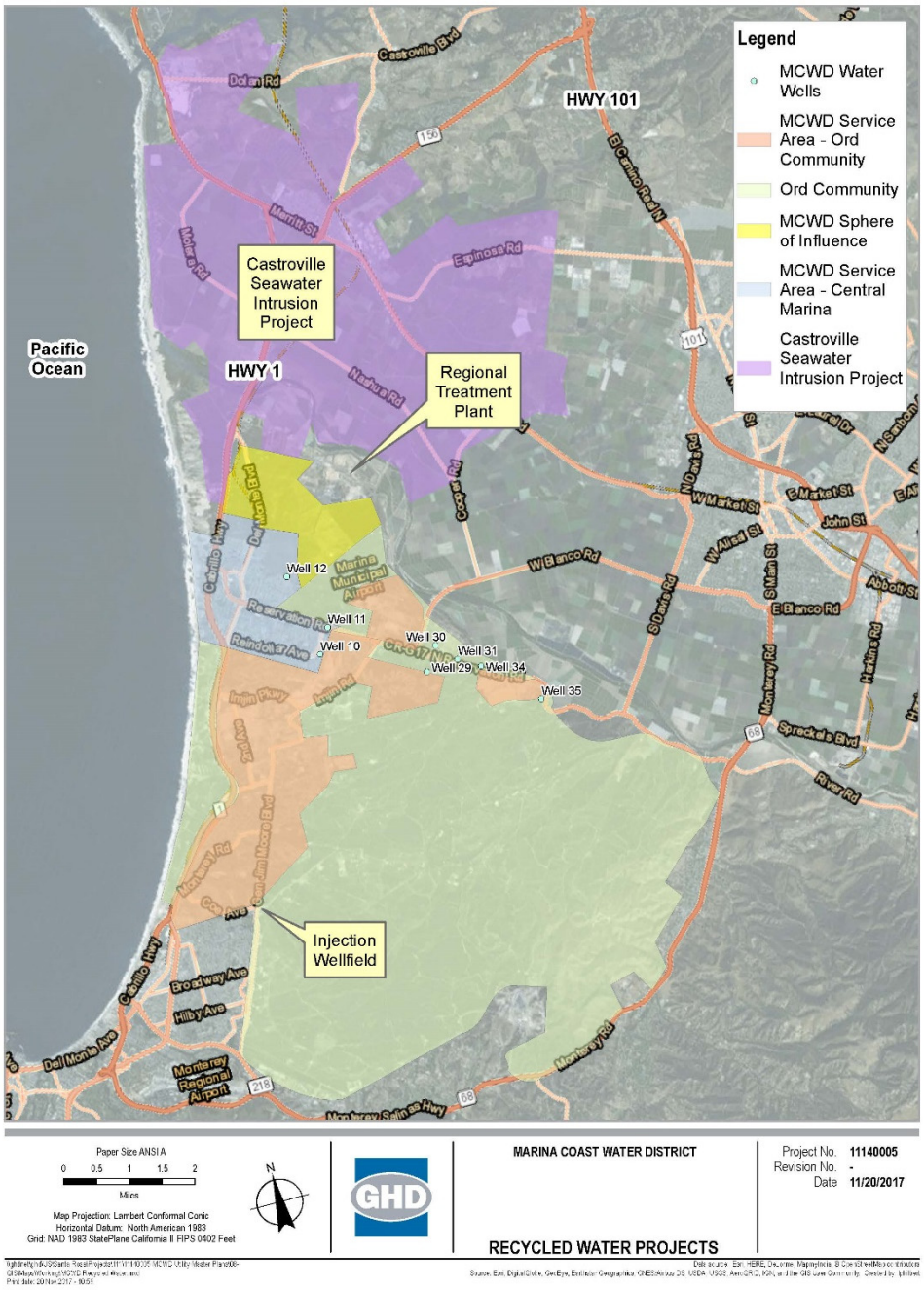

Figure 1 – Planned and Existing Recycled Water Systems

The Pure Water Monterey Project (PWM Project), further described in Section 2.3, will add 5 million gallons per day (MGD) of advanced treated water, or approximately 5,600 AFY, that can be used for indirect potable reuse throughout the year. As wastewater flows increase due to urban development, additional recycled water might also be produced. Under plans from the PWM, additional source waters will be provided to the SVRP. It is anticipated that in normal and wet years approximately 4,500 to 4,750

AFY of additional recycled water supply could be created for agricultural irrigation purposes. In drought conditions, the PWM Project could provide up to 5,900 AFY for crop irrigation.

