CITY OF COTATI

RECYCLED WATER FEASIBILITY STUDY

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March 2007

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List of Abbreviations and Acronyms

AF, ac-ft ..... Acre Feet
ABAG ..... Association of Bay Area Governments
BPU ..... Board of Public Utilities
City ..... City of Cotati
C/I ..... Commercial and Industrial
CCI ..... Construction Cost Index
CEQA ..... California Environmental Quality Act
COP ..... Certificate of Participation
DAFT ..... Dissolved Air Flotation Thickening
EIR ..... Environmental Impact Report
ENR ..... Engineering News Record
FY ..... Fiscal Year
GIS ..... Geographic Information System
GPL ..... Geysers Pipeline
HGL ..... Hydraulic Grade Line
HL ..... Head Loss
IRWMP ..... Integrated Regional Water Management Plan
IRWP ..... Incremental Recycled Water Program
LF ..... Linear Foot
MG ..... Million Gallons
MGD ..... Million Gallons per Day
MGY ..... Million Gallons per Year
MMWD ..... Marin Municipal Water District
MOU ..... Memorandum of Understanding
NCIRWMP ..... North Coast Integrated Regional Water Management Plan
NEPA ..... National Environmental Policy Act
NOP ..... Notice of Preparation
NPDES ..... National Pollutant Discharge Elimination System

O&M .....Operations and Maintenance

P/I .....Public Institutional

psi .....Pounds per Square Inch

RP .....Rohnert Park

SCWRHRP .....Sonoma County Water Recycling and Habitat Restoration Project

SCWA, Agency .....Sonoma County Water Agency

SPA.....Specific Plan Area

SWT.....Surface Water Treatment

UGB.....Urban Growth Boundary

UWMP .....Urban Water Management Plan

WRP .....Water Reclamation Plant

WSTSP .....Water Supply and Transmission System Project

Chapter 1 Study Area Characteristics

1.1 Introduction

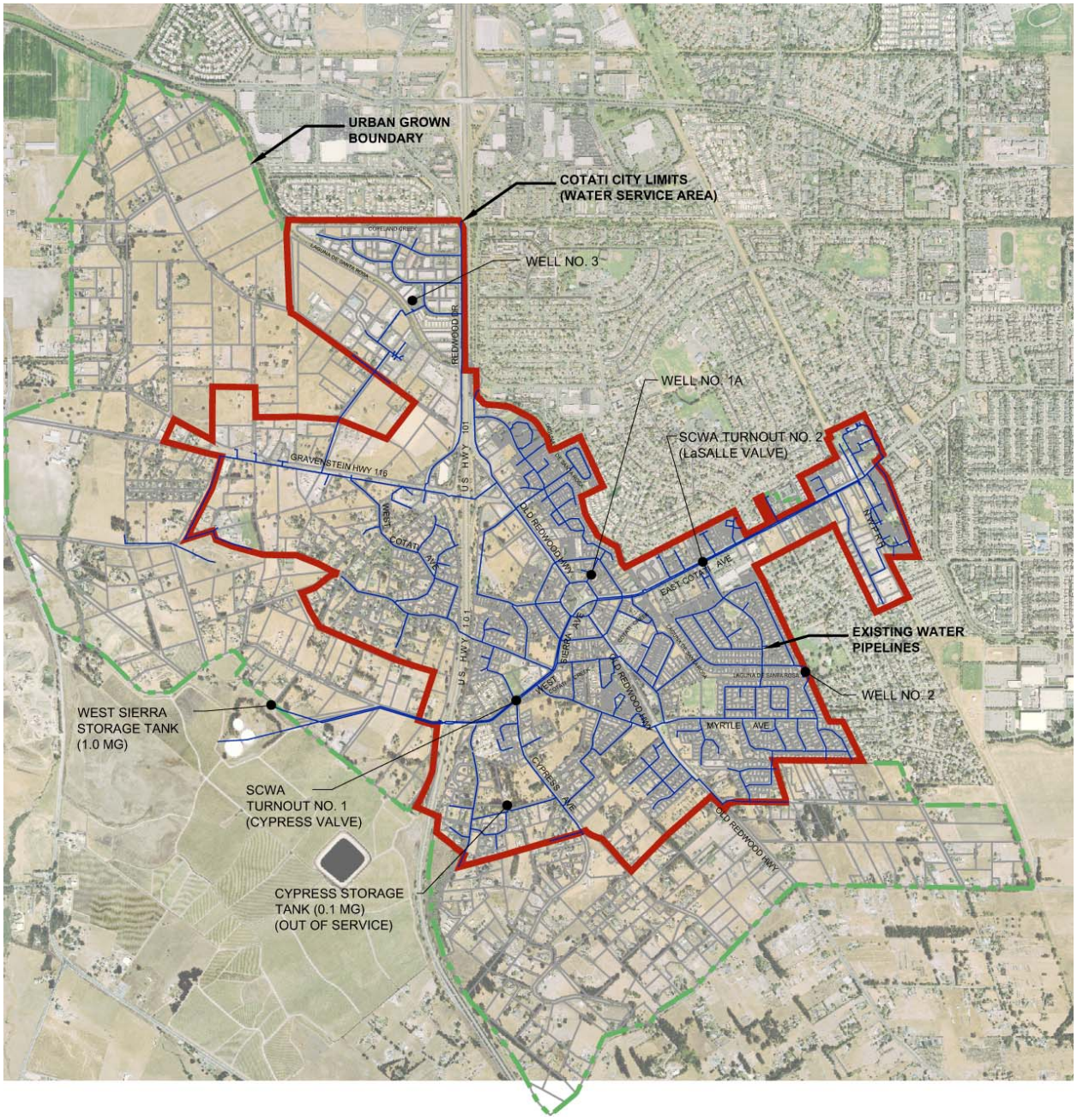
This chapter describes the general characteristics of the Study Area for the Cotati Urban Reuse Project (Project). Also, this chapter includes background on the Study Area including land use and population information.

1.2 Background and Study Area Description

The Study Area, illustrated in Figure 1-1, is bounded by the city limits of the City of Cotati (City). This Study Area is generally consistent with the City's water service area and includes approximately 1,200 acres. The City is a user of the Santa Rosa Subregional Water Reuse System (Subregional System), which provides wastewater treatment, disposal and water recycling services for the cities of Cotati, Rohnert Park, Santa Rosa, Sebastopol and the South Park Sanitation District. The Study Area was included in the analysis for the Subregional System's Incremental Recycled Water Program (IRWP) Master Plan and Environmental Impact Report (EIR). The IRWP documents urban reuse within Cotati, Rohnert Park and Santa Rosa, as one of the Program Alternatives that will allow the Subregional System to manage recycled water flows and regulatory requirements through approximately 2020.

This Feasibility Study provides a more detailed technical analysis of the potential for developing a recycled water delivery system within the Study Area in order to provide both water supply and wastewater disposal benefits.

Figure 1-1: Study Area



Planning Horizon

The City's 1998 General Plan Update (General Plan) projects population through the year 2010, which is a relatively near-term planning horizon. The General Plan was used by the Subregional System in developing its IRWP Master Plan and EIR.

In order to develop its 2005 Urban Water Management Plan (UWMP), the City used population projections developed by the Association of Bay Area Governments (ABAG) in order to project its long-term water supply needs.

This Study uses the General Plan projections, to estimate both wastewater flows generated by the City and potential demand for recycled water within the Study Area. This planning horizon was selected in order to be consistent with the IRWP Master Plan and EIR. An Urban Reuse Project for Cotati that is consistent with the IRWP Master Plan and EIR could use this well developed programmatic overview as a basis for its own CEQA documents.

The potential recycled water use identified in this Study was compared against the 2030 water demands developed in the City's UWMP in order to understand the water supply benefits provided by recycled water.

Unit Convention

Like many agencies, the City describes its water supply and water demands in terms of acre-feet (AF) and its wastewater flows and wastewater capacity in terms of million gallons (MG). There are approximately 3 AF in 1 MG. The IRWP uses a unit convention of MG and that convention is employed in this Feasibility Study. When discussing water supply, this Feasibility Study provides conversions from AF to MG to assist the reader in relating the MG-unit to the AF-unit more typically employed in the water supply planning documents.

1.3 Land Use, Population and Utility System Demand Trends

Land Use

The City is among the smallest of Sonoma County's nine incorporated cities. With an estimated 2005 population of 7,337, the City's planning documents emphasize preservation of its rural environment while providing the incorporated area with necessary urban amenities. The planning documents also reflect the City's desire to remain a distinct small town while accepting the reality of being surrounded by larger neighbors.

The City has a voter approved Urban Growth Boundary (UGB), which extends beyond its city limits, however its current General Plan does not provide direction on where annexations may occur. The City has begun the process of updating this General Plan and as noted above, ABAG projections are used to provide indications of long term population trends.

The City has a traditional downtown, focused on a town square, known as "The Hub". The City provides a wide variety of residential land uses, generally located east of Highway 101. The City's downtown area, also located east of Highway 101, includes smaller commercial enterprises. The areas west of Highway 101 include the majority of the City's larger commercial and industrial land uses.

Population and Utility System Capacities – Current and Projected

With the development pace estimated by AGAB, population within the UGB is expected to reach a total of 8,500 by 2030. This represents a slower rate of growth than outlined in the General Plan, which estimated a total population of 8,097 within the City limits by 2010

Table 1-1 relates the population projections to both the water demand and wastewater disposal demands under current conditions, and at the 2020 and 2030 planning scenarios evaluated in the 2005 UWMP.

The water demands in Table 1-1 are the Gross Water Demands developed by the City in Table 6-3 of its UWMP. The effects of planned water conservation will be described in Chapter 3.

