



City of Manteca

Reclaimed Water Facilities Master Plan

January 2023



Prepared by:



Prepared by:



2175 N. California Blvd
Suite 315
Walnut Creek, CA 94596
925.627.4100 📞





Reclaimed Water Facilities Master Plan

Final Report

Prepared by:



January 2023

ATTACHMENT 2

This page intentionally left blank.

Table of Contents

Executive Summary	ES-1
ES-1 Purpose and Objectives	ES-1
ES-2 Water Supply Considerations	ES-2
ES-3 Wastewater Quality and Quantity	ES-2
ES-4 Market Assessment for Recycled Water	ES-3
ES-5 Comparison of Project Alternatives	ES-4
ES-6 Recommended Project Plan and Implementation	ES-5
 Chapter 1 Introduction	 1-1
1.1 Need for Recycled Water in Manteca	1-1
1.2 Purpose of Master Plan	1-2
1.3 Study Area Characteristics	1-3
1.3.1 Location and Study Area	1-3
1.4 Authorization	1-5
1.5 Acknowledgements	1-5
Chapter 2 Water Supply and Water Rights	2-1
2.1 Treated Water Supply	2-1
2.1.1 Groundwater Supply	2-1
2.1.2 Surface Water Supply	2-3
2.2 Nonpotable Water Supply	2-3
2.3 Water Rights Considerations	2-4
Chapter 3 Wastewater Characteristics and Facilities	3-1
3.1 Wastewater Treatment Facilities	3-1
3.2 Wastewater Quantity	3-2
3.3 Wastewater Quality	3-4
3.3.1 Salts and Nutrients	3-4
3.4 Existing Recycled Water Facilities	3-9
3.5 Plans for Treatment Process Modification	3-9
Chapter 4 Recycled Water Market Assessment	4-1
4.1 Introduction	4-1
4.1.1 The three categories of demands are explored below, followed by a discussion of potential user interest, reliability needs and barriers to recycled water use. Key Assumptions	4-1
4.1.2 Background Data	4-1
4.2 Local Demand Identification	4-2
4.2.1 Urban Irrigation Demands	4-3
4.2.2 Recycled Water Demand Assessment	4-5
4.2.3 Peaking Factors	4-7
4.2.4 Recycled Water Demand Projections for Urban Irrigation	4-7
4.2.5 Industrial, Commercial, and Other Recycled Water Users	4-10
4.3 Regional Project Identification	4-10
4.4 Groundwater Recharge Assessment	4-14
4.4.1 Need for Groundwater Recharge	4-14
4.4.2 Shallow Aquifer	4-14
4.4.3 Deep Aquifer	4-15
4.4.4 Recharge Methods	4-15
4.4.5 Recharge Method Analysis	4-16
4.4.6 Groundwater Recharge Feasibility	4-16
4.5 Customer Outreach	4-17

4.5.1	Local Outreach	4-17
4.5.2	Regional Outreach.....	4-18
4.5.3	City Council and Public Meetings	4-18
Chapter 5	Project Alternatives Analysis	5-1
5.1	Design Criteria.....	5-1
5.2	Local Alternatives	5-2
5.2.1	Alternative 1 – Core Demands.....	5-3
5.2.2	Alternative 2 – All Demands	5-4
5.2.3	Alternative 3 – Core & North Demands.....	5-6
5.2.4	Alternative 4 – Core & North Demands.....	5-6
5.2.5	Alternative 5 – Core & South Demands	5-7
5.2.6	Local Alternative Summary.....	5-9
5.3	Regional Alternatives.....	5-10
5.3.1	Alternative 6 – Partner with South San Joaquin Irrigation District	5-10
5.3.2	Alternative 7 – Deliver Water to Agricultural Users to the Northeast of the City ...	5-12
5.3.3	Alternative 8 – Transfer to Central Valley Project Contractor with Indirect Pipeline to the Delta-Mendota Canal	5-14
5.3.4	Alternative 9 – Transfer to Central Valley Project Contractor with Indirect Pipeline to the Delta-Mendota Canal	5-16
5.3.5	Alternative 10 – Transfer of Water Rights to Mountain House Irrigation District ...	5-17
5.3.6	Summary of Regional Alternatives.....	5-18
5.4	Alternative Evaluation	5-19
5.4.1	Estimated Cost.....	5-19
5.4.2	Non-Monetary Criteria	5-22
5.4.3	Alternative Evaluation	5-23
Chapter 6	Recommended Facilities Project Plan	6-1
6.1	Recommended Project (Alternative 2 with Additional Use at Treatment Plant)	6-1
6.1.1	Target Users.....	6-1
6.1.2	Primary Facilities	6-3
6.1.3	Cost Estimate	6-4
6.1.4	Implementation Considerations	6-5
6.2	Implementation Plan.....	6-6
6.2.1	Phasing Schedule and Cost Breakdown.....	6-8
6.3	Regional Expansion.....	6-12
Chapter 7	Construction Financing Plan and Revenue Program.....	7-1
7.1	Capital Improvement Program (CIP) Schedule	7-1
7.2	Financial Planning	7-1
7.3	Revenue Program	7-2
7.3.1	Offset City Costs.....	7-2
7.3.2	Recycled Water Rates	7-4
7.4	Potential Funding Opportunities.....	7-5
7.4.1	Introduction.....	7-5
7.4.2	DAC Benefits.....	7-5
7.4.3	Funding Opportunities	7-5

List of Tables

Table ES-1: Comparison of Project Alternatives.....	ES-5
Table ES-2: Recommended Capital Improvement Plant	ES-7
Table 2-1: Treated Water Demands in City of Manteca.....	2-1

Table 2-2: Summary of GSP groundwater offset projects.....	2-2
Table 2-3: Nonpotable Water Demands in Manteca.....	2-4
Table 3-1: Current Disposal and Reuse	3-2
Table 3-2: Availability of Tertiary-Treated Recycled Water	3-4
Table 3-3: Water Quality Comparison	3-5
Table 3-4: Suitability of Recycled Water for Irrigation Use.....	3-7
Table 4-1: Urban Irrigation Demand Summary	4-3
Table 4-2: Evapotranspiration Data and Demand Factors.....	4-6
Table 4-3: Application of Demand Estimate Methods	4-6
Table 4-4: Peaking Factors	4-7
Table 4-5: Summary of Potential Recycled Water Demands.....	4-7
Table 4-6: Top 25 Potential Landscape Irrigation Customers	4-9
Table 4-7: WQCF Demand for Recycled Water.....	4-10
Table 4-8: Estimated and Projected Water Demands in the Eastern San Joaquin Groundwater Basin	4-11
Table 4-9: Summary of City Council and Public Meetings	4-18
Table 5-1: Design Criteria	5-1
Table 5-2: Alternative 1 Demands Served.....	5-4
Table 5-3: Alternative 2 Demands Served.....	5-5
Table 5-4: Alternative 3 Demands Served.....	5-6
Table 5-5: Alternative 4 Demands Served.....	5-7
Table 5-6: Alternative 5 Demands Served.....	5-9
Table 5-7: Summary of Local Alternatives.....	5-9
Table 5-8: Estimated Percolation Area Required for Recycled Water Recharge	5-13
Table 5-9: Summary of Regional Alternatives	5-18
Table 5-10: Summary of Local Alternatives Infrastructure	5-19
Table 5-11: Summary of Regional Alternatives Infrastructure.....	5-19
Table 5-12: Local Project Alternative Cost Estimates	5-20
Table 5-13: Regional Project Alternative Cost Estimates	5-21
Table 5-14: Evaluation Criteria	5-22
Table 5-15: Alternative Evaluation – Criteria Grading, Weighting and Scoring ^a	5-23
Table 6-1: Recommended Project Target Users	6-1
Table 6-2: Recommended Project Facilities	6-3
Table 6-3: Recommended Project Estimated Costs	6-4
Table 6-4: Jurisdictional and Stakeholder Agencies for Permitting or Review for Recycled Water Use	6-6
Table 6-5: Major Facilities within each Phase of Recommended Project.....	6-7
Table 6-6: Recommended Project Estimated Costs by Phase.....	6-9
Table 7-1: Capital Improvement Program.....	7-1
Table 7-2: Annual City Costs Offset by Recycled Water Use	7-2
Table 7-3: Recycled Water Rate Estimate.....	7-4
Table 7-4: Potential Funding Opportunities for Recycled Water Projects.....	7-9

List of Figures

Figure ES-1: Comparison of Salt Content to Water Quality Requirements	ES-3
Figure ES-2: Recommended Project (Alternative 2) Facilities	ES-6
Figure 1-1: Study Area Boundaries	1-4
Figure 3-1: Existing Wastewater Treatment Flow Schematic.....	3-2
Figure 3-2: Monthly Average Flow Rates at WQCF.....	3-3

Figure 3-3: Salt Content of WQCF Tertiary-Treated Wastewater.....	3-6
Figure 3-4: Comparison of Salt Content to Water Quality Requirements	3-7
Figure 3-5: Water Quality Comparison with Other Recycled Water Projects	3-9
Figure 4-1: Urban Irrigation Demands	4-4
Figure 4-2: All Potential Local Demands	4-8
Figure 4-3: Groundwater Elevations in San Joaquin County	4-13
Figure 4-4: Groundwater Elevation in the Shallow Aquifer underlying Manteca.....	4-15
Figure 4-5: Groundwater Recharge Mounding	4-16
Figure 5-1: Representative Storage Calculation	5-2
Figure 5-2: Alternative 1 - Core Demands.....	5-3
Figure 5-3: Alternative 2 - All Demands.....	5-5
Figure 5-4: Alternative 4 – North and Core Demands.....	5-7
Figure 5-5: Alternative 5 – North and Core Demands.....	5-8
Figure 5-6: Alternative 6 – Transfer to South San Joaquin Irrigation District.....	5-11
Figure 5-7: Alternative 7 – Transfer to Agriculture to the Northeast of Manteca.....	5-12
Figure 5-8: Alternative 7 – Transfer to Northeast of Manteca for Groundwater Recharge	5-14
Figure 5-9: Alternative 8 – Transfer to Central Valley Project Contractor with Indirect Pipeline to the Delta-Mendota Canal.....	5-15
Figure 5-10: Alternative 9 – Transfer to Central Valley Project Contractor with Direct Pipeline to the Delta-Mendota Canal.....	5-16
Figure 5-11: Alternative 10 – Transfer of Water Rights to Mountain House Irrigation District.....	5-17
Figure 5-12: Alternative Scores versus Costs	5-24
Figure 6-1: Recommended Project.....	6-1
Figure 6-2: Implementation Schedule.....	6-11

Appendices

Appendix A -	Allowable Uses of Recycled Water in California
Appendix B -	Estimated Local Recycled Water Demands
Appendix C -	Demand and Peaking Factor Methodology
Appendix D -	Not Used
Appendix E -	Unit Costs and Detailed Cost Estimates

List of Abbreviations

AF	Acre-Foot or Acre-Feet
AFY	Acre-feet per year
CIP	Capital Improvement Plan
City	City of Manteca
CVP	Central Valley Project
DMC	Delta-Mendota Canal
DWR	Department of Water Resources
EIR	Environmental Impact Report
gpd	Gallons per day
gpm	Gallons per minute
HP	Horsepower
kWh	Kilowatt-hours
LF	Linear Feet
MCL	Maximum Contaminant Level (for drinking water)
MG	Million Gallons
mgd	Million Gallons Per Day
MUSD	Manteca Unified School District
NPDES	National Pollutant Discharge Elimination System
O&M	Operations & Maintenance
psi	Pounds Per Square Inch
RWFMP	Reclaimed Water Facilities Master Plan
SAR	Sodium adsorption ratio
SOI	Sphere of Influence
SSJID	South San Joaquin Irrigation District
TDS	Total Dissolved Solids
Title 22	California Code of Regulations, Title 22, Division 4, Chapter 3
USBR	United States Bureau of Reclamation
WQCF	Water Quality Control Facility

This page intentionally left blank.

Executive Summary

ES-1 Purpose and Objectives

This 2023 report provides updated information for the City of Manteca’s preferred alternative, Alternative 2, which includes proposed infrastructure and cost estimates for improvements intended to serve the North, Core, and South recycled water demands. Since 2017, Manteca has installed a portion of recycled water proposed by Alternative 2, and as such, the proposed infrastructure quantities, and cost estimates for Alternative 2 have been updated, which are reflected in Chapters 5, 6, and 7. Additionally, this 2023 report provides updated demand information from the addition of 2 future parks in the Villa Ticino west development (Chapter 4), information on potential funding sources for the proposed improvements (Chapter 7), as well as new information about the Eastern San Joaquin Groundwater Authority’s (GWA) Groundwater Sustainability Plan (GSP) which was adopted in 2019 (Chapter 2). Information provided for all other alternatives remains unchanged from the 2017 Draft Report.

The purpose of this Reclaimed Water Facilities Master Plan (RWFMP), prepared for the City of Manteca (City), is to evaluate the role that recycled water can play in creating a drought-proof water supply for the City and the surrounding region. The City’s Wastewater Quality Control Facility (WQCF) is already capable of producing disinfected, tertiary-treated water, meeting the highest standard for recycled water recognized by Title 22 of the California Code of Regulations. A portion of the treated wastewater is currently used for agricultural irrigation, and a very small amount is used to fill water trucks for construction and dust control, but most of the treated wastewater is discharged directly into the San Joaquin River where it provides no water supply benefit to the City. The City has been growing rapidly, and increased recycled water use offers several potential direct benefits:

- Recycled water could **reduce groundwater pumping** from the Eastern San Joaquin Groundwater Basin, a basin listed by DWR as being in critical overdraft conditions. The GSP for the Eastern San Joaquin subbasin requires member agencies to move towards sustainable groundwater use, and using recycled water in lieu of groundwater would reduce overdraft conditions and assist in achieving and maintaining long-term groundwater basin sustainability.
- Recycled water could **improve supply reliability** because, unlike surface water, it is not subject to variability during wet and dry years. This reliability could directly benefit the City, or the City could enter into an agreement to sell the water to another end user seeking greater supply reliability.
- Recycled water use would **reduce wastewater discharges** to the San Joaquin River, providing the City greater flexibility in meeting the requirements of its NPDES permit.

To explore expanded recycled water use further, this RWFMP was prepared to meet the following objectives:

- Evaluate existing and projected future water demands in the City that could be met using recycled water (Chapter 4);
- Identify infrastructure that would be needed to expand recycled water usage throughout the City to meet those demands, including distribution system pipelines and storage needed to accommodate peak recycled water demands (Chapter 5);
- Identify infrastructure that would be needed to implement a regional recycled water project serving customers outside of the City (Chapter 5);
- Provide recommendations to the City to plan for expansion of the existing recycled water system (Chapter 6); and

- Develop a capital improvement program for the recommended project (Chapter 7).

ES-2 Water Supply Considerations

Preparation of this RWFMP was motivated primarily by the water resources needs and growing water demands of the City and the wider region, not wastewater disposal. Recent data from 2020 indicates that the City has used about 15,280 acre-feet per year (AFY) of water for the potable water system, about half from groundwater and half from surface water. The surface water is provided by South San Joaquin Irrigation District (SSJID), and is generally higher in quality than the City's groundwater. Nonpotable wells located in the City are also used for irrigation of City parks, schools, and agricultural irrigation, with combined extraction of about 6,000 AFY. This RWFMP was undertaken with the idea that many of the water demands currently using groundwater for irrigation such as parks, schools, commercial and residential landscaping, and construction water, could switch to recycled water served by new recycled water infrastructure thereby reducing groundwater pumping and promoting basin sustainability. The Eastern San Joaquin Groundwater Authority recently adopted three groundwater offset projects that are consistent with the GWA's GSP, and that will benefit from new recycled water infrastructure.

The City's treated wastewater is currently discharged into the San Joaquin River, where it eventually reaches other downstream users, including the large water exporters that draw from the Bay-Delta. Under state law (California Water Code §1211), the City has to consider whether implementing a recycled water project would adversely impact these downstream users as less water would be flowing in the river if the City stops discharging. The process that allows for this change in discharge is called a Wastewater Change Petition, and preparing this documentation would be one of the first steps in implementing a recycled water project.

As an alternative to using recycled water to offset groundwater pumping, the City could **transfer or sell** the recycled water to a downstream water user that currently has insufficient or junior water rights, like the community of Mountain House. These transfers are allowable under California Water Code §1485, which applies specifically to the San Joaquin River.

ES-3 Wastewater Quality and Quantity

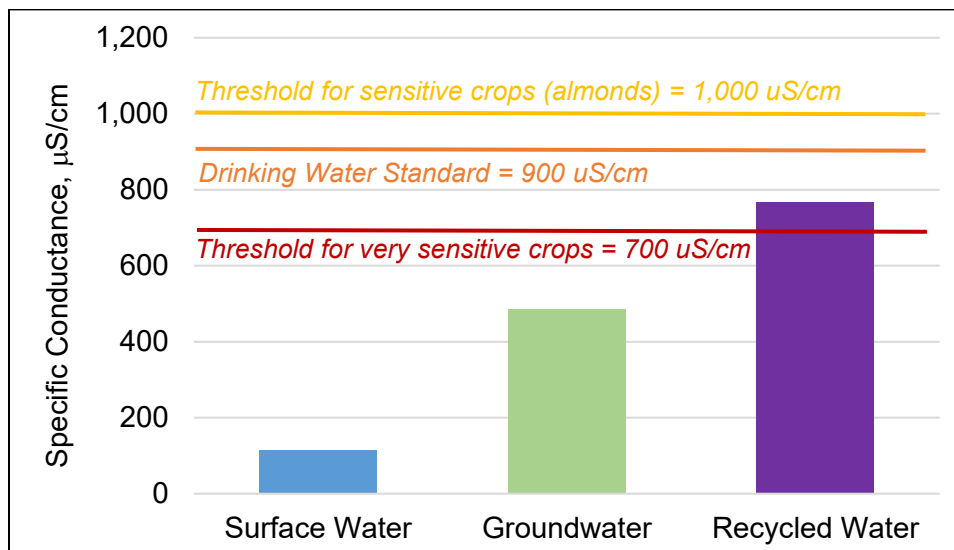
Since 2007, the City has been providing tertiary treatment to all wastewater destined to be discharged to the San Joaquin River or recycled for nonpotable reuse. This means that the wastewater is filtered and UV-disinfected after passing through the biological treatment system. Based on current flows at the WQCF, approximately **5.7 million gallons per day (mgd) or 6,400 AFY of disinfected tertiary-treated water is available for immediate re-use**. The amount of recycled water available will continue to grow as the City grows. The largest amount considered available in this RWFMP was 9.87 mgd (11,000 AFY), the average dry weather flow capacity of the WQCF as presently permitted.

The City already meets stringent water quality requirements for discharges to the San Joaquin River, as contained in its wastewater discharge permit, and has a proven track record of meeting applicable water quality objectives for constituents like metals (e.g., copper, lead, nickel) and organic chemicals. For the recycled water, the primary constituent of concern is salt, which can accumulate both in the root zone of plants and, more regionally, within the groundwater basin.

The City's tertiary-treated wastewater is approximately 40-60% higher in salt than typical groundwater supplies in the City. Importantly, though, salt concentrations in the recycled water are low enough to be used on almost any kind of landscape or agricultural crop as long as proper irrigation techniques are used. For example, the most commonly cited threshold conductance value for irrigating almonds is 1,000 $\mu\text{S}/\text{cm}$, slightly higher than the drinking water criteria of 900 $\mu\text{S}/\text{cm}$. By comparison, the average value of the

City's tertiary-treated water over the past several years is 768 $\mu\text{S}/\text{cm}$, while the average value for local groundwater is about 500 $\mu\text{S}/\text{cm}$. This comparison is shown below in Figure ES-1.

Figure ES-1: Comparison of Salt Content to Water Quality Requirements



ES-4 Market Assessment for Recycled Water

A recycled water market assessment was conducted in 2017 to identify potential customers for the disinfected tertiary-treated wastewater currently produced by the City. The market assessment focused on three broad categories:

- **Local demands.** Within the City's General Plan area, there are about 660 acres of existing parks, school playing fields, golf courses, and other irrigated green space that could use recycled water for irrigation instead of groundwater or potable water. Planned development is expected to create an addition 254 acres of irrigated green space. The total demand of these sites is over 3,700 AFY. In addition, the WQCF itself uses about 300 AFY of groundwater or potable water as process water, and this could be switched to recycled water.
- **Regional partners.** The City could distribute recycled water to regional partners located within the groundwater basin or within the larger area of San Joaquin County. Several diverse options were considered for regional partners; in all cases, the City would act as the recycled water wholesaler. The following regional projects were explored:
 - **South San Joaquin Irrigation District.** SSJID is the geographically the closest potential regional partner for a recycled water project, and pumps a significant amount of water from wells located in the City. SSJID's agricultural customers could be served a blend of recycled water and surface water.
 - **Central Valley Project contractors.** Recycled water could be conveyed by pipeline directly to the Delta-Mendota Canal or indirectly by an existing canal, where it could be conveyed to a federal water contractor through a Warren Act transfer. Del Puerto Water District is currently participating in a similar project with the cities of Modesto and Turlock.

- o **Transfer to downstream user.** Manteca could transfer water rights for the recycled water currently discharged into the San Joaquin River to another downstream water user, such as community of Mountain House.
- **Groundwater recharge.** Recycled water could be used to intentionally recharge the Eastern San Joaquin Groundwater Basin. However, because of the relatively shallow depth to groundwater in the Manteca area, this use is not considered feasible in the central Manteca area. A pipeline would have to be constructed to an area of the basin with a greater groundwater deficit, likely at significant expense. This water use was not carried forward to the level of project alternative development, but could be studied further in the context of the Sustainable Groundwater Management Act of 2014, which will require implementation of a Groundwater Sustainability Plan in the region.

ES-5 Comparison of Project Alternatives

Based on the results of the market assessment conducted in 2017, four local alternatives and four regional alternatives were developed and compared with one another. For each alternative, a conceptual set of facilities – primarily pipelines, pump stations, and storage tanks – was developed as appropriate. These facilities were used as the basis for estimating the capital cost of each alternative. As previously stated, this 2023 update focuses on Alternative 2 and associated updates to Chapters 5, 6 and 7. Operating costs were also estimated based on routine maintenance, electricity use at pumps, and chemical use for booster chlorination. Costs associated with end-user retrofits for local customers (but not wholesale customers) were also included in the estimates. Combining the total capital and operational cost with the volume of recycled water delivered under each alternative provides a unit cost (\$/acre-foot of recycled water) that can be used to compare the alternatives. The alternatives were also compared to one another based on the following five non-monetary criteria:

- Ease of implementation with respect to planning, permitting, and working with partners.
- Ease of construction
- Benefits to the City’s water supply
- Benefits to regional groundwater sustainability
- Environmental impacts

Project performance for all five qualitative criteria was combined into a single score on a scale of 0 – 100% using a weighted scoring process. The project alternatives are compared to one another in Table ES-1, below.

Table ES-1: Comparison of Project Alternatives

Alternative ^a	Qualitative Score	Water Served (AF)	Peak Month Demand (mgd)	Capital Cost ^b (\$M)	O&M Cost ^c (\$M/Yr)	Unit Cost of Recycled Water ^d (\$/AF)
1. Local – Core Demands	95%	95%	910	\$7.8	\$0.2	\$650
2. Local – All Demands ^g	88%	88%	2,686	\$44.8 ^f	\$0.6	\$1,063 ^f
4. Local – North and Core Demands	90%	90%	1,889	\$16.4	\$0.3	\$790
5. Local – South and Core Demands	90%	90%	2,062	\$26.3	\$0.5	\$860
6. SSJID	67%	Up to 5,190	9.4	\$45.3	\$0.4	\$540
8. Indirect Delivery to Delta-Mendota Canal	38%	Up to 10,530	9.4	\$27.7	\$0.4	\$440 ^e
9. Direct Delivery to Delta-Mendota Canal	40%	Up to 10,530	9.4	\$55.8	\$1.2	\$420
10. Transfer to Mountain House	95%	Up to 10,530	9.4	\$0	\$0	\$0

Notes:

- a. Details were not prepared for Alternatives 3 and 7, per City direction.
- b. Costs are referenced to the ENR 20-city CCI for January 2015 at 9,972. Includes 25% contingency for implementation and 30% construction contingency in 2015 dollars.
- c. Assumes no escalation of O&M costs.
- d. Assumes project lifespan of 30 years, 3% interest rate.
- e. Includes estimated wheeling charge of \$200/AF.
- f. Costs for Alternative 2 are referenced to the ENR 20-city CCI for November 2022 at 13,175 which represents a 32% increase from the January 2015 CCI at 9,972. Includes 25% contingency for implementation and 30% construction contingency in 2022 dollars.
- g. Villa Ticino West development parks (Park 1 and Park 2) were added in 2023.

All of the projects listed above are sized to accommodate use of recycled water as process water at the WQCF at a rate equivalent to 5% of WQCF flows.

ES-6 Recommended Project Plan and Implementation

Based on unit cost as compared to the qualitative benefits of each alternative, the recommended project is to move forward with Alternative 2, which maximizes local reuse by serving the following demands:

- Process water at the WQCF (300 AFY)
- Existing landscape irrigation demands located primarily along the Airport Way and Woodward Avenue corridors (1,990 AFY).
- Future landscape irrigation demands associated with planned development located in the northwestern and southern parts of the City (640 AFY).

Total recycled water deliveries under the recommended alternative are approximately 2,900 AFY, which is equivalent to approximately 40% of current flows at the WQCF.

The recommended facilities are shown below in Figure ES-2.

Figure ES-2: Recommended Project (Alternative 2) Facilities

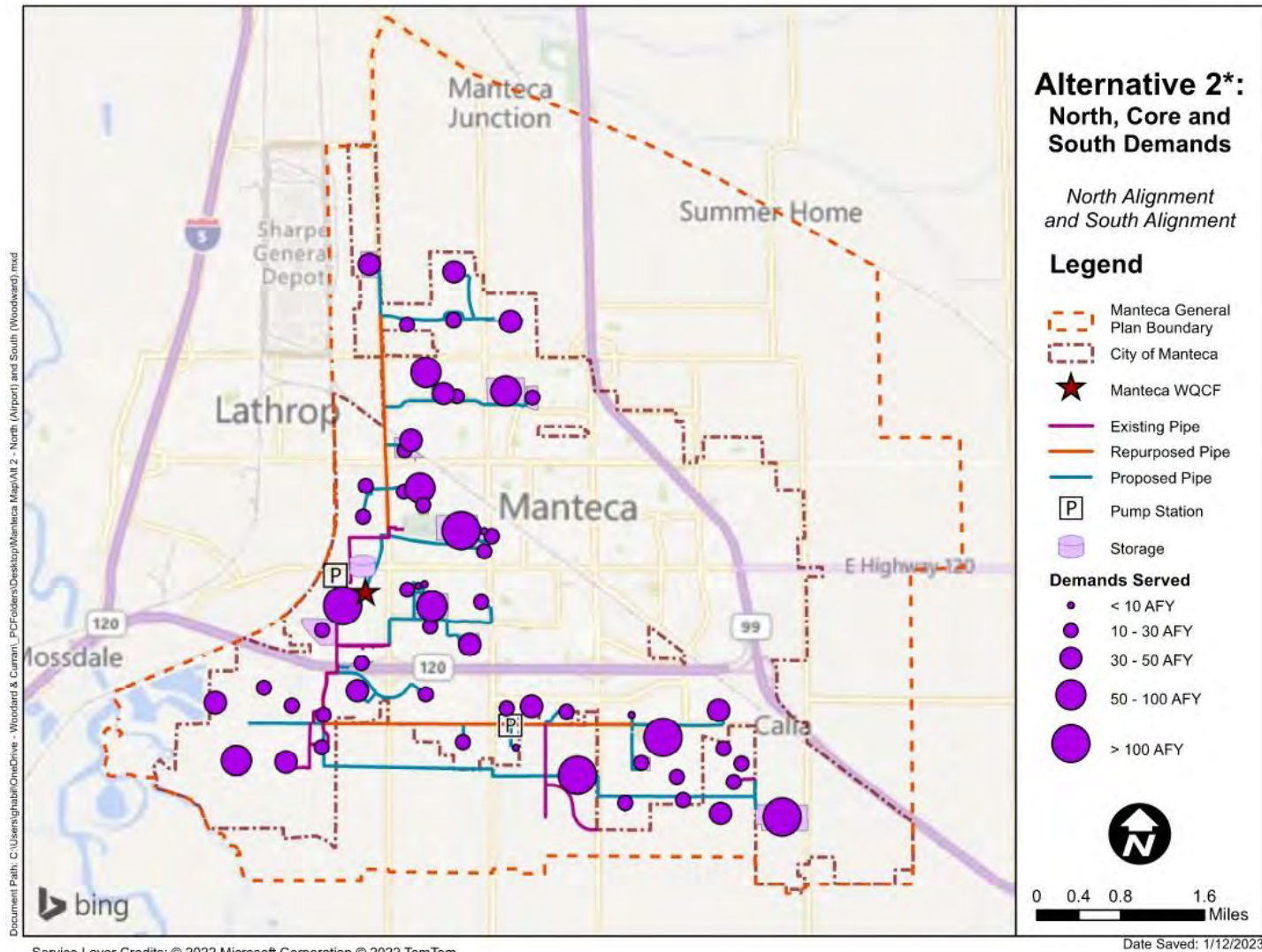


***Figure updated 2023**

The peak month demand served by this recommended project is approximately 4.8 mgd (or 6,100 AFY), which means that only a small amount of treated water would remain for other uses or discharged to the San Joaquin River under summer, dry weather conditions. Nonetheless, the City should continue to explore opportunities with regional partners, such as irrigation districts or the community of Mountain House, recognizing that a single, regional project could be more cost-effective than constructing distribution pipelines throughout the city.

The total cost of facilities to serve the customers shown in Figure ES-2 is approximately \$44.8 million (in 2022 dollars). A recommended capital improvement plan and total cost is presented in Table ES-2 which includes a 3% annual cost increases resulting in an estimated capital cost of \$50.8 million. The City could apply for grant funding and/or low-interest loans to offset costs to the City and ratepayers.

Table ES-2: Recommended Capital Improvement Plan

Project Component	Proposed FY 22/23	Proposed FY 23/24	Proposed FY 24/25	Proposed FY 25 - 30	Phased with Development	Total
Planning (Title 22 Eng. Report, EIR, Water Rights Filing)	\$200,000	\$200,000				\$400,000
Treatment (Sodium Hypochlorite)	\$535,920					\$535,920
Pump Station		\$1,083,000	\$2,006,000		\$1,419,000	\$4,508,000
Pipelines	\$1,500,000	\$1,545,000	\$4,555,000	\$15,811,000	\$9,271,000	\$33,132,000
Onsite Customer Retrofits			\$114,000	\$1,447,000		\$1,561,000
WQCF Retrofits	\$644,160					\$644,160
Storage			\$2,905,000	\$3,990,000	\$3,082,000	\$9,977,000
Total	\$2,880,080	\$2,828,000	\$9,580,000	\$21,248,000	\$13,772,000	\$50,758,080

Note: 1. Costs are referenced to the ENR 20-city CCI for November 2022 at 13,175, which represents an approximate 32% increase from the January 2015 CCI at 9,972.

2. Villa Ticino West Parks 1 and 2 added in 2023.

Chapter 1 Introduction

The City of Manteca (City) is currently producing disinfected, tertiary-treated wastewater at its Wastewater Quality Control Facility (WQCF), located on the western edge of the city, and using this treated wastewater to irrigate fodder crops and/or dispose of it to the San Joaquin River. Only a small portion of the tertiary-treated wastewater – less than 1% -- is recycled through the City’s truck fill program, where it is used for construction and dust control. The City is interested in putting this resource to a higher and better use to offset potable demands and to help expand the City’s supply portfolio to meet growing demands. This Reclaimed Water Facilities Master Plan (RWFMP), originally prepared in 2017 and updated in 2023 as noted below, has been prepared to evaluate the role that recycled water can play in creating a drought-proof water supply for the City and the wider region.

This RWFMP includes the sections listed below.

- Chapter 1: Introduction
- Chapter 2: Water Supply Characteristics and Facilities (revised in 2023)
- Chapter 3: Wastewater Supply Characteristics and Facilities
- Chapter 4: Recycled Water Market Assessment (revised in 2023)
- Chapter 5: Project Alternatives Analysis (revised in 2023)
- Chapter 6: Recommended Facilities Plan (revised in 2023)
- Chapter 7: Construction Financing Plan and Revenue Program (revised in 2023)

Specific sections of the report are included in order to comply with the requirements set forth in Appendix B of the State Water Resources Control Board’s *Water Recycling Funding Program Guidelines*¹. This introductory chapter provides background on the RWFMP, and presents the RWFMP objectives, approach, and organization.

1.1 Need for Recycled Water in Manteca

The City of Manteca (City) has been growing rapidly over the past few decades. Between 2001 and 2015, the City’s population grew by approximately 42 percent², and the City anticipates another boom in both commercial and residential development in the coming years. Recycled water can play an important role in creating a drought-proof water supply to diversify the City’s water supply portfolio and help meet future demands.

The City of Manteca currently reclaims about a quarter of its treated municipal wastewater for summertime irrigation of agricultural fields. Implementation of a tertiary-treated recycled water project could benefit the City by offsetting the use of potable surface water and groundwater, improving the reliability of its supply, increasing the use of a sustainable water resource, and diversifying the City’s options for wastewater disposal. These benefits are described further below:

Offset Groundwater Pumping

The City currently uses a mixture of surface water from South San Joaquin Irrigation District’s South County Water Supply Project and groundwater from City-owned and operated wells within the Eastern San Joaquin Groundwater Basin. The Department of Water Resources (DWR) has declared the Eastern San

¹ *Water Recycling Funding Program Guidelines*. State Water Resources Control Board, June 2015. Available online at http://www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/docs/wrfp_guidelines.pdf

² *City of Manteca, CA, Comprehensive Annual Financial Report for Fiscal Year Ended June 30, 2008, and for Fiscal Year Ended June 30, 2015*. Available online at <http://www.ci.manteca.ca.us/Finance/Documents.aspx?b=cafr>

Joaquin Groundwater Basin to be in critical overdraft condition, both in the past³ and more recently⁴. Although there has been some gradual stabilization and recovery of groundwater levels in portions of the groundwater basin, the basin remains threatened by over drafting and saline water intrusion⁵. Expanding the use of recycled water to serve non-potable demands and/or to recharge the groundwater basin would address some of the overdraft issues by reducing extractions and/or increase recharge. The regional Groundwater Sustainability Plan (GSP) adopted in 2019, and discussed in Chapter 2, provides guidance to member agencies on developing projects to offset groundwater pumping.

Improve Supply Reliability

The City's population is projected to approximately double by 2040, and the City requires a reliable water supply. Recycled water supply serving non-potable demands is considered to be very consistent, even in dry years, and resistant to supply fluctuations in comparison to groundwater or surface water. The use of recycled water will reduce dependency on potable water supplies for non-potable uses and, in turn, preserve potable supplies for its highest beneficial uses (e.g., drinking water). During the current drought, City water customers have been successful at reducing demands by more than ten percent; a recycled water project could reduce these demands even further.

Utilize Tertiary-Treated Wastewater

All treated wastewater (except the amount of secondary-treated wastewater that is currently applied to agricultural fields) is treated at the Wastewater Quality Control Facility (WQCF) to meet standards for disinfected tertiary recycled water, as described in the California Code of Regulations (CCR), Title 22, Division 4, Chapter 3 (hereafter referred to as Title 22). However, only a small amount of recycled water is currently distributed to recycled water users through the City's truck fill program. The 9.87-mgd wastewater treatment plant has the capacity to meet additional recycled water demands, and the City could benefit by finding a market for the surplus tertiary-treated water.

Diversify Wastewater Disposal Options

Increased water recycling would reduce the amount of tertiary-treated wastewater discharged into the San Joaquin River, particularly during the dry season when irrigation demands are highest and the river contains the highest levels of electrical conductivity. This would allow the City some flexibility in meeting the conditions of its wastewater discharge permit by increasing the amount of available dilution in the San Joaquin River. A very large recycled water project could even eliminate the need for summer discharge altogether.

1.2 Purpose of Master Plan

The objectives of this Reclaimed Water Facilities Master Plan are to:

- Evaluate existing and projected future water demands in the City that could be met using recycled water;
- Identify infrastructure that would be needed to expand recycled water usage throughout the City to meet these demands, including distribution system pipelines and storage needed to accommodate peak recycled water demands;

³ *California's Groundwater: Bulletin 118, Update 2003*. California Department of Water Resources, October 2003.

⁴ *Final List of Critically Overdrafted Basins*. California Department of Water Resources, August 6, 2015. Available online at <http://www.water.ca.gov/groundwater/sgm/cod.cfm>

⁵ *2014 Eastern San Joaquin Integrated Regional Water Management Plan Update*. June 2014. Prepared by GEI Consultants for the Eastern San Joaquin County Groundwater Basin Authority.

- Identify infrastructure and partners that would be needed to implement a potential regional recycled water project serving customers outside of the City;
- Provide recommendations to the City to plan for expansion of the existing recycled water system; and
- Develop a capital improvement program for the recommended improvements.

1.3 Study Area Characteristics

1.3.1 Location and Study Area

The City is situated within the northern San Joaquin Valley in San Joaquin County, just east of the San Joaquin River and north of the Stanislaus River. The majority of the City's geographical area is bounded by Interstate 5 to the west, Highway 99 to the east and Highway 120 to the south. Presently, the City limits encompass an area of about 17 square miles (10,905 acres). The City is expected to continue growing, and the 10-year planning horizon includes additional 5 square miles (2,951 acres)⁶.

Incorporated in 1918, the City has an estimated 2015 population of approximately 74,000⁷. The population is expected to grow to 97,400 within the ten-year planning horizon (2025) and to 117,000 within the twenty-year planning horizon (2035)⁸.

The climate in Manteca (and in San Joaquin County, in general) is characterized by long, dry summers with an average growing season of 292 days. Cold and rainy conditions occur in November and last through April with almost 90 percent of the annual precipitation falling in these months. The average annual rainfall is about sixteen inches per year. Temperatures can exceed 110 degrees in the summer and may also fall to the low 20's in extreme cold weather events.

The long, dry summers create a demand for supplemental irrigation water during the growing season, and this demand far exceeds the amount provided by rainfall. Water is in high demand for landscape irrigation within the city, and for agricultural irrigation in the surrounding areas.