According to the MCWD 2015 Urban Water Management Plan[3], the SVRP is capable of producing an average of 29.6 MGD of recycled water or approximately 33,000 AFY. However, as agricultural demands are seasonal, this capacity cannot be fully utilized year round. To increase recycled water yield based on current wastewater flows, storage capacity to capture winter flows for summertime use would be required.

2.2 Available Quantity and Quality compared to the MCWD customer needs

2.2.1 Quantity

MCWD current and future recycled water demands projections are summarized in the following Table 2.1, as described in the 2016 Pure Water Delivery and Supply Project Agreement[4] between MCWD and MRWPCA (now M1W).

Table 2.1 – MCWD Projected Demand for Recycled Water

	2015	2020	2025	2030	2035
Recycled Water (MGD)	0	0.66	1.57	1.57	1.57
Recycled Water (AFY)	0	741	1,762	1,762	1,762

Note: Table 2.1 shows MCWD's projected recycled water demands, i.e., needed recycled water supply. M1W's Advanced Water Purification (AWP) Facility, currently under construction, will provide a portion of MCWD's needed recycled water. Per the MCWD-M1W Pure Water Delivery and Supply Project Agreement First Amendment5, dated 12-18-17, 600 AFY of purified recycled water will be provided to MCWD from AWP Phase 1. Under planning, yet to be scheduled, AWP Phase 2 will provide 1,427 AFY of purified recycled water to MCWD.

In 1989, when MCWD entered into an annexation agreement with M1W. This agreement established MCWD's first right to receive tertiary treated wastewater from the SVRP. MCWD has the right to obtain treated wastewater from M1W's regional treatment plan equal in volume to that of the volume of MCWD wastewater treated by M1W and additional quantities not otherwise committed to other uses. Although several methods of delivering recycled water from M1W to Central Marina have been studied, no designs have been produced. Detailed plans for the Ord Community recycled water delivery have been developed.

MCWD has two points of connection to the regional wastewater collection system. Central Marina connects through a dedicated pump station. The total flow at that station was approximately 1,200 AFY in 2015. The Ord Community connects through a gravity pipeline with a metering flume. The total flow at the flume was just under 900 AFY in 2015. This total MCWD flow of 2,100 AFY should be entitled as

[3] Marina Coast Water District 2015 Urban Water Management Plan. Prepared by Schaaf & Wheeler. June 2016.

[4] Pure Water Delivery and Supply Project Agreement Between Monterey Regional Water Pollution Control Agency and Marina Coast Water District. April 8, 2016

[5] First Amendment to Pure Water Delivery and Supply Project Agreement between Monterey Regional Water Pollution Control Agency and Marina Coast Water District. December 18, 2017

recycled water to MCWD by M1W, and is only expected to increase in the future. Since the MCWD projected recycled water demand is 1,762 AFY by 2035, MCWD entitlements should meet their future recycled water needs.

MCWD's right to purchase recycled water has a contractual upper limit in the summer months, so providing this volume of recycled water supply requires the commitment of summertime flows from M1W and the Monterey County Water Resources Authority (MCWRA). Seasonal storage would allow recycled water, for which there would otherwise be little demand during the winter, to be made available for irrigation demands in warmer months, rather than discharging secondary effluent from the RTP to the ocean. Projected Phase II demands that could be served through additional distribution lines and seasonal storage facilities could bring the total recycled water demand to 1,762 AFY.