Table 1-1: Current and Projected Population and Utility System Capacities[1]

	2005 Estimates	2020 Estimates	2030 Estimates
Population	7,337	8,100	8,500
Potable Water Demand			
AFY	1,271	1,628	1,743
MGY	414	530	568
MGD	1.13	1.45	1.56
Recycled Water Demand			
AFY	0	To Be Determined by this Study	
MGY	0		
MGD	0		
Wastewater Flows (Average Dry Weather Flows)			
MGY	234	277	N/A
MGD	0.64	0.76	N/A

1.4 Climatic and Hydrologic Features

The City is located in the Russian River watershed. The climate and hydrology of the Russian River watershed directly affect the City because its primary wholesale supply from the Sonoma County Water Agency (Agency) is drawn from the Russian River. The climate of the Russian River watershed is tempered by its proximity to the Pacific Ocean and is characterized by seasonal rainfall patterns. Approximately 96 percent of the total annual precipitation falls between October and April. Winters are cool and below freezing temperatures occur occasionally. Summers are warm and frost free. Average annual precipitation is approximately 25 inches.[2]

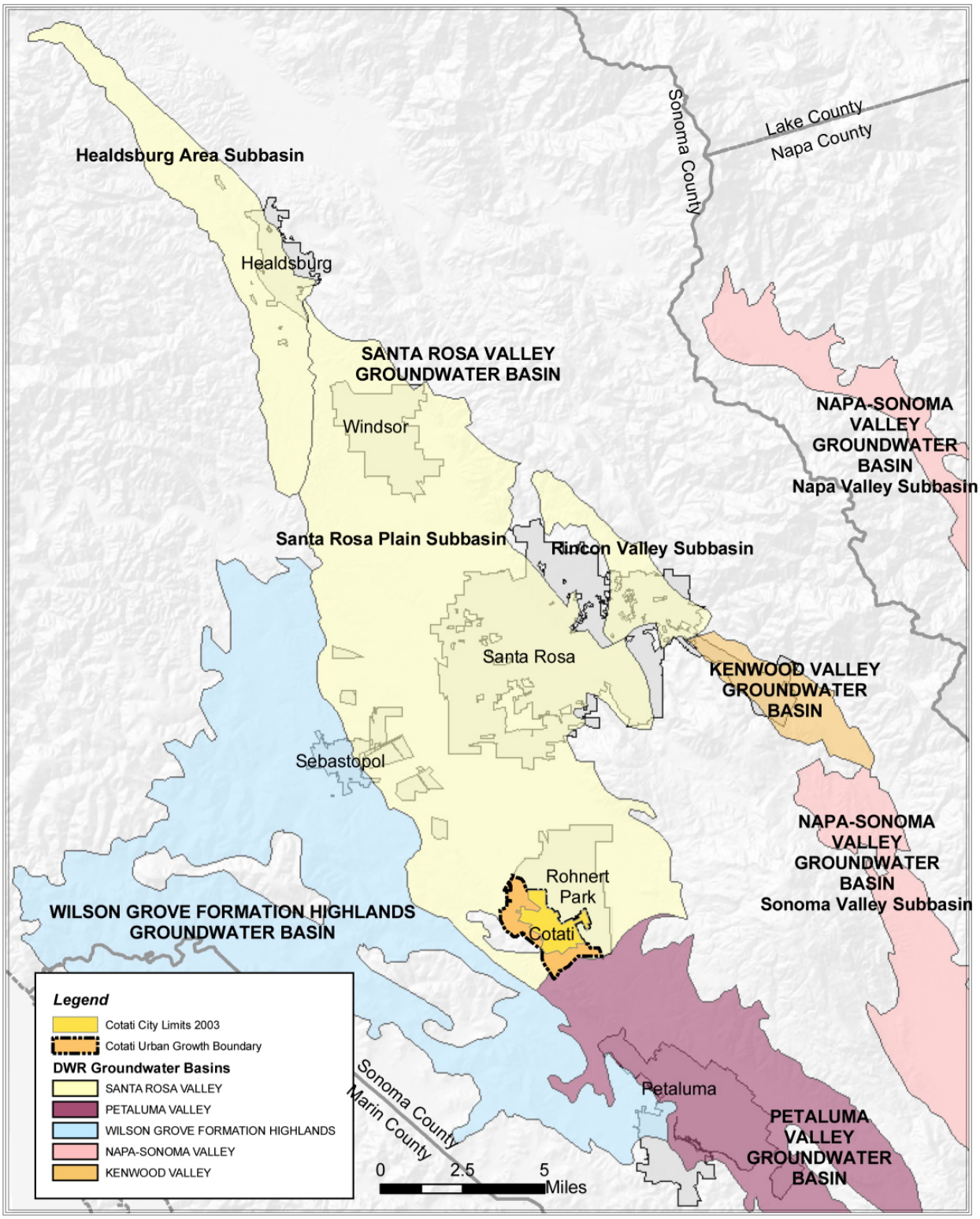
The City is located in the Santa Rosa Valley Groundwater Basin and overlays the Santa Rosa Plain Subbasin.[3] The Santa Rosa Valley Groundwater Basin is located within the Russian River watershed and subject to the same climatic features described above. Figure 1-2 illustrates the Study Area in the context of the major hydrologic features in the area.

[1] Sources include Incremental Recycled Water Program Recycled Water Master Plan (February 2004) and 2005 Urban Water Management Plan, City of Cotati.

[2] 2005 Urban Water Management Plan 2000, City of Cotati.

[3] DWR Bulletin 118

Figure 1-2: Major Hydrologic Features



Chapter 2 Wastewater Facilities, Flows and Reuse

2.1 Introduction

The Project could provide both wastewater disposal and water supply benefits; as such this chapter provides background information on regional wastewater facilities, disposal and reuse. While the City has not requested additional wastewater disposal capacity within the IRWP, other Subregional System member agencies, such as the cities of Santa Rosa and Rohnert Park, may fund expansions to the Subregional System in order to provide adequate wastewater disposal capacity for implementation of their respective General Plans. Thus, wastewater disposal benefits could be important to the Subregional System even if the City would not immediately experience them.

Cost projections are developed on a per million gallon basis assuming that capital costs are financed at a 5% interest rate for a 30 year term.

2.2 Wastewater Facilities

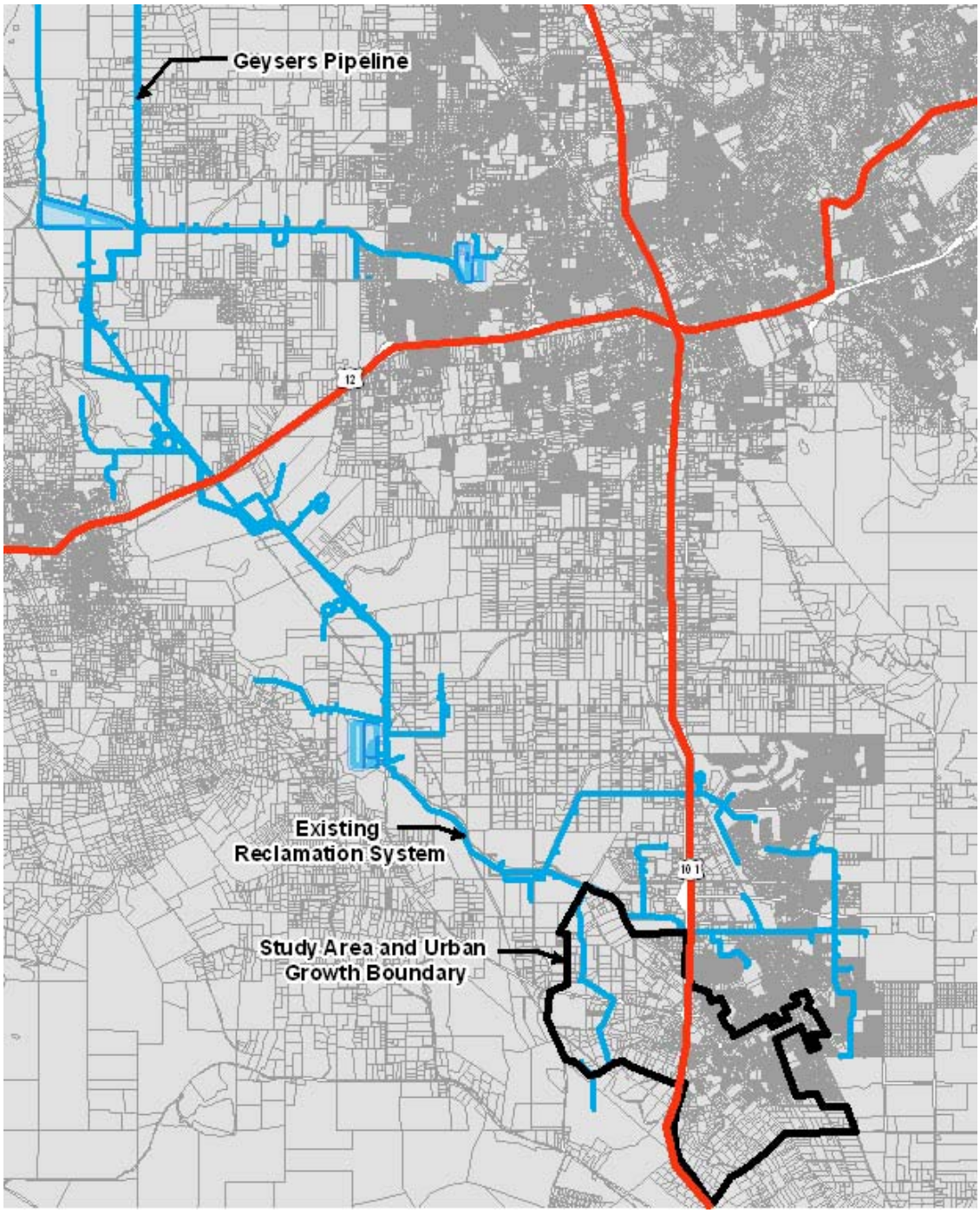
The Subregional System manages two tertiary-level water recycling plants, the Laguna Water Reclamation Plant (WRP) and the Oakmont WRP. The Oakmont WRP is operated seasonally solely to provide recycled water in eastern Santa Rosa; community of Oakmont; its recycled water distribution system is not connected to the larger Subregional System recycled water system.