The study area, shown below in Figure 1-1, includes the entire City of Manteca, and extends beyond the City boundaries to include unincorporated portions of San Joaquin County. The study area includes all of the Eastern San Joaquin Groundwater Basin, which underlies the City and provides a significant portion of the City's water supply. Reclaimed water from the City's WQCF could be used to offset groundwater pumping in this basin, extending the City's water supply and protecting the basin's sustainability. The area where use of the City's potable water supply would be offset is more limited, extending only to the City's water service area (i.e., within current or future City limits, estimated using the City's General Plan Boundary shown in Figure 1-1).

The study area also extends past the boundaries of the East San Joaquin Groundwater Basin to include other unincorporated areas of San Joaquin County on the western side of the San Joaquin River (overlying the Tracy Groundwater Basin), where there may be a potential demand for recycled water. Because the East San Joaquin Groundwater Basin is listed as being in critical overdraft and as groundwater exports are generally prohibited by a San Joaquin County groundwater export ordinance, only projects located inside San Joaquin County were considered.

⁶ *Manteca Municipal Services Review*. July 16, 2015. Prepared by De Novo Planning Group for City of Manteca Community Development Department. Available online at <http://www.co.san-joaquin.ca.us/lafco/Manteca%20MSR/2015%20Manteca%20MSR.pdf>

⁷ *City of Manteca, CA, Comprehensive Annual Financial Report for Fiscal Year Ended June 30, 2015*. Available online at <http://www.ci.manteca.ca.us/Finance/Documents.aspx?b=cafr>

⁸ *Manteca Municipal Services Review*. July 16, 2015. Prepared by De Novo Planning Group for City of Manteca Community Development Department

Figure 1-1: Study Area Boundaries



1.4 Authorization

Woodard & Curran (formerly RMC Water and Environment) was authorized to prepare this Reclaimed Water Facilities Master Plan by the Manteca City Council on October 7, 2014.

1.5 Acknowledgements

The development of the RWFMP would not have been possible without the involvement and assistance of City staff. In particular, the following current and former City staff members and departments provided significant input and important insights throughout the development of the RWFMP:

- Mark Houghton, Director of Public Works
- Elba Mijango, Assistant Engineer, Public Works
- Fernando Ulloa, Sr. Engineer, Public Works
- Bret Swain, Sr. Engineer, Public Works
- Water Quality Control Facility Division staff, Public Works Department
- Operations and Maintenance staff, Parks and Recreation Department

Development of the RWFMP also benefitted from input provided by staff members from Manteca Unified School District and Del Puerto Water District. Approximately fifty members of the general public also attended workshops in March, June, and September 2015 and provided valuable comments.

Chapter 2 Water Supply and Water Rights

This chapter describes the City's existing sources of potable and nonpotable water, and briefly describes the water rights considerations for implementing a recycled water project.

2.1 Treated Water Supply

The City provides treated water service to approximately 22,000 service connections located within City limits. The treated water comes from a blend of two water sources: groundwater and surface water. Total treated water demand in 2015 was approximately 11,000 AFY, primarily serving residential customers, as indicated below in Table 2-1. In 2014 and 2015, in response to drought and mandatory conservation measures, treated water demands fell significantly -- approximately 20% compared to previous years.

Table 2-1: Treated Water Demands in City of Manteca

Category	Estimated 2015 Demand ⁽¹⁾ , AFY
Residential (Single-Family and Multi-Family)	8,432
Industrial	235
Commercial	1,043
Landscape	603
Institutional/Governmental	66
Other, including Losses	855
Total	11,230

Notes: (1) Source: Table 4-1, *Final 2015 Urban Water Management Plan for City of Manteca*, September 2016, prepared by Kennedy/Jenks Consultants.

Treated water deliveries are the source of flows to the wastewater treatment plant, as described in Chapter 3. Each of the supply sources – groundwater and surface water – is described below in greater detail.

2.1.1 Groundwater Supply

The City currently operates 15 potable groundwater wells within the city limits, with well depths ranging from 155 to 400 feet⁹. The system has a peak pumping capacity of 20,010 gallons per minute (36 mgd)⁹. Until 2004, groundwater was the sole source of the City's treated water supply. However, it now makes up approximately half of the City's supply due to the addition of surface water to the supply portfolio (see Section 2.1.2, below).

Groundwater Management Measures

As previously discussed, the Eastern San Joaquin Groundwater Basin has been listed by DWR as being in critical overdraft. Even before the current drought, the annual overdraft was estimated at 70,000 to 80,000 AFY¹⁰. The safe yield for the groundwater basin is estimated to be about 72,000 AFY¹⁰.

The City has set its own standard for groundwater sustainable yield as one acre-foot per acre (13,900 AFY for the 10-year planning horizon)⁹ and has sought to meet that goal by increasing surface water deliveries

⁹ *Manteca Municipal Services Review*. July 16, 2015. Prepared by De Novo Planning Group for City of Manteca Community Development Department. Available online at <http://www.co.san-joaquin.ca.us/lafco/Manteca%20MSR/2015%20Manteca%20MSR.pdf>

¹⁰ *Eastern San Joaquin Integrated Water Management Plan Update*, June 2014. Prepared by GEI for Eastern San Joaquin County Groundwater Banking Authority. See Section 3.2.

and recycled water use. The City's sustainable yield can be expected to gradually increase as the City expands in acreage. Aside from increasing extractions from the underlying basin, the City does not have access to any other groundwater sources. With use of about 7,000 AFY, the City is one of the largest users of the groundwater basin.

The Sustainable Groundwater Management Act (SGMA) was enacted by the California legislature in 2014 in response to the continued overdraft of California's groundwater resources. In response to the enactment of the SGMA, the Eastern San Joaquin Groundwater Authority (GWA) was formed via a Joint Exercise of Powers Agreement between 16 Groundwater Sustainability Agencies, including the City of Manteca. In 2019, the Authority finalized a Groundwater Sustainability Plan (GSP) which outlines a path to groundwater sustainability by 2040, as mandated by the SGMA.

The GSP includes an evaluation of historical estimates and projected groundwater pumping conditions that establish a projected groundwater extraction rate of 800,000 AFY which, if continued, will result in the continued decline of groundwater levels within the Subbasin. In order achieve sustainability, the GSP concludes that groundwater extraction in the subbasin will need to be reduced by approximately 78,000 AFY. To achieve this reduction, the GSP identifies three categories of projects and management actions for implementation: (1) groundwater replacement/recharge, (2) supplemental groundwater supplies, and (3) water conservation. In October 2022, the GWA adopted a Resolution finding that three projects submitted by the City of Manteca are consistent with the GSP. The approved projects from Exhibit A of the adopted Resolution are shown in Table 2-2.

Table 2-2: Summary of GSP groundwater offset projects.

Project	Project Type	Consistency with GSP	Quantifiable Benefits
Metering Infrastructure	Conservation, Other	Would provide for additional water savings, and potentially savings in resident water bills	The City of Manteca has over 23,000 existing residential and commercial customers.
Recycled Water Transfer to Manteca Golf Course	In-lieu recharge, Recycling, Other	This project would make use of recycled water up to 1023 AF instead of groundwater, which is currently being utilized for irrigation	The project would offset groundwater pumping use by up to 1023 AF by utilizing recycled water as a water source for irrigation.
Stormwater Collection, Treatment, and Infiltration	Direct recharge, Stormwater	The project will study the feasibility of capturing, treating, and storing storm water for use to replenish the underlying basin. Water can then be extracted during dry months for use.	Quantification will be done as part of the study after identification of suitable sites.

Groundwater Quality

The quality of the groundwater delivered to customers meets or exceeds all State and Federal standards. However, there have been instances where arsenic concentrations have exceeded the Maximum Contaminant Level (MCL) and nitrate concentrations have approached the MCL. While concentrations of those constituents present in the groundwater may approach the MCL, the water delivered to the customer meets

all drinking water standards due to blending with the treated surface water, which also meets all drinking water standards. Groundwater quality is summarized in the next chapter, in Table 3-3.

Plans for New Facilities

The City has traditionally destroyed old wells when they show signs of age and water quality problems, and replaced those with new wells to maintain the supply. The City's current five-year Capital Improvement Program¹¹ calls for two wells to be replaced in this manner: new wells will be drilled, and the old ones will be properly decommissioned according to the San Joaquin County Well Standards (San Joaquin County Ordinance Code Section 9-1115.6). It also includes planning for test wells in areas where new development is occurring in the City.

2.1.2 Surface Water Supply

The City augments its groundwater water supply with surface water purchased from the South San Joaquin Irrigation District's (SSJID's) South County Water Supply Project (from Woodward Reservoir). The surface water is treated by SSJID at the Nick C. DeGroot Water Treatment Plant in Oakdale, then conveyed to four turnouts located in the City for blending with groundwater and distribution to customers. The City has a long-term contract with SSJID, with an existing allotment of 11,500 AFY. Actual deliveries in 2015 were 5,600 AFY.

Surface Water Quality

The quality of the surface water delivered to customers meets or exceeds all State and Federal drinking water standards. Surface water quality is summarized in the next chapter, in Table 3-3.

Plans for New Facilities

The City's contract with SSJID allows the allotment of surface water to increase from 11,500 AFY to 18,500 AFY in the future. Expansion of the water treatment plant would require funding and new agreements between SSJID and the cities served, which include Manteca, Escalon, Tracy, and Lathrop.

2.2 Nonpotable Water Supply

In addition to the treated water supplies described above, several sources of nonpotable water are used to serve landscape and agricultural irrigation demands in and around the City, including the following:

- The City maintains 31 shallow, nonpotable wells expressly for the purpose of irrigating parks. The wells are metered, and total production from these wells in 2015 was about 1,610 AF.
- Manteca Unified School District has installed irrigation wells at many of its facilities; the water is typically used to irrigate playfields located in the rear of each school, although some schools outside of City limits also use the water as a drinking water supply. Well production data were not available for the schools, so the estimated usage below is based on the irrigated area.
- SSJID also operates a number of wells in the area, including twelve wells located in the current City limits and eight more wells located within the City's General Plan area. Typically, most but not all of these wells are active within a given year.

Nonpotable demands are summarized below in Table 2-3. Numerous private wells for residential and agricultural also exist in the area, but production information is not available and therefore these uses are not included in the table below.

¹¹ City of Manteca Capital Improvement Program, FY2016-2020.

Table 2-3: Nonpotable Water Demands in Manteca

Category	Estimated Usage, Million Gallons / Year	Estimated Usage, AFY
City parks served by nonpotable wells ⁽¹⁾	300	920
Manteca Unified School District ⁽²⁾	190	590
SSJID Wells ⁽³⁾	1,390	4,270
Total Nonpotable Demand	1,880	5,780

Notes:

- (1) Based on 2014 Well Metering, June – December, provided to Woodard & Curran by City staff.
- (2) Estimated based on irrigated area of 15 Manteca Unified School District schools that are located in the City of Manteca and served by wells. Assumes 4 acre-feet/acre of water applied.
- (3) Based on Yearly Pump Report for 2013 provided by SSJID to City staff. Sum of 11 active wells located inside the City’s General Plan area (Wells 12, 61, 70, 72, 77, 79, 81, 85, 87, 88, and 100).

In general, the water quality of the shallow aquifer is sufficient for irrigation purposes. However, during discussions with the City’s Parks and Recreation Department, City staff indicated that during the current drought, trees in some areas have developed more obvious signs of salt stress and leaf burn than trees in other areas, which may reflect variability in the water quality of the shallow aquifer across the City. Water quality monitoring data for the shallow wells is not available to confirm this.

2.3 Water Rights Considerations

State law (California Water Code §1210) confers rights to the treated wastewater to the City -- not SSJID, even though SSJID provides about half of the City’s potable water supply. If the City wishes to make use of the treated wastewater, under California Water Code §1211, the City must first obtain approval from the State Water Resources Control Board prior to making any change in the place or purpose of use of treated wastewater. This process is called a “Wastewater Change Petition,” and it is filed with the State Water Resources Control Board’s Division of Water Rights. The Division considers whether the decreased discharge might adversely affect other downstream, legal users of water, or whether it might harm instream beneficial uses. Given the numerous state and federal water project exports that occur downstream of the City’s discharge, this may be a contentious process for some recycled water project alternatives. The Wastewater Change Petition is typically developed in tandem with environmental documentation, since many similar issues are involved.

A Wastewater Change Petition would be required for any recycled water alternative that involves reducing the City’s discharge to the San Joaquin River, regardless of whether the water is used within the City or conveyed outside City limits. A Wastewater Change Petition is not required for increases in flow that have never been discharged to the river (e.g., flows that are projected to occur under future growth scenarios) – only for past discharges.¹²

The Wastewater Change Petition would cover the entire amount of water that is expected to be recycled, including both surface water and groundwater supplies. The law is sometimes interpreted as being applicable only to the portion of wastewater that is derived from surface water supplies – in this case, about half of the City’s current supply portfolio. However, to be conservative, the portion of the water supply provided by groundwater should also be included in the Wastewater Change Petition, particularly since the exact balance of surface water and ground water may change in any given month and year.

¹² State Water Resources Control Board. *Wastewater Change Petition*.
http://www.swrcb.ca.gov/waterrights/water_issues/programs/applications/wastewaterchange/index.shtml

In lieu of a Wastewater Change Petition, the City could leave the water in the San Joaquin River and transfer it to a downstream user. California Water Code §1485 may allow for a downstream diverter to make use of the City's recycled water. The City would have to file an application to appropriate the water downstream, then transfer the water to the downstream user. California Water Code §1485 is specific to the San Joaquin River and provides:

Any municipality, governmental agency, or political subdivision operating waste disposal plants producing disposal water meeting the requirements of the appropriate regional board, and disposing of said water in the San Joaquin River may file an application for a permit to appropriate an equal amount of water, less diminution by seepage, evaporation, transpiration or other natural causes between the point of discharge and the point of recovery, downstream from said disposal plant and out of the San Joaquin River or the Sacramento-San Joaquin Delta. A permit to appropriate such amount of water may be granted by the board upon such terms and conditions as in the board's judgment are necessary for the protection of the rights of others. Water so appropriated may be sold or utilized for any beneficial purpose. The right to the use of water granted by this section shall not include water flowing in underground streams.

The Legislature finds and declares that the problems incident to the full utilization of the waters of the San Joaquin River and the Sacramento-San Joaquin Delta into which it flows, are unique and that a general law cannot be made applicable thereto.

This option would not involve a Wastewater Change Petition, since there would be no change in the place or purpose of use – the City's wastewater would continue to be discharged to the San Joaquin River. However, a water rights filing would still be required, with a regulatory and public review process that is similar in scope and complexity to the Wastewater Change Petition.

Chapter 3 Wastewater Characteristics and Facilities

This chapter describes the quantity and quality of recycled water that can be produced by the City's wastewater treatment plant.

3.1 Wastewater Treatment Facilities

The City of Manteca's Wastewater Quality Control Facility is located on the western edge of the City, near the border with the City of Lathrop and just north of Highway 120. The location of the WQCF is shown in Figure 1-1. The WQCF has been providing wastewater service for the Manteca community since 1959¹³, and has grown over time from a simple oxidation ditch into a facility that provides primary, secondary, and tertiary treatment complying with Title 22 requirements for disinfected tertiary recycled water. The City has been providing tertiary treatment since 2007.

The WQCF currently serves the City of Manteca, as well as portion of the City of Lathrop, with a combined population of about 87,000¹⁴. By agreement with the City, Lathrop is entitled to 14.7% of the WQCF's treatment capacity. The permitted average dry weather flow of the WQCF is 9.87 mgd. The City plans to expand the WQCF to 17.5 mgd of treatment capacity in the future, and this future expansion has already been approved by the Regional Water Board¹⁴. However, no timeline for the expansion has been set.

The City's WQCF includes the following treatment processes (shown below in Figure 3-1):

Primary Treatment

- Influent screening;
- Aerated grit removal;
- Primary sedimentation;

Secondary Treatment

- Biological treatment in biotowers (for a portion of primary effluent only);
- Ultra-fine bubble activated sludge process, including nitrification-denitrification;
- Secondary sedimentation;

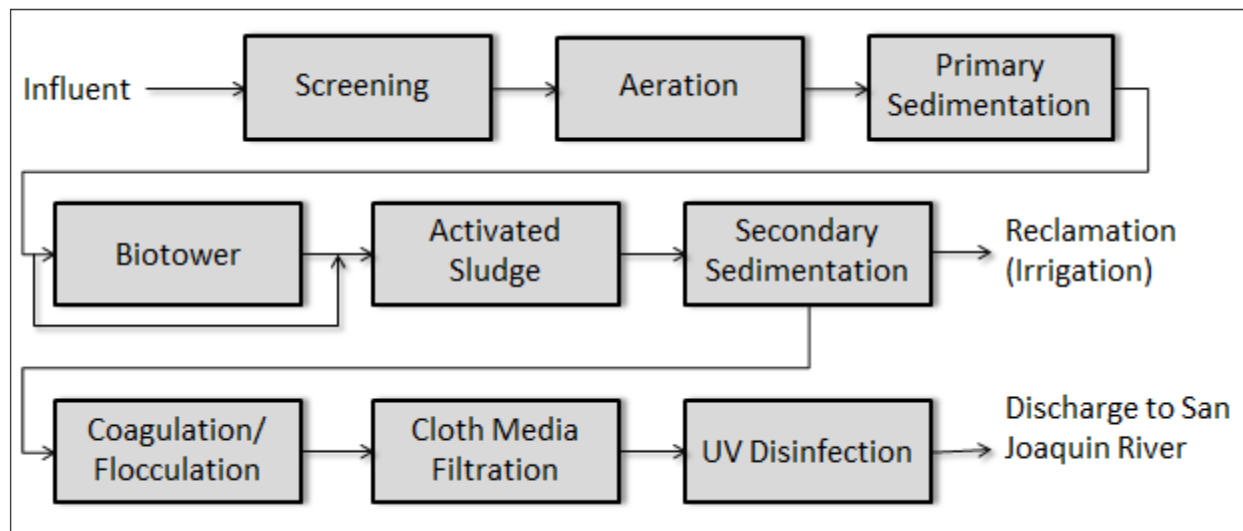
Tertiary Treatment

- Coagulation and flocculation;
- Cloth media filtration;
- UV disinfection;
- Effluent flow measurement and disposal.

¹³ Nolte Associates, 2006. *City of Manteca – Wastewater Quality Control Facility Master Plan Update*. December 2006. Prepared by Nolte Associates, Inc., for the City of Manteca.

¹⁴ Central Valley Regional Water Quality Control Board, 2015. *Waste Discharge Requirements for the City of Manteca and Dutra Farms, Inc., NPDES Permit No. CA0081558*. Order No. R5-2015-0026.

Figure 3-1: Existing Wastewater Treatment Flow Schematic



Most influent wastewater goes through the treatment process shown above in Figure 3-1. The WQCF also provides separate treatment and disposal for food processing wastewater from one large industrial discharger, Eckert Cold Storage. However, this wastewater is segregated from the tertiary treatment process, and is not considered further as part of this study.

3.2 Wastewater Quantity

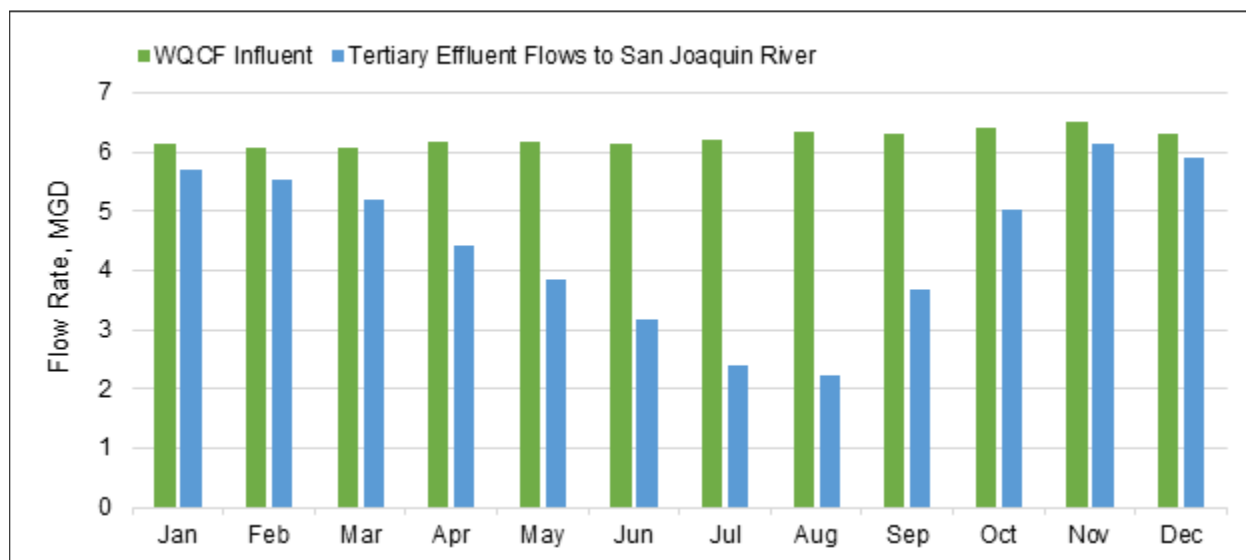
During the winter months, all WQCF flow is tertiary-treated and discharged to the San Joaquin River. In the summer, a portion of WQCF secondary-treated flows are diverted to agricultural uses in land application areas located adjacent to the WQCF. However, a significant portion of WQCF flows are sent to the San Joaquin River even during peak irrigation periods. Recent reclamation and disposal rates are summarized below in Table 3-1. Average monthly WQCF influent and tertiary-treated wastewater flows to the San Joaquin River are shown in Figure 3-2.

Table 3-1: Current Disposal and Reuse

Flow Stream	Million Gallons per Day	Acre-Feet per Year
WQCF Inflow	6.2	7,000
Secondary-Treated Wastewater Reclaimed for Agricultural Irrigation	1.8	2,000
Disinfected Tertiary-Treated Wastewater Discharged to San Joaquin River	4.4	5,000

Source: NPDES Permit monitoring data reported to CIWQS for period October 2011 – September 2016.

Figure 3-2: Monthly Average Flow Rates at WQCF



Source: NPDES Permit monitoring data reported to CIWQS for period October 2011 – September 2016.

For the purposes of this study, no diurnal variation was assumed in the availability of tertiary recycled water. This is because the WQCF has a 7-MG secondary effluent equalization pond that provides buffering of diurnal flow variations. The equalization pond is located downstream of secondary treatment and upstream of tertiary treatment, providing constant flows through the tertiary treatment system. The assumption of constant flows through the day was also verified by WQCF operations staff¹⁵.

As listed above in Table 3-1, the average annual influent rate to the WQCF over the last several years was 6.2 mgd. However, this master plan uses a more conservative (lower) estimate of the recycled water that can be reliably delivered. Over the period October 2011 – September 2016, the daily influent flow rate was greater than 5.8 mgd about 95% of the time, and greater than 5.7 mgd about 99% of the time. A firm delivery rate of 5.7 mgd was assumed for to be available to meet customer demands (i.e., estimates of deliveries and sizing for pump stations and pipelines). For sizing of storage, an additional safety factor of 20% was applied to this low-flow condition, resulting in an estimated total flow of 4.6 mgd available for reuse on a reliable (i.e., peak hour basis). The safety factor is to account for diurnal variability in actual WQCF operations.

In the future, as Manteca grows, wastewater flows will increase, as will the availability of recycled water. As mentioned above, the City's current wastewater discharge permit allows the City to discharge up to 17.5 mgd of tertiary-treated wastewater to the San Joaquin River following a significant expansion of the WQCF¹⁶. However, there is currently no timeline in place for making these improvements, and significant uncertainty exists about the exact timing of increased wastewater flows. The City's wastewater collection system master plan calls for flows of 18.4 mgd within a ten-year planning horizon¹⁷. However, this timing appears to be unrealistic based on recent population projections. A population increase to 117,000, representing a 60% increase over the current population, could result in wastewater flows that increase by only 60%, which is within the existing 9.87-mgd capacity of the WQCF. In fact, the City's Capital

¹⁵ Meeting with WQCF staff, July 22, 2015.

¹⁶ Central Valley Regional Water Quality Control Board, 2015. *Waste Discharge Requirements for the City of Manteca and Dutra Farms, Inc., NPDES Permit No. CA0081558*. Order No. R5-2015-0026

¹⁷ *City of Manteca 2012 Wastewater Collection System Master Plan Update*. January 2013. Prepared for City of Manteca by NV5. See Appendix B.

Improvement Plan for FY 2016-2020 specifically defers an incremental 2.5-mgd expansion of the WQCF past 2020, since the need for additional capacity is not expected within the next 5 years.

Because of this uncertainty about the timing of future growth, the maximum amount of recycled water assumed to be available in the future was 9.87 mgd, the capacity of the treatment plant. Since this was intended to be an upper bound for planning purposes, and was only used for planning alternatives that do not include storage, no operational safety factor was applied to this flow rate. Assumptions related to recycled water availability are summarized below in Table 3-2.

Table 3-2: Availability of Tertiary-Treated Recycled Water

	Current (2016)	Future (10-20 year planning horizon)
Annual Average Influent Flow <i>Oct. 2011 – Sep. 2016</i>	6.2 mgd	-
Average Dry Weather Influent Flow <i>Lowest running 3-month average, Oct. 2011 – Sep. 2016</i>	5.9 mgd	-
Minimum Dry Weather Influent Flow Rate <i>1st percentile, Oct. 2011 – Sep. 2016</i>	5.7 mgd	-
Recycled Water Available, mgd <i>Average dry weather conditions</i>	5.7 mgd	9.87 mgd
Recycled Water Available, AFY	6,400 AFY	11,000 AFY
- 20% Safety Factor for WQCF Operations	-1.2 mgd	-
Minimum Recycled Water Available, mgd	4.6 mgd	9.87 mgd

3.3 Wastewater Quality

Tertiary-treated water from the WQCF that is currently discharged to the San Joaquin River or used for construction or dust control purposes is already fully compliant with the requirements for disinfected tertiary recycled water found in §60301.230 of Title 22. These requirements focus primarily on pathogen inactivation.

The tertiary-treated water is also subject to state and federal requirements listed in the City's National Pollutant Discharge Elimination System (NPDES) permit¹⁶, which means that it meets applicable water quality objectives for the San Joaquin River. These requirements focus primarily on conventional pollutants (biochemical oxygen demand, total suspended sediment, pH), non-conventional pollutants (ammonia, nitrate), and priority pollutants (metals and organic chemicals). The City must meet all water quality objectives at the point of discharge as no dilution credits were granted in the current NPDES permit. Although these water quality limits are not legally applicable to the recycled water, they are indicative of the water quality requirements that the WQCF typically meets, and they provide a high level of certainty that the recycled water is safe for re-use in an irrigation setting.

3.3.1 Salts and Nutrients

Salts and nutrients are additional water quality constituents of concern for using recycled water for landscape and agricultural irrigation. Salts contribute to water stress in plants, and some constituents, such as sodium, chloride, and boron, can accumulative in the leaves and stems. High sodium levels can also reduce the rate that water infiltrates into the soil. This section addresses salts and nutrients in recycled water, including the following:

- A comparison of water quality from WQCF tertiary recycled water to the surface water and groundwater currently used for irrigation;
- Information about the salt sensitivity of landscape plants and crops grown in City parks, and in agricultural areas in and around the City of Manteca;
- An assessment of whether the City's recycled water meets the acceptability criteria for unrestricted use as irrigation water.

The salt and nutrient content of the recycled water is compared to the water quality of existing groundwater and surface water supplies in Table 3-3, below. Bulk salinity of irrigation water can be expressed using Total Dissolved Solids (TDS) or Specific Conductance ($\mu\text{S}/\text{cm}$ at 25°), while the Sodium Adsorption Ratio (SAR), the ratio of sodium to the sum of calcium and magnesium, is used to assess the potential for sodium to build up in the soil. The dissolved salt content of the recycled water is approximately 40-60% higher than typical groundwater supplies in the City.

Table 3-3: Water Quality Comparison

Constituent	Manteca Tertiary-Treated Wastewater ¹⁸	Manteca Municipal Well Water Supply ¹⁹	Municipal Surface Water Supply ²⁰
Specific Conductance, $\mu\text{S}/\text{cm}$	768	486	114
TDS, mg/L	450	331	71
Hardness, Total, mg/L as CaCO_3	141	175	47
Bicarbonate Alkalinity, mg/L as CaCO_3	159	213	52
Ammonia, Total as N, mg/L	0.5	Not Avail.	Not Avail.
Nitrate, Total as N, mg/L	5.5	7.3	Not Avail.
Boron, $\mu\text{g}/\text{L}$	219	125	100
Chloride, mg/L	96	24	8
Sodium, mg/L	84	32	5
Calcium, Total, mg/L	34	47	15
Magnesium, Total, mg/L	9	15	2
SAR (Calculated)	2.5	0.8	0.2

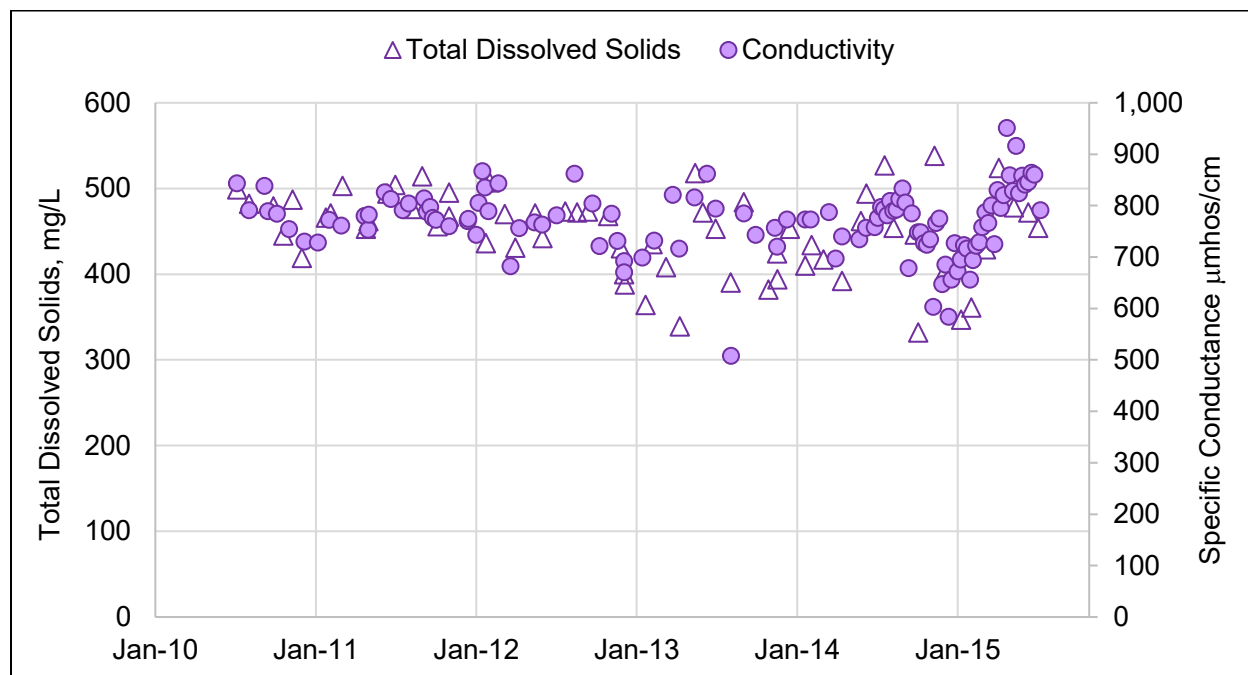
The dissolved salt content of WQCF tertiary-treated wastewater, measured as TDS or specific conductance, is fairly stable over time, and rarely exceeds 550 mg/L or 850 $\mu\text{mhos}/\text{cm}$. The trend over the last several years is shown below in Figure 3-3.

¹⁸ NPDES Permit monitoring data from Manteca WQCF Monitoring Point EFF-001, July 2010-July 2015. Accessed through CIWQS electronic self-monitoring reports (http://www.waterboards.ca.gov/water_issues/programs/ciwqs/)

¹⁹ For most constituents except boron and hardness, groundwater quality data are from the SWRCB's Geotracker database for City of Manteca water supply wells (Well ID 3910005), 2004 – 2014. Accessed through <http://geotracker.waterboards.ca.gov/gama/>. For boron and hardness, which were not available for City wells through Geotracker, data are from well monitoring results from 2010-2014 submitted to CIWQS by Manteca WQCF for compliance with Order No. R5-2009-0095. See link to CIWQS under Note 1, above.

²⁰ Data from water supply monitoring results from 2010-2014, submitted to CIWQS by Manteca WQCF for compliance with Order No. R5-2009-0095. See link under Note 1, above.

Figure 3-3: Salt Content of WQCF Tertiary-Treated Wastewater



The suitability of recycled water for irrigation depends on the salt sensitivity of the plants being irrigated, which varies by species. The most sensitive agricultural crops that are widely planted in the area include almonds, apricots, walnuts, and dry beans²¹. Salt-sensitive landscape plantings identified by City Public Works staff include coast redwood, pin oak, other oaks and maples. The salt sensitivity of these landscape species is approximately the same as the sensitive agricultural crops; for example, redwood trees should not be irrigated with water exceeding a specific conductance of about 1,000 $\mu\text{S}/\text{cm}^2$. Most turfgrass species are fairly salt tolerant, with the exception of annual bluegrass and Kentucky bluegrass²³. Some of these turfgrass species are currently used in City parks for base turf and/or annual over-seeding.

Table 3-4 and Figure 3-4, below, compare the City's tertiary-treated wastewater with guidelines for irrigating salt-sensitive crops. In addition, Table 3-4 show drinking water standards and water quality standards for the Delta-Mendota Canal (DMC) non-project surface water pump-in program, which allows the federal facilities to convey non-project water (e.g., groundwater or recycled water). The Delta-Mendota Canal, which is a possible destination for the City's recycled water (see section 5.3), is used primarily for agricultural irrigation, so the guidelines were developed to be protective of salt-sensitive crops. The guidelines below are protective for both the roots (e.g., salt stress due to high salt content in the soil) as well as foliage (e.g., salt taken up directly by foliage).

²¹ Hoffman, G., 2010. *Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta - Final Report*. Completed for State Water Resources Control Board, Division of Water Rights, January 5, 2010.

²² Oster, J.D., 2009. Irrigation with recycled water in Santa Clara County: Limitations and potentials. In: Solutions Project Report, Santa Clara Valley Water District.

²³ Wu and Dodge, 2005. *Landscape Plant Salt Tolerance Selection Guide for Recycled Water Irrigation*. Special report for the Elvenia J. Slosson Endowment Fund, Department of Plant Sciences, University of California, Davis. Available online at http://slosson.ucdavis.edu/Landscape_Plant_Selection_Guide_for_Recycled_Water_Irrigation/

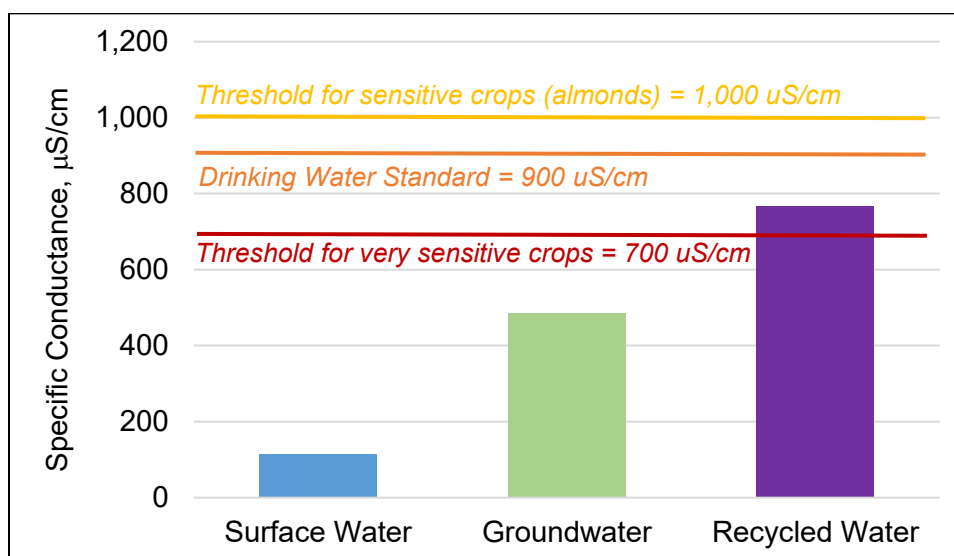
Table 3-4: Suitability of Recycled Water for Irrigation Use

Constituent	Manteca Tertiary-Treated Wastewater, Average	Drinking Water Standard	DMC Water Quality Standards ^(a)	Acceptable Level for Irrigating Sensitive Crops
Specific Conductance, $\mu\text{S}/\text{cm}$	768	900 ^(b)	900	700 - 1,000 ^{(d)(e)}
TDS, mg/L	450	500 ^(b)	500	450 – 650 ^(f)
Bicarbonate Alkalinity, mg/L as CaCO_3	159	-	-	75 ^(g)
Nitrate, Total as N, mg/L	5.5	10 ^(c)	10	5 ^(h)
Boron, $\mu\text{g}/\text{L}$	219	-	700	500 ⁽ⁱ⁾
Chloride, mg/L	96	250 ^(b)	250	100 ^(g)
Sodium, mg/L	84	-	69	69 ^(g)
SAR (Calculated)	2.5	-	-	0-3 ^(f)

Sources:

- US Bureau of Reclamation, 2014. *Delta-Mendota Canal Non-Project Surface Water Pump-in Program, 2015 Water Quality Monitoring Plan*. December 30, 2014. Values listed are the lower bound when a range was provided.
- Secondary Maximum Contaminant Level (MCL), based on consumer acceptance criteria.
- Primary MCL, based on public health criteria.
- Ayers and Westcot, 1985. *Water Quality for Agriculture*. Food and Agricultural Organization of the United Nations – Irrigation and Drainage Paper No. 29, Rev. 1. Available at <http://www.fao.org/DOCRp/003/T0234e/T0234E01.htm>. Values listed are from Table 4 and correspond to 100% crop yield for beans (700 $\mu\text{S}/\text{cm}$) and almonds (1,000 $\mu\text{S}/\text{cm}$), which are widely planted in the region.
- Harivandi, M.A. "Irrigating Turfgrasses with Municipal Reclaimed Water." *Acta Horticulture* 938: 95-103. Sensitive species can be irrigated with water < 700 $\mu\text{S}/\text{cm}$.
- Ayers and Westcot, Table 1. Note that 650 mg/L TDS corresponds to 1,000 $\mu\text{S}/\text{cm}$.
- Ayers and Westcot, Table 1. Values were converted from meq/L to mg/L. Standards are based on leaf absorption and deposition due to overhead sprinkler irrigation.
- Ayers and Westcot, Table 1. Applies only to sensitive species such as sugar beets and grapes.
- Ayers and Westcot, Table 16, lower bound for sensitive crops, which includes walnuts and stone fruits.