In 2006, MCWD began design of the recycled water system. In the Basis of Design Report[6], potential AWP Phase 1 uses generally included planned or existing landscapes along the recycled trunk main alignment, such as the existing Bayonet/Blackhorse Golf Course in Seaside, the sports fields at CSUMB, and the proposed golf resort in Del Rey Oaks. The total of existing irrigation demands exceeds the size of the AWP Phase 1 project, which targets customers along the main pipeline route. Potential AWP Phase 2 uses generally included planned or existing landscapes that required construction of lateral pipelines from the trunk main. Potential customers identified but not included in the AWP Phase 1 project may be included in the future Phase 2. Construction of a recycled water distribution system was estimated to cost $34 million in the 2006 Basis of Design Report. Therefore, full use of the project capacity is required to minimize the per customer costs.

MCWD, in coordination with the M1W and MCWRA as part of its Regional Urban Water Augmentation Project (RUWAP), has designed a transmission line through Marina, the Ord Community, and into the City of Seaside. MCWD has constructed approximately four miles of recycled pipeline, taking advantage of opportunities to install pipelines while roads were being reconstructed by the Fort Ord Reuse Authority. MCWD has designed the remainder of the recycled water distribution system.

Subject to Monterey County Department of Environmental Health and State Department of Public Health approval, MCWD requires the installation of recycled water pipelines to serve all recreational and common irrigated open space areas within new developments (MCWD Code § 4.28.030, Recycled Water Service Availability). This requirement is waived only when the land use jurisdiction indicates that future recycled water will not be allocated to a project. The City of Seaside has adopted a more restrictive standard, requiring residential front yards to be plumbed for future recycled water in addition to recreational and common areas.

2.2.2 Quality

According to the April 8, 2016, MCWD and M1W Pure Water Delivery and Supply Project Agreement[7], all water produced and delivered to MCWD will meet the applicable standards of quality prescribed by

[6] RMC Water and Environment, MCWD Recycled Water Project Basis of Design Report, 2006

[7] Pure Water Delivery and Supply Project Agreement Between Monterey Regional Water Pollution Control Agency and Marina Coast Water District. April 8, 2016.

the State of California (including, but not limited to, the regulations from the State Health Department and set in the California Code of Regulations, Title 22).

Title 22 Criteria - (Section 60304(a)) - specify use of "disinfected tertiary recycled water" for surface irrigation of food crops, parks and playgrounds, school yards, residential landscaping, and unrestricted access golf courses. The recycled water quality under this criteria is less strict than as required for indirect potable reuse and groundwater replenishment and the Project's Waste Discharge Requirements (WDRs) and /Water Recycling Requirements (WRRs) include monitoring to ensure compliance with requirements for disinfected tertiary recycled water. Relevant Title 22 Criteria for production of disinfected tertiary recycled water are presented as follows.

- **Recycled Water for Irrigation -** Per Section 60304(a), recycled water used for irrigation of food crops and areas with unrestricted access shall be disinfected tertiary recycled water. This quality of recycled water can also be used for cooling and all other non-potable purposes listed in the Title 22 Criteria. Use of disinfected tertiary recycled water for nonrestricted recreational impoundments that has not received conventional treatment requires additional pathogen monitoring.
- **Disinfected Tertiary Recycled Water -** Per Section 60301.230, disinfected tertiary recycled water, as it relates to the M1W WWTP, is filtered wastewater that is disinfected with a process that, combined with filtration, inactivates or removes 5 logs of MS2 bacteriophage or poliovirus, as well as achieves total coliform limits. The total coliform limits are a median of 2.2 MPN/100 mL for the last seven days of sampling results, 23 MPN/100 mL in no more than one sample in any 30-day period, and 240 MPN/100 mL all of the time.
- **Filtered Wastewater -** Per Section 60301.320, filtered wastewater, as it relates to the M1W WWTP, is oxidized wastewater that has been passed through microfiltration, ultrafiltration, or reverse osmosis such that the turbidity does not exceed 0.2 NTU more than 5% of the time within a 24-hour period and does not exceed 0.5 NTU at any time.