The Laguna WRP is the water recycling plant serving the Subregional System. The Subregional System provides wastewater treatment, disposal and reuse services for the City and Rohnert Park, Santa Rosa, Sebastopol and the South Park Sanitation District. The Subregional System's facilities have a rated dry weather capacity of 21.3 MGD and the City is allotted 0.76 million gallons per day (MGD) of the total capacity. The Subregional System facilities are illustrated in Figure 2-1 and include:

- The Laguna WRP, a tertiary wastewater treatment plant that utilizes aeration, clarification, conventional filtration, and ultraviolet disinfection;
- A permitted wet weather discharge to the Russian River of up to 5 percent of the River flow under the NPDES Permit CA 0022764;
- The forty-mile long Geysers Pipeline that delivers 11 MGD of recycled water, year round, to the Geysers Steamfield; and
- Approximately 62 miles of recycled water distribution piping that deliver recycled water to approximately 675 sites for agricultural reuse and impoundment and approximately 100

sites for urban reuse, largely in the cities of Rohnert Park and Santa Rosa. [4] This recycled water distribution system includes approximately 1,480 MG of storage[5] in open ponds.

Figure 2-1: Subregional System Facilities



[4] Engineering Report for Master Recycling Permit for the City of Santa Rosa Water Reclamation System, September 2004.

[5] Santa Rosa Incremental Recycled Water Program, Technical Memorandum No. 16 – Water Balance Modeling Summary

2.3 The Incremental Recycled Water Program (IRWP)[6]

In November 2003, the City of Santa Rosa certified the IRWP EIR and in March 2004 adopted the IRWP Master Plan. The purpose of the IRWP Master Plan is to outline a range of programs for managing additional wastewater flows and for managing current and future flows that are discharged to the Russian River and subject to new regulations including the California Toxics Rule. The maximum flow to be managed is 6,700 MGY.

The IRWP Master Plan Selected Program (the Selected Program) is a combination of alternatives that could manage future flows and regulatory issues. The Selected Program Alternatives include:

- Indoor Water Conservation
- Urban Reuse
- Discharge
- Agricultural Reuse
- Geysers Expansion

The Selected Program is intended to be flexible and alternatives could be combined and/or implemented incrementally to provide flexibility. When the IRWP Master Plan was approved, the City of Santa Rosa established a target and a range for each alternative within the Selected Program. These are presented in Table 2-1 below. The Selected Program envisioned that 4,500 MGY would be managed by the Discharge Alternative and that a combination of Indoor Water Conservation, Urban Reuse, Agricultural Reuse and Geysers Expansion would accommodate the additional flow volume of 2,200 MGY (6,700 MGY-4,500 MGY = 2,200 MGY). The IRWP Master Plan may be updated from time to time in order to provide updated technical information on the implementation of the selected program.

Table 2-1: IRWP Master Plan Selected Program Alternative Targets and Ranges

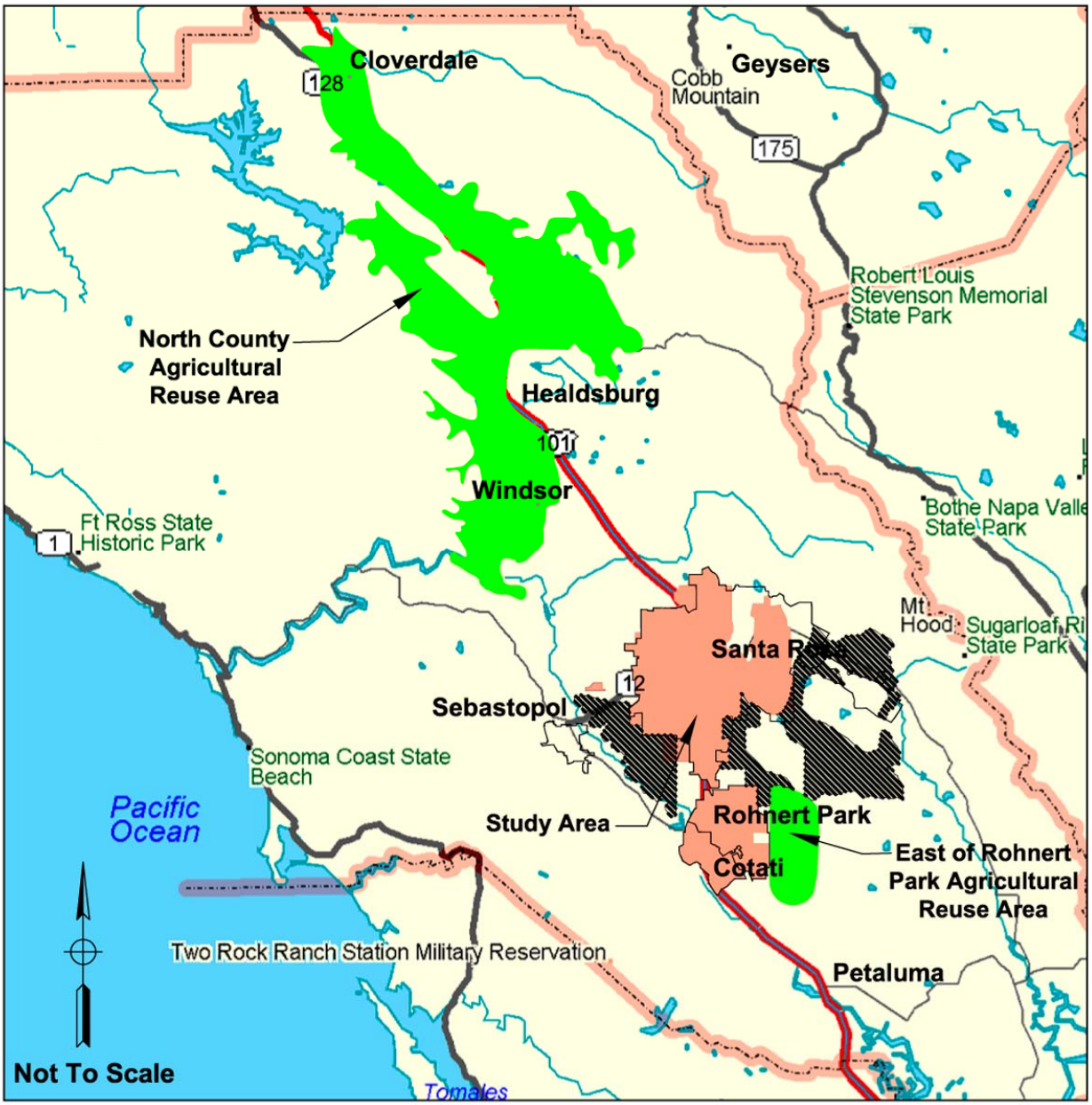
Program Element	Target (MGY)	Range (MGY)
Indoor Water Conservation	300	150 to 300
Urban Reuse	500	0 to 2,200
Agricultural Reuse	1,000	0 to 2,200
Geysers Expansion	400	0 to 2,200
Program Totals	**2,200**	**NA**

The Indoor Water Conservation Alternative is discussed in the context of the City's overall water supply in Chapter 3 Water Supply Facilities and Programs. The Urban Reuse Alternative is the subject of this Study. The remaining IRWP Program Elements are described briefly below.

Agricultural Reuse: The IRWP Master Plan identified two major areas for agricultural reuse, the North County Agricultural Reuse Area and the East of Rohnert Park Agricultural Reuse Area. These areas are illustrated in Figure 2-2.

[6] Incremental Recycled Water Program Recycled Water Master Plan, February 2004.

Figure 2-2: Agricultural Reuse Areas Described in the IRWP



Up to 5,080 MG could be managed using the identified sites, although the IRWP Master Plan has limited Agricultural Reuse to a maximum of 2,200 MG annually. To expand Agricultural Reuse, the Subregional System would need to expand its network of recycled water storage ponds because it must store winter flows to have enough recycled water available to meet additional irrigation system demands. The IRWP Master Plan included a water balance model for the Subregional System that defined the additional storage necessary for each new irrigation use. This model indicates that for each gallon of irrigation demand added to the recycled water system, the Subregional System would need to construct 0.625 gallons of storage and this modeling assumption is used for planning purposes. For example, if an increment of

Agricultural Reuse in North Sonoma County would serve 370 MG of demand, it also includes the construction of 230 MG of storage (0.625 x 370 million = 230 million).

East of Rohnert Park Agricultural Reuse, as developed in the IRWP Master Plan, included three distinct increments with a total capacity of 1,600 MG. North County Agricultural Reuse, as developed in the IRWP Master Plan, included four distinct increments with a total capacity of 3,480 MGY. The costs for Agricultural Reuse developed in the IRWP Master Plan are presented in Table 2-2.