Figure 3-4: Comparison of Salt Content to Water Quality Requirements



Based on the comparison in Table 3-4 and Figure 3-4, above, the following conclusions apply to the City's tertiary-treated water:

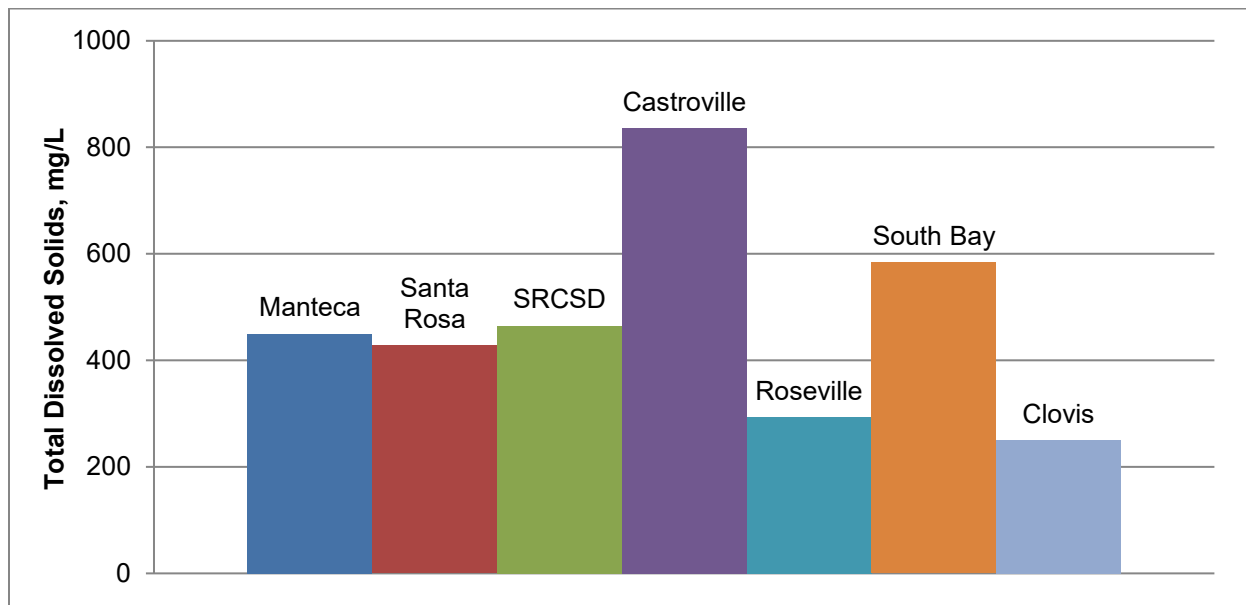
- The concentration of salts in the City's recycled water supply is typically lower than allowed by drinking water standards.
- The City's recycled water supply can be used without blending to irrigate all but the most sensitive agricultural crops. With proper irrigation practices, no yield reduction is expected for most crop types.
- For landscape plants, the most sensitive species of turf grass (e.g., bluegrass) could experience salt stress if irrigated with recycled water; however, many other varieties of turfgrass are available that are more salt-tolerant.
- The City's recycled water supply meets most of the water quality requirements for conveyance to agricultural irrigation customers using the Delta-Mendota Canal. The water meets DMC standards for all constituents except sodium.
- Proper irrigation practices can mitigate the increased salt stress associated with recycled water use. Examples include:
 - Applying sufficient water to leach salts away from the root zone;
 - Avoiding overhead sprinkler use during hot, dry periods;
 - Avoiding direct wetting of salt-sensitive species, such as conifers.
 - Protecting soil permeability, which can be affected by high sodium content, by using soil amendments such as gypsum;
 - Leaching salts from the soil using lower-salinity water on a periodic basis.

Additional information is available from the WateReuse *Salinity Management Guide*²⁴.

With respect to salt content, the City's tertiary-treated water is quite typical of other recycled water projects in northern and central California. Figure 3-5 shows how Manteca's recycled water supply compares to others in the region, including those run by the City of Santa Rosa, Sacramento Regional County Sanitation District (SRCSD), Monterey Regional Water Pollution Control Agency (Castroville), City of Roseville, the South Bay Water Recycling Program, and the City of Clovis. Several of these programs have operated successfully for decades.

²⁴ *Salinity Management Guide*. WateReuse Foundation, 2007. Available online at <https://watereuse.org/salinity-management/index.html>

Figure 3-5: Water Quality Comparison with Other Recycled Water Projects



The City could take steps to lower recycled water salinity by increasing the fraction of surface water and decreasing the fraction of groundwater in the municipal drinking water supply, or by seeking to reduce salt loading from residential sources (i.e., self-regenerating water softeners), or from commercial and industrial sources. However, because the City's recycled water supply is already appropriate for irrigation use, these steps are not required prior to expansion of the recycled water program.

3.4 Existing Recycled Water Facilities

The City currently distributes recycled water to a truck fill station located just north of the WQCF. The water is used for construction purposes and dust control. Water for the truck fill station is chlorinated prior to distribution. In mid-2015, distribution to the truck fill station averaged about 27,000 gallons per day, or about 0.5% of the total recycled that is available.

The City has anticipated eventual construction of a recycled water distribution system, and one significant segment of pipeline is currently in place. A twelve-inch recycled water pipeline runs 2,600 feet along Daniels St. from the Big League Dreams facility to Airport Way (see purple pipe shown in Figure ES-2 or Figure 6-1). The City is also requiring new developments to install recycled water pipelines sufficient for connecting new parks to recycled water distribution pipelines that may one be located in arterial roads.

3.5 Plans for Treatment Process Modification

The City's tertiary treatment system does not require any modifications to meet Title 22 standards or end user requirements. However, if the City plans to construct a distribution system for recycled water, the WQCF will require upgrades to the chlorination system. The WQCF uses UV disinfection to meet Title 22 standards; the chlorination system is used solely to provide residual chlorine, which prevents nuisance growths in distribution pipelines. The current chlorination system is not fully automated, and does not have sufficient capacity to serve uses beyond the truck fill station. Therefore, this RFWMP assumes that a new sodium hypochlorite storage tank and fully automated dosing system will be required.

The addition of reverse osmosis treatment was briefly evaluated but not considered for the alternatives to be presented in Chapter 5. Reverse osmosis could be added to the end of the current treatment train in order

to reduce the salt content of the recycled water. A high-level cost estimate was prepared to determine the increase in cost this treatment would add to the recycled water. The cost of reverse osmosis will vary depending on the starting salt concentration and desired ending salinity, but a reasonable estimate is \$0.70 per pound of salt removed^{25,26}. This cost is roughly 25% capital cost and 75% operations, maintenance and disposal of the salt. This treatment would add about \$500-1,000 per acre-foot of water produced, making the end cost of recycled water extremely high.

²⁵ *Characterizing and Managing Salinity Loadings in Reclaimed Water Systems*. American Water Works Association, 2006.

²⁶ *Survey of High-Recovery and Zero Liquid Discharge Technologies for Water Utilities*. WateReuse, 2008.

Chapter 4 Recycled Water Market Assessment

4.1 Introduction

The purpose of the recycled water market assessment was to identify specific uses for the tertiary-treated wastewater produced by the City. The recycled water market assessment was split into three categories:

1. Local demands – Landscape irrigation, commercial, and industrial demands located within the City’s sphere of influence that could be served directly by the WQCF.
2. Regional demands – Demands beyond the City’s sphere of influence, including wholesale opportunities with neighboring irrigation or water districts.
3. Groundwater recharge – Recycled water could be used to intentionally recharge the Eastern San Joaquin Groundwater Basin.

4.1.1 The three categories of demands are explored below, followed by a discussion of potential user interest, reliability needs and barriers to recycled water use. Key Assumptions

The following assumptions were made during the recycled water market assessment:

- The quality of the recycled water would be the same as the City’s existing tertiary-treated wastewater, with no additional treatment other than addition of residual chlorine (see section 3.3 and section 3.5).
- The quantity of recycled water available for delivery is 5.7 mgd under current conditions. This amount would grow to 9.87 mgd in the future (see Table 3-2, Section 3.2). This amount is available year-round. Seasonal storage was not considered.
- For direct delivery of recycled water, the only uses considered were those listed in Title 22 §60303 - §60307 as acceptable end uses for disinfected tertiary recycled water. These uses include agricultural irrigation (including food crops where the edible portion comes into contact with recycled water), landscape irrigation of parks, playgrounds, and schoolyards, irrigation of unrestricted access golf courses, and residential landscaping. Direct potable reuse was not considered, as the state has not yet developed regulations allowing this practice.
- Local, non-potable demands within the City included current water users, as well as anticipated water users identified in the City’s 2023 General Plan or specifically identified in recent planning documents reviewed or approved by City planning staff (see section 4.1.2, below). This corresponds to a planning horizon of approximately 5-10 years for the local customer base.
- The assessment was focused on non-potable reuse. However, the potential for indirect potable reuse did not automatically exclude projects from consideration. In fact, two of the options considered -- groundwater recharge and water transfers -- would result in incidental reuse by potable water customers. Manteca’s wastewater, since it is discharged to the San Joaquin River, is already indirectly served to the millions of Californians whose drinking water supply comes from the State Water Project.
- Potential projects were initially included regardless of whether a willing project partner could be identified, since this can change with time. The ability to implement the project was considered later, during the evaluation of project alternatives (see section 5.4.3)

4.1.2 Background Data

The data analyzed as part of the Market Assessment were obtained from previous City planning documents, City-provided water use data, San Joaquin County GIS data, landscape irrigation plans provided by

Manteca Unified School District, and discussions with City staff. The documents reviewed during the Market Assessment included the following:

- *City of Manteca Wastewater Quality Control Facility Master Plan Update – Update of Urban Water Recycling Opportunities*. Nolte Associates, Inc., September 2004.
- *City of Manteca 2012 Wastewater Collection System Master Plan Update*. NV5, January 2013.
- City of Manteca Water utility billing records for City potable water customers for calendar year 2013, compiled by Kennedy/Jenks for use in the City's 2015 Urban Water Management Plan.
- Well pump logs for City parks for calendar years 2004-2006.
- Manteca Unified School District, 2014 Site Irrigation Inventory for elementary and middle school sites.
- Parks, schools, and other land use categories for individual parcels as listed in the San Joaquin County GIS database (see <http://www.sjmap.org/>, shapefiles for Parks, Schools, etc.).
- *Union Ranch Specific Plan, Manteca, California*. HLA Group, updated May 2014.
- *Draft Environmental Impact Report (EIR) – South of Woodward Avenue Project*. Section 4.11, “Public Services and Utilities.” November 2014.
- *Draft Austin Road Business Park and Residential Community Master Plan*. City of Manteca Community Development Department, undated.
- *Northwest Airport Way Master Plan*. City of Manteca Community Development Department, November 2010.
- *Monte Bello Final Initial Study and Mitigated Negative Declaration*. IS-14-01. Completed by City of Manteca Community Development Department.
- *Water Supply Assessment for Family Entertainment Zone*. West Yost Associates, November 2014.
- *Notice of Preparation and Initial Study for the Griffin Park Master Plan*. Prepared by De Novo Planning Group for Manteca Community Development Department, June 2016.
- *Notice of Preparation for the Oakwood Landing – Cerri and Denali Subdivisions*. Prepared by De Novo Planning Group for Manteca Community Development Department, August 2016.
- *Terra Ranch Subdivision – Draft Environmental Impact Report Volume I*. Prepared by Raney Planning & Management for City of Manteca, November 2010.
- *The Trails of Manteca Project – Draft Environmental Impact Report*. Prepared by Michael Brandman Associates for City of Manteca, October 14, 2010.
- *Mitigated Negative Declaration and Initial Study for the Amended Shadowbrook Manteca Project*. Prepared by De Novo Planning Group for Manteca Community Development Department, November 2015.
- *Final Environmental Impact Report for the Oakwood Trails Subdivision*. Prepared by De Novo Planning Group for Manteca Community Development Department, October 21, 2015.
- Proposed subdivision maps for Crivello Estates and Dolcinea.

4.2 Local Demand Identification

This section summarizes the potential urban irrigation, industrial and commercial recycled water customers identified within the City’s sphere of influence.

4.2.1 Urban Irrigation Demands

Potential urban irrigation demands identified in the City’s sphere of influence are shown below in Figure 4-1. Potential urban irrigation customers are comprised of parks, school playing fields, sports complexes, a golf course, green spaces and planned parks/green spaces. The majority of the demand comes from City parks and Manteca Unified School District (MUSD) playing fields. While there were 10 MUSD schools identified outside of the City’s SOI, these potential demands were not considered past the initially developed demand list due to the increased complexity and cost associated with serving customers outside of the City’s SOI. The urban irrigation demands located within these customers are summarized in Table 4-1 and are shown in Figure 4-1. Appendix B includes a detailed table of all identified potential urban irrigation demands.

Table 4-1: Urban Irrigation Demand Summary

Urban Irrigation Demand	No. of Sites	Irrigable Acreage
Parks	65	310
School Playing Fields	24	209
Golf Course/Sports Complex	3	107
Green Space	4	35
Planned Park/Open Space	22	257
Total	118 sites	918 acres

Note: Villa Ticino West Parks 1 and 2 added in 2023.

Figure 4-1: Urban Irrigation Demands

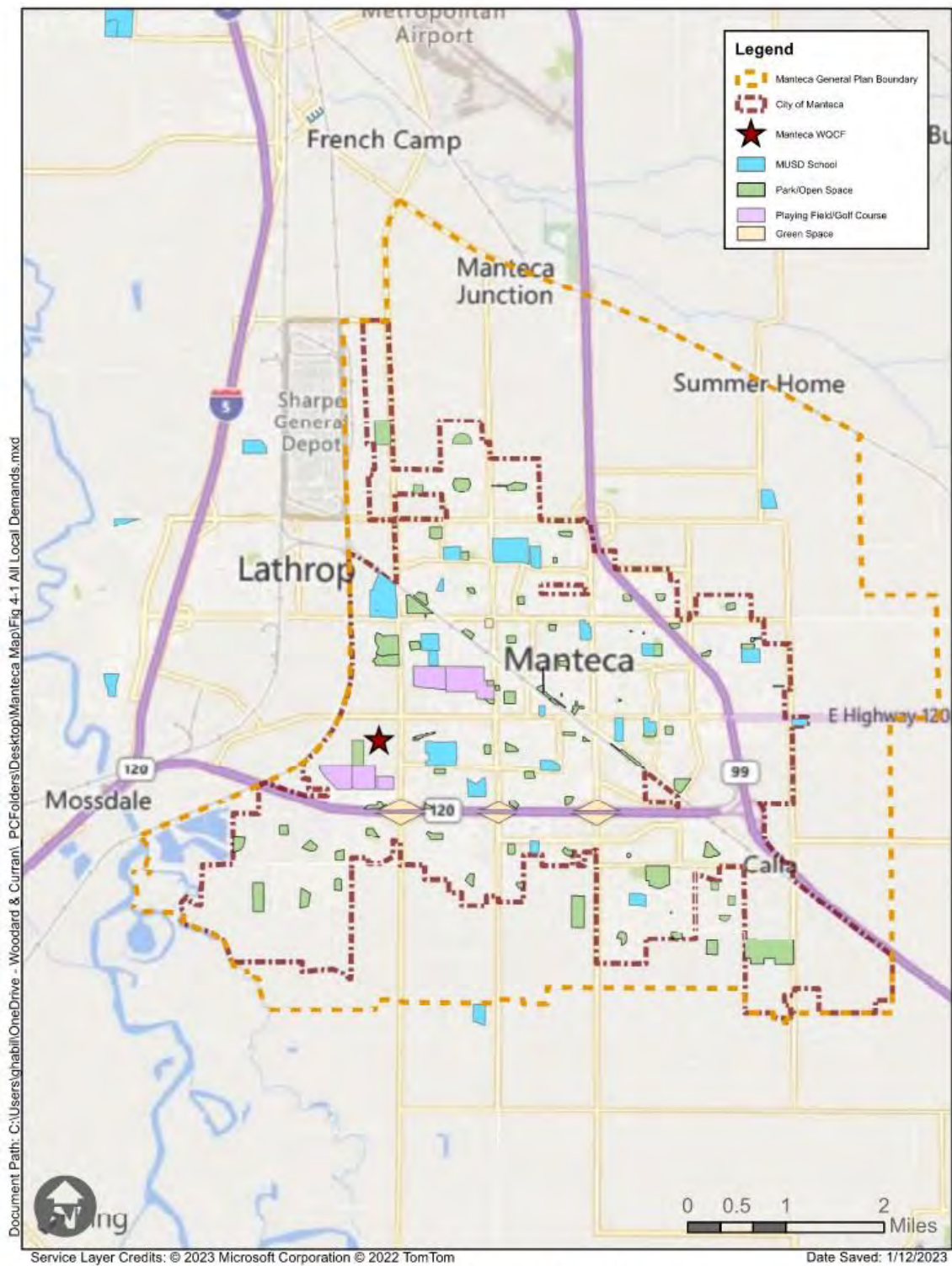


*Figure updated 2023 to include Villa Ticino West

4.2.2 Recycled Water Demand Assessment

The recycled water demands for potential recycled water users were determined according to the demand estimate methods presented below. A summary of the method applied to each of the user subgroups is shown in Table 4-5 on the following page. The overall approach was to use existing water use data from water meters or pumping records, if available. In the absence of water use data, demand was estimated based on typical landscape irrigation demands in the Manteca area. As described below, these estimates vary from about 4 to 4.5 feet of water (or acre-feet per acre) applied per year.

Method A – Irrigation Demand based on Water Use Data

Method A was used to determine the irrigation demand for potential recycled water users with available use data (either pumping records or billing data). Pumping and billing records were provided by the City for City parks (where available). It was assumed that all water usage recorded could be attributed to irrigation.

Method B – Irrigation Demand based on Water Use Data Demand Factor

Method B was used to determine irrigation demands for those City parks which did not have pumping or billing data available. The rationale behind this method is that City parks are all under the jurisdiction of the Parks and Recreation Department, and are therefore likely to have the similar irrigation practices. To determine those parks irrigation demand, a demand factor (acre-foot per acre of irrigable land) was calculated from the park demands from pumping data used in Method A. Irrigable acreage for parks was assumed to be 90% of the total acreage unless otherwise specified. The demand factor was calculated to be 4.46 acre-feet per acre. The calculation for this demand factor can be found in Appendix C.

Method C – Irrigation Demand based on Landscape/Crop Coefficient Data

Method C was used to determine irrigation demands for playing fields and green space at Manteca Unified Schools as well as green space at CalTrans on/off ramps and the Union Memorial Cemetery. The rationale behind this method is that these areas are not under the jurisdiction of the City Parks and Recreation Department, and therefore may be irrigated differently. Evapotranspiration calculations were based on a crop coefficient for turf species (0.8) and CIMIS and precipitation data for Manteca. The demand factor was calculated to be 3.98 acre-feet per acre. The calculation for this demand factor are shown below in Table 4-2.

Table 4-2: Evapotranspiration Data and Demand Factors

Month	ET _o ^a (in/month)	Average Precipitation ^b (in)	Irrigation Demand (in/unit area)	Adjusted Irrigation Demand ^c (in/unit area)	Percent of Annual Demand
Jan	1.08	2.45	-1.3	0.0	0.0%
Feb	1.91	1.6	0.5	0.5	0.9%
Mar	3.52	1.53	2.3	2.3	4.8%
Apr	5.04	0.99	4.5	4.5	9.5%
May	6.76	0.18	7.3	7.3	15.2%
Jun	7.69	0.07	8.4	8.4	17.6%
Jul	7.97	0.1	8.7	8.7	18.2%
Aug	7.03	0.15	7.6	7.6	15.9%
Sep	5.15	0.14	5.5	5.5	11.6%
Oct	3.36	0.63	3.0	3.0	6.4%
Nov	1.67	1.96	-0.2	0.0	0.0%
Dec	1.01	2.03	-1.0	0.0	0.0%
Annual Total	52.2	11.83		47.7	100.0%
Average Monthly Demand				3.98	acre-in/acre
Average Annual Demand Factor				3.98	AF/acre

Notes:

- a. Average ETo values reported on CIMIS - Station 70 Manteca
<http://www.cimis.water.ca.gov/UserControls/Reports/MonthlyEtoReportViewer.aspx>
- b. Average Monthly precipitation for Manteca from Western Regional Climate Center. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5303>
- c. Assumes crop coefficient of 0.8, the coefficient for cool season turf species from Univ. of California Cooperative Extension and California Department of Water Resources, *A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California*, August 2000. Also assumes a 75 percent infiltration rate into the vegetation root zone, a leaching rate factor of 1.1 (10 percent leaching rate through the vegetation root zone), and 80% irrigation efficiency.

Method D – Irrigation Demand based on Planning Documents

Method D was used for planned developments within the City's sphere of influence. When available, the demands from the planning documents were used as the irrigation demand. Otherwise, the demand factor from Method B was applied to the provided irrigable acreage, since most of the properties correspond to future City parks.

Table 4-3: Application of Demand Estimate Methods

Method	Urban Demand	Count
A	City Parks with Water Use Data	30
	City Parks without Water Use Data	35
B	Planned Park /Open Space	21
	Golf Course/Sports Complex	3
C	School Playing Field	24
	Green Space	4
D	Planned Park/Open Space	1
All	Total	118

4.2.3 Peaking Factors

Peaking factors were determined based on monthly water use data for City parks, and planned daily irrigation windows. The peak month factor was determined to be 2.2 based on past monthly water use data (i.e., water use in August is 2.2x higher than the annual average). This reflects the fact that irrigation is typically turned on in the spring, then turned off in the fall, with relatively little adjustment throughout the dry season. As a result, there is no significant difference between peak day and peak month conditions, and no daily peaking factor. The calculations for these peaking factors can be found in Appendix C.

The peak hour factor (3.0) was calculated based on a planned eight-hour irrigation window, consistent with standard guidance to limit irrigation to late evening and early morning hours. This approach reduces the likelihood for public contact with recycled water. This planned peaking factor may be lower than existing landscape irrigation practices in the City. The parks and schools are typically irrigated at night, but at smaller parks, the irrigation happens over a shorter window (2-3 hours instead of 8 hours). Irrigation at these smaller parks could be staggered to ensure that the overall peaking factor stays within the planned ratio.

Table 4-4: Peaking Factors

Peaking Factor Category	Value
Peak Month	2.2 x Annual Average Demand
Peak Hour	3.0 x Peak Month Demand ^a

Notes: (24 hours / 8 hour irrigation window) = 3.0 Peak Month

4.2.4 Recycled Water Demand Projections for Urban Irrigation

A summary of all of the potential recycled water demands for local users is presented in Table 4-5 and is illustrated in Figure 4-2. The full list of estimated recycled water demands (listed by ID number shown in Figure 4-2) is included in Appendix B, and a partial list of the 25 largest potential users is presented in Table 4-6. The top 25 users listed in Table 4-6 make up about 60% of the total estimated demand from all 116 potential customers.

Table 4-5: Summary of Potential Recycled Water Demands

Urban Demand	Count	Annual Average Demand		Peak Month Demand	
		(AFY)	(mgd)	(AFY)	(mgd)
Existing Park	65	1,227	1.09	2,655	2.37
School	24	836	0.75	1,806	1.61
Playing Field/Golf Course	3	447	0.40	963	0.86
Green Space	4	140	0.12	302	0.27
Planned Park/Open Space	22	1,115	1.01	2,399	2.14
Total	118	3,765	3.37	8,011	7.26

Note: Villa Ticino West Parks 1 and 2 added in 2023.

Figure 4-2: All Potential Local Demands

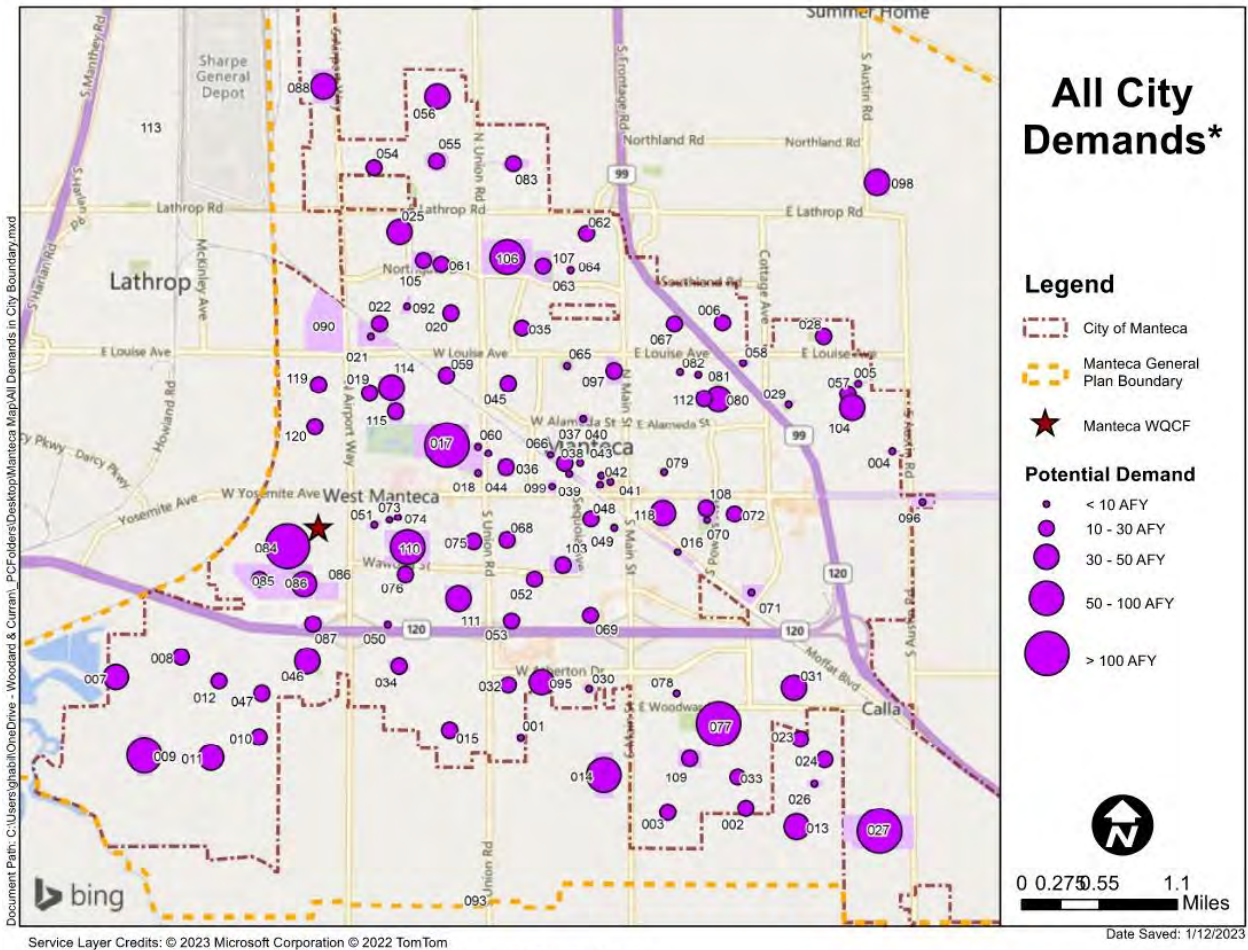


*Figure updated 2023 to include Villa Ticino West

Table 4-6: Top 25 Potential

Landscape Irrigation Customers

ID #	NAME	Type	Demand Source	Demand Method	Irrigable Acreage	Annual Average Irrigation Demand (AFY)	Annual Average Irrigation Demand (mgd)	Existing Supply
017	Golf Course	Park	Estimate	Method B	90.9	405.8	0.36	Well
027	Austin Rd Development	Park	Estimate	Method B	54.9	245.1	0.22	Future
084	Family Entertainment Zone	Park	Development Plans	Method D	60.3	244.0	0.22	Future
077	Woodward Community	Park	Estimate	Method B	45.6	203.4	0.18	Well
014	Griffin Park	Park	Estimate	Method B	23.4	104.5	0.09	Future
094	Lathrop High School	School	ET Estimate	Method C	25.2	100.9	0.09	Well
106	East Union High School	School	ET Estimate	Method C	23.3	93.3	0.08	Well
110	Sierra High School	School	ET Estimate	Method C	23.1	92.4	0.08	Well
009	Trails at Manteca Park	Park	Estimate	Method B	18.0	80.3	0.07	Future
114	Brockman (Stella) Elementary	School	ET Estimate	Method C	14.7	58.9	0.05	Well
025	Chadwick Square	Park	Well Data	Method A	8.1	50.3	0.04	Well
088	Airport Way	Park	Estimate	Method B	10.0	44.6	0.04	Future
080	Shasta Park	Park	Estimate	Method B	9.9	44.0	0.04	Well
086	BLD - Fields	Park	Estimate	Method B	9.3	41.5	0.04	Well
011	Cerri Park	Park	Estimate	Method B	9.0	40.2	0.04	Future
013	Hat Ranch Park	Park	Estimate	Method B	9.0	40.2	0.04	Future
118	Manteca High School	School	ET Estimate	Method C	9.6	38.2	0.03	Well
031	Tesoro Park	Park	Estimate	Method B	8.6	38.2	0.03	Well
046	Bella Vista	Park	Estimate	Method B	8.3	37.1	0.03	Well
111	Brock Elliott Elementary	School	ET Estimate	Method C	9.2	36.9	0.03	Well
007	Oakwood Trails Parcel D	Park	Estimate	Method B	8.1	36.2	0.03	Future
095	Veritas Elementary	School	ET Estimate	Method C	9.0	36.0	0.03	Potable
056	Union Ranch North Park	Park	Estimate	Method B	8.0	35.8	0.03	Potable
098	New Haven Elementary	School	ET Estimate	Method C	8.5	33.9	0.03	Well
104	Cowell (Joshua) Elementary	School	ET Estimate	Method C	8.5	33.9	0.03	Well

4.2.5 Industrial, Commercial, and Other Recycled Water Users

In addition to landscape irrigation, recycled water can be used for industrial and commercial uses. The largest user that could easily be switched to recycled water is the WQCF itself, which uses groundwater and/or potable water to meet the plant's needs for process water. The water is used for equipment washdown, and mixed with coagulant and polymer for use in the tertiary treatment system, in addition to many other uses. There is a shallow well located at the WQCF dedicated to providing process water for these uses. There is also a connection to the potable water system in place as a backup supply, in case the well water is not available or not acceptable. Potable water is not required, however, and the process water system is separate from other potable uses at the plant site (e.g., potable use inside the WQCF office). The amount of non-potable water used at the WQCF is about 5% of plant flows²⁷, or a minimum of 300 AFY under current conditions, as indicated below in Table 4-7. The City formerly had identified a capital project in the FY 2015-2019 Capital Improvement Plan (Project #13027) to convert the plant to secondary-treated wastewater water as a source of process water by adding sand filtration and modifying piping at the plant. However, since tertiary-treated water is now available, the sand filters are not needed. The project was not included in the FY 2016-2020 Capital Improvement Plan.

Table 4-7: WQCF Demand for Recycled Water

	Current	Future
WQCF Average Dry Weather Flow	5.7 mgd	9.87 mgd
Demand for Recycled Water = 5% of WQCF Flow	0.3 mgd	0.5 mgd
Demand for Recycled Water, AFY	300 AFY	550 AFY

Although there are many uses for process water at the plant that can easily be switched to tertiary water, the polymer feed system may (or may not) be suitable for conversion. Some wastewater treatment plants use recycled water in the polymer feed system, while others report that the polymer does not perform well when mixed with recycled water. Laboratory bench-scale tests and full-scale testing at the WQCF will be required to determine the feasibility of conversion. This testing would be worthwhile, since switching the polymer feed system to tertiary water would reduce the need for piping modifications, and thereby reduce the cost of conversion.

Other than the WQCF, no other significant, viable commercial or industrial users was identified within the City's sphere of influence. Toilet flushing was not considered further because retrofitting existing buildings for dual use (potable and recycled water) is extremely expensive, and City staff did not want to pursue alternatives involving toilet flushing. If other commercial and industrial users are identified in the future, the City could serve these customers recycled water as long as they use water for an approvable use under California Code of Regulations, Title 22 §60303 - §60307. Per this section of the code, the approvable uses for disinfected tertiary recycled water include flushing toilets, commercial laundry, decorative fountains, as well as many other industrial uses such as cooling towers and boiler feed systems.

4.3 Regional Project Identification

The recycled water market assessment for regional projects focused on potential partners for which the City could serve as a wholesale provider of recycled water. This is in contrast to the market assessment for local demands, which focused on individual customers. The regional wholesale partners could be located within the Eastern San Joaquin Groundwater Basin or within the larger area of San Joaquin County.

²⁷ Meeting with WQCF staff, July 22, 2015.

Table 4-8 summarizes the total water demand in the Eastern San Joaquin Groundwater Basin. The available recycled water from the City is less than 1% of the total demand.

**Table 4-8: Estimated and Projected Water Demands
in the Eastern San Joaquin Groundwater Basin**

Water Use Sector	2010 Estimated Water Demand	2035 Projected Water Demand
Urban	154,566	236,500
Agricultural	1,051,855	984,516
Total	1,206,421	1,221,016

Source: Excerpt from Table ES-2, *Eastern San Joaquin Integrated Water Management Plan Update*, June 2014. Prepared by GEI for Eastern San Joaquin County Groundwater Banking Authority.

The following regional recycled water wholesale partners were assessed:

South San Joaquin Irrigation District. The District currently encompasses about 55,000 acres of irrigated agricultural land; its service area includes nearly all of the area in the City of Manteca. Most of SSJID's irrigated lands are planted with permanent crops such as almonds, grapes, fruit trees, and walnuts²⁸. From 1994-2008, average deliveries of surface water to irrigated lands were 172,696 AFY, with an additional 5,778 AFY provided from District wells²⁸. SSJID holds pre-1914 water rights and offers a very reliable source of water to its customers. As mentioned previously, it also provides about half of the City's potable water supply. There is no indication that recycled water would improve SSJID's water supply reliability, which is already very strong. However, it could be feasible for the City to make a trade of potable water for recycled water, or to engage with SSJID and another third party in a water exchange. As a completely hypothetical example, Manteca could provide SSJID with recycled water, then SSJID could transfer surface water to another surface water user served by New Melones Reservoir (for example, Oakdale Irrigation District).

Central Valley Project (CVP) Contractors. The CVP is a federal water project operated by the United States Bureau of Reclamation (USBR). Unlike SSJID, CVP water contractors are chronically short of water – particularly the agricultural contractors located south of the Delta²⁹. For example, from water years 2008 – 2013, the annual allocations to agricultural customers located South of Delta ranged from 10% to 80% of contract amounts, with an average value of 40%³⁰. As a group, CVP customers need additional water supplies in dry years, and improved supply reliability over the long term.

A critical component of CVP infrastructure located in the greater Manteca region is the Delta-Mendota Canal (DMC), which is located about 12 miles to the southwest of the City. There are no direct municipal customers downstream of Tracy, so any connection to the DMC should be made downstream of Tracy.

The Warren Act of 1911 authorizes USBR to execute temporary contracts to impound, store, and carry water in federal irrigation canals when excess capacity is available. Such contracts are negotiated by USBR to allow the introduction of “non-project water” into the DMC. This non-project water can include groundwater from wells near the DMC, or it could include recycled water. For example, the Cities of Modesto and Turlock are currently constructing the North Valley Regional Recycled Water Project, which would convey recycled water from two wastewater treatment plants to the DMC for downstream use by

²⁸ *SSJID 2012 Agricultural Water Management Plan*. December 2012. Prepared by Davids Engineering for SSJID.

²⁹ *Water Supply and Yield Study*. USBR, 2008. Available online at <http://www.usbr.gov/mp/cvp/docs/Water%20Supply%20and%20Yield%20Study.pdf>

³⁰ *CVP Contract Water Delivery Information, Water Year 2008 – 2013*. USBR. Available online at http://www.usbr.gov/mp/PA/water/docs/CVP_Water_Deliveries.pdf

Del Puerto Water District. Del Puerto Water District expects to have unmet demands even after completion of the North Valley project, and could be a potential regional partner for the City of Manteca. For reference, approximately 8,163 acres of Del Puerto Water District are located within San Joaquin County.

The California Aqueduct serving the State Water Project is also located about 12 miles from the City (about ½ mile beyond the DMC). However, because the State Water Project directly serves municipal customers, and because direct potable reuse was not considered as part of this master plan, alternatives serving the California Aqueduct were not considered.

Other Agricultural Customers. The concept of serving agricultural customers in the area northeast of the City, east of Stockton – about halfway between Manteca and Farmington – was also considered. This area is approximately the edge of the groundwater basin’s large cone of depression, as shown below in Figure 4-3 (see next page). The area is part of the Central San Joaquin Water Conservation District, a federal water contractor with the CVP, but many farmers in the area rely solely on groundwater for irrigation.

Surface water deliveries from New Melones Reservoir that began in 1983 have reduced overdrafting³¹; the addition of recycled water could further reduce groundwater pumping in a critically overdrawn area. That said, the water conservation district is not likely to be able to serve as a wholesale customer, because there is no distribution system for reaching individual customers. Although this region of the County does not seem to be a viable partner at this time, for the City’s future reference, a cost for delivering water to this area was developed in Chapter 5 (see section 5.3.2). This information could be useful for future planning conducted with respect to groundwater basin sustainability.

Mountain House Community Services District. Water rights for the tertiary-treated wastewater currently discharged to the San Joaquin River could be used to provide water to a user located downstream. The City would be the water right holder, and would then enter into a long-term agreement with the downstream user to transfer or sell the water.

For example, the Mountain House Community Services District (CSD) is located in the Sacramento-San Joaquin Delta, downstream of the City, and may have a need for water. Mountain House currently has a water services agreement with Byron-Bethany Irrigation District for up to 9,413 acre-feet of water, with current use of approximately half that amount. In the summer of 2015, the State Water Resources Control Board issued a water rights curtailment for Byron-Bethany Irrigation District’s pre-1914 water rights, which had previously been viewed as secure. Because of the legal uncertainty surrounding its water supply, the community of Mountain House and other water users may be looking to supplement or replace their existing water rights with recycled water.