2.3 Evaluating the Impacts of Improvements to the M1W WWTP and the Pure Water Monterey Project

The Pure Water Monterey Groundwater Replenishment Project (PWM) is currently being implemented by M1W and the Monterey Peninsula Water Management District (MPWMD), with cooperation from MCWD, MCWRA and the City of Salinas. It will provide: (1) purified recycled water (product water) for replenishment of the Seaside Groundwater Basin (Seaside Basin) that serves as a drinking water supply; (2) purified recycled water (product water) for landscape irrigation by MCWD; and (3) recycled water to augment the existing Castroville Seawater Intrusion Project's (CSIP's) agricultural irrigation supply[8]. The planned date for Project startup is 2019 and is expected to provide an advanced treated water capacity of 5 MGD.

- **Replenishment of the Seaside Basin.** The PWM Project will enable the California American Water Company (CalAm) to reduce its diversions from the Carmel River system by up to 3,500 AFY by

[8] Pure Water Monterey Groundwater Replenishment Project. Final Engineering Report. Nellor Environmental Associates, Inc., Trussel Technologies Inc., Todd Groundwater. Revised November 2017.

injecting the same amount of product water into the Seaside Basin. The product water will be produced at the new AWP Facility at M1W's RTP and will be conveyed to and injected into the Seaside Basin via a new pipeline and new well facilities. The injected water will then mix with the existing groundwater and be stored for future urban use (including use as a potable source of supply) by CalAm.

- **Landscape irrigation by MCWD**. The Project will provide up to 600 AFY of Phase 1 AWP Facility product water for landscape irrigation by MCWD customers. The product water will be diverted from the AWP Facility product water conveyance pipeline. The quality of the product water will meet all recycled water quality requirements for landscape irrigation, as it will be treated to the higher water quality standards required for groundwater replenishment. Treatment and production by M1W are further described in the 2017 PWM Engineering Report. A separate Engineering Report will be submitted by MCWD to describe the recycled water distribution system, recycled water uses, and recycled water program administration. MCWD will also separately submit a Notice of Intent for recycled water program coverage under the Statewide General Order Water Reclamation Requirements for Recycled Water Use (Order WQ 2016-0068-DDW).
- **Additional recycled water for agricultural irrigation in northern Salinas Valley**. As part of the PWM Project, the existing tertiary recycled water facility at the RTP will provide additional source waters to the SVRP (treated first at the RTP) in order to provide supplementary tertiary recycled water for use in the CSIP agricultural irrigation system. It is anticipated that in normal and wet years approximately 4,500 to 4,750 AFY of additional recycled water supply could be created for agricultural irrigation purposes. In drought conditions, the PWM Project could provide up to 5,900 AFY for crop irrigation.

Figure 2 shows areas receiving recycled water through the M1W facility.