Table 2-2: Summary of Cost Estimates for Agricultural Reuse

	Agricultural Reuse East of Rohnert Park			Agricultural Reuse in North Sonoma County			
	Increment 1	Increment 2	Increment 3	Increment 1	Increment 2	Increment 3	Increment 4
Disposal Capacity Provided	440 MG	377 MG	783 MG	370 MG	170 MG	240 MG	2,700 MG
New Storage Required	275 MG	235 MG	490 MG	230 MG	106 MG	150 MG	1,690 MG
Total Estimated Capital Cost[7]	$23.5 mil	$23.0 mil	$42.7 mil	$25.4 mil	$11.7 mil	$15.7 mil	$127.4 mil
Estimated Operational Cost	$577,000	$526,000	$1,156,000	$747,000	$362,000	$463,000	$8,245,000
Year of Estimate	2004	2004	2004	2004	2004	2004	2004
ENR CCI for Year of Estimate	7,115	7,115	7,115	7,115	7,115	7,115	7,115
ENR CCI Base for this Study	7,400	7,400	7,400	7,400	7,400	7,400	7,400
Escalated Capital Cost	$24.4 mil	$23.9 mil	$44.4 mil	$26.5 mil	$12.2 mil	$16.3 mil	$132.2 mil
Escalated Operational Costs	$600,100	$547,100	$1,202,300	$776,900	$376,500	$481,500	$8,575,300
Cost per MG	$4,977	$5,579	$5,225	$6,763	$6,874	$6,429	$6,362

Geysers Expansion: The Geysers Recharge Project is a system of pump stations and pipelines that conveys recycled water from the Llano Pump Station at the Laguna WRP to the Geysers Steamfield. The system includes two sections: the Valley Section and the Mountain Section. The Valley Section, which extends from the Laguna WRP to the Bear Canyon Pump Station, includes a 48-inch-diameter section and a 30-inch-diameter section of pipeline. The Valley Section can deliver water to locations along the pipeline route. The Mountain Section extends from the Bear Canyon Pump Station to the terminal tank at the Geysers Steamfield. This pipeline section includes a 30-inch-diameter pipe and three pump stations (Bear Canyon, Mayacamas, and Pine Flat).

[7] Total costs include costs of Irrigation Systems (See IRWP Recycled Water Master Plan Table 4) and costs of Storage (See IRWP Recycled Water Master Plan Table 7).

The IRWP Master Plan developed three flow expansion increments. These were 16, 19, and 25 MGD. The maximum expansion would manage up to 6,400 MG of flow. The Selected Program limited Geysers Expansion to a maximum of 2,200 MGY or the equivalent of 17 MGD. This analysis looks only at the first two incremental expansions (15 and 19 MGD), which would provide for the future capacity needs of the Subregional System.

Table 2-3, below summarizes the estimated capital and operational costs for Geysers Expansion. The operational costs have been reduced by 25 percent from the costs presented in the IRWP Master Plan. This reduction was made at the request of the Subregional System to reflect the expected cost-sharing structure with the Geysers customer.

Table 2-3: Summary of Cost Estimates for Geysers Expansion

	Expansion to 15 MGD	15 to 19 MGD Expansion
Disposal Capacity Provided	1,460 MGY	2,200 MGY
Estimated Capital Cost	$13,100,000	$19,929,000
Estimated Operational Cost	$1,698,600	$1,812,900
Year of Estimate	2004	2004
ENR CCI for Year of Estimate	7,115	7,115
ENR CCI Base for this Study	7,400	7,400
Escalated Capital Cost	$13,591,500	$20,727,300
Escalated Operational Costs	$1,766,600	$1,885,500
Cost per MG	$1,816	$2,215

Chapter 3 Water Supply Facilities and Programs

3.1 Introduction

The Project could provide both wastewater disposal and water supply benefits; as such this chapter provides background information on regional water supply resources. The City's UWMP indicates that recycled water could provide a beneficial water source, particularly late in the UWMP planning period.

Similar to Chapter 2, cost projections are developed on a per million gallon basis assuming that capital costs are financed at a 5% interest rate for a 30 year term. This parallel cost development will provide a framework to allocate a portion of the costs of an urban reuse project to water supply benefits and a portion to wastewater disposal benefits.

3.2 Water Supply – Current and Projected

The City currently utilizes two sources for water supply and manages an active water conservation program. Water is supplied by the Sonoma County Water Agency (Agency) and from City wells (groundwater). While the City has historically used groundwater to supply more than half of its demands, its current water management strategy is to draw its primary water supply from the Agency and utilize groundwater to supplement its needs during peak demand periods or periods of drought. Table 3-1 summarizes the water supply currently available and planned to be available to the City. According to the City's UWMP, the 2020 and 2030 water supply is approximately equal to demand.

Table 3-1: Current and Planned Water Supply from Various Sources

	2005	2020	2030
Sonoma County Water Agency (1)			
AFY	1,069	1,339	1,489
MGY	348	436	485
Local Groundwater (1)			
AFY	49	172	90
MGY	16	56	29
Recycled Water (2)			
AFY	0	0	33
MGY	0	0	11
Conserved Water (3)			
AFY	0	117	131
MGY	0	38	43
Totals			
AFY	1,118	1,628	1,743
MGY	364	530	568

(1) Based on City of Cotati 2005 UWMP, Table 7-1.

(2) Based on City estimates. The proposed volume of urban reuse and timing of urban reuse implementation may be refined by the study.

(3) Based on City of Cotati 2005 UWMP, Table 6-4. Water Conservation is brought forward in the supply calculations in order to facilitate economic comparisons.

3.3 Sonoma County Water Agency Supply

The Agency provides wholesale water service from its Russian River System to eight prime contractors (the cities of Santa Rosa, Rohnert Park, Cotati, Petaluma and Sonoma; the Town of Windsor; North Marin Water District and Valley of the Moon Water District, hereinafter the Contractors) under the Restructured Agreement for Water Supply (Restructured Agreement), and to other customers under individual governing agreements.

The Russian River System includes Lake Mendocino, Lake Sonoma, six Raney collectors and seven conventional wells located in the gravels of the Russian River, at Wohler and Mirabel near Forestville. The Raney collectors and wells divert river underflow for potable supply. Lake Sonoma and Lake Mendocino provide primary diversions for the Russian River system and their combined storage for water supply is in excess of 300,000 AF (97,750 MG). The Agency currently has rights to divert and re-divert up to 75,000 AFY (24,438 MGY) from the Russian River System. In 1998, the Agency completed an EIR for its Water Supply and Transmission System Project (WSTSP) to increase these diversion rights up to 101,000 AFY (32,911 MGY) and to construct improvements to its transmission and storage system. In 2003, as a result of challenges and an eventual decision by the Court of Appeals, the Agency vacated certification of this EIR. The status of proposed improvements to the Agency's supply is discussed in this section under the subheading, Planned Improvements to the Agency Water Supply.

Agreements for Agency Water Supply and Transmission Capacity

The Agency and the Contractors currently operate under the Restructured Agreement. The Restructured Agreement defines how water is allocated among the Contractors. Section 3.5 of the Restructured Agreement also defines how water supply and transmission system capacity would be allocated in case of shortage. The City is entitled to 1,520 AFY (495 MGY), with a maximum monthly average delivery rate of 3.8 MGD under the Restructured Agreement.

The Restructured Agreement also provides for additional investments in alternative water supplies (conservation and recycling) and in watershed restoration activities to benefit the Russian River System.

Because the Agency has been unable to construct certain upgrades to its transmission system that allow it to meet peak demands, the Memorandum of Understanding Regarding Water Transmission System Capacity Allocation during Temporary Impairment (the Temporary Impairment MOU) was executed on March 1, 2001 and renewed on June 20, 2006. The Temporary Impairment MOU outlines each Contractor's allocation of transmission system capacity during the peak usage periods of June through September through 2008. The City's maximum monthly average delivery rate under the Temporary Impairment MOU is 1.9 MGD. The Temporary Impairment MOU affects only transmission system capacity and in no way modifies the City's annual volume entitlement of 1,520 AF.

Planned Improvements to the Agency Water Supply [8]

In May 2004, the Agency released a Notice of Preparation (NOP) of a Supplemental EIR for the Water Supply and Transmission System Project (WSTSP): Litigation, Project Updates, Changes in Circumstances and New Information. Based on comments received in response to the NOP and events that have occurred since the WSTSP was approved in 1998, Agency staff recommended to its Board of Directors that the Agency prepare a new EIR to provide the public and decision-makers with an environmental document that not only addresses the deficiencies identified by the Court of Appeals, but also more closely reflects the Agency's and its customers' current water supply circumstances. In November 2004, the Agency's Board adopted a resolution directing the preparation of a new EIR, called the Water Supply, Transmission, and Reliability Project EIR (the Water Project EIR). In February 2005, the Agency released an NOP for the Water Project EIR.

The objective of the Water Project remains similar to the objective of the WSTSP—to provide a reliable water supply to meet the defined current and future needs in the Agency's service area. Because the Water Project EIR is not yet available, this analysis assumes that, at least for the purpose of estimating future costs, the planned improvements will be similar to those identified in the WSTSP EIR. These are described briefly below. Table 3-2 presents the estimated future costs.

Russian River Component: The Russian River Component is likely to include increased diversions from the Russian River and a new permit from the State Water Resources Control Board to allow the increased diversions. The Agency has considered several diversion strategies and at least two capacity options.

New conventional wells or Raney Collectors, which divert water from underflow of the Russian River, are referred to as Aquifer Diversion. Costs for Aquifer Diversion have been estimated for a maximum capacity of 26,000 AFY (8,470 MGY) which is the amount necessary to support a Water Right Increase from 75,000 AFY to 101,000 AFY.

A new Surface Water Treatment Plant (SWT) is another mechanism to support increased diversions. Costs for a SWT have been developed for two capacity sizes 57 MGD and 120 MGD. Both facilities support 26,000 AFY in new diversions. The larger capacity SWT would allow the Agency to reduce diversions through its Raney Collectors and wells by increasing diversions through the SWT.

Transmission System Component: The Transmission System Component is likely to include improvements to transmission pipelines, storage tanks, and pumping facilities. The Transmission System Component has been estimated for a maximum additional capacity of 26,000 AFY including allowances for maximum pumping rates.

[8] Sonoma County Water Agency, Diversion Alternatives Status Update.