³¹ 2014 Eastern San Joaquin Integrated Regional Water Management Plan Update. June 2014. Prepared by GEI Consultants for the Eastern San Joaquin County Groundwater Basin Authority.

Figure 4-3: Groundwater Elevations in San Joaquin County

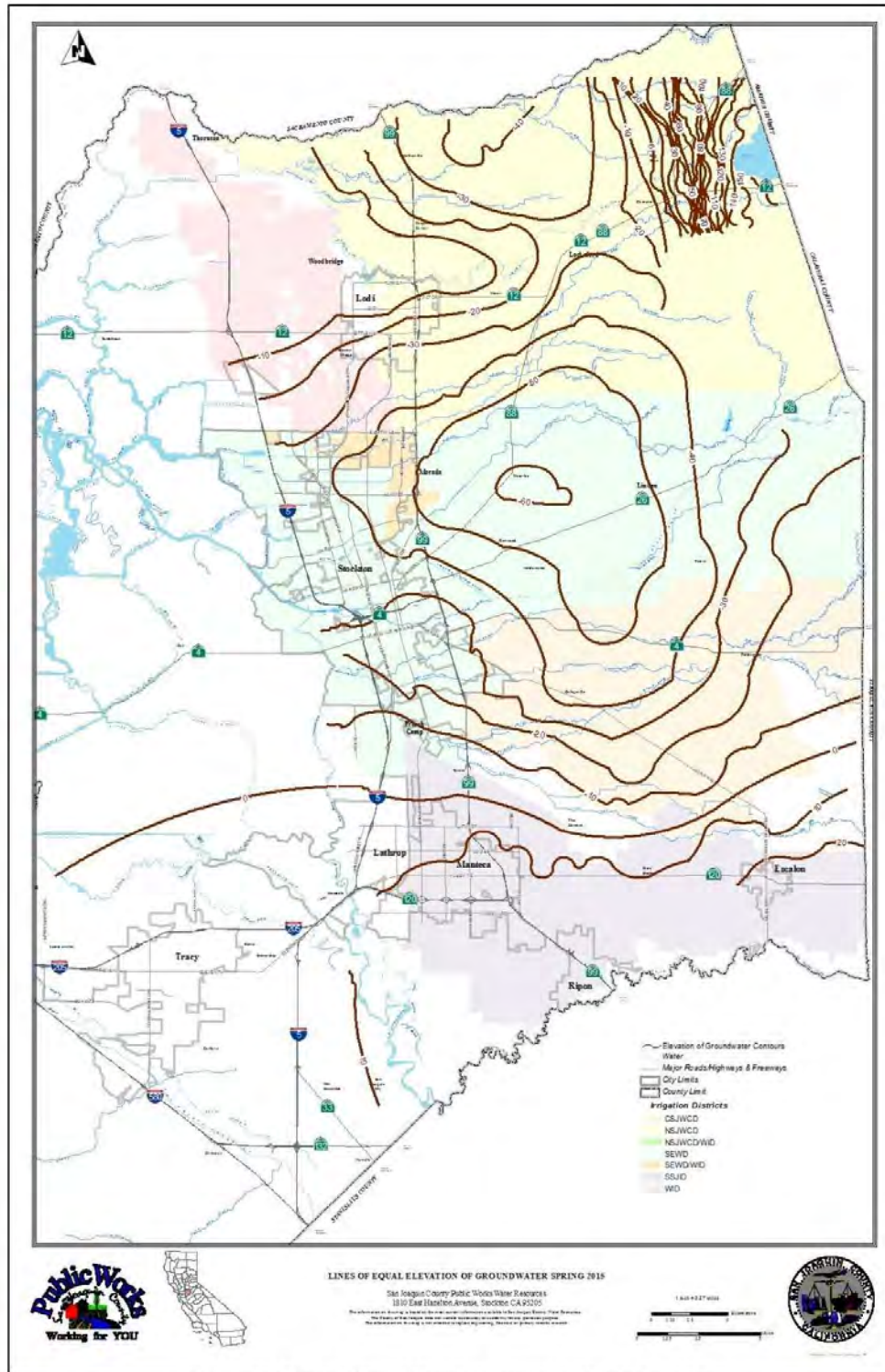


Figure 2-33 Lines of Equal Elevation of Groundwater Spring 2015

Source: *Groundwater Report, Spring 2015*. San Joaquin County Flood Control and Water Conservation District.
San Joaquin County Department of Public Works, Stockton, 2015.

4.4 Groundwater Recharge Assessment

Separately from the identification of potential projects within the City (Section 4.2) or with regional partners (Section 4.3), the potential for groundwater recharge within or near to the project area was evaluated. Per the California Code of Regulations, Title 22, Division 4, Chapter 3, recycled water can be used for groundwater replenishment provided multiple provisions are met, the primary of which is the blending of the recycled water with water from an approved drinking water source (referred to as ‘diluent water’) at ratios not greater than specified in Section 60320.116 of the aforementioned code section³². In such a project, typically referred to as an Indirect Potable Reuse (IPR) project, recycled water is recharged into the groundwater basin via either percolation or direct injection. The blended water could then be extracted from the basin and treated and used as a supply or left in place to assist with groundwater basin sustainability. Groundwater replenishment with recycled water is addressed in this section.

4.4.1 Need for Groundwater Recharge

As discussed in Section 2.1, the City currently uses a mixture of surface water from SSJID’s South County Water Supply Project and groundwater from City-owned and -operated wells overlying the Eastern San Joaquin Groundwater Basin. The California Department of Water Resources has declared the Eastern San Joaquin Groundwater Basin to be in critical overdraft^{33,34} and it has been ranked as a high-priority groundwater basin under the California State Groundwater Elevation Monitoring program (CASGEM). Although there has been some gradual stabilization and recovery of groundwater levels in portions of the groundwater basin (including some of those areas underlying the City of Manteca), the groundwater basin remains threatened by overdrafting and saline water intrusion³⁵. The City overlays both a shallow and a deep aquifer, separated by the Corcoran Clay and/or equivalent aquitard, and pumps from the deep aquifer for potable use and from the shallow aquifer for irrigation and other non-potable uses.

4.4.2 Shallow Aquifer

The depth to groundwater (the shallow aquifer) varies throughout the City, averaging around 15 feet on the west side (closer to the San Joaquin River) and 25 feet on the east side of Manteca. Groundwater levels in the shallow aquifer underlying the City have been relatively stable for about two decades, as shown in Figure 4-4, even as groundwater levels have dropped elsewhere in the basin. Water quality in this aquifer is generally acceptable for irrigation purposes, though there are some concerns throughout the Eastern San Joaquin Groundwater Basin regarding salinity intrusion from the San Joaquin River which is reflected in some instances of higher sodium and chloride levels, increasing total dissolved solids (TDS) concentrations, and general degradation of water quality from overlying land uses. Additionally, the City Parks and Recreation Department has reported that some wells in the southeast section of the City are likely suffering from poor water quality as evidenced by trees in those parks showing signs of salt stress.

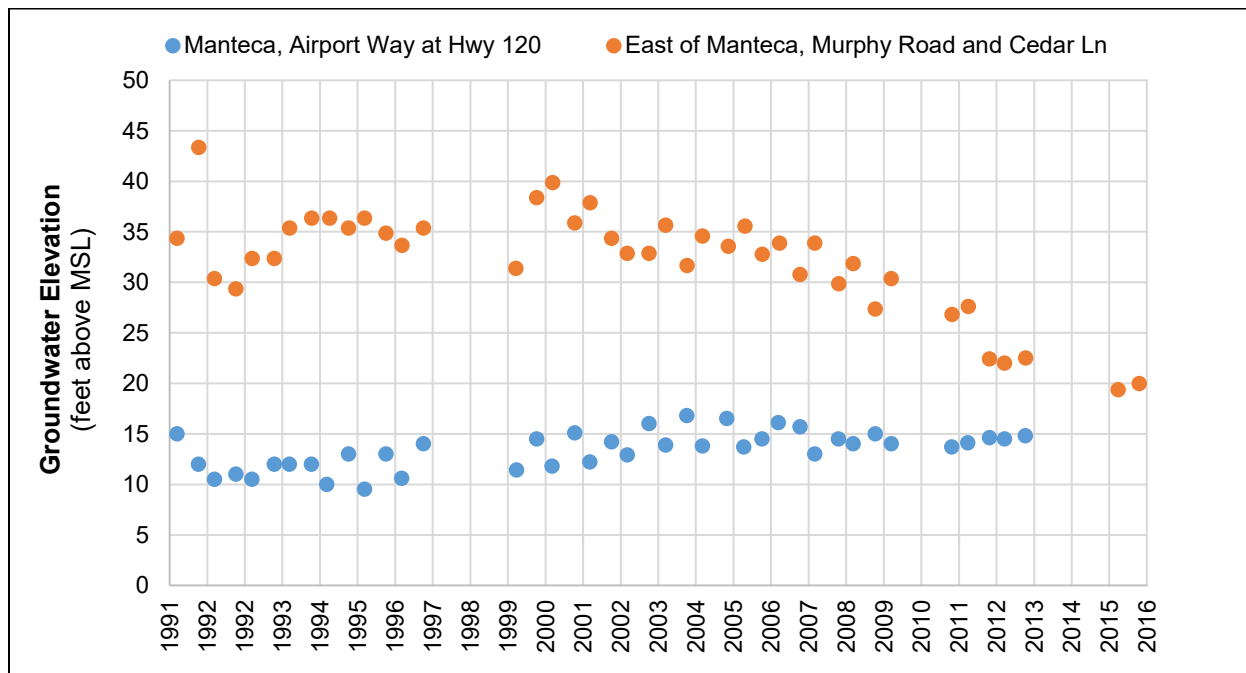
³² 22 CCR § 60320.116 – *Recycled Municipal Wastewater Contribution (RWC) Requirements*. Available online at <https://govt.westlaw.com/calregs/Document/I003BF4E0FE8D11E3B0769A3904EA2000>

³³ *Final List of Critically Overdrafted Basins*. California Department of Water Resources, January 2016. Available online at <http://www.water.ca.gov/groundwater/sgm/cod.cfm>

³⁴ *California’s Groundwater: Bulletin 118, Update 2003*. California Department of Water Resources, October 2003.

³⁵ *2014 Eastern San Joaquin Integrated Regional Water Management Plan Update*. June 2014. Prepared by GEI Consultants for the Eastern San Joaquin County Groundwater Basin Authority.

Figure 4-4: Groundwater Elevation in the Shallow Aquifer underlying Manteca



Source: Groundwater elevation data from the CASGEM database, Local Well # 02SO8E08A001 in SSJID Service Area, also tracked as "Well V" in San Joaquin County Flood Control and Water Conservation District groundwater reports. Location is east of Murphy Road and south of Cedar Ln. Available online at <http://www.water.ca.gov/groundwater/casgem/data.cfm> and <http://www.sjwater.org/Groundwater%20Reports.htm>

4.4.3 Deep Aquifer

The deep aquifer is located below an aquitard, a section of the Corcoran Clay (or equivalent), at a depth ranging from approximately 190 to 400 feet below the ground surface³⁶. In general, the water quality in this deeper aquifer is suitable for potable use with minimal treatment, though arsenic and nitrate levels are a growing concern.

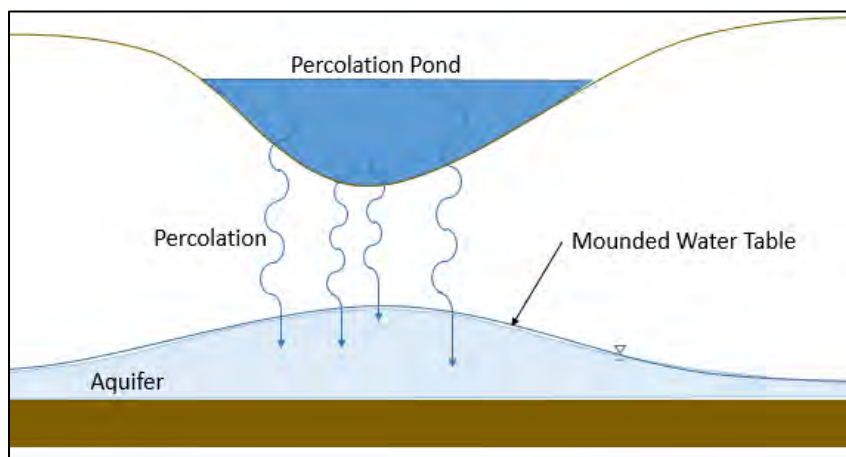
4.4.4 Recharge Methods

The simplest and most cost-effective method for groundwater recharge is through percolation ponds. Percolation ponds provide a large surface area and natural pressure head which allows for continual, natural infiltration to the water table aquifer. The recharge rate is driven by a number of factors, the most important of which are soil type, depth of the pond and depth to groundwater. In the Manteca area, soils consist primarily of a mix of fine sand, loamy sand, and loamy coarse sand, which are conducive to relatively high infiltration rate; however, field tests would be needed to determine the most suitable pond location(s).

When percolation ponds are used, infiltrated water travels from the pond through the area directly below the ponds but above the water table, referred to as the vadose zone. As water travels through this area, naturally-occurring biological and geochemical processes occur that provide some measure of water treatment, typically referred to as Soil Aquifer Treatment. Once the water reaches the water table, it typically forms a mound, or area of elevated water levels (as shown in Figure 4-5), as the water slowly moves both vertically and horizontally through the aquifer and the water table rises.

³⁶ City of Manteca 2005 Urban Water Management Plan. See p. 10.

Figure 4-5: Groundwater Recharge Mounding



Groundwater recharged via percolation will not generally recharge areas below confining layers such as the Corcoran Clay. In the Manteca area, any recharged recycled water would remain in the shallow aquifer and therefore most likely available only for non-potable uses.

A second mode of recharging a groundwater basin is through direction injection. Direct injection is similar to groundwater pumping but in reverse – water is moved from the surface into the screened zone of a well, where it then moves vertically out into the water-bearing formation. For the Manteca area, direct injection would be required to recharge the deep aquifer used for potable supply. To achieve this, injection wells would need to be designed, constructed and maintained.

4.4.5 Recharge Method Analysis

Recycled water percolation is typically a preferred alternative for groundwater recharge in that percolation basins are fairly easy to construct, easy to maintain, and most often cost-effective. However, as previously noted, percolation ponds will only recharge the water table (or shallow) aquifer. This could result in groundwater level rises, potentially impacting root zones, basements and other subsurface structures, especially on the west side of the City where groundwater elevations are already high. Additionally, while such a project would recharge the groundwater basin, it would only benefit the shallow zone which is presently only used for non-potable water.

Groundwater recharge via direct injection is currently allowed under California regulations, provided permitting is acquired on a site-by-site basis and the State's current guidelines for this type of reuse are followed. Injection wells can be, however, expensive to design and construct, and can be difficult to maintain. Unlike percolation ponds, biological growth and/or geochemical interactions resulting in encrustation or precipitation of solids onto the well screens, can have detrimental effects on injection well performance, requiring, in some cases, an extensive well rehabilitation program. The primary benefit to be achieved by direct injection is the recharge of the deeper potable water aquifer, providing additional supplies, and the mitigation of overdraft conditions in the Eastern San Joaquin Groundwater Basin as a whole.

4.4.6 Groundwater Recharge Feasibility

Though the Eastern San Joaquin Groundwater Basin has been classified as being in critical overdraft, groundwater elevations in the Manteca area have been relatively stable. Given this general stability and the shallow depth to groundwater throughout the City (and especially on the western side of the City near the wastewater treatment plant), there appears to be limited capacity for groundwater recharge within City

limits. This limited capacity would be further lessened by water table mounding resulting from groundwater recharge by either method, and could potentially lead to adverse consequences in the shallow aquifer. Considering groundwater recharge in light of other potential reuse alternatives for the City's recycled water, it is not recommended that the City pursue groundwater recharge as a local recycled water reuse alternative at this time.

Groundwater recharge may be a feasible alternative for reuse outside of the City limits. A recycled water recharge project to the east of the City could potentially benefit local agriculture and the groundwater basin itself. However, for such a project to occur, recycled water would need to be piped to a section of the groundwater basin with capacity for recharge. This type of project would be compatible with Alternative 7 in Section 5.3.2. While the project would benefit the groundwater basin, a recycled water pipeline would have to be constructed to the east and could potentially make the project cost-prohibitive. Additionally, for any groundwater recharge project with recycled water, diluent water from an approved surface water source would have to be obtained to meet the required dilution requirements prior to recharge. Given the current status of surface water allocations in the State, along with current programs being evaluated to reduce surface water diversions from the Stanislaus, Tuolumne, Mokelumne, and Merced Rivers to increase fish flows, it is unclear if additional surface water supplies would be available for the required diluent water.

4.5 Customer Outreach

4.5.1 Local Outreach

In February 2015, Woodard & Curran and representatives from the City Public Works Department held separate meetings with the Manteca Parks and Recreation Department and with representatives from the Manteca Unified School District. At these meetings, the project team presented information about master planning process, and the suitability of using recycled water for irrigation. The project team solicited information about existing irrigation practices, and on whether switching to recycled water would be a concern. The following important points emerged during these discussions:

- Most of the MUSD school sites irrigate front landscaping with potable water, and have a separate system for landscape irrigation with non-potable groundwater in the back where the sports fields are located.
- For MUSD, the cost of providing irrigation water is a major concern, whether with groundwater, potable water, or recycled water. Water is the second-highest utility bill for MUSD.
- For Parks and Recreation Department staff, the primary concern with switching to recycled water is the salt content in the recycled water, including TDS and boron. Some trees in the City are already showing signs of salt stress. The Parks and Recreation Department were especially protective of turf and landscaping at the community parks, particularly Woodward Park and Northgate Park. They were supportive of an incremental approach whereby recycled water use would only be expanded after it has been successfully demonstrated at a pilot test site.
- A few parks are irrigated with potable water; these should be the highest-priority for switching to recycled water, if possible.
- Most parks do not have bathrooms or other extensive cross-connections between the landscaping and potable uses (e.g., drinking fountains), and retrofitting existing parks to recycled water should not be particularly difficult.
- The golf course, which currently uses groundwater for irrigation, has unlined storage ponds that are currently filled from groundwater pumps. It is possible to hydraulically separate these lakes from other landscape irrigation piping. This might be necessary because (a) storing recycled water in unlined ponds is generally not permissible, except as part of an intentional recharge project and (b) storing recycled water in shallow ponds is likely to lead to nuisance algal growth.

4.5.2 Regional Outreach

City staff and Woodard & Curran held a meeting with a representative from Del Puerto Water District in August 2015 to discuss the potential use of Manteca recycled water by the irrigation district. City staff provided written notice to SSJID as the local irrigation district and requested their participation in development of the Master Plan; however, SSJID elected not to participate.

4.5.3 City Council and Public Meetings

During the course of the project, there were three public meetings and three City Council meetings. These meetings were used to explain the master planning process and keep the public up to date on its progress while also gathering feedback that could be incorporated into project alternatives and alternative evaluation. Table 4-9 summarizes the topics covered at the three public and City Council meetings.

Table 4-9: Summary of City Council and Public Meetings

Topics Covered	Meeting Date	
	Public Meeting	City Council Meeting
Description of the Recycled Water Master Plan process and presentation of customers identified.	March 26, 2015	May 19, 2015
Project alternatives identified.	June 30, 2015	August 4, 2015
Ranking of project alternatives and identification of recommended project portfolio	September 29, 2015	January 24, 2023

Chapter 5 Project Alternatives Analysis

Based on the results of the market assessment conducted in 2017 and discussions held as part of the master plan outreach process, conceptual project alternatives were developed for five local alternatives and five regional alternatives for recycled water use. For each alternative, a conceptual set of facilities – primarily pipelines, pump stations, and diurnal storage – was developed. These facilities were used as the basis for estimating the cost of each alternative. Operating costs were also estimated based on routine maintenance, electricity use at pumps, and chemical use for booster chlorination. Combining the total capital and operational cost with the volume of recycled water delivered under each alternative provides a unit cost (\$/AF of recycled water) that can be used to compare the alternatives. The alternatives were also compared to one another based on non-monetary criteria such as groundwater sustainability, ease of implementation, and environmental impacts.

The purpose of this chapter is to describe the development and evaluation of the recycled water project alternatives, with the goal of identifying a project or set of projects that maximizes the beneficial use of recycled water and improves water supply reliability at the lowest cost.

5.1 Design Criteria

To reduce groundwater pumping by implementing projects in-line with the regional GSP, recycled water pipelines are needed to connect to recycled water end users to the source of recycled water at the WQCF, whether it is a single pipeline to reach a single wholesale customer, or entire network designed to reach potential customers around the City, including City parks, residential and commercial irrigation, and construction sites. A Microsoft EXCEL spreadsheet-based hydraulic model was used to size the pipelines and pump stations and estimate their cost for all the project alternatives evaluated. The hydraulic criteria shown in Table 5-1 were used as a basis for these analyses.

Table 5-1: Design Criteria

Criteria	Value	Unit
Design Velocity Range	2 – 10	feet per second (fps)
Minimum Delivery Pressure ^a	40	psi
Maximum Delivery Pressure	120	psi
Minimum Pipe Size	6	inches
Available Pipe Sizes ^b	6, 8, 10, 12, 16, 20, 24 and 30"	inches
Maximum Head Loss	7	feet per 1,000 feet of pipe

Notes:

- While some local groundwater customers may be able to retrofit their existing pumps to boost pressure onsite, and thereby accept delivery at approximately 10 psi, setting the minimum pressure at 40 psi will allow greater flexibility for expansion of the system.
- Pipe sizes are for new pipes only. Wastewater force mains are also repurposed in specific locations for local alternatives.

Pump Stations

Pump stations must be capable of pumping a range of flows based on varying demand. The following design criteria were used to establish planning-level pump station facilities and cost estimates;

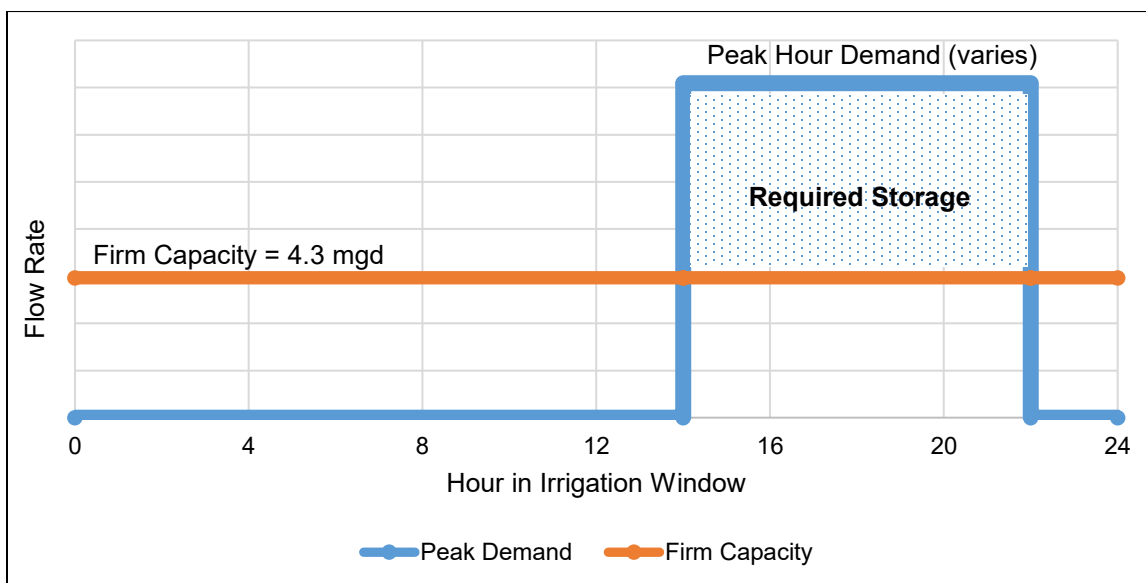
- Construction on City property (assumed that all pump stations would be located at the WQCF);
- Sized for peak hour demands;

- Driven by variable frequency drives (VFDs), since there is no storage downstream of the pump station;
- No back-up power supply, since recycled water is assumed to be an interruptible supply based on the customers served (primarily irrigation);
- One standby pump; and
- At least two pumps should be the same size.

Storage

For the local supply alternatives, storage tanks were sized to allow sufficient supply during the 8-hour irrigation window. The storage tanks were assumed to be located at the WQCF. Storage is necessary because the night-time demand peak will not be accompanied by an increase in recycled water production from the tertiary treatment system, which operates at a constant flow rate through the day. To estimate storage needs, peak hour recycled water supply was assumed to be 4.6 mgd, which includes a 20% safety factor for operational flexibility within the WQCF (see Table 3-2). The recycled water to be used internally within the WQCF under dry weather conditions (about 0.3 mgd) was subtracted from this capacity, resulting in a firm capacity of 4.3 mgd available to meet peak hour recycled water demands outside of the WQCF. A visual representation of the storage volume calculation is shown in Figure 5-1. Regional alternatives would receive water as it is treated at the WQCF, at a constant rate throughout the day, and therefore these alternatives do not require storage.

Figure 5-1: Representative Storage Calculation



The assumption of 4.3 mgd for the firm capacity has a significant impact on the phasing of storage construction. No storage is needed initially, as peak hour demands would not exceed the firm capacity. Once more customers are connected and the average summer demands exceed 1.4 mgd, storage is required to meet peak hour demands. If the plant can be operated with a higher firm capacity (i.e., 5 mgd), the need for storage would be reduced and construction could be delayed further into the future.

5.2 Local Alternatives

Five conceptual distribution system alternatives (numbered 1, 2, 3, 4 and 5) were developed to serve local landscape irrigation demands within the City. The alternatives were developed based on the results of the

Market Assessment discussed in Chapter 4. For each alternative, a conceptual pipeline network was developed to serve a specific list of customers. Backbone (i.e., main distribution) pipelines were first identified to serve the largest irrigation users, then smaller users were added in, with the intent of constructing the fewest facilities to serve the most users.

5.2.1 Alternative 1 – Core Demands

Alternative 1 focuses on serving the “core” demands — those demands closest to the WQCF, including the golf course, Big League Dreams and the Family Entertainment Zone. Facilities required for Alternative 1 are illustrated in Figure 5-2 and a summary of the customers and demands served is presented in Table 5-2.

Figure 5-2: Alternative 1 - Core Demands

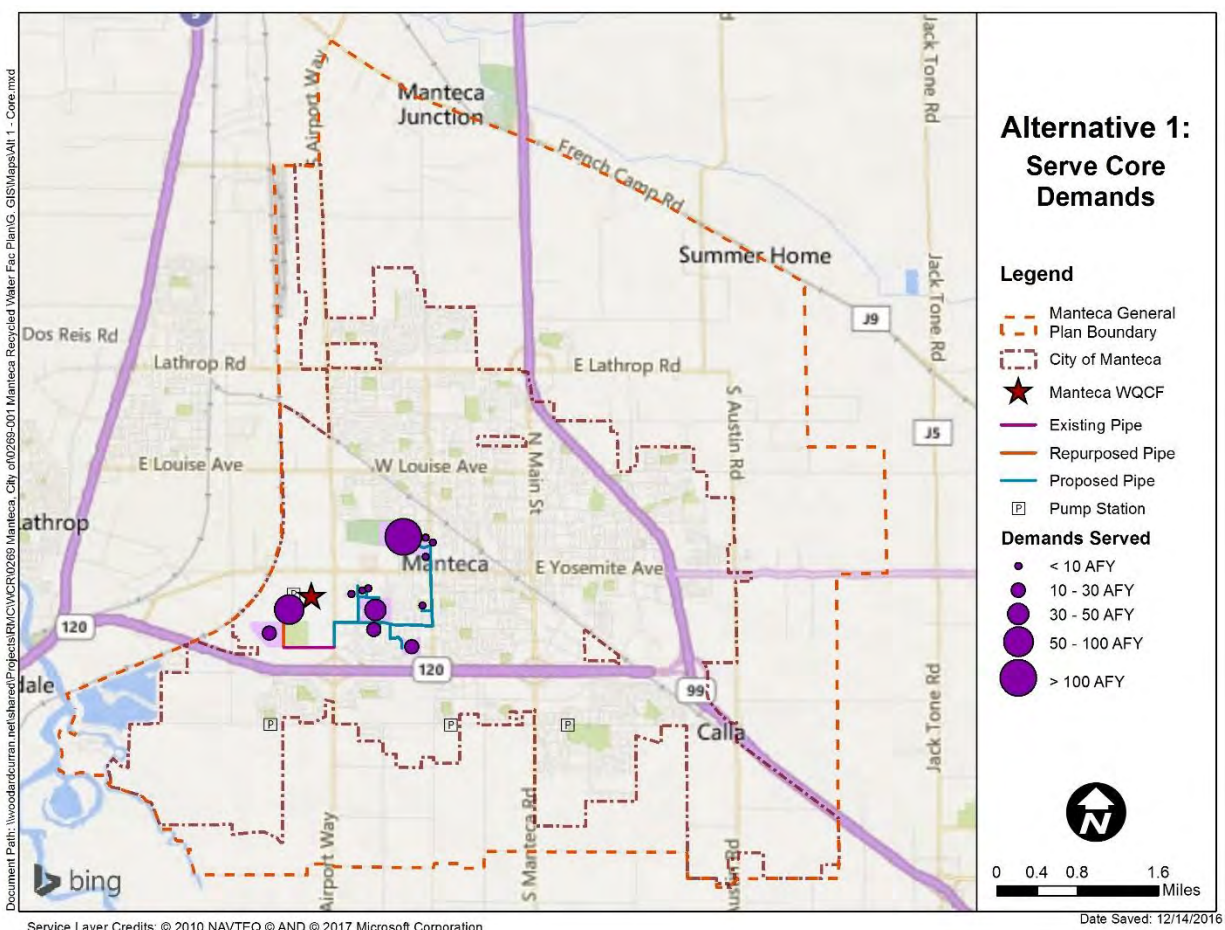


Table 5-2: Alternative 1 Demands Served

Alternative		1 - Core
No. of Customers (by type)	Schools	2
	Parks	8
	Playing Field/Golf Course	3
	Green Space	0
	Planned Park/Open Space	1
Total Demand	Average Annual Demand (AFY)	910
	Peak Month Demand (AFY)	2,000
	Peak Month Demand (mgd)	1.8

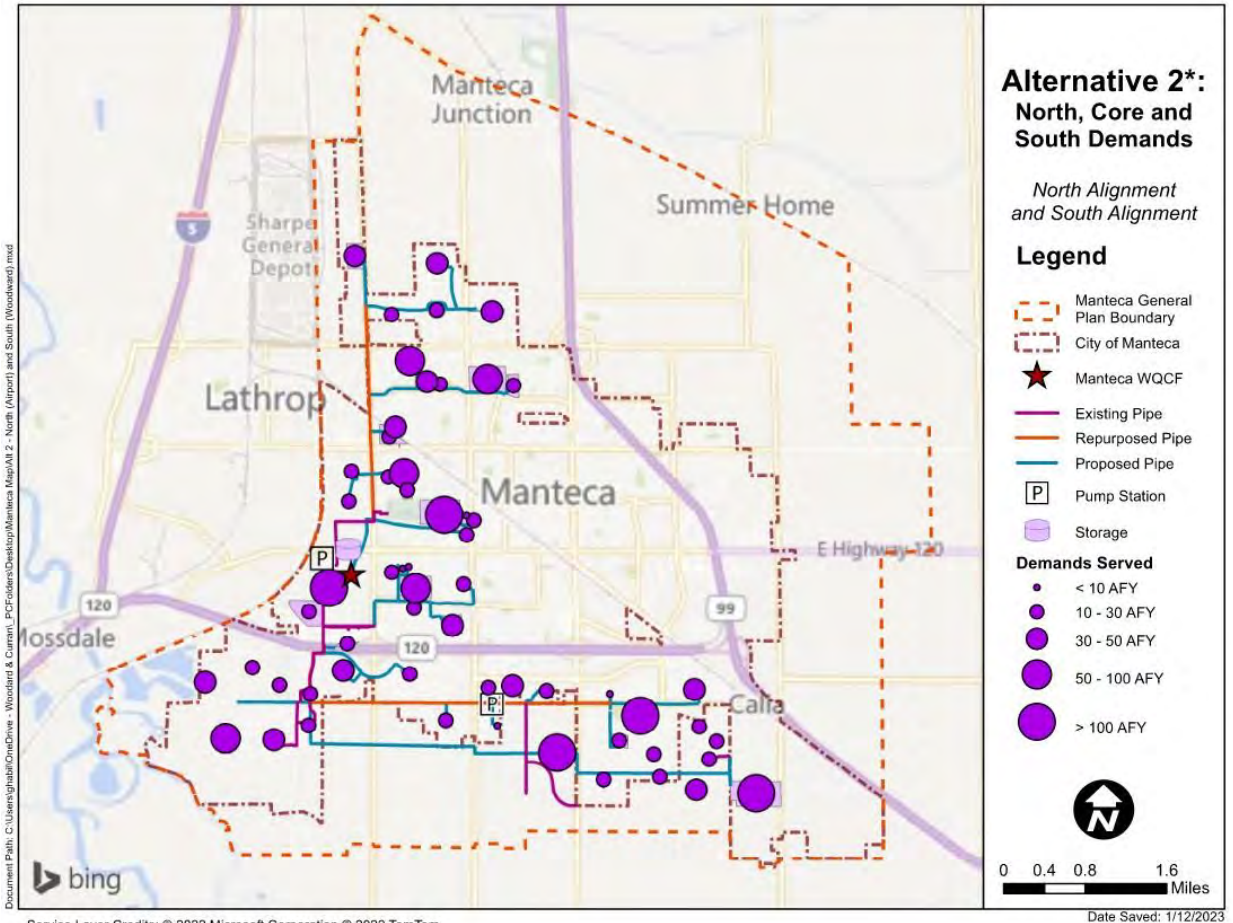
5.2.2 Alternative 2 – All Demands

Alternative 2 was created to serve as many demands within the City’s General Plan boundary as economically feasible, with an emphasis on providing recycled water to planned future development. The recycled water distribution layout was based on an analysis of the demand densities throughout the City, as well as the location of existing sanitary sewer force mains that can be re-purposed for distribution of recycled water. Due to a lack of anchor customers in the northwest portion of the City (north of Yosemite Avenue and east of Main Street), no distribution pipelines were extended to this area. Distribution pipelines were extended to each existing customer, and to the edge of proposed future developments. Small distribution pipelines (or laterals) within new developments were not included in the cost estimate for Alternative 2 as the developer was assumed to be responsible for construction.

The existing 12-inch sanitary sewer force main in Woodward Avenue forms the initial backbone of the distribution system in this alternative. However, this 12-inch pipeline does not have sufficient capacity to meet all buildout demands south of Highway 120. A parallel pipeline has therefore been included in the design to serve future customers, with the exact alignment to be determined at a later date. Alternatively, the 12-inch pipeline in Woodward Avenue could be removed and replaced with a larger pipeline.

Facilities required for Alternative 2 are illustrated in Figure 5-3, and a summary of the customers and demands served is presented in Table 5-3.

Figure 5-3: Alternative 2 - All Demands



Service Layer Credits: © 2022 Microsoft Corporation © 2022 TomTom

*Figure updated 2023

Table 5-3: Alternative 2 Demands Served

Alternative		2 – All
No. of Customers (by type)	Schools	9
	Parks	28
	Playing Field/Golf Course	2
	Green Space	0
	Planned Park/Open Space	19
Total Demand	Average Annual Demand (AFY)	2,686
	Peak Month Demand (AFY)	5,829
	Peak Hour Demand (mgd)	5.2

Note: Villa Ticino West Parks 1 and 2 added in 2023.

5.2.3 Alternative 3 – Core & North Demands

Alternative 3 was created to serve similar demands as Alternative 2, but with a backbone pipe serving northern Manteca aligned along N. Union Road instead of Airport Way. City staff requested that Alternative 3 not be developed further due to the complexity and cost of laying a new pipe along a significant portion of N. Union Road. Alternative 2 and Alternative 4 both assume a backbone pipe alignment along Airport Way. A summary of the customers and demands served is presented in Table 5-4.

Table 5-4: Alternative 3 Demands Served

Alternative		3 – Core & North
No. of Customers (by type)	Schools	6
	Parks	23
	Playing Field/Golf Course	3
	Green Space	0
	Planned Park/Open Space	8
Total Demand	Average Annual Demand (AFY)	2,031
	Peak Month Demand (AFY)	N/A
	Peak Hour Demand (mgd)	N/A

5.2.4 Alternative 4 – Core & North Demands

Alternative 4 was created to serve as many demands identified for Alternative 2 located to the north of Highway 120 as economically feasible in addition to the core demands identified in Alternative 1. The pipeline alignment to the north seeks to take advantage of existing pipeline in Airport Way that can be repurposed for recycled water. Facilities required for Alternative 4 are illustrated in Figure 5-4 and a summary of the customers and demands served is presented in Table 5-5.