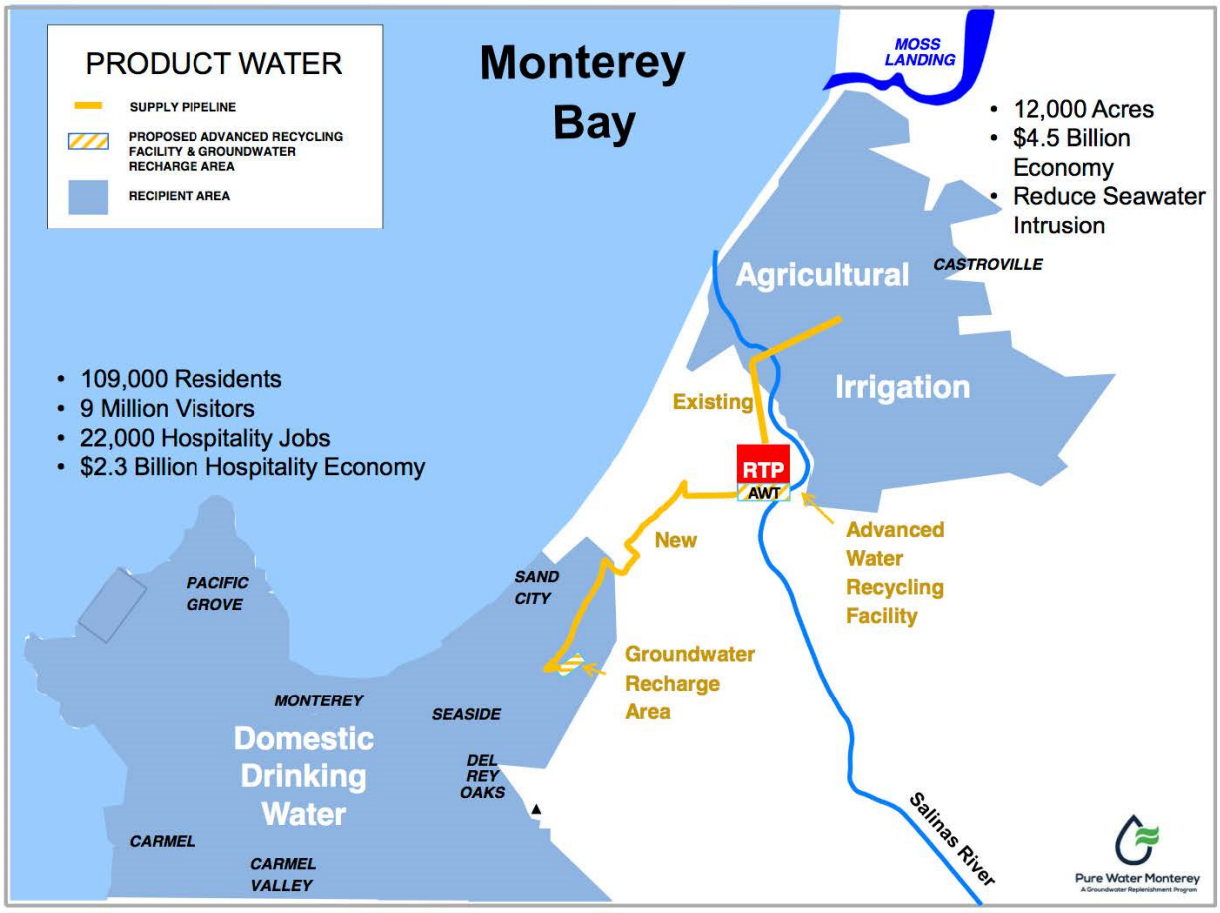

Figure 2 – Recycled Water Areas receiving M1W Recycled Water[8]

The PWM Project will also include a drought reserve component to support greater use of the new supply for crop irrigation during dry years. The PWM Project will provide an additional 200 AFY of product water that will be injected in the Seaside Basin in wet and normal years for up to five consecutive years. This will result in a "banked" drought reserve totaling up to 1,000 acre-feet (AF). During dry years, the PWM Project will provide less than 3,500 AF of water to the Seaside Basin; however, CalAm will be able to extract the banked water to make up the difference to its supplies, such that its extractions and deliveries will not fall below 3,500 AFY. The source waters that are not sent to the AWP Facility during these dry years when water from the drought bank is being used by CalAm will be sent to the SVRP to increase supplies for CSIP.

The PWM Project components include: conveyance of three types of source waters to the RTP for treatment; the new AWP Facility and other improvements to the RTP; a treated water conveyance system, including pipeline, a pump station, a reservoir, and connections to the pipeline for landscape irrigation; groundwater injection and monitoring wells; and potable water distribution system improvements. Construction of the PWM Project is anticipated to require approximately 18 months, plus three months of testing and start-up.