Table 3-2: Summary of Cost Estimates for Planned Improvements to Agency Supply[9]

	Project Component			
	Russian River Component			Transmission System Component
	Aquifer Diversion	Surface Water Treatment 1 (57 MGD)	Surface Water Treatment 2 (120 MGD)	
Supply Delivered				
AFY	26,000	26,000	75,000	26,000
MGY	8,470	8,470	24,400	8,470
Estimated Capital Cost	$40 to $70 million	$175 to $225 million	$275 -$375 million	$130 to $140 million
Estimated Operational Cost	$2.9 to $3.0 million	$6.2 to $8.3 million	$9.6 to $14.9 million	Included with supply
Year of Estimate	2001	2001	2001	2001
ENR CCI for Year of Estimate	6,343	6,343	6,343	6,343
ENR CCI Base for this Study	7,400	7,400	7,400	7,400
Escalated Capital Cost	$47 to $82 million	$204 to $262 million	$321 to $438 million	$152 to $163 million
Escalated Operational Costs	$3.4 to $3.5 million	$7.2 to $9.7 million	$11.2 to $17.4 million	Included with supply
Cost per MG	$2,295	$4,414	$6,228	Included with supply

3.4 Local Groundwater Supply

As noted above, the City modified its water supply management strategy in the 1990s in order to increase its use of Agency supply and utilize its groundwater supply to meet peak demands and for emergency situations. The City is not planning to expand its local groundwater well network. Investments in the groundwater supply system will be to support continued use of the current capacity and not to provide new capacity to the system.

3.5 Water Conservation

The City's 2005 UWMP provides the most current assessment of measurable reduction in water use due to water conservation from implementation of the California Urban Water Conservation Council's Best Management Practices (BMPs). The 2005 UWMP also provides an analysis of additional conservation activities, beyond the fourteen BMPs. The IRWP, described in Chapter 2, projects a 450-1,000 AFY (150-300 MGY) level of indoor water conservation, by 2020, as part of an overall strategy to manage wastewater flows.

As the managing partner and largest contributor to the Subregional System, Santa Rosa has been working to implement water conservation strategies since the mid-1990s. This experience provides Santa Rosa with a significant database in order to analyze the effectiveness and cost of various conservation programs. Based on the cost of its most recent water conservation efforts, Santa Rosa anticipates that an initial capital investment of approximately $9,000/AF is required. Annual operating costs are estimated at $100/AF. These costs are carried forward into Table 3-3

[9] Sonoma County Water Agency, Diversion Alternatives Study Update

in order to provide the City with an estimate of long term budgetary cost of Water Conservation and in order to provide for economic comparisons between the various water supply strategies.

Table 3-3: Summary of Cost Estimates for Planned Water Conservation

Supply Delivered	
AFY	131
MGY	43
Estimated Capital Cost	$1,179,000
Estimated Operational Cost	$13,100
Year of Estimate	2005
ENR CCI for Year of Estimate	7,400
ENR CCI Base for this Study	7,400
Cost per MG	$2,088

3.6 Recycled Water

The Subregional System's current facilities deliver recycled water to the Rohnert Park Urban Reuse system, directly north and east of the City, to Gallo Vineyards south of the City and to one irrigation customer on West Sierra Avenue, outside of the City limits but within its UGB.

As noted in Chapter 2, the IRWP Master Plan included urban reuse in Cotati within its Alternative 3. Since the completion of the IRWP Master Plan, the City of Sana Rosa has developed a Feasibility Study of urban reuse with its Urban Growth Boundary and documented a four-phase urban reuse project. As part of implementing the IRWP Master Plan, the Subregional system has requested that the City of Cotati provide information on the amount of recycled water it would like to use pursuant to the Subregional System Agreement. This document will analyze the potential for recycled water use in Cotati in order to assist the City with its water supply planning and to inform its response to the Subregional System.

Chapter 4 Market Assessment

4.1 Introduction

This chapter describes the methodology used to identify potential recycled water customers and quantifies the recycled water market in the City. Specifically, this chapter:

- Identifies potential recycled water customers and organizes those customers in a manner that facilitates decision making;
- Quantifies potential demand for recycled water in annual totals by customer class and size.

4.2 Identification & Classification of Potential Customers

Potential recycled water customers were identified through the use of a GIS database (the Demand Database) that includes all the irrigation meters in the City, their location expressed by both site address and assessor parcel number, historic water demands based on City billing records and estimated water budgets, when these were available.

To analyze discrete market segments and assist the City in making decisions related to future service, potential customers were classified using criteria related to water use patterns and potential customer service needs. These criteria are described below.

Potable Offset Potential

The Market Assessment focused on potential recycled water customers that offset potable water demand (i.e. reduce demand for potable water supply). The City's water utility will receive benefit from an urban reuse project that provides recycled water to offset and supplement potable water, thus creating a new supply of potable water. Potable offset customers were identified by focusing on the City's customers with dedicated irrigation meters.

This exercise identified 109 potential recycled water customers with a total potable offset of 52.4 MGY (approximately 161 AFY). The City's UWMP identifies recycled water deliveries of approximately 10 MGY (30 AFY) which is just under 20% of the total market.

Customer Organization & Decision Structure

Effective management of the recycled water resource, especially by irrigation users, requires an ongoing dialogue between the recycled water supplier and the end user. To assure the most effective systems are put in place to guarantee this dialogue, the Market Assessment distinguishes irrigation users based on the customers' organization including internal decision structures, information needs and need for ongoing programmatic support.

Commercial/Industrial Landscapes

Commercial and Industrial (C/I) landscapes are typically managed professionally, which could provide the City with a ready point of contact that could serve as Site Supervisor to assist in implementing recycled water program requirements. While these landscapes are typically open to the public, the level of public access is frequently low as the landscape is often intended as an

aesthetic enhancement rather than a recreational amenity (private golf courses would be an exception). In compliance with City policy, most of these customers have dedicated landscape meters, meaning that the irrigation system is already separated from the domestic water system which facilitates conversion to recycled water. Rate incentives could be an effective tool for this class of customer.

The Demand Database includes 56 C/I customers with a total demand of 10.5 MGY, or approximately 20% of the total market. The C/I customers are concentrated in the areas of the City west of Highway 101. For the purposes of this study, C/I customers are illustrated in red.

Public/Institutional Landscapes

Public and Institutional (P/I) accounts include parks, schools, government complexes, and publicly maintained landscaped open areas. Like commercial and industrial landscapes, these landscapes are typically professionally managed and often plumbed with a dedicated irrigation meter.

Unlike commercial and industrial landscapes, P/I landscapes often have high public access and contain recreational amenities. Therefore, the managers of P/I landscapes must often consider the opinions of their customers when making decisions regarding conversion to recycled water. As such, their decisions could be directed by general public opinion as much as by incentives.

The Demand Database includes 25 P/I customers with a total demand of 26 MGY, or approximately 50% of the total market. The majority of the P/I uses are concentrated on or just beyond The Hub. For the purposes of this study, P/I customers are illustrated in green.

Residential Common Areas

This class includes the common areas associated with apartment complexes, condominium complexes, mobile home parks, and single-family residential developments, with common areas maintained by homeowners' associations. While often professionally managed, decisions about these landscapes typically rest with or could be highly influenced by the residents. As such, regular communication channels could be more challenging to establish because decision-making is more diversified.

This class of customer often requires much more outreach and education regarding recycled water quality and safety to become comfortable with the use of recycled water. However there are many successful examples of recycled water use in residential settings.

The Demand Database includes 28 Residential customers with a total demand of 16 MGY, or approximately 30% of the total market. For the purposes of this study, Residential customers are illustrated in blue.

Customer Size

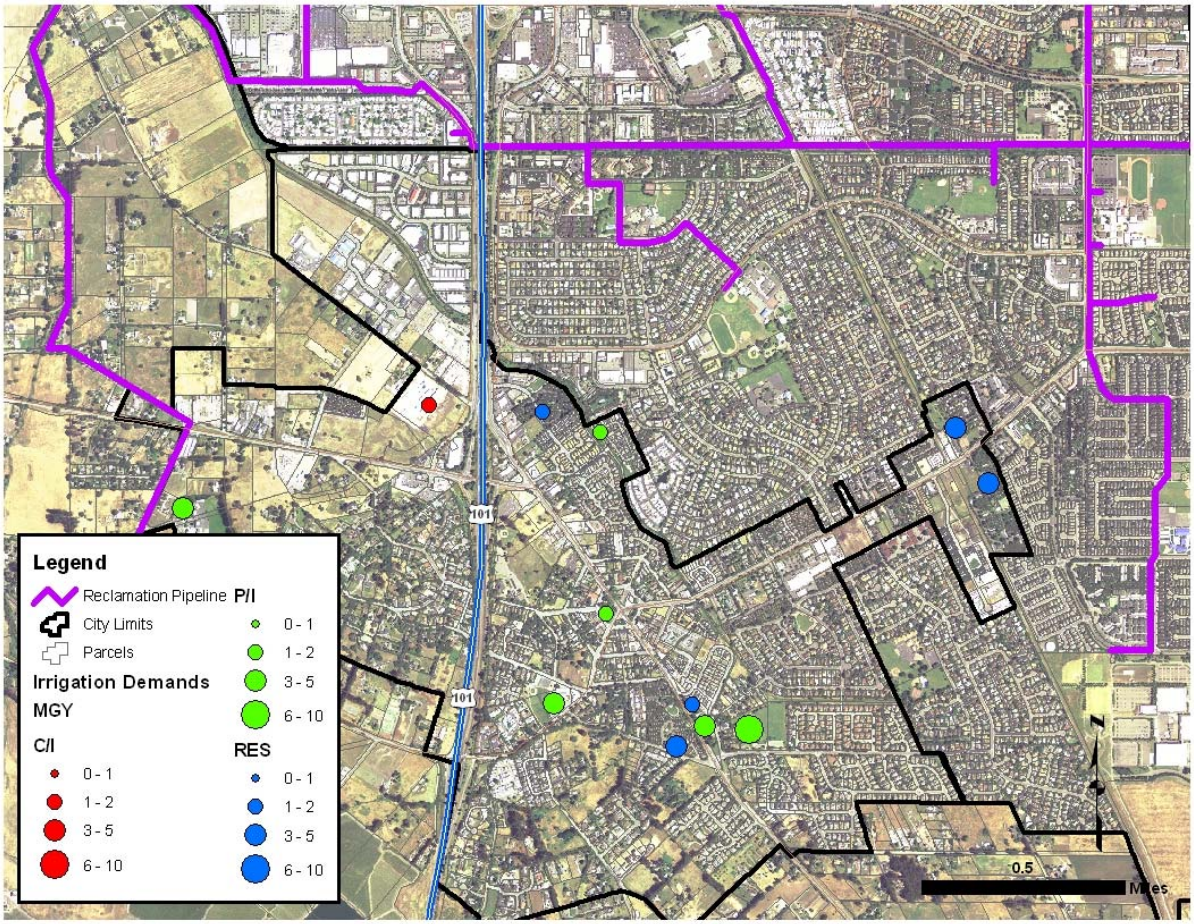
When a recycled water distribution system is developed in an existing urbanized area, it is highly unlikely that all the identified customers would be connected to the system at once. Pipeline extensions to serve small, remote customers are very expensive and requirements for site supervision and monitoring are far more efficient when they can be focused on relatively large customers, or customers in tight clusters, rather than upon multiple, scattered, small customers.