Figure 5-4: Alternative 4 – North and Core Demands

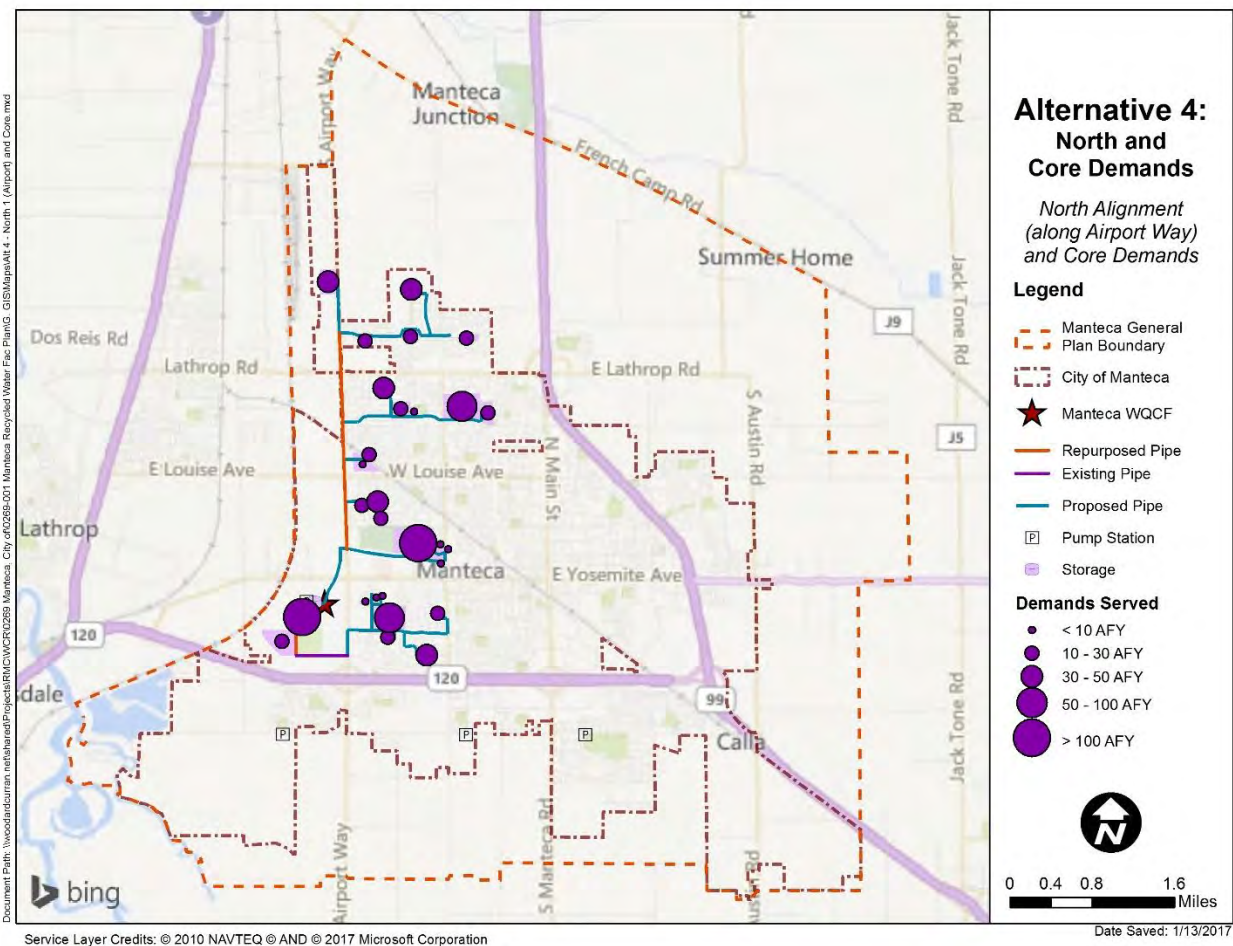


Table 5-5: Alternative 4 Demands Served

Alternative		4 – Core & North
No. of Customers (by type)	Schools	8
	Parks	18
	Playing Field/Golf Course	2
	Green Space	0
	Planned Park/Open Space	13
Total Demand	Average Annual Demand (AFY)	1,889
	Peak Month Demand (AFY)	4,080
	Peak Month Demand (mgd)	3.6

5.2.5 Alternative 5 – Core & South Demands

Alternative 5 was created to serve as many demands identified for Alternative 2, located to the south of Highway 120, as economically feasible in addition to the core demands identified in Alternative 1. The pipeline alignment to the south of Highway 120 seeks to take advantage of existing sanitary sewer force main in Woodward Avenue that can be repurposed for recycled water. However, similar to Alternative 2, this force main does not have sufficient capacity to meet all buildout demands south of Highway 120. A

parallel pipeline has been included to serve future customers, with the exact alignment to be determined at a later date. Alternatively, the 12-inch pipeline in Woodward Avenue could be removed and replaced with a larger pipeline.

Facilities required for Alternative 5 are illustrated in Figure 5-5 and a summary of the customers and demands served is presented in Table 5-6.

Figure 5-5: Alternative 5 – North and Core Demands

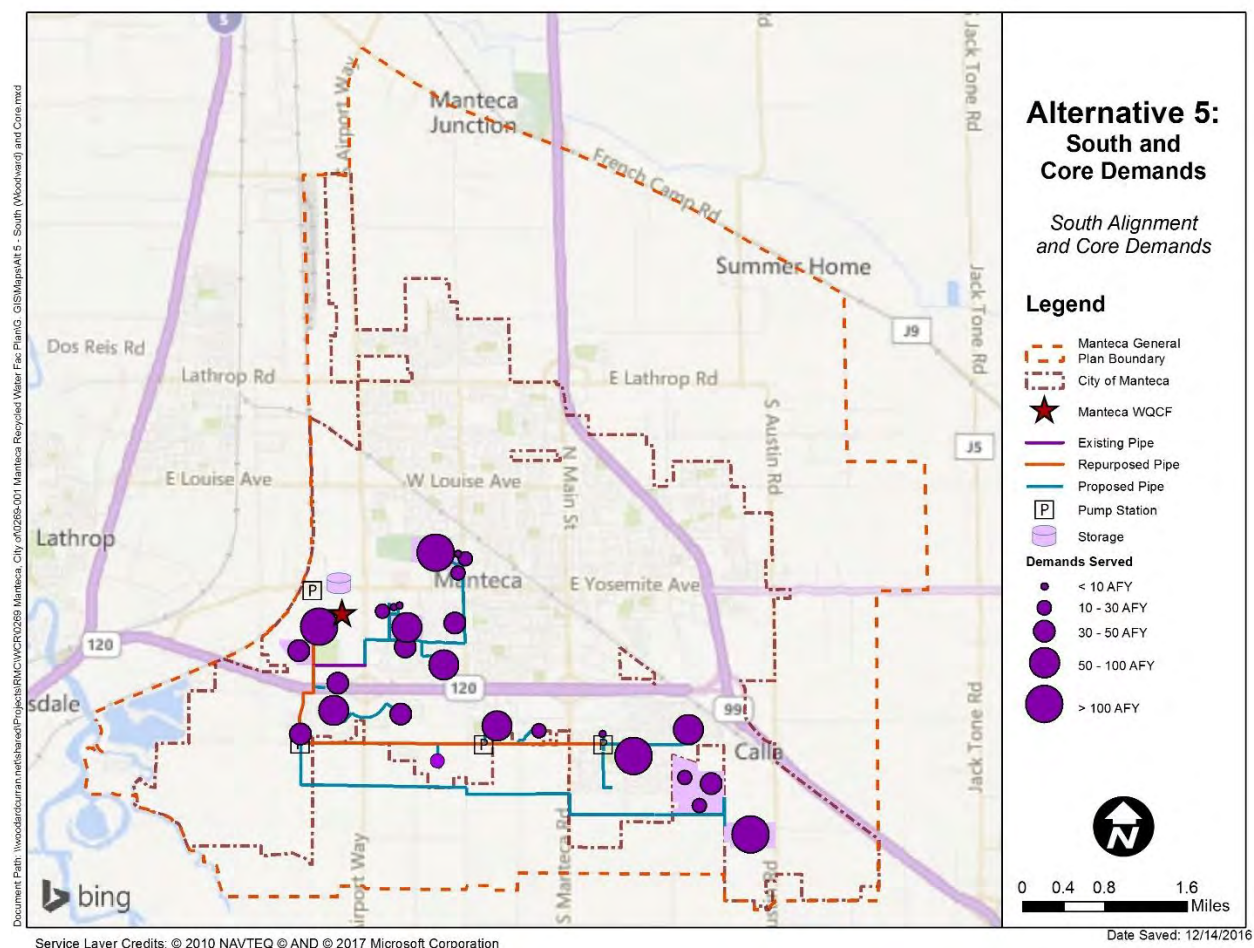


Table 5-6: Alternative 5 Demands Served

Alternative		5 – Core & South
No. of Customers (by type)	Schools	4
	Parks	18
	Playing Field/Golf Course	2
	Green Space	0
	Planned Park/Open Space	15
Total Demand	Average Annual Demand (AFY)	2,082
	Peak Month Demand (AFY)	4,580
	Peak Month Demand (mgd)	4.1

5.2.6 Local Alternative Summary

A summary of the demands served by the local alternatives can be found in Table 5-7. Alternative 1 focuses on serving the “core” demands—those demands closest to the WQCF, including the golf course, Big League Dreams and planned development of the Family Entertainment Zone. Alternative 2 was designed to serve as many demands to the north and south of Highway 120 as economically feasible (based on an analysis of the demand densities throughout the city). From there, Alternatives 4 and 5 were developed which served varying levels of demands within the range set by Alternatives 1 and 2. As discussed previously, Alternative 3 was eliminated because it serves the same customers as Alternative 2, but with a less desirable pipeline alignment.

Table 5-7: Summary of Local Alternatives

Alternative		1	2	4	5
		Core	All	Core & North	Core & South
No. of Customers (by type)	Schools	2	9	8	4
	Parks	8	28	16	17
	Playing Field/Golf Course	2	2	2	2
	Green Space	0	0	0	0
	Planned Park/Open Space	1	19	6	16
Total Demand	Average Annual Demand (AFY)	910	2,630	1,889	2,082
	Peak Month Demand (AFY)	2,000	5,680	4,081	4,580
	Peak Month Demand (mgd)	1.8	5.1	3.6	4.1
Demand Information	Average Day Demand Potable Use Offset (AFY)	34	97	34	97
	Average Day Demand of Future Customers (AFY)	244	1,058	346	956

City staff provided Woodard & Curran with information on two existing wastewater force mains (pipelines operating under pressure downstream of pump stations) that are scheduled to be decommissioned and could potentially be repurposed for recycled water. Using this information, Alternatives 1, 2, 4 and 5 were adjusted and evaluated further as described in Section 5.4.

5.3 Regional Alternatives

Based on discussions with the City staff and the results of the Market Assessment discussed in Chapter 4, five conceptual alternatives (numbered 6, 7, 8, 9, and 10) were developed to explore the possibility of collaborating with a regional partner. For each potential partner, a small and large sub-alternative was developed based on the following assumptions:

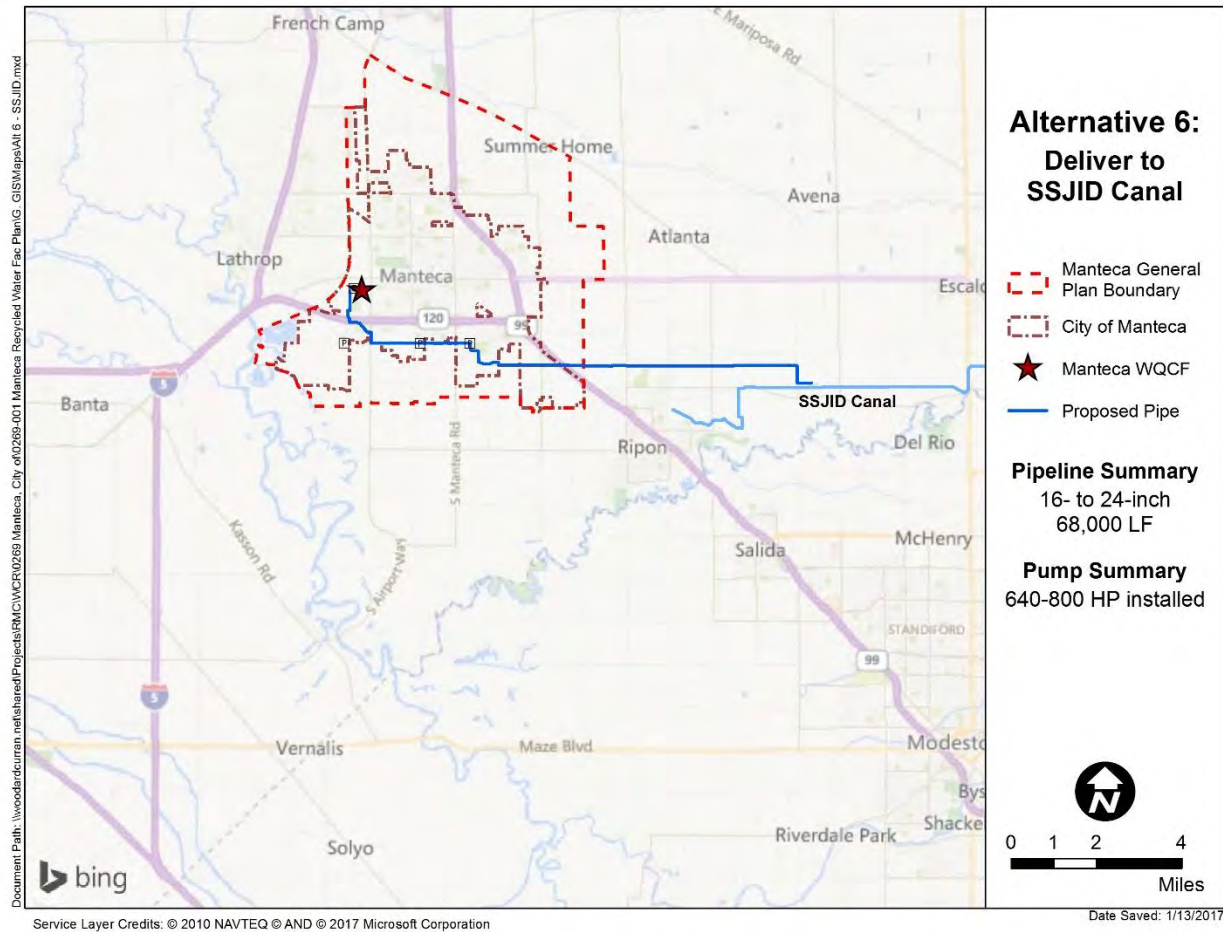
- (a) For the larger sub-alternative, recycled water deliveries were set equal to the maximum flow rate available at buildout of the WQCF (9.87 mgd), with no allowance for other landscape irrigation customers. This represents the maximum possible volume of recycled water deliveries.
- (b) For the smaller sub-alternative, recycled water deliveries were capped at a peak month flow rate of 3.6 mgd. This is equal to the current availability of recycled water (5.7 mgd) less planned internal usage at the WQCF (0.3 mgd) and less deliveries to the small base of urban landscape irrigation customers listed in Alternative 1 (1.8 mgd).

Each regional alternative is discussed further in the sections below.

5.3.1 Alternative 6 – Partner with South San Joaquin Irrigation District

In Alternative 6, the City would partner with South San Joaquin Irrigation District. The City would pump recycled water to the east into the SSJID distribution system. SSJID would either purchase the water or exchange it for treated water for potable use in Manteca. It is assumed that SSJID would only receive water during the 6-month irrigation season when irrigation demand is high, resulting in a demand of 1,990 AFY under current conditions and 5,190 AFY at buildout. Facilities required for Alternative 6 are illustrated in Figure 5-6.

Figure 5-6: Alternative 6 – Transfer to South San Joaquin Irrigation District

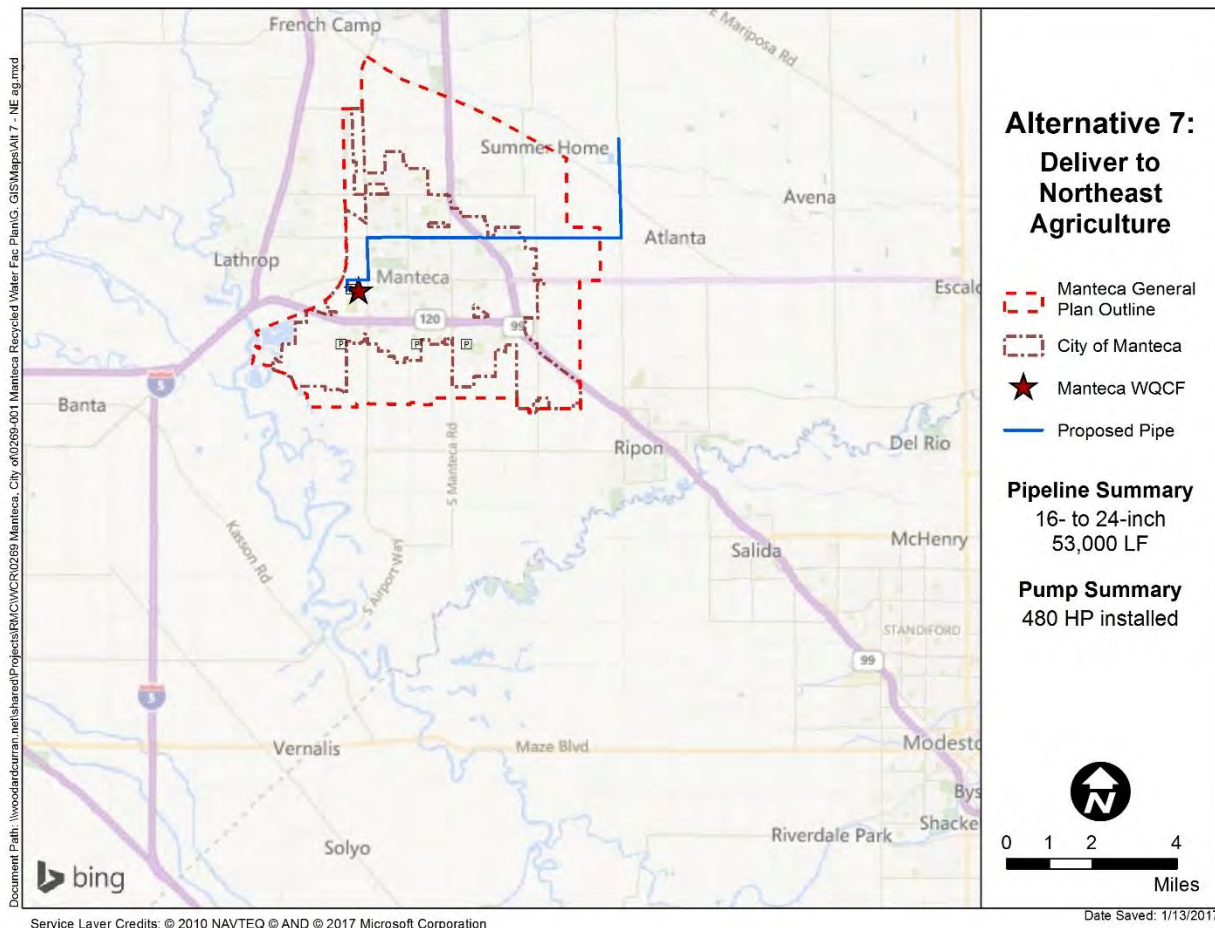


5.3.2 Alternative 7 – Deliver Water to Agricultural Users to the Northeast of the City

Under Alternative 7, the City would sell water to agricultural users northeast of the City, located within the Central San Joaquin Water Conservation District service area, or provide the water to the local Groundwater Sustainability Agencies (GSAs) for use in groundwater basin recharge to overcome existing overdraft conditions and help sustain the basin. Under the first version of Alternative 7, the City would target customers located northeast of the City so that recycled water use for irrigation would offset groundwater pumping in an area with a significant cone of depression. No specific customers have been identified this alternative; rather, this alternative was developed primarily to support a cost estimate for designing and constructing a recycled water pipeline to this area of the county. Under this alternative, it is assumed that agricultural users would only receive water during the 6-month irrigation season, resulting in a demand of 1,990 AFY under current conditions and 5,190 AFY at buildout. Facilities required for Alternative 7 are illustrated in Figure 5-7.

Either version of Alternative 7 – with or without percolation ponds for recharge of recycled water – could be also used for seasonal deliveries to landscape or agricultural irrigation customers located near the pipeline right-of-way. The pipeline alignment shown below was developed primarily for cost estimating purposes, without consideration of utility conflicts or consideration of irrigation demands along the pipeline route.

Figure 5-7: Alternative 7 – Transfer to Agriculture to the Northeast of Manteca



A second version of Alternative 7 would be to use the same assumed pipeline to deliver recycled water for a year-round groundwater recharge project. As shown in Figure 5-8, the pipeline would terminate near the edge of the Farmington Groundwater Recharge Area. The Farmington Groundwater Recharge Area is operated as part of the Farmington Groundwater Recharge Program (Farmington Program), a program designed to replenish the underlying aquifers to help ensure future groundwater supply and protect against further saltwater intrusion. The goal of the Farmington Program is to primarily benefit the groundwater basin and enhance local habitats. As envisioned, the program would obtain 25 to 30 parcels of land, totaling 1,200 acres, for directly recharging the groundwater aquifers. It is estimated that the development of the identified parcels into recharge areas may return approximately 35,000 AF/Y of water into the over-drafted groundwater basin in eastern San Joaquin County. The program is referenced here as an example of the type of recharge projects that have already been envisioned in the region, not a requirement or endorsement of this specific program.

At present, the Farmington Groundwater Recharge Program facility consists of two 15-acre recharge ponds with earthen berms, one 5-acre overflow pond and one 19-acre dual purpose storage/recharge pond, with a capacity of 60-million gallons for a total active recharge area of 49 acres, about 80% of the 60-acre site. Water is gravity fed into the recharge ponds until a sufficient head is developed to regulate percolation. Since 2003, the observed range of recharge at the Farmington Program site has fluctuated from 2,789 AFY to 5,825 AFY with an average of 4,400 AFY.

Under this version of Alternative 7, additional percolation ponds could be constructed in the Farmington Program area for additional basin augmentation. Surface water currently being percolated by the project would potentially provide the required diluent water for a recycled water recharge program, and the blended (surface water + recycled water) water supplies would be percolated into the groundwater basin via new percolation ponds. For direct recharge of the recycled water alone, and without consideration of seasonal storage, a parcel size of between 4 – 115 acres would be required for direct percolation of the City's anticipated recycled water production, as shown below in Table 5-8.

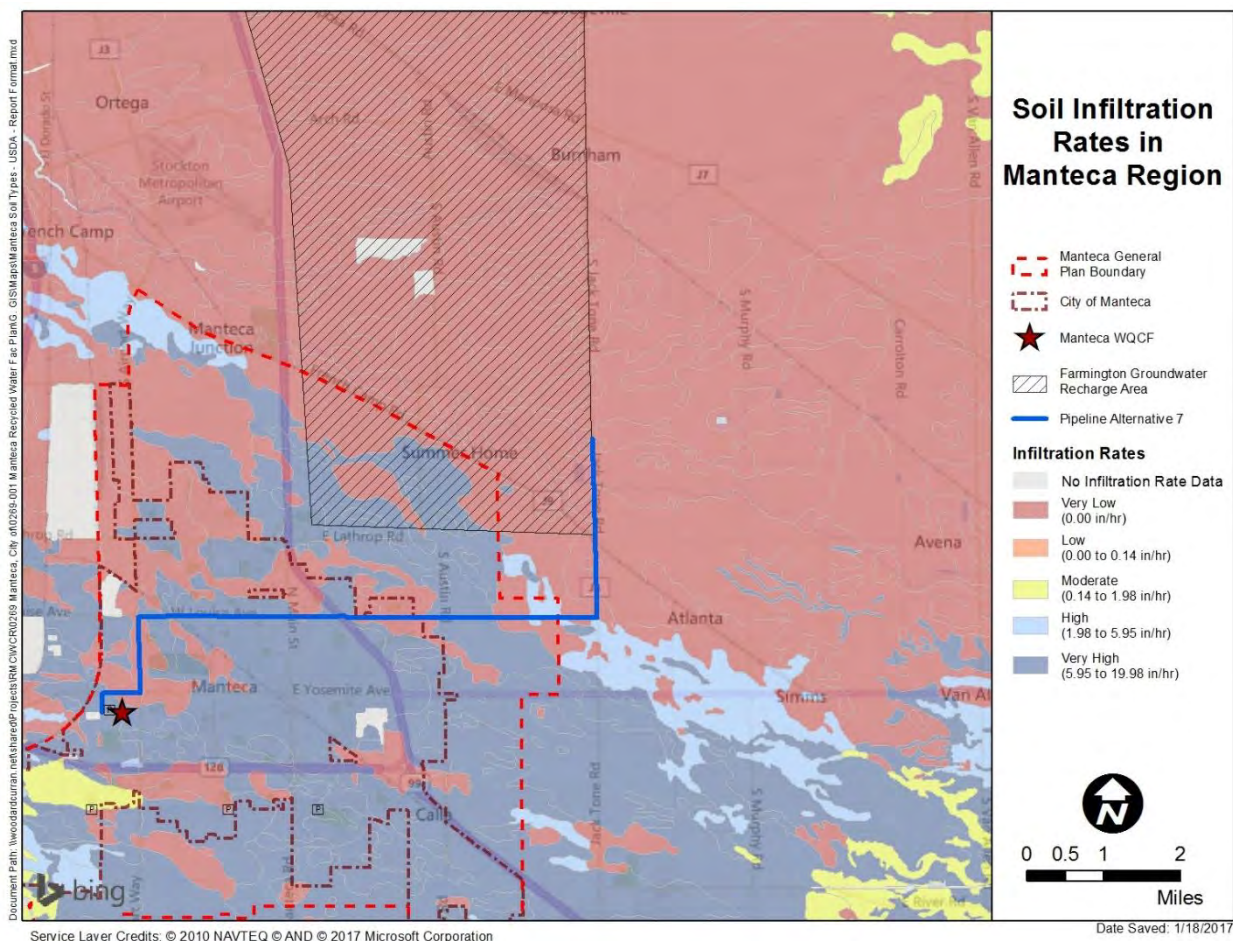
Table 5-8: Estimated Percolation Area Required for Recycled Water Recharge

Percolation Rate	Basis	Area Needed for 3.4 mgd flow rate (acres)	Area needed for 9.4 mgd flow rate (acres)
High – 3 ft/day	CALFED Recharge Basin	3.5	10
Low - 0.25 ft/day	Tracy Lakes	42	115

Source: *Amended Map to Accompany Permit 10477 by North San Joaquin Water Conservation District*. December 2014. Available online at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/petitions/2014/12842_draft_map.pdf

Percolation rates (and therefore percolation pond sizing) is highly dependent on site-specific soil conditions, which vary considerably in the region east of the City, as indicated below in Figure 5-8. The areas with the most favorable soil conditions for recharge are within City limits or to southeast (see Figure 5-8), while the areas of the groundwater basin with critical overdraft conditions are primarily north and northeast of the City (see Figure 4-3).

Figure 5-8: Alternative 7 – Transfer to Northeast of Manteca for Groundwater Recharge

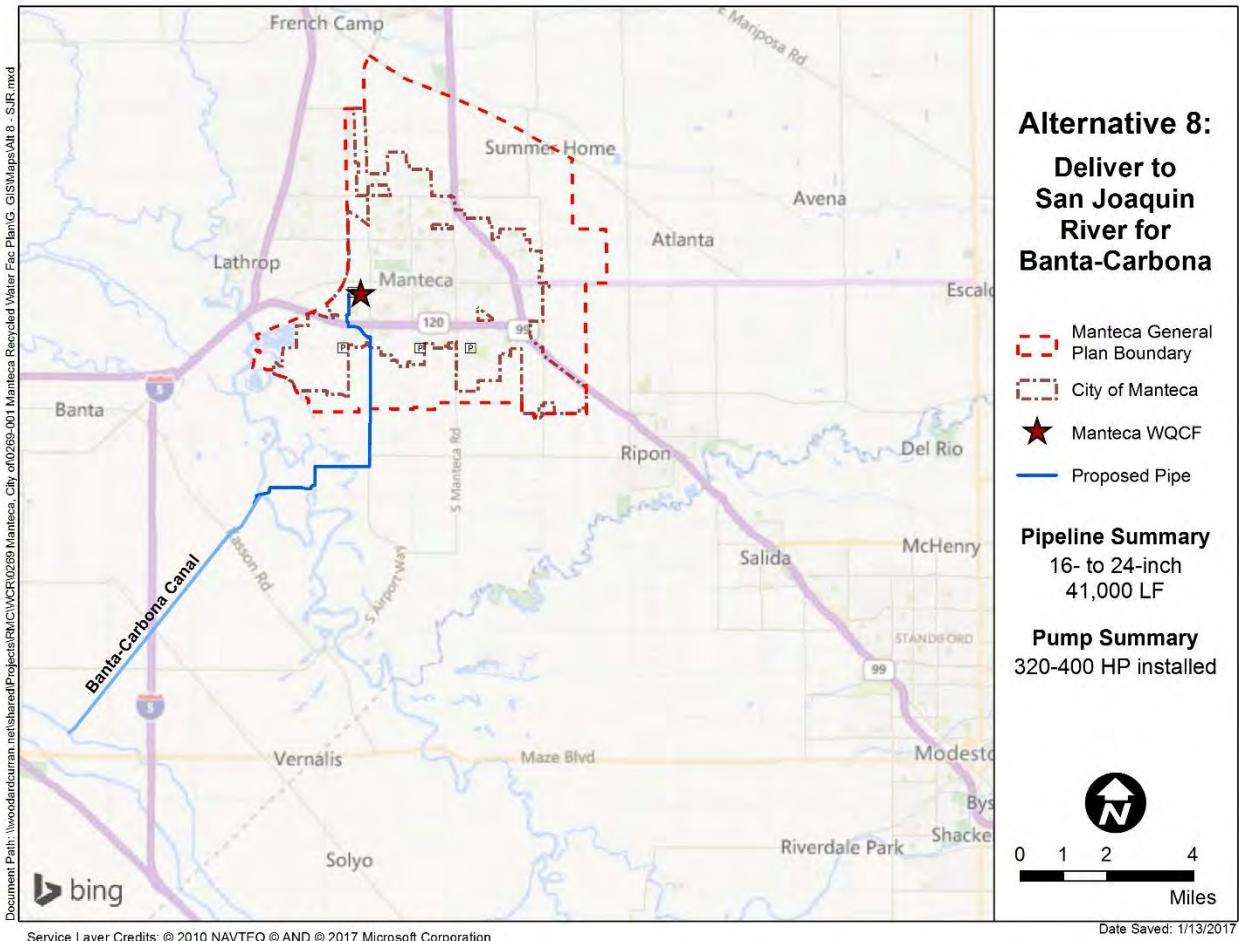


In summary, Alternative 7 could be implemented to directly supply agricultural irrigators northeast of the City, or it could support a groundwater recharge program in the area. Either approach could contribute to groundwater sustainability in the region, thereby warranting further analysis in the context of SGMA and the Groundwater Sustainability Plan to be developed for the basin. Due to the array of possible outcomes for SGMA implementation (see section 2.1.1), this alternative was not carried forward for additional analysis except to develop a cost estimate for the relevant pipeline and pump station.

5.3.3 Alternative 8 – Transfer to Central Valley Project Contractor with Indirect Pipeline to the Delta-Mendota Canal

In Alternative 8, the City would sell water to a Central Valley Project (CVP) contractor. Water would be piped from the WQCF to an intermediary's canal (such as the Banta-Carbona Canal), which would deliver water to the Delta-Mendota Canal for diversion and use by the water buyer. The City would deliver water year-round, resulting in a delivery of 4,030 AFY under current conditions and 10,530 AFY at buildout. Facilities required for Alternative 8 are illustrated in Figure 5-9.

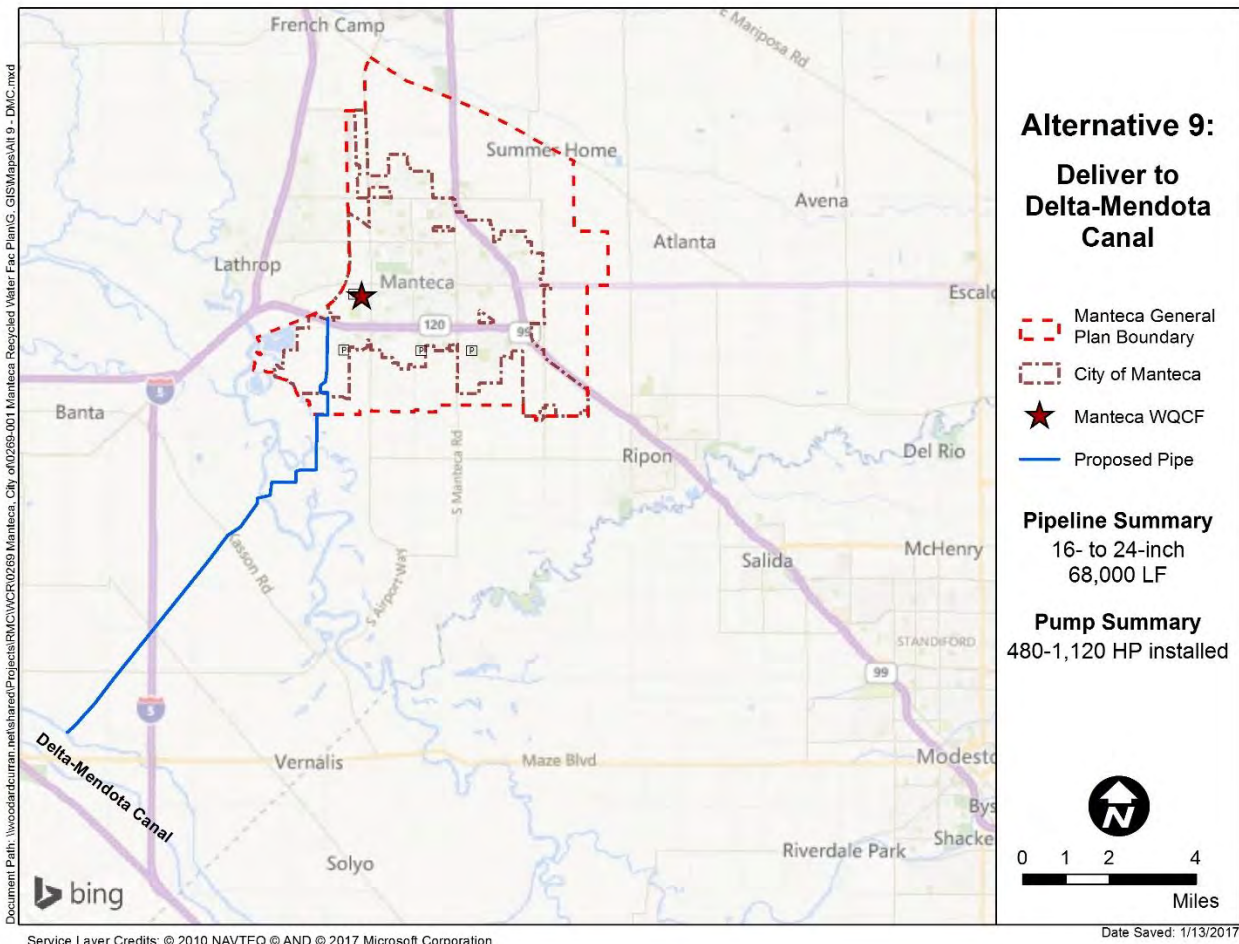
Figure 5-9: Alternative 8 – Transfer to Central Valley Project Contractor with Indirect Pipeline to the Delta-Mendota Canal



5.3.4 Alternative 9 – Transfer to Central Valley Project Contractor with Indirect Pipeline to the Delta-Mendota Canal

In Alternative 9, the City would sell water to a CVP contractor (as under Alternative 8); however, under this alternative, the water would be piped from the WQCF directly to the Delta-Mendota Canal for diversion and use by the water buyer. The City would deliver water year-round, resulting in a delivery of 4,030 AFY under current conditions and 10,530 AFY at buildout. Facilities required for Alternative 9 are illustrated in Figure 5-10.

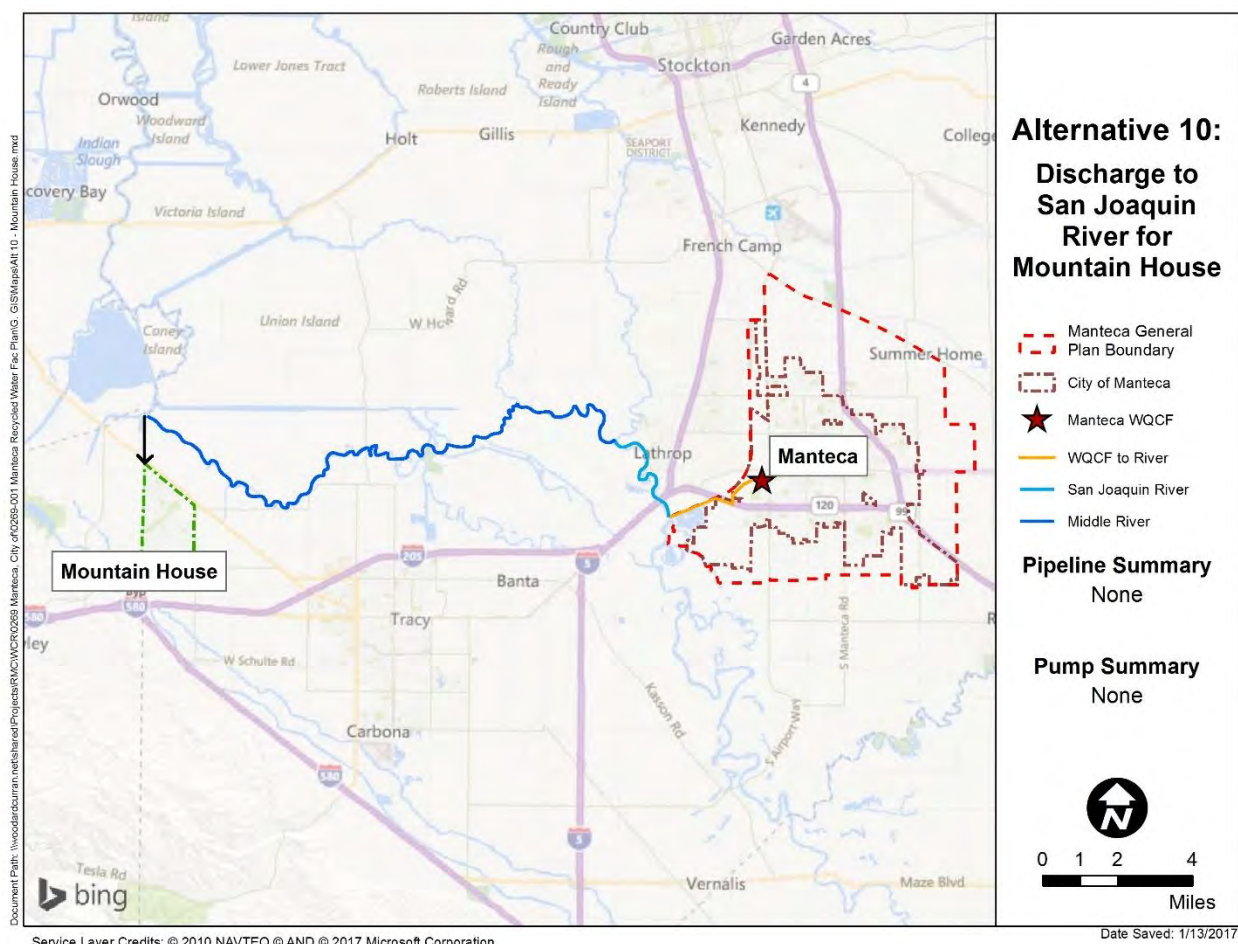
Figure 5-10: Alternative 9 – Transfer to Central Valley Project Contractor with Direct Pipeline to the Delta-Mendota Canal



5.3.5 Alternative 10 – Transfer of Water Rights to Mountain House Irrigation District

In Alternative 10, the City would continue discharging recycled water to the San Joaquin River, secure water rights for those discharges and then sell those rights to Mountain House Community Services District. The City would not be required to build any additional facilities, but Mountain House would have to construct new intake facilities on Middle River or use its existing delivery infrastructure that connects to Clifton Court Forebay. The City would deliver water to the San Joaquin River year-round, resulting in a delivery of 4,030 AFY under current conditions and 10,530 AFY at buildout. Alternative 10 is illustrated in Figure 5-11.