The sources of supply identified in the PWM Project include: secondary-treated municipal wastewater which is currently discharged to the ocean outfall (i.e., winter flows); agricultural wash water from vegetable processing, which is currently treated at the Salinas Industrial Wastewater Treatment Facility (SIWTF); urban run-off from the City of Salinas and City of Monterey; and surface water diversions from the Blanco Drain, Reclamation Ditch and Tembladero Slough, which primarily carry agricultural tile drainage during the summer months. All of these flows would be conveyed to the RTP, most using available capacity in the existing wastewater interceptor system and at the Salinas Pump Station (SAPS). A simplified diagram of the project is provided in Figure 3. A visual of source water amounts for for various inputs are included in Figure 4.

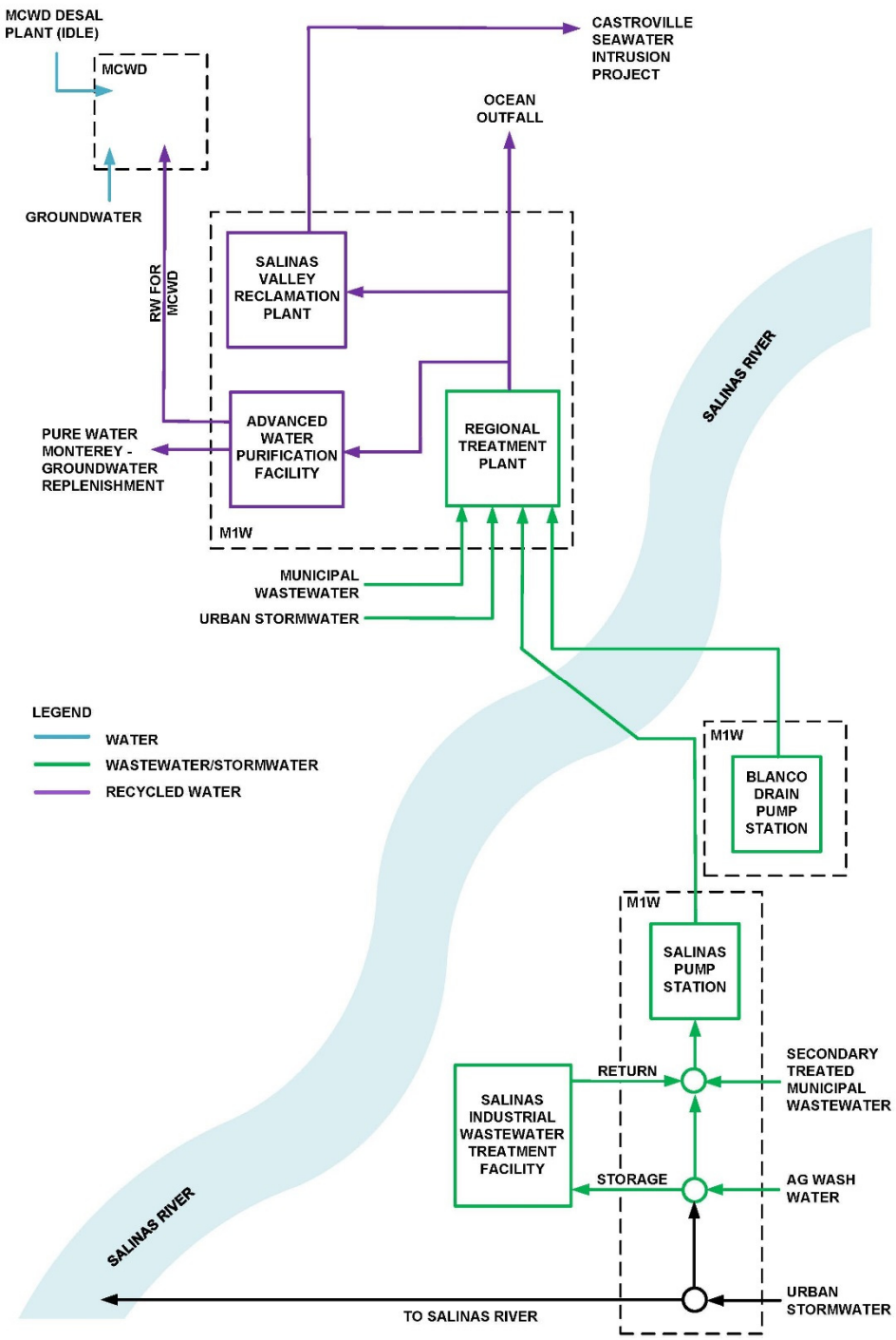

Figure 3 – MCWD and M1W System Schematic

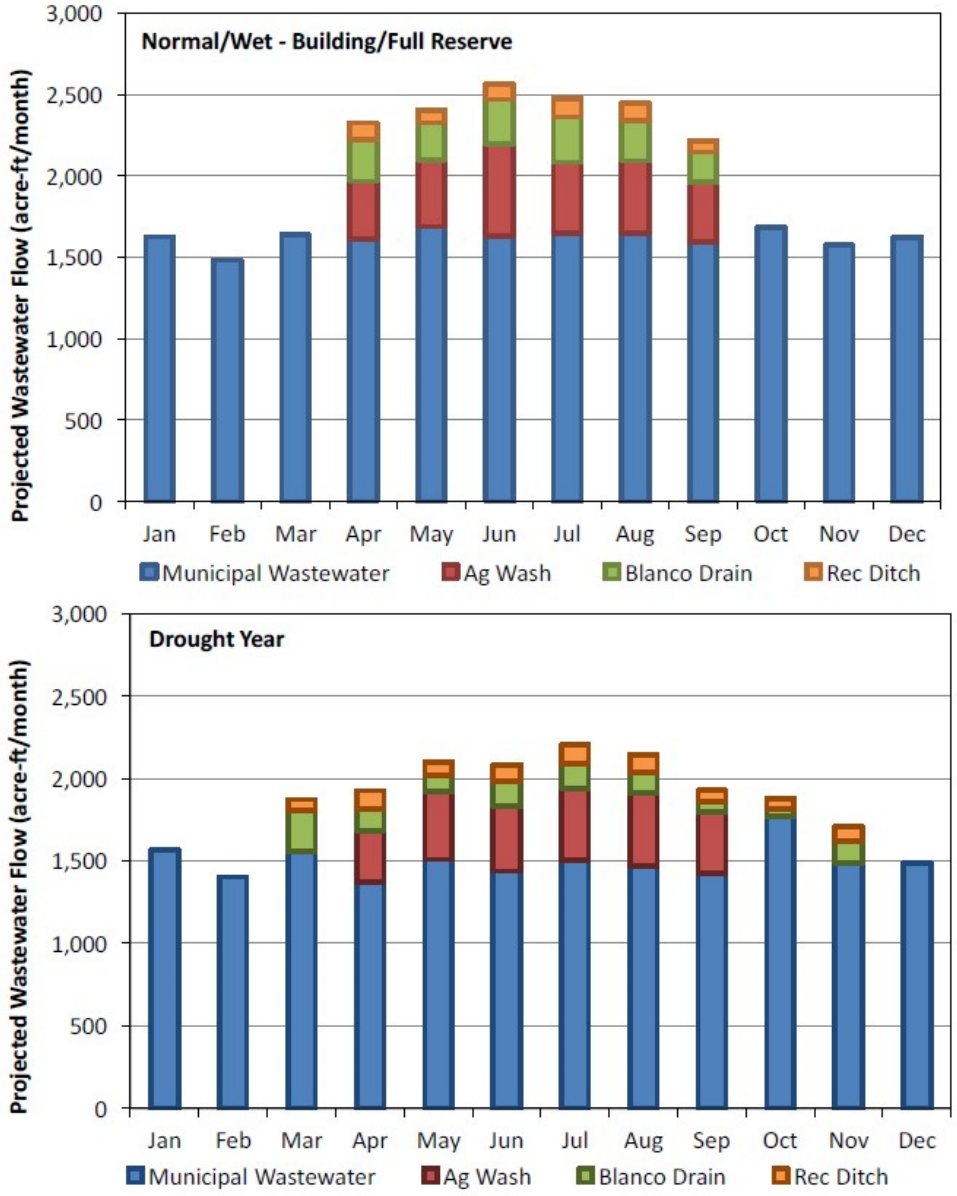

Figure 4 – Estimated Availabilities for Source Waters Entering the RTP, using wastewater flowrates from 2012 through 2016[9]