For the purpose of analyzing the "efficiency" of alternative recycled water systems, customers were classified by size, as described below. Large Customers and Large Groups of customers can "anchor" a recycled water distribution system and justify the economic decision to extend the system.

Large Customers

For the purpose of this analysis, a "Large Customer" is defined as single customer with a demand of over 1.0 MGY. Figure 4-1 illustrates the large customers in the City; the color-coding convention indicates the customer classes with red being C/I, green being P/I and blue being residential common areas. There are twelve large customers in the Demand Database. Together these customers include 28 MGY of demand or nearly 60% of the system total. These customers are scattered throughout the City with the largest concentrations occurring near The Hub on P/I landscapes.

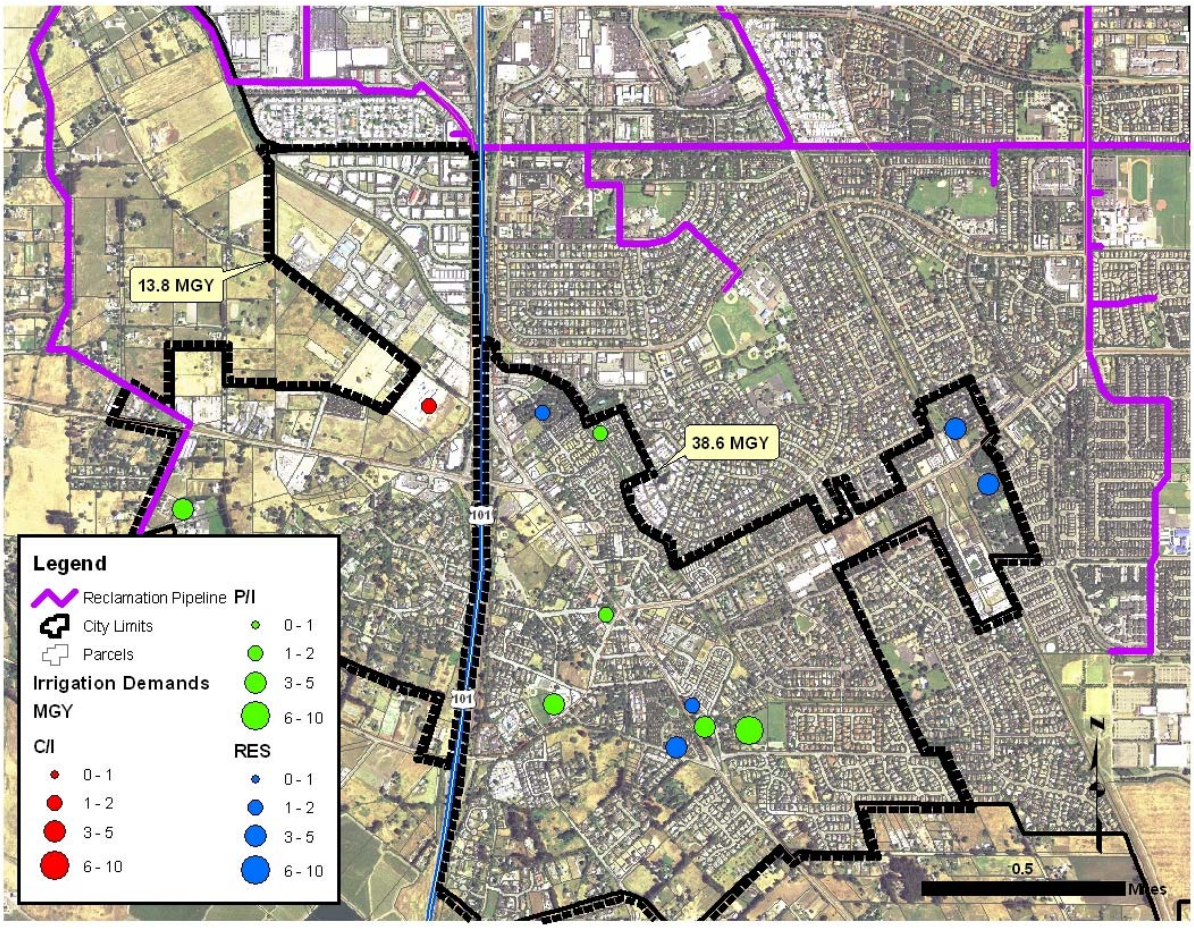
Figure 4-1: Large Customers



Groups of Customers

To assure that the recycled water distribution system could provide adequate hydraulic capacity, customers were mapped so that concentrations of customers could be recognized. Figure 4-2 illustrates the all of the potential customers and reveals, in addition to the concentration around The Hub, another significant group in the northwest portion of the City. The portion of the Study Area west of Highway 101 includes 26% of the total market and almost all the users are within one-half mile of the existing recycled water distribution system.

Figure 4-2: Customer Grouping



Chapter 5 Engineering and Cost Criteria

5.1 Introduction

This chapter describes the engineering criteria and cost assumptions that were used in developing alternatives.

5.2 Cost Estimating Accuracy

The cost estimating approach used in this Study is based on guidelines developed by the American Association of Cost Engineers (AACE). AACE has developed definitions for levels of accuracy commonly used by professional cost estimators. The AACE defined the three levels of cost estimates as *order-of-magnitude, budget,* and *definitive* estimates. The costs presented here are best characterized as order-of magnitude estimates. An order-of-magnitude estimate is made without detailed engineering data. Some examples include:

- An estimate from cost capacity curves
- An estimate using scale-up or scale-down factors
- An approximate ratio estimate

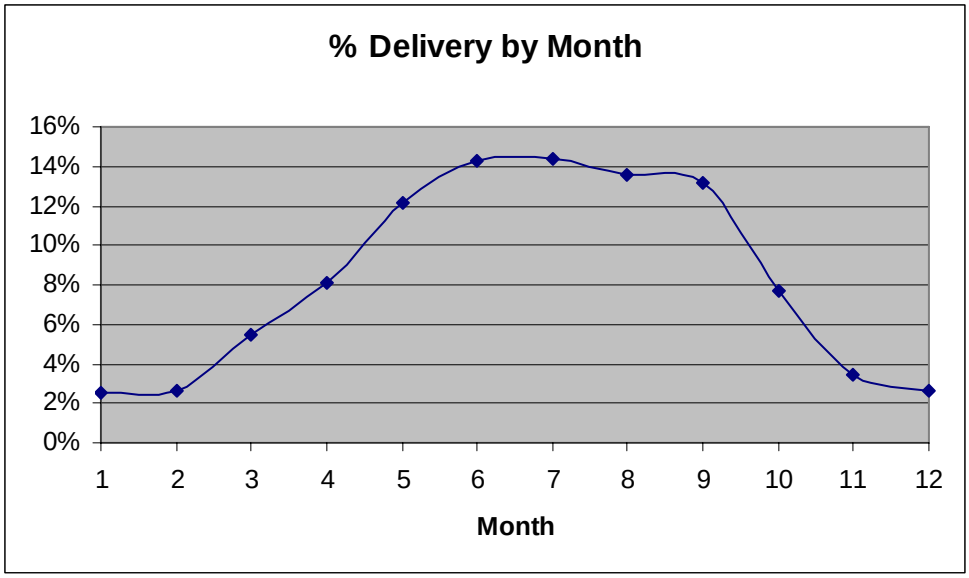
Typically, an order-of-magnitude estimate is prepared *at the end of the schematic design phase* of the design delivery process. It is normally expected that an estimate of this type would be accurate within plus 50 percent to minus 30 percent of the estimated cost.

5.3 Recycled Water Demand Factors

Recycled water demand factors were used to model the peak demands. The peak demand calculation was intended to reflect both seasonal demand variations and daily patterns of use.

The annual water use pattern for the recycled water system was brought forward from the Santa Rosa Urban Reuse Project Feasibility Study. This demand distribution was developed using the average distribution across several thousand dedicated irrigation meters in Santa Rosa, providing a solid sample upon which to base future projections. This water use pattern is illustrated in Figure 5-1.

Figure 5-1: Annual Distribution of Demand



Several alternative analytical tools were used to arrive at an estimate for peak hourly demand including review of monthly evapotranspiration data and review of specific water accounts. Each analysis performed resulted in a peak hourly demand of approximately 10 times the annual daily average demand.

For this analysis, peak hour demand was calculated as follows:

Peak Hour = (Total Annual Demand/365 Days/Year) x 10

An irrigation cycle of 6 hours was used to translate hourly values into daily values (i.e. this analysis assumed that the total daily irrigation demand is delivered in 6 hours). The peak day demand was calculated as shown below. The peak hour is 4 times the peak day.

Peak Day Demand = Peak Hour Demand x 6 hours/24 hours/day

5.4 Engineering and Cost Assumptions

The engineering and cost assumptions presented here are consistent with the Santa Rosa Urban Reuse Project Feasibility Study. The City of Santa Rosa is pursuing predesign studies for the Santa Rosa Urban Reuse Project and both engineering assumptions and cost assumptions may be modified as a result of this work.