Figure 5-11: Alternative 10 – Transfer of Water Rights to Mountain House Irrigation District



5.3.6 Summary of Regional

Alternatives

Table 5-9 summarizes the demands for each of the regional alternatives.

Table 5-9: Summary of Regional Alternatives

Alternative	6		7		8		9		10	
	a	b	a	b	a	b	a	b	a	b
Regional Partner	South San Joaquin Irrigation District		Agriculture NE of Manteca		CVP Contractor (indirect pipeline to the DMC)		CVP Contractor (direct pipeline to the DMC)		Mountain House Irrigation District	
Description	Pump water to the east of the City into the SSJID distribution system		Pump water to the agricultural users to the northeast of the City where there is a significant cone of depression for use in lieu of groundwater for irrigation		Pump water to an existing canal (such as the Banta-Carbona Canal) which can wheel water to the DMC for use by a CVP partner		Pump water directly to the DMC to be transported to a CVP partner		Continue discharging water to the San Joaquin River and transfer water rights for that discharge to Mountain House.	
Annual Demand (AFY)	5,190	1,990	5,190	1,990	10,530	4,030	10,530	4,030	10,530	4,030
Peak Month Demand (mgd)	9.4	3.6	9.4	3.6	9.4	3.6	9.4	3.6	9.4	3.6

Using the Microsoft EXCEL spreadsheet-based hydraulic model and the design criteria described in the previous section, the pipeline and pump station sizes were determined for each alternative. Table 5-10 summarizes the infrastructure required for each of the local alternatives. All of the local alternatives will require addition of sodium hypochlorite to provide a chlorine residual within the local distribution system. The treatment system will be sized according to demands for the alternative.

Table 5-10: Summary of Local Alternatives Infrastructure

Alternative		1	2	4	5
Infrastructure Needed	Total Pipe Length (ft)	23,600	158,000	63,100	95,100
	Pump Station (HP)	370	1,080	560	860
	Storage (MG)	0.4	3.7	1.4	2.7
	Treatment Needed (Sodium Hypochlorite)	Y	Y	Y	Y
Total Demand	Average Annual Demand (AFY)	910	2,686	1,447	2,082
	Peak Month Demand (AFY)	2,000	5,790	3,180	4,580
	Peak Month Demand (mgd)	1.8	5.2	2.8	4.1
	Peak Hour Demand (mgd)	5.4	15.5	8.5	12.3

Table 5-11 summarizes the requirements for the regional alternatives, which do not include booster chlorination prior to distribution, as that cost would be put on the water exchange partner if it is required. After meeting with WQCF staff, it was determined that a new clearwell will be required at the pump station, even if new storage is not constructed (e.g., for the regional alternatives).

Table 5-11: Summary of Regional Alternatives Infrastructure

Alternative	6		7		8		9		10	
	a	b	a	b	a	b	a	b	a	b
Regional Partner	SSJID		Agriculture NE of Manteca		CVP Contractor		CVP Contractor		Mountain House	
Total Pipe Length (ft)	68,100		52,800		41,200		68,000		None	
Pump Station (HP)	640	800	480	480	320	400	480		None	
Demand (AFY)	5,190	1,990	5,190	1,990	10,530	4,030	10,530	4,030	10,530	4,030
Demand (mgd)	9.4	3.6	9.4	3.6	9.4	3.6	9.4	3.6	9.4	3.6

5.4 Alternative Evaluation

Alternatives were evaluated based on cost as well as a number of non-monetary criteria as discussed below.

5.4.1 Estimated Cost

Planning-level cost estimates were developed for each alternative. The estimated costs are summarized in Table 5-12 and Table 5-13 for the local and regional alternatives, respectively. A more detailed breakdown of the costs for each alternative can be found in Appendix E. Costs associated with any required retrofits for recycled water use on the customer's property were not included in the overall alternative cost estimates.

Table 5-12: Local Project Alternative Cost Estimates

Alternative	1	2	4	5
Total Capital Cost ^a	\$7,839,000	\$44,825,000	\$16,407,000	\$26,281,000
Annual O&M ^b	\$192,000	\$568,000	\$309,000	\$450,000
Total Annualized Cost^c	\$594,000	\$2,855,000	\$1,146,000	\$1,791,000
Estimated Yield (AFY)	910	2,686	1,450	2,080
Peak Flow (mgd)	5.4	15.5	8.5	12.3
Unit Cost (\$/AF)	\$650	\$1,063	\$790	\$860

Notes:

- Costs are referenced to the ENR 20-city CCI for November 2022 at 13,175. which represents an approximate 32% increase from the January 2015 CCI at 9,972. Includes 25% for implementation and 30% for contingency in 2022 dollars. Costs for Alternatives 1, 4, and 5 are referenced to the ENR 20-city CCI for January 2015 at 9,972.
- Assumes no escalation of O&M costs.
- Assumes project lifespan of 30 years and 3% interest rate.

Table 5-13: Regional Project

Alternative Cost Estimates

Alternative		6		7		8		9		10	
		a	b	a	b	a	b	a	b	a	b
Regional Partner		SSJID		Agriculture NE of Manteca		CVP Contractor		CVP Contractor		Mountain House	
Demand (mgd)		9.4	3.6	9.4	3.6	9.4	3.6	9.4	3.6	9.4	3.6
Total Capital Cost ^a		45,260,000	\$30,866,000	\$37,645,000	27,676,000	\$27,676,000	\$18,974,000	\$50,357,000	\$35,469,000	\$0	\$0
Annual O&M ^b		\$515,000	\$281,000	\$679,000	\$360,000	\$133,000	\$315,000	\$1,404,000	\$684,000	\$0	\$0
Total Annualized Cost^c		\$2,824,000	\$1,856,000	\$2,600,000	\$1,772,000	\$1,988,000	\$1,283,000	\$3,973,000	\$2,494,000	\$0	\$0
Estimated Yield (AFY)		5,190	1,990	5,190	1,990	10,530	4,030	10,530	4,030	10,530	4,030
Wheeling Costs (\$/AFY)	USBR DMC ^d	--	--	--	--	\$50	\$50	\$50	\$50	--	--
	Banta-Carbona ^d	--	--	--	--	\$200	\$200	--	--	--	--
Unit Cost (\$/AF)		\$540	\$930	\$500	\$890	\$440	\$570	\$380	\$620	N/A	N/A

Notes:

- a. Costs are referenced to the ENR 20-city CCI for January 2015 at 9,972. Includes 25% for implementation and 30% construction contingency.
- b. Includes 30% for contingency.
- c. Assumes project lifespan of 30 years, 3% interest rate.
- d. Wheeling costs are estimates.

5.4.2 Non-Monetary Criteria

A number of different criteria taken into consideration in evaluating the ten identified alternatives. Table 5-14 provides an overview of the criteria used in the evaluation.

Table 5-14: Evaluation Criteria

Criteria	Description	Score Range
Ease of Implementation - Planning/Permits/ Partners	Assessment of the time, challenges and requirements to plan the project, obtain all required permits, and coordinate with partner agencies to develop the institutional structure for project operation.	1 – Least Favorable (Requires the most planning/permits/partners) 4 – Most Favorable (Requires the least planning/permits/partners)
Ease of Construction	Assessment of the time, challenges and requirements to design and construct the necessary infrastructure for the supply option.	1 – Least Favorable (Requires the most effort to construction) 4 – Most Favorable (Requires the least effort to construct)
City Supply Benefits	Assessment of the impact to the City's water supply. Does the alternative benefit the City's local water supply by offsetting potable water use, decreasing reliance on groundwater, or improving supply reliability?	1 – Does not impact the City's water supply 2 – May impact the City's water supply 3 – Will increase the City's water supply
Regional Groundwater Sustainability	Assessment of the impact on regional groundwater sustainability. Does the alternative contribute to regional groundwater sustainability?	1 – Water is not used within the groundwater basin 2 – Water is used within the groundwater basin
Environmental Impacts	Assessment of the challenges to implement the alternative without significant impacts to the environment and the level of mitigation that may be required to address any impacts.	1 – Water that would be discharged to the San Joaquin River is redirected for other use, or discharged water is diverted downstream 2 – All treated water remains in the San Joaquin River

A score was developed for each alternative based on how well it met the goals of the criteria in Table 5-14, and the relative weight of each criteria based on City feedback. The scoring for each alternative is presented in Table 5-15. The score assigned to each alternative for each criteria ranged from (1) being least favorable to (2), (3) or (4) being the most favorable, with a 2.84 being a perfect final score. Alternative 7 was not evaluated as the City requested that this alternative be removed from further consideration.

Table 5-15: Alternative Evaluation – Criteria Grading, Weighting and Scoring^a

Criteria (Scoring Range)	Weight	1 - Core	2 - All	4 - North	5 - South	6 - SSJID	8 – Indirect DMC	9 - Direct DMC	10 – Mtn House
Ease of Implementation - Planning/Permits/Partners (1, 2, 3 or 4)	13%	4	3	3	3	2	1	2	2
Ease of Construction (1, 2, 3 or 4)	8%	4	3	4	4	2	2	1	4
City Supply Benefits (1, 2, or 3)	40%	3	3	3	3	2	1	1	1
Regional Groundwater Sustainability (1 or 2)	29%	2	2	2	2	2	1	1	1
Environmental Impacts (1 or 2)	11%	1	1	1	1	1	1	1	1
Score^b		2.69	2.49	2.56	2.56	1.89	1.08	1.13	2.69
Score as a Percentage		95%	88%	90%	90%	67%	38%	40%	95%

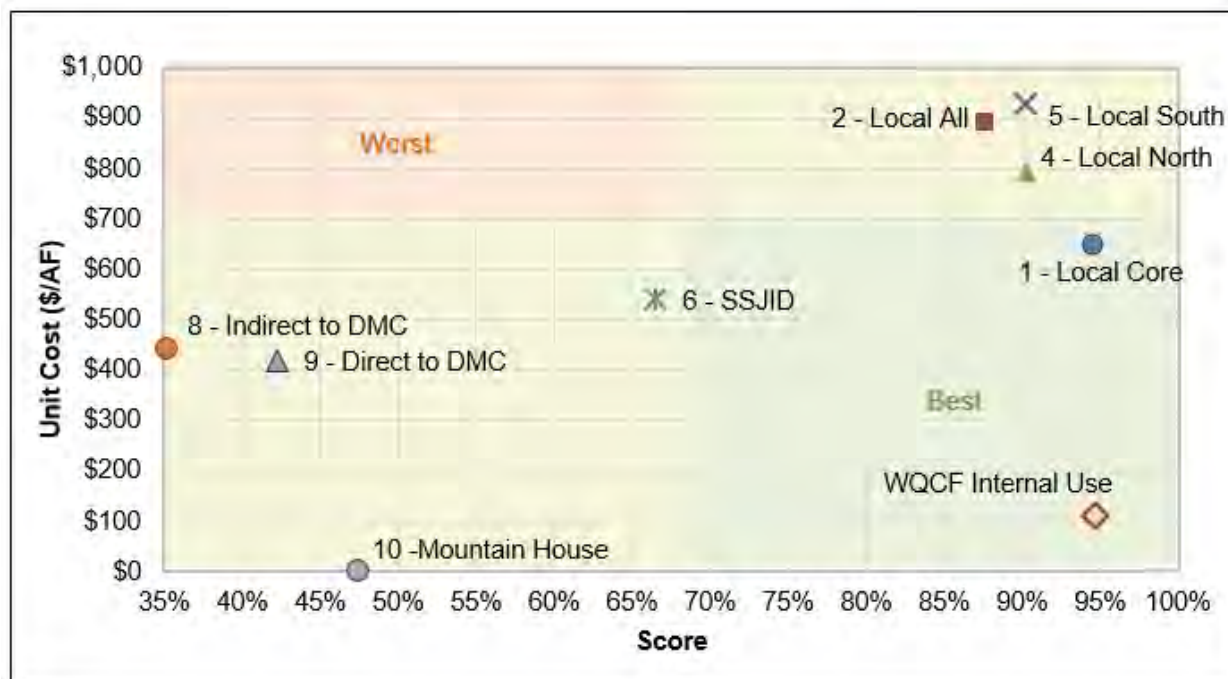
Notes:

- a. The City requested that Alternative 7 be removed from further consideration.
b. The larger the number, the more favorable the score, with a perfect score being 2.84

5.4.3 Alternative Evaluation

Once the alternatives were scored, the results were compared using both unit costs (\$/AF) and non-monetary criteria scoring. The cost and score of each alternative is shown below in Figure 5-12, in which the lower right area (green shading) is labeled “Best” because these projects have the highest score for the least cost. Conversely, the “Worst” projects (orange shading in the upper left) have the lowest score and the highest cost.

Figure 5-12: Alternative Scores versus Costs



Chapter 6 Recommended Facilities Project Plan

Based on the results of Chapter 5, the recommended project is to move forward with a local project that maximizes reuse within the City. The recommended project, Alternative 2, includes approximately 2,686 AFY of deliveries to current and future landscape irrigation customers, and approximately 300 AFY for internal reuse within the WQCF.

6.1 Recommended Project (Alternative 2 with Additional Use at Treatment Plant)

Alternative 2 (All Demands) was selected as the recommended local project for the following reasons:

- **Maximizes Local Reuse:** Alternative 2 serves as many local demands as possible, resulting in more reuse within the City than any other alternative. Existing customers, such as the golf course and Woodward Community Park would be converted from groundwater to recycled water for irrigation, reducing the City's reliance on groundwater pumping and contributing to groundwater sustainability. This approach is also consistent with California's water use targets (SBx7-7 and its recycled water mandate).
- **Ability to Expand Over Time:** The project can initially be sized to serve existing demands, in particular those located adjacent to the WQCF and listed as part of Alternative 1. New customers can be added gradually as the distribution grows north along Airport Way and south along Woodward Avenue.
- **Meets Demands of New Development:** New users can be tied into the distribution system as development occurs. Notable future users include development along Airport Way in the northern part of the City; development near Austin Road in the southeastern part of the City; and planned subdivisions such as Griffin Park, Trails at Manteca, and others.
- **Utilization of Existing Infrastructure:** Alternative 2 takes advantage of two existing pipeline spines which decreases the unit cost of reaching customers and eliminates the cost of decommissioning the main

The recommended project is illustrated in Figure 6-1. This alternative would be implemented along with the conversion of the WQCF to use recycled water for internal process water.

Figure 6-1: Recommended Project

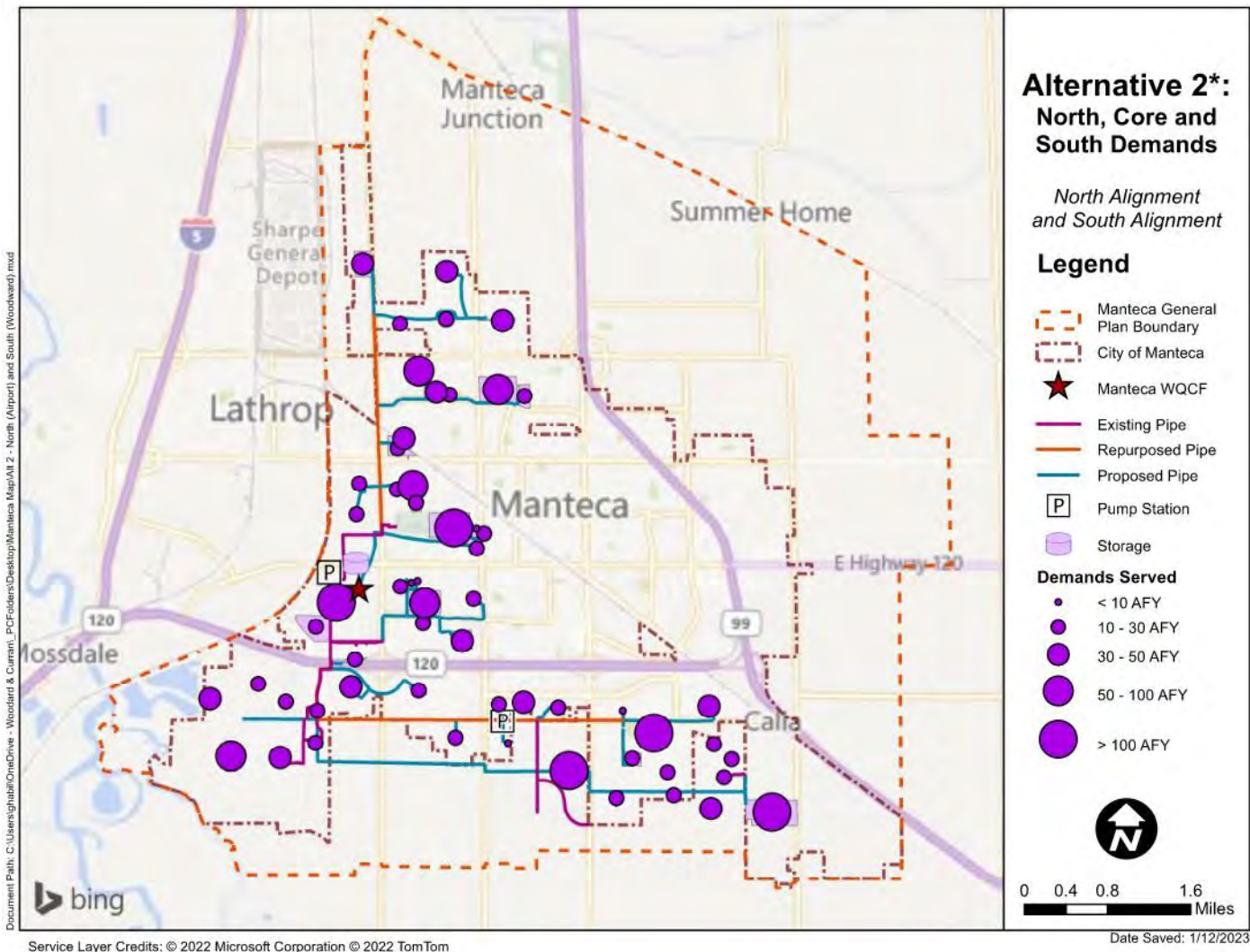


***Figure updated 2023**

6.1.1 Target Users

The recommended project would provide approximately 2,686 AFY of recycled water to irrigation customers throughout the City, including 643 AFY for landscape irrigation demands serving future development. In addition, the project will result in approximately 300 AFY of reuse onsite at the treatment plant. The target users are listed in Table 6-1.

Table 6-1: Recommended Project Target Users

ID #	Name	Type	Demand (AFY)	Potable Offset (Y/N)	Groundwater Offset (Y/N)
017	Golf Course	Park	406	N	Y
018	Morezone Ballfield	Park	13	N	Y
019	Villa Ticino Park	Park	27	N	Y
021	Monte Bello Park	Park	12	N	Y
022	Primavera Park	Park	31	N	Y
023	Woodward Park 2	Park	17	N	Y
024	Woodward Park 3	Park	20	N	Y
025	Chadwick Square	Park	50	N	Y
026	Woodward Park 1	Park	14	N	Y
027	Austin Rd Development	Park	245	N	Y
015	Palmer Memorial Park	Park	21	N	Y
030	Terra Bella Park	Park	14	N	Y
031	Tesoro Park	Park	38	N	Y
032	Antigua Park	Park	20	Y	Y
034	Dutra S.E. Park	Park	28	N	Y
044	Union Road Tennis Park	Park	11	N	Y
046	Bella Vista	Park	37	N	Y
047	Dutra Estates Park	Park	21	N	Y
051	Gonsalves Estate Greenbelt	Park	10	Y	Y
054	Union Ranch West Park	Park	22	N	Y
055	Union Ranch Rec Center	Park	28	N	Y
056	Union Ranch North Park	Park	36	N	Y
060	Union Road Park	Park	6	Y	Y
061	Doxey Park	Park	16	N	Y
063	Northgate Parks	Park	17	N	Y
073	Cambridge Greenbelt	Park	6	N	Y
074	Gonsalves Estate Park	Park	3	N	Y
075	Union West Park	Park	19	Y	Y
076	Robert Estates	Park	22	N	Y
077	Woodward Community	Park	203	N	Y

ID #	Name	Type	Demand (AFY)	Potable Offset (Y/N)	Groundwater Offset (Y/N)
078	Paseo West Circle Park	Park	6	Y	Y
083	Union Ranch East Park	Park	30	N	Y
084	Family Entertainment Zone	Park	244	N	Y
086	BLD - Fields	Park	42	N	Y
087	Stadium Plaza Park	Park	19	N	Y
088	Airport Way	Park	45	N	Y
095	Veritas Elementary School	School	36	Y	Y
105	McParland (George) Elementary School	School	31	N	Y
106	East Union High School	School	93	N	Y
107	Hafley (Neil) Elementary	School	22	N	Y
109	Woodward (Walter) Elementary School	School	26	N	Y
110	Sierra High School	School	92	N	Y
111	Brock Elliott Elementary School	School	37	N	Y
114	Brockman (Stella) Elementary School	School	59	N	Y
115	Brockman (Stella) Elementary School Annex	School	20	N	Y
003	Evans Estates Park	Park	23	N	Y
007	Oakwood Trails Parcel D	Park	36	N	Y
008	Oakwood Trails Parcel A	Park	20	N	Y
009	Trails at Manteca Park	Park	80	N	Y
010	Terra Ranch Park	Park	20	N	Y
011	Cerri Park	Park	40	N	Y
012	Denali Park	Park	24	N	Y
013	Hat Ranch Park	Park	40	N	Y
014	Griffin Park	Park	104	N	Y
001	Blossom Grove Park	Park	9	N	Y
002	Pillsbury Estates Park	Park	19	N	Y
#N/A	Villa Ticino West Park 1	Park	28	N	Y
#N/A	Villa Ticino West Park 2	Park	28	N	Y
Total (AFY)			2,686	97	2,349

Note: Villa Ticino West Parks 1 and 2 added in 2023.

6.1.2 Primary Facilities

Table 6-2 summarizes the primary facilities required for this alternative. These facilities include a 1,080-horsepower (HP) recycled water pump station at the WQCF, approximately 160,000 linear feet (LF) of distribution pipelines (including 32,000 LF of already constructed recycled water main and 22,000 LF of constructed main to be rehabbed for recycled water delivery), and approximately 3.7 million gallons (MG) of storage at the WQCF. A new clearwell and a sodium hypochlorite disinfection treatment will also be required to treat water before distribution to customers. Onsite retrofits will be needed at the golf course and other sites to make use of recycled water, and pressure reducing valves (PRVs) will likely be required at the Family Entertainment Zone and Big League Dreams in order to ensure delivery pressures fall within the required range. Additionally, onsite retrofitting of the WQCF will be needed in order to utilize recycled water at the treatment facility.

Due to the number of future demands (and their large associated flow rates) served with Alternative 2, the proposed pump station and storage can be phased in order to maximize efficiency and cost. The pump station should be constructed so as to allow for easy expansion when future parks are developed south of Highway 120. This includes the initial construction of empty pump cans, extensions of discharge/suction headers, and added space and conduits for the electrical wiring and pump drives. The storage requirement can be split into two tanks, the first of which will provide storage for existing customers and the second tank can be constructed as future customers come online.

Table 6-2: Recommended Project Facilities

Project Facilities	Quantity	Unit
Pipelines		
4-inch	27,200	LF
6-inch	18,200	LF
8-inch	12,800	LF
10-inch	16,500	LF
12-inch	55,000 ^a	LF
16-inch	13,000	LF
18-inch	7,900 ^b	LF
20-inch	2,900	LF
24-inch	6,500 ^c	LF
Storage		
Storage Tanks	3,700,000	Gallons
Pumping		
Pump Station at WQCF		
1,080-HP Pump Station	1	ea
Number of Duty Pumps	4	ea
Pump Size	300	HP
Onsite Customer Retrofits		
Retrofits for existing customer, including extensive golf course and WQCF retrofits	40	EA
Customer PRV		
Customers requiring PRVs	2	EA

Notes:

- Includes 24,000 LF of installed recycled water main and 15,500 LF of installed pipeline to be rehabbed. Assumes that all installed recycled water main is 12-inch diameter.
- Includes 7,900 LF of installed recycled water main (rehabbed)
- Includes 6,500 LF of installed pipeline to be rehabbed.

6.1.3 Cost Estimate

Table 6-3 presents the estimated costs for this alternative. These costs include \$396,000 for onsite retrofits at the WQCF, based on the City's 2014 Capital Improvement Plan (CIP), as well as costs for converting the golf course and other sites. Exact requirements for the onsite retrofits (and therefore associated costs) are not yet known, but were estimated as \$330,000 for the golf course, \$11,800 per site for existing potable water users, and \$14,500 per site for existing groundwater users. These costs are based on similar recycled water conversion projects throughout the state, primarily in Southern California.

Table 6-3: Recommended Project Estimated Costs

Project Facilities		Estimated Cost ^b
Pipelines	\$/lf^a	
4-inch	\$56	\$2,143,680
6-inch	\$84	\$1,989,240
8-inch	\$112	\$1,730,520
10-inch	\$140	\$3,026,760
12-inch	\$168 (new) & \$42 (rehabbing pipe)	\$4,686,680
16-inch	\$224	\$3,108,000
20-inch	\$280	\$1,071,840
24-inch	\$84 (rehabbing pipe)	\$722,040
Storage		
Storage Tank		\$5,616,600
Pumping		
1,080-HP Pump Station and Clearwell		\$2,538,360
Treatment		
Sodium Hypochlorite		\$330,000
Onsite Customer Retrofits		
1 Retrofit per existing customer		\$550,440
Extensive Golf Course Retrofit		\$330,000
Customer PRV		\$13,200
Retrofit of WQCF		\$396,000
Raw Construction Cost		\$28,251,360
Capital Implementation Costs (25%)		\$6,497,875
Construction Total		\$34,749,450
Capital Project Contingency (30%)		\$10,077,356
Total Capital Cost		\$44,826,861
Total Annualized Capital Cost		\$2,287,033
Operations & Maintenance		
Annual O&M ^c		\$568,000
Total Annualized Cost		\$2,855,033
Yield (AF) ^c		2,686
Unit Cost (\$/AF)		\$1,063

Notes:

- Cost per lineal foot of pipe remains unchanged from previous draft. Estimated cost totals are escalated per note b.
- Costs are referenced to the ENR 20-city CCI for November 2022 at 13,175, which represents an approximate 32% increase from the January 2015 CCI at 9,972.
- Annual O&M and Yield estimates remain unchanged from previous draft.

6.1.4 Implementation Considerations

In order to implement the recommended project, the City will need to prepare a Title 22 Engineering Report, complete a project-level Environmental Impact Report (EIR), file for water rights (wastewater change petition), and secure funding through grants and/or low-interest loans. The City would also need to enroll in the State Water Resources Control Board's general order, *Waste Reclamation Requirements for Recycled Water Use* (Order No. WQO-2016-0068-DDW), which would replace portions of the City's current NPDES permit related to recycled water production and distribution. The City is currently developing their Urban Water Management Plan, and upon completion, will be able to apply for state grant funding.

Environmental Review and Documentation

An initial analysis of the environmental impacts that would be expected to occur from construction and operation of the recommended project must be conducted in order to proceed with project implementation. The environmental analysis should evaluate the impacts of removing all recycled water from the discharge stream (to the San Joaquin River) as preparation for potential future expansion of recycled water use.

Water Rights Filing

As described in Section 2.3, the City should file a Wastewater Change Petition under California Water Code §1211 to secure water rights for the wastewater currently discharged to the San Joaquin River. This filing will ensure the City's ability to fully utilize all of the tertiary-treated wastewater as recycled water, though it will likely be met with some resistance from water users downstream on the San Joaquin River. Alternatively, if the City ultimately determines to transfer or sell water to Mountain House or another downstream user, a water rights filing under California Water Code §1485 would be required.

Title 22 Engineering Report and General Order Enrollment

The City completed an *Engineering Report for Production, Distribution, and Use of Reclaimed Water* in 2005³⁷. The report, often referred to as a "Title 22 Report," included some details about landscape irrigation, but the City never received formal approval from California Department of Public Health (now the State Water Resources Control Board's Division of Drinking Water) for landscape irrigation. This 2005 report is the basis for the City's approved truck fill program, which was approved and is described in the City's NPDES permit.

The 2005 Engineering Report requires a major update, as follows:

- Revise any descriptions of the actual, installed tertiary treatment system that differ from the design described in the 2005 document. The 2005 document was completed before the tertiary treatment system was constructed.
- Add additional details about actual end users (golf course, Big League Dreams, etc.) and the distribution system that will be constructed.
- Develop and add more detailed information about how the City will implement a recycled water program, including monitoring of use sites, cross-connection testing, and training.
- Remove information about hypothetical end users that are not currently planned, such as groundwater recharge and dual plumbed use areas.

The Title 22 Report serves as the core technical document needed for the City to receive approval from the Division of Drinking Water to delivery recycled water to end users, and to enroll in the State Water Resources Control Board's *Water Reclamation Requirements for Recycled Water Use* (Order No. WQO-2016-0068-DDW). According to WQCF staff, the Central Valley Regional Water Quality Control Board

³⁷ Nolte, December 2005.

staff have expressed a strong preference for the City to enroll in this general order, rather than modifying the City's NPDES permit to include recycled water distribution and use. Unlike the NPDES permit, enrollment in the General Order does not expire, and permit terms will not change every 5 years (as they are likely to do under the NPDES permit).

Table 6-4 summarizes key required permits for the recommended project.

Table 6-4: Jurisdictional and Stakeholder Agencies for Permitting or Review for Recycled Water Use

Agency Name	Permits or Special Topics
Central Valley Regional Water Quality Control Board	- Water Discharge Requirements and/or Water Recycling Requirements (preferred option is to enroll in General Order WQO-2016-0068-DDW) - Stormwater General Permit for Construction
State Water Resources Control Board – Division of Water Rights	Wastewater Change Petition
State Water Resources Control Board – Division of Drinking Water	Title 22 Engineers Report for the Production, Distribution and Use of Recycled Water
San Joaquin Valley Air Pollution Control District	Permit to Construct
City of Manteca Department of Public Works	- Grading and clearing - Encroachment Permit
Pacific Gas & Electric Company, cable and telecommunications providers	Infrastructure review, as applicable

6.2 Implementation Plan

The recommended project can be split into four phases in order to better manage cash flow and the scaling up of recycled water deliveries. A description of those phases is presented below.

Phase 1

Phase 1 would include the following activities:

- Begin pre-design, to the extent that it is necessary for properly phasing the project, preparing applications for grant funding, and identifying environmental impacts.
- Complete a Wastewater Change Petition (California Water Code §1211).
- Complete and certify an Environmental Impact Report.
- Obtain agreements with end users (particularly those that are not part of the City Parks and Recreation Department) to ensure that customers will convert to recycled water once the distribution system is constructed.
- Apply for funding applicable to Phases 1, 2, and 3.
- Update the *Title 22 Engineering Report for Production, Distribution, and Use of Reclaimed Water*.
- Apply for enrollment under the State Water Resources Control Board's General Order, *Water Reclamation Requirements for Recycled Water Use* (Order No. WQO-2016-0068-DDW).
- Upon preparation of the reports and receipt of all required permits, finalize design and construct the disinfection treatment system (sized for Phases 1 through 3). Outside funding can be pursued to help offset these construction costs.

- Complete retrofits at the WQCF for about 300,000 gpd of onsite recycled water use. Grant funding can be pursued to help offset these construction costs.

Phase 2

In Phase 2, planning, permitting and design for the pipelines and pump station serving all demands should be prepared (e.g., complete the pipeline design for both Phase 2 and Phase 3). Construction of the pump station (with pumps to meet existing demands) and pipelines to Big League Dreams and the Family Entertainment Zone should be completed and work should be done to rehabilitate existing pipeline (cleaning, testing, etc.). All required retrofits at the Big League Dreams facility should also be completed; retrofits are not needed for Family Entertainment Zone because it is not yet constructed. Outside funding can be pursued to help offset construction costs, although pipelines that are sized for future uses are subject to special rules.

Phase 3

In Phase 3, construction of the pipelines to serve existing customers should be completed in addition to retrofits at the user facilities for recycled water. Finally, the first recycled water storage tank at the WQCF can be built. Outside funding can be pursued to help offset construction costs.

Phase 4 – Phased with Development

In Phase 4, construction of the pipelines to serve future customers will take place as those developments are finalized. The pump station at the WQCF can be upsized, as appropriate, to handle the increased demands, and a second storage tank will be constructed to meet additional demands. Developer funding can be pursued to help offset construction costs. The timing of this phase is completely dependent on planned development and can be shifted ahead of or in conjunction with Phase 3. Major construction to be completed during each phase is listed below in Table 6-5.

Table 6-5: Major Facilities within each Phase of Recommended Project

Phase	Facility Upgrade/Construction
1	• Install booster chlorination system at WQCF • Complete retrofits at WQCF to allow for onsite recycled water use
2	• Construct pump station at WQCF • Rehab existing sanitary sewer force mains for recycled water use • Install pipe to serve Big League Dreams and Family Entertainment Zone • Complete retrofits at Big League Dreams to allow for recycled water use
3	• Install pipelines to serve all additional existing customers (except those already constructed in Phase 2) • Complete retrofits for existing customers to allow for recycled water use, including retrofits to golf course • Construct storage tank at WQCF to meet recycled water demands
4	• Install pipelines to serve future customers as they come online • Upsize pump station at WQCF (fill empty can and controls/electrical) to meet demands of additional customers • Construct additional storage tank at WQCF to meet additional recycled water demands

6.2.1 Phasing Schedule and Cost Breakdown

A breakdown of the recommended project costs by phase are presented below in Table 6-6.

Table 6-6: Recommended Project Estimated Costs by Phase

Project Facilities	Estimated Cost^a
Phase 1	
Planning	
Title 22 Eng. Report, EIR, Water Rights Filing ^b	\$400,000
Distribution System Pre-Design (including Pump Station) ^b	\$1,732,000
Treatment	
Sodium Hypochlorite	\$535,920
Onsite Customer Retrofits	
1 extensive retrofit at the WQCF	\$396,000
Raw Construction Cost	\$2,663,920
Capital Implementation Costs (25%)	\$665,980
Capital Project Contingency (30%)	\$998,970
Total Phase 1 Capital Cost	\$4,328,870
Total Phase 1 Cost	\$4,728,870
Phase 2	
Pipelines	
Prepare existing pipeline for cleaning/rehab ^c (~22,000 LF) + Ongoing Design for Phase 3	\$2,223,320
Pumping	
1,080-HP Pump Station	\$1,164,240
Onsite Customer Retrofits	
BLD and FEZ retrofits	\$66,000
Storage	
Storage Tank Design ^b	\$1,276,000
Raw Construction Cost	\$4,729,560
Capital Implementation Costs (25%)	\$1,182,390
Capital Project Contingency (30%)	\$1,773,585
Total Phase 2 Capital Cost	\$7,685,535
Total Phase 2 Cost	\$7,685,535
Phase 3	
Pipelines	
Install new pipe to connect to existing users (~67,400 LF) ^d	\$8,354,720
Onsite Customer Retrofits	
1 golf course retrofit	\$330,000
1 retrofit per existing customer	\$484,440
Storage	
Storage Tank Construction	\$2,246,640
Raw Construction Cost	\$12,415,800
Capital Implementation Costs (25%)	\$3,103,450
Capital Project Contingency (30%)	\$4,655,925
Total Phase 3 Capital Cost	\$20,175,675
Total Phase 3 Cost	\$20,175,675

Project Facilities	Estimated Cost
Phase 4	
Pipelines	
Install new pipe to connect to future users (~26,700 LF) ^d	\$5,068,800
Pumping	
1,080-hp Pump Station Buildout	\$776,160
Storage	
Storage Tank Construction	\$1,684,320
Raw Construction Cost	\$7,529,280
Capital Implementation Costs (25%)	\$1,882,320
Capital Project Contingency (30%)	\$2,823,480
Total Phase 3 Capital Cost	\$12,235,080
Total Phase 4 Cost	\$12,235,080
Total Cost	\$44,825,160

Notes:

- a. Costs are referenced to the ENR 20-city CCI for November 2022 at 13,175. which represents an approximate 32% increase from the January 2015 CCI at 9,972.
- b. Design/permitting costs remains unchanged from previous draft.
- c. Length of pipe to be rehabbed has decreased since 2017 based on conversion to recycled water pipe.
- d. Length of proposed recycled water pipe is assumed to be equal to proposed length from previous draft.

An implementation schedule for the recommended project is shown in Figure 6-2.

Figure 6-2: Implementation Schedule

Task Name	2023				2024				2025				2026				2027				Future
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Local Reuse Alternative																					
Petition for Change (Water Rights Filing)																					
Environmental Documentation																					
Funding Pursuit																					
Market Assurances																					
Title 22 / General Order Enrollment																					
Design (All Phases)																					
Permitting Phase 1																					
Bidding Phase 1																					
Construction Phase 1																					
Permitting Phase 2																					
Bidding Phase 2																					
Construction Phase 2																					
Permitting Phase 3																					
Bidding Phase 3																					
Construction Phase 3																					
Permitting Phase 4																					
Bidding Phase 4																					
Construction Phase 4																					

6.3 Regional Expansion

The recommended project, if fully constructed, will use much of the City's available recycled water during summer months (5.5 mgd out of a currently available flow of 5.7 mgd). However, should the City choose to implement a smaller project— such as Alternative 1, serving users located adjacent to the WQCF — it could be supplemented with additional recycled water use project(s). Additionally, WQCF flows are expected to grow in the future, providing additional recycled water. From a cost perspective, a single, larger project that would utilize all remaining recycled water with minimal additional infrastructure would be best, and therefore the supplemental project would most likely be one of the regional alternatives. As such, three regional alternatives are recommended for future consideration, described below.

Mountain House Water Rights Transfer

This option, which would build off Regional Alternative 10, is the lowest-cost project. The City would secure water rights to their recycled water discharges and then sell those rights to Mountain House. This project is ideal because the City would not have to construct any additional facilities; the major costs would be associated with legal and planning work. Further discussions and negotiations are needed with Mountain House before a more detailed implementation plan can be prepared, but the City should seek to secure water rights for its current recycled water discharges to the San Joaquin River so that it is able to transfer that water to its future partner should this alternative move forward.