Most of these new source waters will be combined within the existing wastewater collection system before arriving at the RTP; water from Blanco Drain will be conveyed directly to the headworks of the RTP. As part of the California Environmental Quality Act (CEQA) adopted Environmental Impact Report (EIR) for the PWM Project, the assessment included these new sources as well as agricultural drainage water from Tembladero Slough and storm water diversions from the Lake El Estero facility in Monterey.

[9] Pure Water Monterey Groundwater Replenishment Project. Final Engineering Report. Nellor Environmental Associates, Inc., Trussel Technologies Inc., Todd Groundwater. Revised November 2017.

Neither grant, loan financing, design, engineering, nor permitting are currently being pursued for Tembladero Slough, but may be reconsidered in the future. The Lake El Estero source is not planned for diversion for the Project, but may be reassessed in the future.

The proposed alignment for the PWM advanced treated water pipeline is the same as for the MCWD RUWAP recycled water trunk main. The two agencies have agreed to share a single pipeline, and to deliver advanced treated water for urban irrigation instead of tertiary-treated recycled water as originally planned in order to meet the more stringent requirements for indirect potable reuse and groundwater replenishment. Due to the size and length of the trunk main, combining the two projects results in a significant cost savings. The approved water pipeline can be seen in Figure 5.

Figure 5 – Product Water Transmission Facilities[8]

On April 8, 2016, MCWD and M1W entered into the Pure Water Delivery and Supply Project Agreement[10] wherein the Product Water Conveyance Facilities will be designed, constructed, owned, and operated by MCWD with a capacity and right to utilize a net 1,427 AFY of the AWP Facility's treatment capacity to serve the Ord Community and to implement the recycled water portion of the RUWAP. The project is expected to provide 600 AFY (Phase 1) in 2020, and increase to 1,427 AFY (Phase 2) in 2025. The project functions as an in-lieu groundwater recharge project and will be a major component of any groundwater sustainability plan for the Marina Area.

In December 2017, the first amendment to the Pure Water Delivery and Supply Project Agreement between the M1W (formerly MRWPCA) and MCWD was enacted[11]. The amendment allows for the possibility of their own groundwater injection under the following conditions:

- The CEQA work completed and approved by the M1W Board in October, 2017 describes a MCWD project that applies this water for irrigation. Any change to that CEQA work, from irrigation to injection and sale shall be at the sole expense of MCWD and M1W shall not be responsible for any delays that any such change might cause in the timing of delivery of water for injection to MCWD.
- If MCWD elects to inject, it will be responsible for permitting at its injection site, but M1W agrees to help by providing all of the work product it completed for its injection well project, e.g., engineering report for the drinking water permit, to MCWD for its use.
- M1W injection well field and infrastructure will not be used for MCWD injection unless and until there is a future separate agreement between the parties hereto.
- Any costs for a change from irrigation to injection, e.g. CEQA, engineering, permitting, test well construction, modeling, etc. shall be the sole responsibility of MCWD. To the extent that M1W agrees to do work to assist MCWD, MCWD agrees to pay any such invoices to M1W within the time period for payment specified by the service provider.
- The portion of the summer delivery water that is not used by MCWD for the AWP Facility Phase 1 will be available for use by M1W. For the AWP Facility Phase 2, the entire amount of the 650 acre feet of summer delivery will be needed and used by MCWD and will no longer be available to M1W.

[10] Pure Water Delivery and Supply Project Agreement Between Monterey Regional Water Pollution Control Agency and Marina Coast Water District. April 8, 2016.

[11] First Amendment to Pure Water Delivery and Supply Project Agreement between Monterey Regional Water Pollution Control Agency and Marina Coast Water District. December 18, 2017

APPENDIX B

Recycled Water Capacity Fees
(Pending Finalization)