Pipeline Sizing and Base Capital Costs

The pipeline network for the Project was sized to distribute the maximum flow expected for each reach or segment in the distribution network. The pipeline design criteria used is summarized in Table 5-1. The minimum and maximum allowable flows for each pipe size were determined based on the peak hourly low rate.

Table 5-1: Pipeline Size and Base Costs

Pipeline Size and Base Costs[1,2]								
Diameter (inches)	Roughness Coefficient (C)	Peak Flow Rate (gpm)		Low Flow		High Flow		Total Capital Costs ($/LF)
		Low	High	HL per 1,000 feet	Velocity (fps)	HL per 1,000 feet	Velocity (fps)	
6	120	Not Modeled						75
8	120	0	700	0	0	8.9	4.5	80
12	120	700	1,736	1.1	2.0	8.2	4.9	110
18	120	1,736	3,968	1.1	2.2	5.3	5	190
24	120	3,968	7,068	1.3	2.8	3.8	5	245
30	120	7,068	10,975	1.3	3.2	2.9	5	280
36	120	10,975	17,361	1.2	3.5	2.8	5.5	350
48	120	17,361	34,102	0.7	3.1	2.4	6	500

Notes:
(1) Prices are based on Engineering News Record's CCI of 7,400.
(2) Base pipeline costs are based on a review of available bid data in Sonoma County.
fps = feet per second
LF = linear feet
HL = head loss

The peak hourly flow rates were calculated by applying the Recycled Water Demand Factors, described above, to the demand data described in Chapter 4.

The pipe sizes were calculated using the Hazen-Williams Formula. Although the type of pipe can affect the friction coefficient for a pipeline, a "C" value of 120 was used for all pipelines because on a long term basis, most pipeline interiors converge on this roughness value.

The sizing of pressure pipelines was based on a combination of head loss (friction) and maximum velocity. A high head-loss rate means that extra pumping would be required. A maximum head loss of 10 feet per 1,000 feet of pipe was used for sizing the pipes.

Velocities in the smaller diameter pipes were kept to a maximum of 5 feet per second (fps) to limit forces and pressures on the pipes. As shown in Table 5-2, the maximum flow allowed in pipe sizes of 12 to 30 inches is controlled by the 5.0-fps maximum velocity. For pipes sized between 30 and 48 inches, the velocity was allowed to gradually increase from 5 to 8 fps.

Costs for pipe sizes ranging from 8 inches to 48 inches in diameter were developed through a review of recent bid data. All costs were adjusted to the CCI of 7,400. Pumping costs were not included in the pipeline costs, but were accounted for separately (see Assumptions Regarding Pump Stations and Costs, below). The capital costs include an allowance for planning, engineering (design), administration, and permitting. These costs were estimated to be 23 percent of the base construction costs.

Although the material selected for a pipeline can affect the cost of the pipeline, this factor was not considered due to the preliminary nature of this Study. Many pipe types were included in the sources and the bids, and all of these pipe types were included in the comparison. Therefore, the estimated costs tend to represent an average cost of the possible materials for each pipe's size. No land-acquisition costs are included in the base pipeline costs.

Land-Use Factors Applied to Base Capital Costs

Land use surrounding the pipeline construction corridor could have a significant impact on installation costs. Pipeline that is constructed in open areas has little or no utility interference or traffic control requirements, whereas construction in urban areas could be significantly complicated by these conditions.

The U.S. EPA published a technical report in 1978 entitled *Construction Costs for Municipal Wastewater Conveyance Systems: 1973-1977*, and then updated this report in 1982. This report includes "cultural modifiers" or multipliers for sanitary sewer construction costs based on surrounding land-use. Previous construction projects have been evaluated with these factors and this evaluation indicates that these factors are useful in developing estimates that closely parallel actual bid data and specific cost estimates prepared for pipelines representing these conditions.

For this analysis, a baseline condition, with a rural or barren land use interface, has a multiplier at 1.00. The EPA category multipliers are then normalized to this baseline condition. No land-acquisition costs are included in the urban or built-up land-use categories because of the assumption that pipelines will be routed within existing public rights-of-way. Because the GIS land uses cover a much wider range of conditions than is covered in the EPA's publications, many of the land-use multipliers have been estimated based on EPA's work and good estimating practices.

Table 5-2 shows a complete listing of the GIS land-use categories and the associated land-use multiplier. An average tunneling cost was assumed for those land uses that would typically require tunneling. Land uses that would typically require tunneling include crossings for creeks, freeways, highways, and railroads. The multiplier for these is 5.33. Areas where construction of a pipeline was considered extremely impractical, if not impossible, were given the highest multipliers of 7.50 or 10.00. A factor that is less than the base factor of 1.00 was used for areas that have been deemed to be favorable for construction of recycled water pipelines. This factor was typically applied to existing pipeline rights –of-way. Following established flood control channels was also favorable, because the land-acquisition costs can be minimal since these areas tend to be publicly owned lands or relatively open areas with minimal potential conflicts from other utility lines.

Table 5-2: Pipeline Land-Use Cost Factors

Land-Use Factors		Freeways/Highways/Railroads	
Description/Item	**Norm. to Rural**	**Description/Item**	**Norm. to Rural**
Urban/Built-Up Land		Freeways	
Residential	1.20	To Cross	5.33
Commercial	1.53	To Follow (Factor Times Underlying Land Use)	0.80
Industrial	1.53	To Cross Freeway Interchanges	10.00
Transportation, Communication	1.53	Highways	
Airports, Transportation Centers	10.00	To Cross	5.33
Mixed/Other Urban	1.35	To Follow (Factor Times Underlying Land Use)	0.80
Agricultural Land (all types)	1.00	Railroads	
Forest and Rangeland (all types)	1.00	To Cross Only	5.33

Land-Use Factors		Freeways/Highways/Railroads	
Description/Item	Norm. to Rural	Description/Item	Norm. to Rural
Water Bodies		Hydrography	
Wetlands	7.50	Rivers	
Creeks	5.33	To Cross	5.33
Bays and Estuaries	7.50	To Follow (Factor Times Underlying Land Use)	1.80
Lakes & Reservoirs	10.00	Creeks	
Open Space	1.00	To Cross	5.33
Unknown	1.00	To Follow (Factor Times Underlying Land Use)	1.80
Barren Lands		Existing Recycled Water Pipelines	
Dry Salt Flats	1.00	Pipelines with No Excess Capacity	0.80
Beaches	5.33	Pipelines with Excess Capacity	0.00
Sandy Areas Other Than Beaches	.75		
Bare Exposed Rock and Tundra	7.00		
Strip Mines, Quarries, and Gravel Pits	1.20		
Transitional Areas	1.20		
Mixed Barren Land	1.20		

Operations and Maintenance Costs

These costs were estimated to be approximately 0.50 percent of the actual construction costs on an annual basis.

Assumptions Regarding Pump Stations and Costs

Capital Costs

The pump station capital cost estimates included construction, engineering, planning, and administration. These costs are estimated to be approximately 23 percent of the total construction cost.

Practically, recycled water service would be provided to the City through a planned upgrade of the Rohnert Park Pump Station located near the intersection of Stony Point Road and Rohnert Park Expressway. For the purpose of this Study's estimates, pump station capital costs were based on new connected horsepower (hp) demands. The following equation was derived based on the above-mentioned sources for the construction cost of a pump station:

Capital cost = $\$15{,}900 \times hp_{peak}^{\;0.68}$

Where:

hppeak = peak brake horsepower (all users on at the same time)

$$= \frac{Q_{peak}[gpm] \times \left(\Delta Elev + h_{L-peak} + P_O\right)}{3956} \times \frac{1}{Efficiency}$$

Where:

Efficiency = 75 percent (wire to water)

Elev +hL-peak +PO = total head in pipeline segment (feet)

PO = Initial or boosting pressure

hL-peak= friction loss under peak flow rate along pipeline based on Hazen-Williams Formula

$$= \frac{10.44 \times L \times \left(\frac{Q_{peak}[AFY]}{1.6128} \right)^{1.85}}{C^{1.85} \times Diam[in]^{4.8655}}$$

Where:

L = Length of pipeline in feet

C = 120 (Hazen-Williams Coefficient for friction)

Diam = the pipe diameter in inches based on the peak flow rate

Operation and Maintenance Costs

O&M costs included labor, equipment replacement, and electrical power usage. Annual expenditures for labor and equipment replacement were based on the initial construction cost of the pump station. The following equation was used to estimate the annual O&M labor and equipment replacement costs ($O\&M_{LE}$) for each pump station:

Annual O&MLE = $10,600 + 3 percent of construction costs

Electrical costs for pumping were estimated by applying the average flow for the network over a 24-hour period of operation. Because the landscape irrigation users tend to be seasonal users and are expected to operate only about six months of the year, electrical costs for pumping were computed under peak conditions. Under the peak condition, it was assumed that all users would be using recycled water for 6 months, and electrical pumping costs were computed on that basis. Electrical costs were computed by using the following annualized equations, which were prorated for the 6-month period:

Assumed cost for electricity = $0.10/kilowatt-hour

Annual electrical cost = $$\$0.10 \times hp_{ave} \times 24hrs \times Time \times 0.7457 \frac{kw-hr}{hp}$$

Where:

Time = 6 months

hpave = the average brake horsepower

$$= \frac{Q_{avg}[gpm] \times (\Delta Elev + h_{L-avg} + P_O)}{3956} \times \frac{1}{Efficiency}$$

$$= \frac{Q_{avg}\left[AFY\right]/1.6128 \times (\Delta Elev + h_{L-avg} + P_O)}{3956} \times \frac{1}{0.75}$$

Where:

Qavg = average flow

HL-avg = friction loss along pipeline based on Hazen-Williams formula

Chapter 6 Project Alternatives

6.1 Introduction

This chapter summarizes the techniques used to analyze various alternatives for implementing a recycled water Project in the City. This chapter discusses:

- Common Recycled Water Project Components
- Alternative Recycled Water Projects
- Alternative Analysis and Recommendations

6.2 Common Recycled Water Project Components

The Subregional System has conceptually developed a range of urban reuse projects in its IRWP. In addition, Santa Rosa has been actively planning an urban reuse project within its UGB that ranges in size from up to 1,000 MGY. As a result of these activities, a range of improvements that are necessary to allow the existing Subregional System facilities to effectively deliver high quality recycled water for urban use have been identified. Because the City is located directly adjacent to the existing Rohnert Park Urban Reuse System and because its potential demands are so small compared to the overall planning effort, work performed as part of the IRWP and for the Santa Rosa Urban Reuse Project provide important information regarding the baseline improvements that will be necessary to allow the existing facilities to effectively serve expanded urban reuse in Cotati.