South San Joaquin Irrigation Partnership

This option would build off of Regional Alternative 6 in which the City would partner with SSJID. The City could either sell recycled water to SSJID or trade it for potable supply. In addition to sending recycled water to SSJID, additional local users could potentially be served along the regional pipeline route. At this time, SSJID has not expressed interest in the City's recycled water, so further discussion and negotiations would be needed to develop a more detailed plan. In the meantime, the City should seek to secure water rights for its current recycled water discharges to the San Joaquin River so that it is able to transfer that water to SSJID should this alternative move forward.

Central-Valley Project Contractor Partnership

This option would build off of Regional Alternative 9 in which the City would construct a direct pipeline to the DMC and sell water to a downstream CVP contractor. Further discussions and negotiations are required with a potential CVP partner(s) before a more detailed implementation plan can be prepared. In the meantime, the City should seek to secure water rights for its current recycled water discharges to the San Joaquin River so that it is able to transfer that water to its future partner(s) should this alternative move forward.

Chapter 7 Construction Financing Plan and Revenue Program

7.1 Capital Improvement Program (CIP) Schedule

The total cost of facilities to serve the customers is \$44.8 million in 2022 dollars. The following CIP schedule matches the order of the recommended project phasing presented in Chapter 6. This schedule can be incorporated into the City's existing CIP in order to properly budget and schedule the recommended project. The Phased costs are escalated at 3% per year for the first 5 years, resulting in a total capital cost of \$50.8 million. The column titled, "Phased with Development," corresponds to project elements that are for future planned developments; the phasing of these elements would be development-dependent and could be partially or fully funded by developers. In this case, the "Phased with Development" costs could be higher depending on the timing of development projects. The proposed CIP schedule for the recommended project is shown in Table 7-1.

Table 7-1: Capital Improvement Program

Project Component	Proposed FY 22/23	Proposed FY 23/24	Proposed FY 24/25	Proposed FY -23 - 25	Phased with Development	Total
Planning (Title 22 Eng. Report, EIR, Water Rights Filing)	\$200,000	\$200,000				\$400,000
Treatment (Sodium Hypochlorite)	\$535,920					\$535,920
Pump Station		\$1,083,000	\$2,006,000		\$1,419,000	\$4,508,000
Pipelines	\$1,950,000	\$1,545,000	\$4,555,000	\$15,811,000	\$9,271,000	\$33,132,000
Onsite Customer Retrofits			\$114,000	\$1,447,000		\$1,561,000
WQCF Retrofits	\$644,160					\$644,160
Storage			\$2,905,000	\$3,990,000	\$3,082,000	\$9,977,000
Total	\$2,880,080	\$2,828,000	\$9,580,000	\$21,248,000	\$13,772,000	\$50,758,080

Note: Costs are referenced to the ENR 20-city CCI for November 2022 at 13,175 which represents an approximate 32% increase from the January 2015 CCI of 9,972.

7.2 Financial Planning

In order to offset the costs of the recommended project, the City should pursue state and/or federal funding. There are various grant and low-interest loan financing opportunities available to municipalities through programs administered by multiple funding agencies as described in section 7.4, below. By leveraging grants and low-interest loans, project costs paid directly by the City and its ratepayers can be offset. Any portion of the project costs not funded by a grant or low-interest loan would be added to the City's CIP and be financed through sewer rates. The City will need to determine how to incorporate the cost of the recommended project into its rates. If the project is expanded in the future to include a regional partner, it is assumed that the partner will share in the costs of the project expansion. It should also be noted that the proposed schedule in Figure 6-2 does not include potential delays caused by syncing the project with

funding and financial cycles. For example, applying for SRF funding by the end of 2023 would result in funding of a construction loan around June 2025, pushing out the proposed schedule accordingly.

In preparation for state and federal funding, the City should prepare a Title 22 Engineering Report, an Environmental Impact Report (EIR) that addresses CEQA, as well as applicable federal crosscutters (often referred to as CEQA-Plus), and file for the wastewater change petition. For those funding opportunities which could offset the cost of construction, preliminary designs (with associated construction cost estimates) should be completed prior to the pursuit of funding. Planning and design costs are sometimes eligible for construction grant funding, and if not, they can often count towards a local cost share.

7.3 Revenue Program

In order to create an appropriate cash flow during project implementation, a preliminary cash flow analysis was conducted assuming payments from the City, offset City costs and an outside funding source.

7.3.1 Offset City Costs

Once the recommended project has been implemented, the City will be able to eliminate costs associated with groundwater pumping or potable water deliveries at those sites to be served by recycled water. Table 7-2 summarizes the City's costs that would be offset by recycled water use. MUSD pumping costs for those schools served by this alternative are listed for reference, but are not included in the total costs shown at the bottom of Table 7-2. These costs were developed in 2017 and will be updated as each project is developed.

Table 7-2: Annual City Costs Offset by Recycled Water Use

Demand Served	Water Source	Demand (AFY)	Pumping Costs (\$/Yr)	Potable Water Costs (\$/Yr)
Airport Way	Groundwater	45	--	--
Antigua Park	Potable	20	--	\$10,200
Austin Rd Development	Groundwater	245	--	--
Bella Vista	Groundwater	37	\$400	--
BLD - Fields	Groundwater	42	\$448	--
Blossom Grove Park	Groundwater	9	\$96	--
Brock Elliott Elementary School	Groundwater	37	\$400 <i>paid by MUSD</i>	--
Brockman (Stella) Elementary School	Groundwater	59	\$640 <i>paid by MUSD</i>	--
Brockman (Stella) Elementary School Annex	Groundwater	20	\$224 <i>paid by MUSD</i>	--
Cambridge Greenbelt	Groundwater	6	\$64	--
Cerri Park	Groundwater	40	\$432	--
Chadwick Square	Groundwater	50	\$544	--
Denali Park	Groundwater	24	\$256	--
Doxey Park	Groundwater	16	\$176	--
Dutra Estates Park	Groundwater	21	\$224	--
Dutra S.E. Park	Groundwater	28	\$304	--

Demand Served	Water Source	Demand (AFY)	Pumping Costs (\$/Yr)	Potable Water Costs (\$/Yr)
East Union High School	Groundwater	93	\$1,024 <i>paid by MUSD</i>	--
Evans Estates Park	Groundwater	23	\$256	--
Family Entertainment Zone	Groundwater	244	--	--
Golf Course	Groundwater	406	\$4,432	--
Gonsalves Estate Greenbelt	Potable	10	--	\$5,015
Gonsalves Estate Park	Groundwater	3	\$32	--
Griffin Park	Groundwater	104	\$1,136	--
Hafley (Neil) Elementary	Groundwater	22	\$240 <i>paid by MUSD</i>	--
Hat Ranch Park	Groundwater	40	\$432	--
McParland (George) Elementary School	Groundwater	31	\$336 <i>paid by MUSD</i>	--
Monte Bello Park	Groundwater	12	\$128	--
Morenzone Ballfield	Groundwater	13	\$144	--
Northgate Parks	Groundwater	17	\$192	--
Oakwood Trails Parcel A	Groundwater	20	\$224	--
Oakwood Trails Parcel D	Groundwater	36	\$400	--
Palmer Memorial Park	Groundwater	21	\$224	--
Paseo West Circle Park	Potable	6	--	\$3,160
Pillsbury Estates Park	Groundwater	19	\$208	--
Primavera Park	Groundwater	31	\$336	--
Robert Estates	Groundwater	22	\$240	--
Sierra High School	Groundwater	92	\$1,008 <i>paid by MUSD</i>	--
Stadium Plaza Park	Groundwater	19	\$208	--
Terra Bella Park	Groundwater	14	\$144	--
Terra Ranch Park	Groundwater	20	\$224	--
Tesoro Park	Groundwater	38	\$416	--
Trails at Manteca Park	Groundwater	80	\$880	--
Union Ranch East Park	Groundwater	30	\$336	--
Union Ranch North Park	Groundwater	36	--	--
Union Ranch Rec Center	Groundwater	28	\$304	--
Union Ranch West Park	Groundwater	22	--	--
Union Road Park	Potable	6	--	\$2,840
Union Road Tennis Park	Groundwater	11	\$112	--
Union West Park	Potable	19	--	\$9,340

Demand Served	Water Source	Demand (AFY)	Pumping Costs (\$/Yr)	Potable Water Costs (\$/Yr)
Veritas Elementary School	Potable	36	--	\$18,019 <i>paid by MUSD</i>
Villa Ticino Park	Groundwater	27	\$288	--
Woodward (Walter) Elementary School	Groundwater	26	\$288 <i>paid by MUSD</i>	--
Woodward Community	Groundwater	203	\$2,224	--
Woodward Park 1	Groundwater	14	--	--
Woodward Park 2	Groundwater	17	--	--
Onsite use at WQCF	Groundwater	300	\$3,280	--
Total		2,930	\$19,744^a	\$30,555^a
			\$50,299^a	

Notes:

a. Does not include the costs paid by MUSD.

7.3.2 Recycled Water Rates

Recycled water rates were estimated in 2017 based on the estimated annual operation and maintenance costs of the recycled water system. It is assumed that the City will not include the capital costs associated with the recommended project in the recycled water rates, because doing so would result in recycled water rates that exceed potable water rates. A recycled water rate of about \$167/AF (in \$2015) is expected to offset the costs of operation and maintenance for the recycled water system. This rate will not be applied to internal use of recycled water at the WQCF, and costs associated with use at the facility were not included in this analysis. This calculated recycled water rate is less than half of the current City potable water rate of \$449/AF³⁸, making this a reasonable estimate for the recycled water rate. A breakdown of the recycled water rate is presented in Table 7-3.

Table 7-3: Recycled Water Rate Estimate

Project Component	Unit Cost	Units	Annual O&M Cost
Treatment	\$ 0.50	\$ / MG	\$ 43,000
Pipeline	\$ 0.60	\$ / LF / yr	\$ 80,000
Pump Station	\$ 0.16	\$ / kWh	\$ 165,000
	5% of capital + \$10k		\$ 108,000
Storage Facility	1%	% of capital	\$ 43,000
	Total		\$ 439,000
	RW Yield	AFY	2,630
	Rate	\$ / AF	\$ 167
	Rate	\$ / ccf	\$ 0.38

Note: O&M costs based on 2017 data. Actual costs will be evaluated with each implementation phase

³⁸ This corresponds to a water rate of \$1.03/ccf for the first tier of residential water rates.

7.4 Potential Funding Opportunities

7.4.1 Introduction

There are a variety of funding opportunities for planning and implementing recycled water projects. In addition to customary financing methods, including pay-as-you-go (cash reserves and operating revenues) and traditional bond financing, there are funding methods such as grant and low-interest loan programs administered by various state and federal agencies including, but not limited to:

- State Water Resources Control Board (SWRCB) Clean Water State Revolving Fund (CWSRF) loan program
- SWRCB Water Recycling Funding Program (WRFP) Grants
- California Infrastructure and Economic Development Bank (I-Bank) Infrastructure SRF Program
- U.S. Bureau of Reclamation (Reclamation) Title XVI / Water Infrastructure Improvements for the Nation Act (WIIN)
- Water Infrastructure Finance and Innovation Act (WIFIA)

7.4.2 DAC Benefits

While there are disadvantaged communities (DACs) within the City of Manteca, the City itself is not considered a DAC. A DAC is a community with a median household income (MHI) less than 80% of the CA MHI of \$78,672, based on the U.S. Census American Community Survey (ACS) dataset for 2016-2020. DACs have MHIs less than \$62,938 and severely DACs (SDACs) have MHIs less than \$47,203. Manteca's MHI is \$76,846 based on the ACS 2016-2020 data, and thus, it does not qualify as a DAC. There are census tracts and census block groups within the City's boundaries, so it is possible project benefits could be realized by DACs and securing grants and/or low-interest loans could reduce or eliminate potential rate increases that could provide a financial burden to DACs.

Funding programs that provide grants to DACs often require that the project will directly benefit a small DAC (either with a population less than 20,000 or 10,000 depending on the program). With a population of approximately 83,000, the City would not be considered "small" under the Drinking Water or Clean Water State Revolving Funding programs. If recycled water will offset potable supplies within the City and thus, benefit DACs in its service area and/or regional DACs with critical water supply or quality issues, it is possible that the project could more competitive.

7.4.3 Funding Opportunities

The recommended project could be eligible for the following programs which include grants, principal forgiveness, and low-interest loans. Grants are more desirable than low-interest loans. Low-interest loans from SWRCB through the CWSRF Program or ISRF loans from I-Bank are more desirable than WIFIA loans. This is described in more detail below and summarized in **Error! Reference source not found..**

CWSRF – SWRCB

SWRCB administers the CWSRF Program, offering low-interest loans to eligible applicants for construction of publicly-owned facilities, including wastewater treatment, local sewers, sewer interceptors, water reclamation facilities, and stormwater treatment; expanded use projects including implementation of nonpoint source projects or programs; and development and implementation of estuary comprehensive conservation and management plan, as well as water recycling projects.

CWSRF loans typically have a lower interest rate than bonds, at 50% of the rate obtained by the State Treasurer for California's most recent General Obligation bond (typically 2.5% to 3%, currently 2.6%) at the time of the financing agreement. Loans are paid back over a term of up to 30 years. Repayment begins one year after construction is complete. Historically, SWRCB has offered principal forgiveness (PF) (i.e.

grants) to applicants if the project directly benefits a small, DAC. Guidelines for the amounts of PF/grants available to DACs are outlined in the annual Intended Use Plan released by SWRCB each year.

The CWSRF application consists of the General, Technical, Financial, and Environmental packages each of which includes a form and various attachments. For a recycled water project, a CWSRF application is submitted, in addition to necessary water recycling project-specific application items including recycled water user assurances and a user connection schedule. Once an application is submitted, it can take nine to 12 months to execute a financing agreement once a project is placed on the intended Use Plan funding list, which is a 6 month process. Projects must comply with the California Environmental Quality Act (CEQA) and additional federal requirements (i.e. CEQA-Plus). Other eligibility requirements include certification for compliance with water metering, certification for maintaining a Fiscal Sustainability Plan, complying with RWQCB requirements, and approval of an Urban Water Management Plan (UWMP) by DWR. Applications are submitted through SWRCB's online submittal system, FFAST.

SWRCB funds projects on a readiness-to-proceed basis and score projects at the end of each calendar year to develop a fiscal year fundable list. It is important to be aware that funding through the CWSRF Program has been limited due to an oversubscription of funds. They continue to encourage agencies to apply, but have recommended applicants have a back-up plan for project financing should CWSRF financing not be available.

More information about the SWRCB CWSRF Program can be found here:

http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/.

Water Recycling Funding Program (WRFP) Grants

Prop 1 allocated \$625M for water recycling projects, administered by SWRCB. Planning grants are available and applications are continuously accepted. WRFP construction grants are awarded when funding is available; based on information from SWRCB, because of the significant influx of recycled water applications, water recycling grants for construction projects is already allocated; however, additional funding could be available in the future.

Planning: The WRFP provides planning grants to assist public agencies to investigate the feasibility of recycling wastewater and assist with completing planning for water recycling projects.

Grants cover 50% of eligible project costs, up to the maximum established by the SWRCB in the CWSRF Intended Use Plan, or as otherwise limited by the SWRCB. Currently, a planning grant up to \$300,000 is available with 50% (\$150,000) cost sharing by the City. The application consists of a form; a Plan of Study that describes the activities to complete the study and develop the project report; a certification for compliance with water metering; demonstration of compliance with Regional Water Quality Control Board requirements; an authorizing resolution to submit the application and execute an agreement; and any relevant service, management, operating or joint powers agreements.

Applications are submitted through SWRCB's online submittal system, FFAST. The City is currently developing the 2020 Urban Water Management Plan and will be eligible for funding once it is finalized. Since this Reclaimed Water Facilities Master Plan was intended to align with the requirements of a Water Recycling Planning Grant (despite not receiving funding), a planning grant would only be needed if the City plans to substantively revise the analysis included in this Master Plan.

Construction: Construction grants through the WRFP fall under the purview of the CWSRF loan program, meaning in order to apply for a WRFP construction grant, a CWSRF application consisting of the General, Technical, Financial, and Environmental Packages is submitted to SWRCB. Once the application is submitted and a financing agreement is executed, SWRCB allocates the best loan and grant package possible (i.e. typical CWSRF financing, WRFP grant if available, principal forgiveness if available, etc.). SWRCB can award WRFP grants for construction projects up to 35% of the reasonable, estimated

construction cost for the project or the final construction cost for the project. Because the WRFPP is part of the CWSRF program, the same funding limitations apply. As stated above, construction grants are not likely to be available to new applicants due to the large number of applications received to date; however, funding could be available in the future.

More information about WRFPP grants is available here:

http://www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/proposition1_funding.shtml.

Infrastructure SRF Program – I-Bank

The Infrastructure SRF (ISRF) Program provides low-interest loan financing to public agencies for a wide variety of infrastructure projects such as water supply, parks and recreation facilities, sewage collection and treatment, and water treatment and distribution projects. Financing is available in amounts ranging from \$50,000 to \$25 million with loan terms up to 30 years. I-Bank uses a proprietary interest rate method to ensure borrowers have the best chance to receive below-market interest rates, and the interest rate is set at the time the financing is approved. As of Fall 2021, interest rates were about 2.5-3%. Eligible applicants include cities, counties, special districts, assessment districts, joint power authorities, and nonprofit organizations. The applicant must demonstrate project readiness and feasibility to complete construction within 2 years after I-Bank's loan approval. Additionally, the project must ***promote economic development and attract, create, and sustain long-term employment opportunities***. There is no required match; however, there is a one-time origination fee of 1% of the ISRF financing amount or \$10,000, whichever is greater. Applications are accepted on continuous basis. The I-Bank recommends applications be submitted upon completion of design as construction must begin within 6 months of the I-Bank's loan commitment.

More information about the ISRF Program can be found here:

<https://www.ibank.ca.gov/loans/infrastructure-loans/>

Title XVI / WIIN

The WIIN Act was enacted in December 2016 to address water resources infrastructure that is critical to the country's economic growth, health, and competitiveness. Through the Title XVI Water Reuse and Reclamation grant program, Reclamation identifies and investigates opportunities to reclaim and reuse wastewaters and impaired ground and surface waters. Title XVI funds the planning, design, and construction of water recycling and reuse projects.

Prior to the WIIN act, only projects that were congressionally authorized could apply for Title XVI grant funding. Now, any project can apply once it receives Reclamation approval of its Title XVI Feasibility Study (prepared using the Directives & Standards provided by Reclamation). An authorized Title XVI project is a project that is specifically authorized for funding by Congress under Title XVI of Public Law 102-575. Projects eligible for funding under the WIIN Act are those that have a completed Feasibility Study that has been reviewed and approved by Reclamation. Reclamation has combined the funding solicitations for Title XVI projects and WIIN-eligible projects. The total amount of available funds is \$550 million, however the funding available per round varies. Typically, Reclamation awards between \$1 million and \$6 million per applicant per round but this can vary depending on the administration and priorities at the time of awards. Applicants apply repeatedly each solicitation until it reaches its maximum award. Title XVI / WIIN provides grant funding to maximum of 25% of the total project costs or \$30 million, whichever is less.

While compliance with the National Environmental Policy Act (NEPA) is not required for a feasibility determination, it is required prior to the receipt and expenditure of Federal funds.

More information is available from Reclamation's website here: <http://www.usbr.gov/watersmart/title/>.

WIFIA

The Water Infrastructure Finance and Innovation Act (WIFIA) is intended to accelerate investment in the nation's water and wastewater infrastructure by providing long-term, low-interest loans. The loan program is being administered by the U.S. Environmental Protection Agency (USEPA). The loans have repayment periods of 35 years or the useful life of the project, whichever is less. Other program details include:

- WIFIA assistance may not exceed 49% of a project's eligible costs (i.e. planning, design, construction, property acquisition costs).
- Eligible costs can be reimbursed retroactively (like CWSRF loans).
- Total federal assistance may not exceed 80% of a project's eligible costs.
- Projects must cost at least \$20 million for large communities and \$5 million for small communities (population of 25,000 or less). Manteca qualifies as a large community so the project cost must exceed \$20 million.
- Interest rate is no less than the yield on Treasury securities of a similar maturity, estimated to be around 2.5 to 3.5% for 30 year loans.
- Approximately \$5.5 billion is available in total funding.
- Costs can cover planning, design, construction, property acquisition for eligible projects such as:
 - Wastewater conveyance and treatment projects that are eligible for the Clean Water SRF
 - Drinking water treatment and distribution projects that are eligible for the Drinking Water SRF
 - Enhanced energy efficiency at drinking water and wastewater facilities
 - Repair, rehabilitation, or replacement of a treatment works, community water system, or aging water distribution or waste collection facility
 - Brackish or seawater desalination, aquifer recharge, and water recycling projects
 - Prevent, reduce, or mitigate the effects of drought, including projects that enhance the resilience of drought-stricken watersheds
 - Acquisition of property if it is integral to the project or will mitigate the environmental impact of a project
 - Bundled SRF projects submitted under one application by an SRF program
 - A combination of projects secured by a common security pledge

Generally, WIFIA is not desirable if CWSRF loans or other funding is available because the WIFIA program has a \$100,000 application fee and additional credit fees required by the applicant. To apply, an applicant submits a Notice of Intent to USEPA. If selected to prepare a full application, the applicant does so and at that time, pays the application fee.

More information at the program's website here: <https://www.epa.gov/wifia/learn-about-wifiaprogram#information>.

Table 7-4: Potential Funding

Opportunities for Recycled Water Projects

Program	Administering Agency	Program Goals / Objectives	Requirements / Other Info	Funding Amounts and Terms	Website
Clean Water State Revolving Fund (CWSRF) loan program & WRFP construction grants	State Water Resources Control Board (SWRCB)	The CWSRF Program provides low-interest loans (and some grant funding small DACs and/or recycled water projects when available) for the construction of publicly-owned facilities including wastewater treatment, local sewers, sewer interceptors, water reclamation and distribution, stormwater treatment, and combined sewers, as well as water recycling. Construction financing agreements can reimburse soft costs (planning, design, environmental) already incurred.	Applications are submitted through SWRCB online application system, FFAST. Each application consists of the General, Technical, Financial, and Environmental Packages. CEQA-Plus is required. SWRCB scores projects at the end of each calendar year and develops a fundable list that is included in its annual Intended Use Plan. Once a complete application is submitted, it can take between 9 and 12 months for SWRCB to review, process, and execute a financing agreement.	Interest rate is ½ of the General Obligation Rate (SRF i=2.6% for this year). Financing term up to 30 years. There is no maximum financing amount for a project / agency. A recycled water project may receive grant funds up to 35% of project costs for construction.	http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/

Program	Administering Agency	Program Goals / Objectives	Requirements / Other Info	Funding Amounts and Terms	Website
Water Recycling Funding Program (WRFP) Planning Grants	SWRCB	Provide grants to assist public agencies with facilities planning studies to evaluate the feasibility of implementing recycled water projects to offset the use of fresh/ potable water from the state and/ or local supplies.	The facilities planning report must include an analysis of all of the essential components of the projects and be prepared using SWRCB WRFP project report outline. Only local public agencies are eligible for planning grants. Grant funds are provided in two disbursements. Up to 50% of the grant may be disbursed after SWRCB acknowledges receipt of the draft project report. The remainder of the grant amount may be disbursed after SWRCB accepts the final project report.	Grants for 50% of eligible costs up to the maximum established by the SWRCB in the CWSRF Intended Use plan, or as otherwise limited by the SWRCB, currently \$150,000.	http://www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/facilitiesplan.shtml
Infrastructure SRF Loan Program	California Infrastructure and Economic Development Bank (I-Bank)	Provides low-interest loans to public agencies and non-profit corporations for a wide variety of infrastructure and economic development projects. Eligible project categories include, but are not limited to, city streets, county highways, state highways, drainage, water supply and flood control, educational facilities, environmental mitigation measures, parks and recreational facilities, port facilities, public transit, sewage collection and treatment, solid waste collection and disposal, water treatment and distribution, defense conversion, public safety facilities, and power and communications facilities.	Financing applications are continuously accepted. Project must demonstrate economic development / job creation.	ISRF Program funding is available in amounts ranging from \$50,000 to \$25,000,000, with loan terms of up to 30 years. Interest rate typically 2.5% - 3%.	https://www.ibank.ca.gov/loans/infrastructure-loans

Program	Administering Agency	Program Goals / Objectives	Requirements / Other Info	Funding Amounts and Terms	Website
Title XVI / WIIN	U.S. Bureau of Reclamation (Reclamation)	Provide funding for identifying and investigating opportunities to reclaim and reuse wastewater. These grant monies are made available for the construction of water recycling treatment and conveyance facilities.	The program is open to both congressionally authorized Title XVI projects and WIIN projects. For WIIN eligibility, a Feasibility Study must be submitted to Reclamation for review and approval.	Recent fiscal year appropriations for Title XVI and WIIN varies per round. Typically, awards between \$1 million and \$6 million per applicant.	http://www.usbr.gov/watersmart/title/
WIFIA	USEPA	Accelerate investment in our nation's water infrastructure by providing long-term, low-interest loans.	Examples of eligible projects include wastewater conveyance and treatment projects, drinking water treatment and distribution projects, desalination and water recycling projects, land acquisition. Must comply with NEPA, Davis Bacon, and all other federal cross-cutters.	Minimum project size for the City would be \$20M. Maximum of 49% of costs can be financed by WIFIA. Interest rate greater or equal to U.S. Treasury rate of similar maturity. There is an 80% federal funding cap per project. \$100,000 application fee due at time of submittal. Additional credit fees up to an additional \$150,000 apply.	https://www.epa.gov/wifia

Appendix A - Allowable Uses of Recycled Water in California

ATTACHMENT 2

This page intentionally left blank.

Appendix A: Allowable Uses of Recycled Water in California¹

Recycled Water Use	Treatment Level			
	Disinfected Tertiary Rec. Water ²	Disinfected Secondary-2.2 Rec. Water	Disinfected Secondary-23 Rec. Water	Undisinfected Secondary Rec. Water
Irrigation				
Food crops where recycled water contacts the edible portion of the crop, including all root crops	Allowed	Not Allowed	Not Allowed	Not Allowed
Parks and playgrounds				
School yards				
Residential landscaping				
Unrestricted-access golf courses				
Any other irrigation uses not prohibited by other provisions of the California Code of Regulations				
Food crops, surface-irrigated, above-ground edible portion, and not contacted by recycled water	Allowed	Allowed	Allowed	Not Allowed
Cemeteries				
Freeway landscaping				
Restricted-access golf courses				
Ornamental nursery stock and sod farms with unrestricted access				
Pasture for milk animals for human consumption				
Nonedible vegetation with access control to prevent use as a park, playground or school yard	Allowed	Allowed	Allowed	Allowed
Orchards with no contact between edible portion and recycled water				
Non food-bearing trees, including Christmas trees not irrigated less than 14 days before harvest				
Fodder and fiber crops and pasture for animals not producing milk for human consumption				
Seed crops not eaten by humans				
Food crops undergoing commercial pathogen-destroying processing before consumption by humans				
Toilet/ Urinal Flushing				
Flushing toilets and urinals	Allowed	Not Allowed	Not Allowed	Not Allowed
Impoundments and Fountains				
Non-restricted recreational impoundments, with supplemental monitoring for pathogenic organisms	Allowed	Not Allowed	Not Allowed	Not Allowed
Decorative fountains				
Restricted recreational impoundments and accessible fish hatcheries			Allowed	
Landscape impoundments without decorative fountains		Allowed		
Cooling/ Air Conditioning				
Industrial or commercial cooling or air conditioning involving cooling tower, evaporative condenser, or spraying that creates a mist	Allowed	Not Allowed	Not Allowed	Not Allowed
Industrial or commercial cooling or air conditioning not involving cooling tower, evaporative condenser, or spraying that creates a mist		Allowed	Allowed	
Other Uses				
Priming drain traps	Allowed	Not Allowed	Not Allowed	Not Allowed
Industrial process water that may contact workers				
Structural fire fighting				
Commercial laundries				
Consolidation of backfill material around potable water pipelines				
Artificial snow making for commercial outdoor uses				
Commercial car washes, not heating the water, excluding the general public from the washing process	Allowed	Allowed	Allowed	Not Allowed
Industrial process water that will not come into contact with workers				
Industrial boiler feed				
Nonstructural fire fighting				
Backfill consolidation around nonpotable piping				
Soil compaction				
Mixing concrete				
Dust control on roads and streets				
Cleaning roads, sidewalks and outdoor work areas				
Flushing sanitary sewers				
Groundwater Recharge	Allowed under special case-by-case permits (prior to July 2014) or if project complies with new Groundwater Replenishment Reuse Project rules made effective in 2014			

Notes:

1. Per California Code of Regulations, Title 22, Division 4, Chapter 3 as of 2017.
2. This is the level of treatment that Manteca currently produces.

This page intentionally left blank.

Appendix B - Estimated Local Recycled Water Demands

ATTACHMENT 2

This page intentionally left blank.

Appendix B: Estimated Local Recycled Water Demands

ID #	NAME	Address	APN	Type 2	Type	Demand Source	Demand Method	Irrigable Acreage	Annual Average Irrigation Demand (AFY)	Annual Average Irrigation Demand (mgd)	Peak Month Demand (mgd)	Existing Supply	Offset Potable Use? (Y / N)	Within Service Area? (Y / N)	Considered for Alternative development? (Y / N)
017	Golf Course	305 N. Union Rd.	20015030	Playing Field/Golf Course	Park	Estimate	Method B	90.9	405.8	0.36	0.78	Well	N	Y	Y
027	Austin Rd Development		22614008	Planned Park/Open Space	Park	Estimate	Method B	54.9	245.1	0.22	0.47	Future	N	Y	Y
084	Family Entertainment Zone		24130048	Planned Park/Open Space	Park	Development Plans	Method D	60.3	244.0	0.22	0.47	Future	N	Y	Y
077	Woodward Community	710 E. Woodward Ave.	22404023	Park	Park	Estimate	Method B	45.6	203.4	0.18	0.39	Well	N	Y	Y
014	Griffin Park	Griffin Park Project		Planned Park/Open Space	Park	Estimate	Method B	23.4	104.5	0.09	0.20	Future	N	Y	Y
094	Lathrop High School	647 West Lathrop Rd.	19121028	School	School	ET Estimate	Method C	25.2	100.9	0.09	0.19	Well	N	N	N
106	East Union High School	1700 N Union Rd	21612001	School	School	ET Estimate	Method C	23.3	93.3	0.08	0.18	Well	N	Y	Y
110	Sierra High School	1700 Thomas St	22211001	School	School	ET Estimate	Method C	23.1	92.4	0.08	0.18	Well	N	Y	Y
009	Trails at Manteca Park	Trails at Manteca Project		Planned Park/Open Space	Park	Estimate	Method B	18.0	80.3	0.07	0.16	Future	N	Y	Y
114	Brockman (Stella) Elementary School	763 Silverado Dr	20002010	School	School	ET Estimate	Method C	14.7	58.9	0.05	0.11	Well	N	Y	Y
025	Chadwick Square	1953 London Ave.	20229033	Park	Park	Well Data	Method A	8.1	50.3	0.04	0.10	Well	N	Y	Y
088	Airport Way		22614008	Planned Park/Open Space	Park	Estimate	Method B	10.0	44.6	0.04	0.09	Future	N	Y	Y
080	Shasta Park	955 E. Edison St.	22327003	Park	Park	Estimate	Method B	9.9	44.0	0.04	0.08	Well	N	Y	Y
086	BLD – Fields		24131048	Playing Field/Golf Course	Park	Estimate	Method B	9.3	41.5	0.04	0.08	Well	N	Y	Y
011	Cerri Park	Cerri Project		Planned Park/Open Space	Park	Estimate	Method B	9.0	40.2	0.04	0.08	Future	N	Y	Y
013	Hat Ranch Park	Hat Ranch Project		Planned Park/Open Space	Park	Estimate	Method B	9.0	40.2	0.04	0.08	Future	N	Y	Y
118	Manteca High School	450 E Yosemite Av	22109020	School	School	ET Estimate	Method C	9.6	38.2	0.03	0.07	Well	N	Y	Y
031	Tesoro Park	1399 Tesoro Dr.	22448039	Park	Park	Estimate	Method B	8.6	38.2	0.03	0.07	Well	N	Y	Y
046	Bella Vista	1580 Bella Terra Dr.	24142078	Park	Park	Estimate	Method B	8.3	37.1	0.03	0.07	Well	N	Y	Y
111	Brock Elliott Elementary School	1110 Stonum Lane	22230001	School	School	ET Estimate	Method C	9.2	36.9	0.03	0.07	Well	N	Y	Y
007	Oakwood Trails Parcel D	Oakwood Trails Parcel D		Planned Park/Open Space	Park	Estimate	Method B	8.1	36.2	0.03	0.07	Future	N	Y	Y
095	Veritas Elementary School	1600 Pagola St	22449011	School	School	ET Estimate	Method C	9.0	36.0	0.03	0.07	Potable	Y	Y	Y
056	Union Ranch North Park		20434036	Planned Park/Open Space	Park	Estimate	Method B	8.0	35.8	0.03	0.07	Potable	Y	Y	Y
098	New Haven Elementary School	14600 S Austin Rd	20610005	School	School	ET Estimate	Method C	8.5	33.9	0.03	0.07	Well	N	Y	Y
104	Cowell (Joshua) Elementary School	740 Pestana Av	20852001	School	School	ET Estimate	Method C	8.5	33.9	0.03	0.07	Well	N	Y	Y
091	Mossdale Elementary School	455 Brookhurst Blvd	19119048	School	School	ET Estimate	Method C	7.8	31.1	0.03	0.06	Potable	Y	Y	Y
093	Nile Garden Elementary School	5700 E Nile Rd	22607003	School	School	ET Estimate	Method C	7.7	30.9	0.03	0.06	Well	N	Y	Y

ID #	NAME	Address	APN	Type 2	Type	Demand Source	Demand Method	Irrigable Acreage	Annual Average Irrigation Demand (AFY)	Annual Average Irrigation Demand (mgd)	Peak Month Demand (mgd)	Existing Supply	Offset Potable Use? (Y / N)	Within Service Area? (Y / N)	Considered for Alternative development? (Y / N)
022	Primavera Park	1253 Primavera Ave.	20222015	Park	Park	Well Data	Method A	6.2	30.9	0.03	0.06	Well	N	Y	Y
105	McParland (George) Elementary School	1601 Northgate Dr	20206011	School	School	ET Estimate	Method C	7.7	30.6	0.03	0.06	Well	N	Y	Y
083	Union Ranch East Park	925 Raccoon Valley Dr.	19702054	Park	Park	Estimate	Method B	6.8	30.1	0.03	0.06	Potable	Y	Y	Y
103	Sequoia Elementary School	710 Martha Street	21925004	School	School	ET Estimate	Method C	7.2	28.6	0.03	0.06	Well	N	Y	Y
055	Union Ranch Rec Center		20416047	Park	Park	Estimate	Method B	6.3	28.1	0.03	0.05	Potable	Y	Y	Y
034	Dutra S.E. Park	1850 Sparrowhawk St.	22621031	Park	Park	Estimate	Method B	6.2	27.7	0.02	0.05	Well	N	Y	Y
112	Shasta Elementary School	751 W Edison	22327001	School	School	ET Estimate	Method C	6.9	27.6	0.02	0.05	Potable	Y	Y	Y
108	Lincoln Elementary School	750 E Yosemite Av	22118001	School	School	ET Estimate	Method C	6.8	27.2	0.02	0.05	Well	N	Y	Y
097	Golden West Elementary School	1031 N Main St	21707006	School	School	ET Estimate	Method C	6.7	26.8	0.02	0.05	Potable	Y	Y	Y
019	Villa Ticino Park	1970 Geneva Wy.	20020042	Park	Park	Well Data	Method A	5.0	26.7	0.02	0.05	Well	N	Y	Y
109	Woodward (Walter) Elementary School	575 Tannehill Drive	22404037	School	School	ET Estimate	Method C	6.6	26.5	0.02	0.05	Well	N	Y	Y
068	Yosemite Park	600 E. Portal	21909010	Park	Park	Well Data	Method A	4.5	26.1	0.02	0.05	Well	N	Y	Y
057	Springport Park	746 Pestana Ave.	20851001	Park	Park	Estimate	Method B	5.8	25.9	0.02	0.05	Well	N	Y	Y
028	Diamond Oaks	1179 Pestana Ave.	20809023	Park	Park	Well Data	Method A	5.8	24.1	0.02	0.05	Well	N	Y	Y
012	Denali Park	Denali Project		Planned Park/Open Space	Park	Estimate	Method B	5.4	24.1	0.02	0.05	Future	N	Y	Y
036	Civic Center (Non-bldg.)	1001 W. Center St.	21703003	Park	Park	Estimate	Method B	5.3	23.6	0.02	0.05	Well	N	Y	Y
045	Greystone Park	810 Agate	21739030	Park	Park	Well Data	Method A	4.7	23.3	0.02	0.05	Well	N	Y	Y
003	Evans Estates Park	Evans Estates / end of Mono St.		Planned Park/Open Space	Park	Estimate	Method B	5.1	22.9	0.02	0.04	Future	N	Y	Y
072	Curran Grove Parks	196 Bernt Ave.	22123001	Park	Park	Well Data	Method A	4.1	22.4	0.02	0.04	Well	N	Y	Y
054	Union Ranch West Park		20410036	Planned Park/Open Space	Park	Estimate	Method B	4.9	21.7	0.02	0.04	Potable	Y	Y	Y
107	Hafley (Neil) Elementary	849 Northgate Drive	21612003	School	School	ET Estimate	Method C	5.4	21.7	0.02	0.04	Well	N	Y	Y
076	Robert Estates	1740 Rail St.	22220047	Park	Park	Well Data	Method A	4.6	21.6	0.02	0.04	Well	N	Y	Y
047	Dutra Estates Park	2701 Ancestry St.	24159041	Park	Park	Estimate	Method B	4.7	21.2	0.02	0.04	Well	N	Y	Y
069	Cotta Park	505 Mission Ridge Dr.	21960032	Park	Park	Well Data	Method A	3.3	20.8	0.02	0.04	Well	N	Y	Y
015	Palmer Memorial Park	1495 Sephos St.	22618016	Park	Park	Estimate	Method B	4.6	20.7	0.02	0.04	Well	N	Y	Y
032	Antigua Park	1055 Collins St.	22449011	Park	Park	Estimate	Method B	4.6	20.4	0.02	0.04	Potable	Y	Y	Y
035	Colony Park	1232 Trailwood Ave.	21638002	Park	Park	Estimate	Method B	4.5	20.2	0.02	0.04	Well	N	Y	Y
008	Oakwood Trails Parcel A	Oakwood Trails Parcel A		Planned Park/Open Space	Park	Estimate	Method B	4.5	20.1	0.02	0.04	Future	N	Y	Y
010	Terra Ranch Park	Terra Ranch Project		Planned Park/Open Space	Park	Estimate	Method B	4.5	20.1	0.02	0.04	Future	N	Y	Y
024	Woodward Park 3		22405013	Planned Park/Open Space	Park	Estimate	Method B	4.5	20.1	0.02	0.04	Future	N	Y	Y
033	Pillsbury Park	890 Mono St.	22432009	Park	Park	Estimate	Method B	4.5	20.1	0.02	0.04	Well	N	Y	Y

ID #	NAME	Address	APN	Type 2	Type	Demand Source	Demand Method	Irrigable Acreage	Annual Average Irrigation Demand (AFY)	Annual Average Irrigation Demand (mgd)	Peak Month Demand (mgd)	Existing Supply	Offset Potable Use? (Y / N)	Within Service Area? (Y / N)	Considered for Alternative development? (Y / N)
115	Brockman (Stella) Elementary School Annex	763 Silverado Dr	20002016	School	School	ET Estimate	Method C	5.0	19.9	0.02	0.04	Well	N	Y	Y
087	Stadium Plaza Park	2470 Daniels St.	24153003	Park	Park	Estimate	Method B	4.3	19.1	0.02	0.04	Well	N	Y	Y
020	St. Francis Park	1273 Devonshire	20216030	Park	Park	Estimate	Method B	4.3	19.1	0.02	0.04	Well	N	Y	Y
075	Union West Park	1291 Parkview St.	22217030	Park	Park	Well Data	Method A	3.3	18.7	0.02	0.04	Potable	Y	Y	Y
002	Pillsbury Estates Park	890 Mono St.		Park	Park	Estimate	Method B	4.1	18.5	0.02	0.04	Well	N	Y	Y
038	Tidewater Bikeway	Lathrop Rd to Moffat Blvd.	21715010	Park	Park	Well Data	Method A	30.6	18.5	0.02	0.04	Well	N	Y	Y
053	Quail Ridge Parks	1020 Mission Ridge Dr.	21953001	Park	Park	Well Data	Method A	2.8	17.8	0.02	0.03	Well	N	Y	Y
048	Southside Park	409 Oregon St.	21932023	Park	Park	Well Data	Method A	3.0	17.5	0.02	0.03	Well	N	Y	Y
023	Woodward Park 2		22405011	Planned Park/Open Space	Park	Estimate	Method B	3.9	17.3	0.02	0.03	Future	N	Y	Y
063	Northgate Parks	1750 Hoyt Ln.	21612003	Park	Park	Well Data	Method A	13.6	17.0	0.02	0.03	Well	N	Y	Y
067	Springtime Park	1268 Springtime Ave.	21818002	Park	Park	Estimate	Method B	3.6	16.2	0.01	0.03	Well	N	Y	Y
059	Mayors Park	1440 Kelley Dr.	20006021	Park	Park	Estimate	Method B	3.6	16.2	0.01	0.03	Well	N	Y	Y
006	Shadowbrook Park	Shadowbrook Project		Planned Park/Open Space	Park	Estimate	Method B	3.6	16.1	0.01	0.03	Future	N	Y	Y
061	Doxey Park	1355 Northgate Dr.	20206012	Park	Park	Well Data	Method A	7.6	15.7	0.01	0.03	Well	N	Y	Y
052	Sequoia Park	868 Wawona St.	21948046	Park	Park	Well Data	Method A	3.6	15.6	0.01	0.03	Well	N	Y	Y
062	Crestwood Park	1901 Crestwood	21608026	Park	Park	Estimate	Method B	3.5	15.5	0.01	0.03	Well	N	Y	Y
026	Woodward Park 1		22614003	Planned Park/Open Space	Park	Estimate	Method B	3.2	14.2	0.01	0.03	Future	N	Y	Y
030	Terra Bella Park	1630 Luna Bella Ln.	22442049	Park	Park	Estimate	Method B	3.1	13.6	0.01	0.03	Well	N	Y	Y
096	Calla High School	10500 E State Route 120	22803001	School	School	ET Estimate	Method C	3.4	13.6	0.01	0.03	Well	N	Y	Y
065	Franciscan Park	1041 Elm Ave.	21742012	Park	Park	Well Data	Method A	3.6	13.5	0.01	0.03	Well	N	Y	Y
018	Morenzone Ballfield	1323 W Center St	20015011	Park	Park	Estimate	Method B	3.0	13.3	0.01	0.03	Well	N	Y	Y
071	Spreckels Recreation Park (BMX)	1063 Spreckels Ave.	22121035	Park	Park	Estimate	Method B	2.9	13.1	0.01	0.03	Well	N	Y	Y
066	Walnut Place Park	360 Victory Ave.	21767045	Park	Park	Well Data	Method A	1.8	13.0	0.01	0.03	Well	N	Y	Y
021	Monte Bello Park		20222006	Park	Park	Estimate	Method B	2.7	12.1	0.01	0.02	Well	N	Y	Y
058	Rodoni Park	1006 Lucio St.	22361050	Park	Park	Estimate	Method B	2.5	11.1	0.01	0.02	Well	N	Y	Y
089	French Camp Elementary School	241 E Fourth St	19311018	School	School	ET Estimate	Method C	2.7	10.7	0.01	0.02	Well	N	Y	Y
044	Union Road Tennis Park	307 N. Union Rd	21738004	Park	Park	Estimate	Method B	2.4	10.7	0.01	0.02	Well	N	Y	Y
051	Gonsalves Estate Greenbelt	407 Fishback Rd.	22203035	Park	Park	Billing Data	Method D	3.1	10.0	0.01	0.02	Potable	Y	Y	Y
050	Dutra N.E. Park	1282 Laurel Park Cr.	22236068	Park	Park	Billing Data	Method D	1.6	9.9	0.01	0.02	Potable	Y	Y	Y
#N/A	Union Memorial Cemetery	1050 N Union Rd.	20004053	Green Space	Open Space	ET Estimate	Method C	2.3	9.1	0.01	0.02	Well	N	Y	N
001	Blossom Grove Park	Pagola Ave		Park	Park	Estimate	Method B	2.0	8.8	0.01	0.02	Well	N	Y	Y
092	McParland (George) Annex Elementary School	1370 London Ave	20222021	School	School	ET Estimate	Method C	2.2	8.6	0.01	0.02	Potable	Y	Y	Y

ID #	NAME	Address	APN	Type 2	Type	Demand Source	Demand Method	Irrigable Acreage	Annual Average Irrigation Demand (AFY)	Annual Average Irrigation Demand (mgd)	Peak Month Demand (mgd)	Existing Supply	Offset Potable Use? (Y / N)	Within Service Area? (Y / N)	Considered for Alternative development? (Y / N)
099	Manteca Day School	737 W Yosemite Av	21712039	School	School	ET Estimate	Method C	1.9	7.6	0.01	0.01	Potable	Y	Y	Y
005	Springport Park Addition at Crivello Estates	Azalea Ave		Planned Park/Open Space	Park	Estimate	Method B	1.5	6.8	0.01	0.01	Future	N	Y	Y
016	Moffat Basin Park	800 Moffat Blvd.	22104061	Park	Park	Estimate	Method B	1.4	6.4	0.01	0.01	Well	N	Y	Y
049	Baccilieri Park	154 Stockton St.	21938401	Park	Park	Well Data	Method A	1.1	6.4	0.01	0.01	Well	N	Y	Y
078	Paseo West Circle Park	1759 Buena Vista Dr.	22435043	Park	Park	Billing Data	Method D	0.9	6.3	0.01	0.01	Potable	Y	Y	Y
064	Wm. Martin Park	1605 Maywood	21613021	Park	Park	Estimate	Method B	1.4	6.2	0.01	0.01	Well	N	Y	Y
073	Cambridge Greenbelt	406 Fishback Rd.	22204049	Park	Park	Estimate	Method B	1.4	6.0	0.01	0.01	Well	N	Y	Y
060	Union Road Park	245 N. Union Rd.	20015002	Park	Park	Billing Data	Method D	1.3	5.7	0.01	0.01	Potable	Y	Y	Y
070	Lincoln Park and Pool	245 S. Powers Ave.	22118007	Park	Park	Well Data	Method A	3.3	5.4	0.00	0.01	Well	N	Y	Y
004	Dolcinea Park	Dolcinea Subdivision		Planned Park/Open Space	Park	Estimate	Method B	1.2	5.2	0.00	0.01	Future	N	Y	Y
042	Library Park	320 W. Center St.	21721071	Park	Park	Estimate	Method B	1.1	5.0	0.00	0.01	Well	N	Y	Y
074	Gonsalves Estate Park	435 Fishback Rd.	22204050	Park	Park	Estimate	Method B	0.7	3.2	0.00	0.01	Well	N	Y	Y
029	Button Estates	1457 Discovery Creek Dr.	20822028	Park	Park	Well Data	Method A	3.3	3.2	0.00	0.01	Well	N	Y	Y
037	Giles Memorial Park	545 W. Alameda St.	21708010	Park	Park	Billing Data	Method D	3.6	3.1	0.00	0.01	Potable	Y	Y	Y
043	Center St. Tennis Courts	311 W. Center St.	21722111	Park	Park	Well Data	Method A	0.4	1.9	0.00	0.00	Well	N	Y	Y
041	Wilson Park	244 W. Center St.	21721012	Park	Park	Estimate	Method B	0.3	1.5	0.00	0.00	Well	N	Y	Y
079	Hildebrand Park	431 Pine St.	22322108	Park	Park	Well Data	Method A	0.5	1.5	0.00	0.00	Well	N	Y	Y
039	Skate Park	Center St and Elm Ave	21715012	Park	Park	Estimate	Method B	0.3	1.3	0.00	0.00	Well	N	Y	Y
082	Montecello	Montecello Lane	22354020	Park	Park	Billing Data	Method D	0.3	1.0	0.00	0.00	Potable	Y	Y	Y
040	Mini Parks	246 Elm St.	21720001	Park	Park	Estimate	Method B	0.2	0.7	0.00	0.00	Well	N	Y	Y
081	Souza Is.	900 Blk Souza Ln.	22351030	Park	Park	Billing Data	Method D	0.1	0.3	0.00	0.00	Potable	Y	Y	N
085	BLD – Basin	1077 Milo Candini Dr.	24131044	Playing Field/Golf Course	Park	Estimate	Method B	6.6	0.0	0.00	0.00	Well	N	Y	Y
090	Manteca Adult School	2271 W Louise	19811006	School	School	ET Estimate	Method C	0.0	0.0	0.00	0.00	Potable	Y	Y	Y
#N/A	Villa Ticino West Park 1	Villa Ticino West	19816038	Planned Park/Open Space	Park	Estimate	Method B	6.3	28.2	0.03	0.05	Future	N	Y	Y
#N/A	Villa Ticino West Park 2	Villa Ticino West		Planned Park/Open Space	Park	Estimate	Method B	6.3	28.0	0.03	0.05	Future	N	Y	Y

Notes:

- 1. Demand sources are as follows:
 - a. Method A – Demand determined based on historical water use data (pumping records or billing data)
 - b. Method B – Demand determined based on a demand factor (acre-foot per acre of irrigable land) calculated from the water use data compiled for Method A
 - c. Method C – Demand determined based on evapotranspiration calculations
 - d. Method D – Demands based on planning documents for parcels yet to be developed
- 2. Water demand estimates were developed in 2017.
- 3. Villa Ticino West Park 1 and Park 2 added in 2023.

Appendix C - Demand and Peaking Factor Methodology

ATTACHMENT 2

This page intentionally left blank.

Method A – Irrigation

Demand based on Water Use Data

Method A was used to determine the irrigation demand for potential recycled water users with available use data (either pumping records or billing data). Pumping and billing records were provided by the City for City parks (where available). It was assumed that all water usage recorded could be attributed to irrigation.

Method B – Irrigation Demand based on Water Use Data Demand Factor

Park Irrigation Demand Factor Calculation from Use Data

The park irrigation demand factor was calculated using data from City pumping records. Complete pumping records for the parks listed below were only available from 2004-2006. The total annual average demand was divided by the irrigated acreage of the park to determine the demand factor for each individual park. Those demand factors were then averaged to determine the park irrigation demand factor of 4.5.

Park	2004-06 Averages (gal)														Irrigated Area (acre)	Demand (AFY/Acre)
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total (gal/y)	Total (AFY)		
Baccilieri Park	-	1,100	198,900	154,500	266,367	243,633	357,067	270,700	273,697	178,451	145,813	3,289	2,093,515	6.4	1.13	5.69
Button Estates	-	-	290,300	748,100	-	-	-	-	-	-	-	-	1,038,400	3.2	3.33	0.96
Center St. Tennis Courts	-	-	27,342	48,999	80,201	99,391	111,449	103,062	106,748	22,955	1,468	-	601,616	1.8	0.41	4.50
Chadwick Square	2,400	44,650	458,550	1,195,933	2,680,100	2,723,650	2,953,750	2,970,823	2,231,120	835,583	273,108	22,050	16,391,718	50.3	8.10	6.21
Cotta Park	-	600	159,250	484,133	953,833	1,109,497	1,207,150	1,252,283	989,017	398,104	209,183	17,792	6,780,841	20.8	3.33	6.25
Curran Grove Parks	-	-	47,763	562,227	846,138	1,272,594	1,394,409	1,500,601	1,049,527	366,664	205,948	59,623	7,305,493	22.4	4.05	5.54
Diamond Oaks	-	3,400	214,650	583,900	857,967	1,722,450	1,625,200	1,367,833	913,313	414,763	140,917	12,843	7,857,237	24.1	5.81	4.15

City of Manteca
Reclaimed Water Facilities Master Plan

Appendices

ATTACHMENT 2

	2004-06 Averages (gal)														Irrigated Area (acre)	Demand (AFY/Acre)
Park	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total (gal/y)	Total (AFY)		
Doxey Park	-	-	-	356,250	609,200	751,970	1,081,117	1,039,267	649,153	387,927	178,365	46,260	5,099,508	15.6	7.56	2.07
Dutra N.E. Park	2	12,200	215,400	210,963	439,302	462,302	470,041	496,656	590,818	310,895	114,492	38,137	3,361,208	10.3	1.58	6.53
Greystone Park	-	9,550	165,000	624,267	1,093,667	1,293,817	1,526,817	1,249,967	1,058,753	377,193	187,985	16,125	7,603,140	23.3	4.67	5.00
Hildebrand Park	-	7,480	11,070	25,656	56,362	86,326	77,146	88,127	61,937	51,770	7,212	910	473,996	1.5	0.52	2.80
Lincoln Park and Pool	7,447	35,065	108,544	149,986	157,619	247,623	278,113	245,587	240,229	150,655	101,983	34,937	1,757,788	5.4	3.34	1.62
Northgate Parks	70,267	214,666	187,663	570,243	783,655	802,084	982,979	886,628	677,945	290,886	45,454	38,468	5,550,937	17.0	13.60	1.25
Primavera Park	-	-	245,400	925,667	1,582,767	1,563,217	1,811,850	1,854,427	1,359,103	544,733	132,787	35,437	10,055,387	30.9	6.22	4.96
Quail Ridge Parks	40,000	50,000	113,900	322,433	694,200	831,600	1,052,360	1,052,800	745,217	679,445	198,278	8,100	5,788,333	17.8	2.76	6.44
Roberts Estates	-	100	290,800	547,667	1,058,803	1,207,311	1,038,950	1,401,367	871,323	409,900	190,220	27,420	7,043,860	21.6	4.56	4.74
Sequoia Park	-	-	-	351,967	734,567	1,195,899	823,015	1,153,700	419,123	253,837	116,735	33,180	5,082,022	15.6	3.57	4.37
Southside Park	-	-	466,250	529,009	754,009	782,256	911,486	732,971	732,404	519,384	240,346	41,508	5,709,621	17.5	2.99	5.86
Tidewater Bikeway	2,768	63,692	188,544	969,767	1,591,877	771,141	743,497	769,402	580,767	332,056	5,988	269	6,019,767	18.5	30.60	0.60
Union West Park	1,050	-	127,650	338,300	1,074,233	1,218,033	1,019,767	989,667	658,533	438,067	186,657	34,900	6,086,857	18.7	3.28	5.70
Villa Ticino Park	1,300	-	219,150	579,833	1,318,833	1,427,817	1,600,950	1,381,857	1,123,887	736,000	215,813	101,700	8,707,140	26.7	5.04	5.30
Walnut Place Park	800	82,231	311,521	293,941	535,381	644,946	732,442	401,069	377,946	459,929	238,978	160,795	4,239,978	13.0	1.84	7.07
Yosemite Park	2,700	-	135,200	526,200	976,633	1,241,317	1,562,650	1,701,883	1,127,290	675,920	535,350	27,890	8,513,033	26.1	4.50	5.81
Average Demand (AFY/Acre or Ft/Yr)																4.50

Methodology C – Irrigation Demand based on Landscape/Crop Coefficient Data

Evapotranspiration Demand Factor Calculation

The evapotranspiration demand factor was calculated utilizing the below equation to determine the Irrigation Demand (in/unit area).

$$\text{Irrigation Demand} \left[\frac{\text{in}}{\text{unit area}} \right] = ((K_c * ET_o) - (\text{Precipitation [in.]} * \text{Infiltrate [\%]})) * \text{Leaching Rate Factor} * \left(\frac{1}{\text{Irrigation Efficiency [\%]}} \right)$$

Month	Crop Coefficient ^a , K _c	ET _o ^b (in/month)	Average Precipitation (in) ^c	Percent Infiltrate ^d	Leaching Rate Factor ^e	Irrigation Efficiency	Irrigation Demand, (in/unit area)	Irrigation Demand, (in/unit area)	Percent of Annual Demand
Jan	0.8	1.08	2.45	75%	1.1	80%	-1.3	0.0	0.0%
Feb	0.8	1.91	1.6	75%	1.1	80%	0.5	0.5	0.9%
Mar	0.8	3.52	1.53	75%	1.1	80%	2.3	2.3	4.8%
Apr	0.8	5.04	0.99	75%	1.1	80%	4.5	4.5	9.5%
May	0.8	6.76	0.18	75%	1.1	80%	7.3	7.3	15.2%
Jun	0.8	7.69	0.07	75%	1.1	80%	8.4	8.4	17.6%
Jul	0.8	7.97	0.1	75%	1.1	80%	8.7	8.7	18.2%
Aug	0.8	7.03	0.15	75%	1.1	80%	7.6	7.6	15.9%
Sep	0.8	5.15	0.14	75%	1.1	80%	5.5	5.5	11.6%
Oct	0.8	3.36	0.63	75%	1.1	80%	3.0	3.0	6.4%
Nov	0.8	1.67	1.96	75%	1.1	80%	-0.2	0.0	0.0%
Dec	0.8	1.01	2.03	75%	1.1	80%	-1.0	0.0	0.0%
Annual Total		52.2	11.83					47.7	100.0%

Average Monthly Demand	3.98	inches
Average Annual Demand Factor	3.98	AF/acre

a. Crop coefficient for cool season turf species from Univ. of California Cooperative Extension and California Department of Water Resources, *A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California*, August 2000.

b. Average ET_o values reported on CIMIS - Station 70 Manteca (<http://www.cimis.water.ca.gov/UserControls/Reports/MonthlyEtoReportViewer.aspx>)

c. Average Monthly precipitation for Manteca from (<http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5303>)

d. Assumed 75 percent infiltration rate into the vegetation root zone

e. Leaching rate factor represents a 10 percent leaching rate through the vegetation root zone

Method D – Irrigation Demand based on Planning Documents

Method D was used for planned developments within the City's sphere of influence. When available, the demands from the planning documents were used as the irrigation demand. Otherwise, the demand factor from Method B was applied to the provided irrigable acreage.

Peaking Factor Calculations

Peak Month Factor Calculation

The peak month factor was calculated using monthly demand estimates from the evapotranspiration calculation. Shown in the table below, the monthly peaking factor for each month was calculated using the equation:

$$\text{Monthly Peaking Factor} = \frac{\text{Monthly Irrigation Demand}}{\text{Annual Total Irrigation Demand} * \frac{1}{12}}$$

The peak month factor was determined to be 2.2 (from the month of July).

Month	Irrigation Demand, (in/unit area)	Percent of Annual Demand	Monthly Peaking Factor ^a
Jan	0.0	0.0%	0.0
Feb	0.5	0.9%	0.1
Mar	2.3	4.8%	0.6
Apr	4.5	9.5%	1.1
May	7.3	15.2%	1.8
Jun	8.4	17.6%	2.1
Jul	8.7	18.2%	2.2
Aug	7.6	15.9%	1.9
Sep	5.5	11.6%	1.4
Oct	3.0	6.4%	0.8
Nov	0.0	0.0%	0.0
Dec	0.0	0.0%	0.0
Annual Total	47.7	100.0%	

Notes:

a. Monthly peaking factor is the calculated monthly irrigation demand divided by the average monthly irrigation demand

Peak Hour Factor Calculation

The peak hour factor was calculated based on the assumed irrigation window for recycled water users. After discussing the irrigation window with the City, it was determined that an 8-hour irrigation window should be assumed. The peak hour factor was calculated as follows:

$$\text{Peak Hour Factor} = \frac{\frac{24 \text{ hours}}{\text{day}}}{\frac{8 \text{ hours}}{\text{irrigation window}}} = 3.0$$

Combined Peaking Factor

The combined peaking factor was calculated by multiplying the peak month and daily peaking factors.

$$\text{Combined Peaking Factor} = (\text{Peak Month Factor}) * (\text{Peak Hour Factor}) = 2.2 * 3.0 = 6.6$$

This page intentionally left blank.

Appendix D - Not Used

This page intentionally left blank

Appendix E - Unit Costs and Detailed Cost Estimates

ATTACHMENT 2

This page intentionally left blank.

Manteca RWFMP			
Unit Costs			
ENR CCI (20-city, Jan '15) =		9,972	
Item	Unit Cost	Units/Notes	Cost Reference
Capital Costs			
Pipelines			
6-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
8-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
10-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
12-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
14-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
16-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
18-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
20-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
24-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
28-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
32-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
36-inch diameter	\$14	in-dia/LF	North Valley Project/Engineering experience
Slip-lining Pipelines (fusible PVC)			
8-inch in 12-inch	\$97	/LF (includes annular space grout)	Trenchless Pipe Specialist – Jennifer Glynn
8-inch in 18-inch	\$102	/LF (includes annular space grout)	Trenchless Pipe Specialist – Jennifer Glynn
12-inch in 18-inch	\$136	/LF (includes annular space grout)	Trenchless Pipe Specialist – Jennifer Glynn
6-inch in 18-inch	\$85	/LF (includes annular space grout)	Trenchless Pipe Specialist – Jennifer Glynn
10-inch in 24-inch	\$144	/LF (includes annular space grout)	Trenchless Pipe Specialist – Jennifer Glynn
Item	Unit Cost	Units/Notes	

12-inch in 24-inch	\$156	/LF (includes annular space grout)	Trenchless Pipe Specialist – Jennifer Glynn
16-inch in 24-inch	\$193	/LF (includes annular space grout)	Trenchless Pipe Specialist – Jennifer Glynn
Pump Station	$0.58 \times \text{HP} \times (17,437 \times \text{HP}^{\wedge} (-0.36) \times \text{CCI} / 4500)$	HP (Based on peak flow)	JMM Pump Station Cost Curve
Capital Costs			
Retrofit (Golf Course)	\$250,000	per site	City of San Clemente Retrofit Program and Engineering Experience
Retrofit (offset Potable)	\$9,000	per site	City of San Clemente Retrofit Program and Engineering Experience
Retrofit (not offset potable)	\$11,000	per site	City of San Clemente Retrofit Program and Engineering Experience
Storage	\$1.15	per gallon	LADWP, 2012 and Engineering Experience
O&M Annual Costs			
Treatment	Disinfection with NaOCl	\$ 50	\$ / MG
Conveyance		\$ 0.60	\$ / LF / yr
Pump Station Equipment		5.0%	of capital costs
		\$ 10,000	\$ / yr
Pump Station Electrical		\$ 0.16	per kWh
Pressure Reducing Stations		1.0%	of capital costs
Storage		1.0%	of capital costs
Contingencies			
Capital Implementation Costs		25%	for design, environmental, etc.
Capital Project Contingency		30%	for construction / O&M costs
Item	Unit Cost	Units/Notes	Cost Reference

O&M Cost Contingency	30%	of O&M Cost Subtotal	
<u>Project Financing</u>			
Interest Rate	3.0%		
Period	30		
Present Worth Factor (to P given A)	19.60		

Manteca RWFMP				
Alternative 1 - Urban Landscape Irrigation serving Core Demands				
Item	Qty	Units	Cost	
Capital Costs				
Treatment			\$	130,000
Conveyance			\$	2,871,000
Pumping Stations			\$	987,000
Pressure Regulating Stations			\$	-
Retrofits			\$	376,000
Storage			\$	460,000
	Construction Subtotal		\$	4,824,000
	Capital Implementation Costs	25%	\$	1,206,000
	Construction Total		\$	6,030,000
	Capital Project Contingency	30%	\$	1,809,000
	Total Capital Costs		\$	7,839,000
O&M Costs (Annual)				
Treatment	50	\$ / MG	\$	15,000
Conveyance	\$0.60	\$ / LF / yr	\$	14,000
Pumping Stations	5%	of capital costs	\$	59,400
Pumping Stations Electrical	\$0.16	per kWh		\$55,300
Pressure Regulating Stations			\$	-
Storage	1%	of capital costs	\$	4,600
	O&M Subtotal		\$	148,300
	O&M Cost Contingency	30%	\$	44,000
	Total O&M Costs (\$/yr)		\$	192,000
Annual Costs (\$ / Year)				
	Annualized Capital Costs		\$	400,000
	Annual O&M Costs		\$	192,000
	Total Annualized Cost		\$	592,000
Unit Cost (\$/AF)				
	Yield (AFY)			910
Estimated Unit Cost (\$/AF)				\$650

Manteca RWFMP				
Alternative 2 - Urban Landscape Irrigation serving North, South, & Core Demands				
Item	Qty	Units	Cost	
Capital Costs				
Treatment			\$	330,000
Conveyance			\$	18,969,000
Pumping Stations			\$	2,538,000
Pressure Regulating Stations			\$	-
Retrofits			\$	1,289,000
Storage			\$	5,616,000
	Construction Subtotal		\$	29,400,000
	Contingencies	30%	\$	11,025,000
	Construction Total		\$	36,750,000
	Capital Implementation Costs			
		25%	\$	7,350,000
	Total Capital Costs		\$	44,775,000
O&M Costs (Annual)				
Treatment	\$50	\$ / MG	\$	43,000
Conveyance	\$0.60	\$ / LF / yr	\$	78,000
Pumping Stations	5%	of capital costs	\$	98,000
Pumping Stations Electrical	\$0.16	per kWh		\$165,000
Pressure Regulating Stations	1%	of capital costs	\$	-
Storage	1%	of capital costs	\$	43,000
	O&M Subtotal		\$	437,000
	Capital Project Contingency	30%	\$	131,000
	Total O&M Costs (\$/yr)		\$	568,000
Annual Costs (\$ / Year)				
	Annualized Capital Costs		\$	2,388,752
	Annual O&M Costs		\$	568,000
	Total Annualized Cost		\$	2,956,752
Unit Cost (\$/AF)				
	Yield (AFY)			2,686
Estimated Unit Cost (\$/AF)				\$1,124

Note: Costs are referenced to the ENR 20-city CCI for November 2022 at 13,175. which represents an approximate 32% increase from the January 2015 CCI at 9,972. O&M costs remain unchanged from 2017 estimates.

Manteca RWFMP				
Alternative 4 - Urban Landscape Irrigation serving North & Core Demands				
Item	Qty	Units	Cost	
Capital Costs				
Treatment			\$	190,000
Conveyance			\$	6,458,000
Pumping Stations			\$	1,287,000
Pressure Regulating Stations			\$	-
Retrofits			\$	552,000
Storage			\$	1,610,000
	Construction Subtotal		\$	10,097,000
	Capital Implementation Costs	25%	\$	2,524,000
	Construction Total		\$	12,621,000
	Capital Project Contingency	30%	\$	3,786,000
	Total Capital Costs		\$	16,407,000
O&M Costs (Annual)				
Treatment	\$50	\$ / MG	\$	24,000
Conveyance	\$0.60	\$ / LF / yr	\$	38,000
Pumping Stations	5%	of capital costs	\$	75,000
Pumping Stations Electrical	\$0.16	per kWh		\$85,000
Pressure Regulating Stations	1%	of capital costs	\$	-
Storage	1%	of capital costs	\$	16,000
	O&M Subtotal		\$	238,000
	O&M Cost Contingency	30%	\$	71,000
	Total O&M Costs (\$/yr)		\$	309,000
Annual Costs (\$ / Year)				
	Annualized Capital Costs		\$	837,000
	Annual O&M Costs		\$	309,000
	Total Annualized Cost		\$	1,146,000
Unit Cost (\$/AF)				
	Yield (AFY)			1,450
Estimated Unit Cost (\$/AF)				\$790

Manteca RWFMP			
Alternative 5 - Urban Landscape Irrigation serving South & Core Demands			
Item	Qty	Units	Cost
Capital Costs			
Treatment			\$ 250,000
Conveyance			\$ 10,873,000
Pumping Stations			\$ 1,693,000
Pressure Regulating Stations			\$ -
Retrofits			\$ 502,000
Storage			\$ 3,105,000
	Construction Subtotal		\$ 16,173,000
	Capital Implementation Costs	25%	\$ 4,043,000
	Construction Total		\$ 20,216,000
	Capital Project Contingency	30%	\$ 6,065,000
	Total Capital Costs		\$ 26,281,000
O&M Costs (Annual)			
Treatment	50	\$ / MG	\$ 34,000
Conveyance	\$0.60	\$ / LF / yr	\$ 54,000
Pumping Stations	5%	of capital costs	\$ 85,000
Pumping Stations Electrical	\$0.16	per kWh	\$132,000
Pressure Regulating Stations	1%	of capital costs	\$ -
Storage	1%	of capital costs	\$ 31,000
	O&M Subtotal		\$ 346,000
	O&M Cost Contingency	30%	\$ 104,000
	Total O&M Costs (\$/yr)		\$ 450,000
Annual Costs (\$ / Year)			
	Annualized Capital Costs		\$ 1,341,000
	Annual O&M Costs		\$ 450,000
	Total Annualized Cost		\$ 1,791,000
Unit Cost (\$/AF)			
	Yield (AFY)		2,080
Estimated Unit Cost (\$/AF)			\$860

Manteca RWFMP

Alternative 6 - Manteca WQCF to SSJID Reservoir

Item	Qty	Units	9.4 mgd	3.6 mgd
Capital Costs				
Treatment			\$ -	\$ -
Conveyance	68,100	LF	\$ 25,212,000	\$ 17,585,000
Pumping Stations			\$ 2,640,000	\$ 1,409,000
Pressure Regulating Stations			\$ -	\$ -
Storage			\$ -	\$ -
	Construction Subtotal		\$ 27,852,000	\$ 18,994,000
	Capital Implementation Costs	25%	\$ 6,963,000	\$ 4,749,000
	Construction Total		\$ 34,815,000	\$ 23,743,000
	Capital Project Contingency	30%	\$ 10,445,000	\$ 7,123,000
	Total Capital Costs		\$ 45,260,000	\$ 30,866,000
O&M Costs (Annual)				
Treatment			\$ -	\$ -
Conveyance	\$0.60	\$ / LF / yr	\$ 41,000	\$ 41,000
Pumping Stations	5%	of capital costs	\$ 132,000	\$ 70,000
Pumping Stations Electrical	\$0.16	per kWh	\$ 223,000	\$ 105,000
Pressure Regulating Stations			\$ -	\$ -
Storage			\$ -	\$ -
	O&M Subtotal		\$ 396,000	\$ 216,000
	O&M Cost Contingency	30%	\$ 119,000	\$ 65,000
	Total O&M Costs (\$/yr)		\$ 515,000	\$ 281,000
Annual Costs (\$ / Year)				
	Annualized Capital Costs		\$ 2,309,000	\$ 1,575,000
	Annual O&M Costs		\$ 515,000	\$ 281,000
	Total Annualized Cost		\$ 2,824,000	\$ 1,856,000
Unit Cost (\$/AF)				
	Yield (AFY)		5,193	1,989
Estimated Unit Cost (\$/AF)			\$540	\$930

Manteca RWFMP

Alternative 7 - Manteca WQCF to Ag. Irrigation Northeast of City

Item	Qty	Units	9.4 mgd	3.6 mgd
Capital Costs				
Treatment			\$ -	\$ -
Conveyance	52,800	LF	\$ 19,744,000	\$ 15,077,000
Pumping Stations			\$ 3,422,000	\$ 1,954,000
Pressure Regulating Stations			\$ -	\$ -
Storage			\$ -	\$ -
	Construction Subtotal		\$ 23,166,000	\$ 17,031,000
	Capital Implementation Costs	25%	\$ 5,792,000	\$ 4,258,000
	Construction Total		\$ 28,958,000	\$ 21,289,000
	Capital Project Contingency	30%	\$ 8,687,000	\$ 6,387,000
	Total Capital Costs		\$ 37,645,000	\$ 27,676,000
O&M Costs (Annual)				
Treatment			\$ -	\$ -
Conveyance	\$0.60	\$ / LF / yr	\$ 32,000	\$ 32,000
Pumping Stations	5%	of capital costs	\$ 171,000	\$ 98,000
Pumping Stations Electrical	\$0.16	per kWh	\$ 319,000	\$ 147,000
Pressure Regulating Stations			\$ -	\$ -
Storage			\$ -	\$ -
	O&M Subtotal		\$ 522,000	\$ 277,000
	O&M Cost Contingency	30%	\$ 157,000	\$ 83,000
	Total O&M Costs (\$/yr)		\$ 679,000	\$ 360,000
Annual Costs (\$ / Year)				
	Annualized Capital Costs		\$ 1,921,000	\$ 1,412,000
	Annual O&M Costs		\$ 679,000	\$ 360,000
	Total Annualized Cost		\$ 2,600,000	\$ 1,772,000
Unit Cost (\$/AF)				
Yield (AFY)			5,193	1,989
Estimated Unit Cost (\$/AF)			\$500	\$890

Manteca RWFMP

Alternative 8 - Manteca WQCF to Banta-Carbona Irrigation District

Item	Qty	Units	9.4 mgd	3.6 mgd
Capital Costs				
Treatment			\$ -	\$ -
Conveyance	41,200	LF	\$ 15,077,000	\$ 10,463,000
Pumping Stations			\$ 1,954,000	\$ 1,213,000
Pressure Regulating Stations			\$ -	\$ -
Storage			\$ -	\$ -
Construction Subtotal			\$ 17,031,000	\$ 11,676,000
Capital Implementation Costs		25%	\$ 4,258,000	\$ 2,919,000
Construction Total			\$ 21,289,000	\$ 14,595,000
Capital Project Contingency		30%	\$ 6,387,000	\$ 4,379,000
Total Capital Costs			\$ 27,676,000	\$ 18,974,000
O&M Costs (Annual)				
Treatment			\$ -	\$ -
Conveyance	\$0.60	\$ / LF / yr	\$ 25,000	\$ 25,000
Pumping Stations	5%	of capital costs	\$ 98,000	\$ 61,000
Pumping Stations Electrical	\$0.16	per kWh	\$ 320,000	\$ 156,000
Pressure Regulating Stations			\$ -	\$ -
Storage			\$ -	\$ -
O&M Subtotal			\$ 443,000	\$ 242,000
O&M Cost Contingency		30%	\$ 133,000	\$ 73,000
Total O&M Costs (\$/yr)			\$ 576,000	\$ 315,000
Annual Costs (\$ / Year)				
Annualized Capital Costs			\$ 1,412,000	\$ 968,000
Annual O&M Costs			\$ 576,000	\$ 315,000
Total Annualized Cost			\$ 1,988,000	\$ 1,283,000
Unit Cost (\$/AF)				
Yield (AFY)			10,529	4,033
USBR Wheeling Charge for DMC			\$50	\$50
Banta-Carbona Wheeling Charge			\$200	\$200
Estimated Unit Cost (\$/AF)			\$440	\$570

Manteca RWFMP

Alternative 9 - Manteca WQCF to Delta-Mendota Canal

Item	Qty	Units	9.4 mgd	3.6 mgd
Capital Costs				
Treatment			\$ -	\$ -
Conveyance	67,600	LF	\$ 27,202,000	\$ 19,631,000
Pumping Stations			\$ 3,787,000	\$ 2,196,000
Pressure Regulating Stations			\$ -	\$ -
Storage			\$ -	\$ -
	Construction Subtotal		\$ 30,989,000	\$ 21,827,000
	Capital Implementation Costs	25%	\$ 7,747,000	\$ 5,457,000
	Construction Total		\$ 38,736,000	\$ 27,284,000
	Capital Project Contingency	30%	\$ 11,621,000	\$ 8,185,000
	Total Capital Costs		\$ 50,357,000	\$ 35,469,000
O&M Costs (Annual)				
Treatment			\$ -	\$ -
Conveyance	\$0.60	\$ / LF / yr	\$ 41,000	\$ 41,000
Pumping Stations	5%	of capital costs	\$ 189,000	\$ 110,000
Pumping Stations Electrical	\$0.16	per kWh	\$ 850,000	\$ 375,000
Pressure Regulating Stations			\$ -	\$ -
Storage			\$ -	\$ -
	O&M Subtotal		\$ 1,080,000	\$ 526,000
	O&M Cost Contingency	30%	\$ 324,000	\$ 158,000
	Total O&M Costs (\$/yr)		\$ 1,404,000	\$ 684,000
Annual Costs (\$ / Year)				
	Annualized Capital Costs		\$ 2,569,000	\$ 1,810,000
	Annual O&M Costs		\$ 1,404,000	\$ 684,000
	Total Annualized Cost		\$ 3,973,000	\$ 2,494,000
Unit Cost (\$/AF)				
Yield (AFY)			10,529	4,033
USBR Wheeling Charge for DMC (\$/AF)			\$0	\$0
Estimated Unit Cost (\$/AF)			\$380	\$620

ATTACHMENT 2

This page intentionally left blank.