Recycled Water Source Improvements

The Subregional System distributes recycled water produced by the Laguna WRP to the reclamation system storage ponds and distribution piping (where it is used for agricultural or urban reuse), and to the Geysers Pipeline (GPL). The Subregional System's Rohnert Park Urban Reuse System begins at the intersection of Stony Point Road and Rohnert Park Expressway. Recycled water from the Laguna WRP is delivered through an 18-inch-diameter low-pressure distribution system that dead-ends at the Fox Tail Golf Course (the low-pressure system) and the high-pressure system that includes the Poncia Pump Station, screen filters, and a 24-inch-diameter transmission main that extends along Copeland Creek to Snyder Lane; from here a 14-inch diameter main continues to Sonoma State University. The high pressure system also provides seasonal deliveries to the Gallo Vineyard utilizing an 18-inch pipeline along the City's western limit (see Figure 6-1).

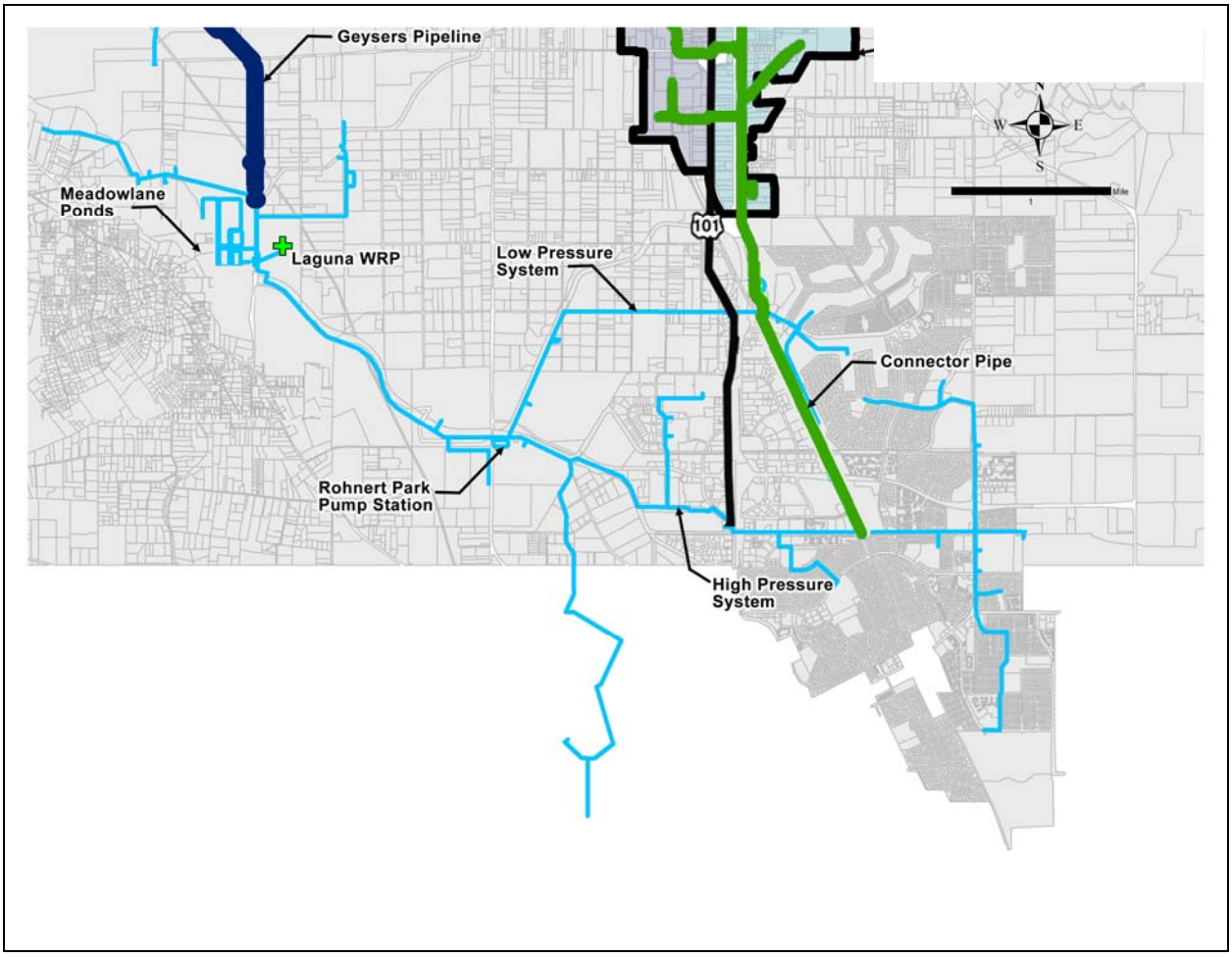
Capacity Determination

An analysis of the existing Rohnert Park Urban Reuse System was performed using H2ONet and is included in Appendix 1. The conclusion was that from 3,000 to 7,000 gpm (approximately 4 to 10 MGD) could be supplied through the existing low and high pressure systems to Cotati. This flow is time dependent, because there are existing users on the Rohnert Park Urban Reuse System.

The overall system would be maximized by adding a 7,700 ft connector pipe, and a between the low-pressure and high-pressure systems, and a diurnal storage tank as indicated on Figure 6-1. This would maximize the ability to serve new recycled water users in Rohnert Park, south Santa Rosa and/or the City. The existing hydraulic capacity of the Rohnert Park Urban Reuse System, coupled with current demands on this system, effectively limits the new capacity that can be developed through the Rohnert Park Urban Reuse System to 1,000 MGY, which is sufficient to serve the demands identified for Rohnert Park and the City in the IRWP Master Plan and over one-half of the Santa Rosa Urban Reuse System as outlined in the Santa Rosa Urban Reuse Feasibility Study. The recycled water source improvements, described below, are estimated assuming 1,000 MGY of capacity will ultimately by developed.

Additionally, the Subregional System would undertake a planned expansion of the Rohnert Park Pump Station to install additional pumping capacity.

Figure 6-1: Rohnert Park Source Improvements



Polishing Treatment

As noted in Chapter 2, The Laguna WRP is a tertiary treatment plant with a rated capacity of 21.3 MGD. The current average dry weather flow of the plant is approximately 16 MGD. The Geysers Steamfield utilizes a constant 11 MGD, leaving 5 MGD of "fresh effluent" from the Laguna WRP to meet irrigation demands. Much of this 5 MGD is taken by the flows to the

existing Rohnert Park Urban Reuse System. Any other flow must come from storage, which is located west of the Laguna WRP in the Meadowlane Ponds. An initial review of the effluent quality from the Meadowlane Ponds indicates that late irrigation season water quality is not adequate to supply urban users primarily because of algal growth that occurs in the stored water, which clogs irrigation systems. In addition, because the Laguna WRP uses ultraviolet light for disinfection, the recycled water does not have residual chlorine, which can prevent bacteriological re-growth in the distribution system. The Subregional System is currently installing a chlorination system for the Rohnert Park Urban Reuse System to reduce regrowth and improve water quality within the Rohnert Park Urban Reuse System.

Because of issues related to algae and bacteriological re-growth, the Subregional System has budgeted for polishing treatment for this source. For the purposes of developing costs, the conceptual polishing treatment system would include:

- A pipeline from the Meadowlane Ponds to the Laguna WRP;
- Installation of dissolved air floatation thickening (DAFT) to remove algae;
- Installation of polishing filters;
- Installation of a sodium hypochlorite disinfection system.

Depending on the actual water quality in the Meadowlane Ponds, it may be possible to eliminate the DAFT and to utilize existing wet-weather filter capacity in-lieu of new polishing filters.

Diurnal Storage

A diurnal storage tank would be utilized to store treated recycled water prior to delivery into the distribution system. For the purpose of developing costs, the storage tank was sized to be filled at the Peak Day flow rate and emptied at the Peak Hour flow rate. Diurnal storage is less costly than sizing transmission facilities to meet peak hour demand. Appendix 2 provides the sizing calculations. Diurnal storage was estimated at $1.00 per constructed gallon.

Transmission Pipeline

As described above under Capacity Analysis, a transmission pipeline that connects the low-pressure and high-pressure systems would be required. This pipeline has been sized as a 24-inch diameter pipeline to maximize the capacity available through the Rohnert Park Urban Reuse System.

Cost Summary

Table 6-1 shows the design quantities and costs necessary to upgrade the existing Subregional System facilities to serve new urban demands for high quality recycled water. The data was developed in the Feasibility Study for the Santa Rosa Urban Reuse Project. The City's maximum market demand of 52 MGY is quite small in comparison to Santa Rosa's demand of 1,000 MGY (52 MGY/1000 MGY = 5.2%). This incremental increase in demand can be accommodated within the engineering design tolerances of the various facilities. However, because the City would be using capacity, it would need to contribute to the cost of these facilities in proportion to the demand it placed upon them or as agreed upon between the entities.

Table 6-1: Summary Cost Estimate Subregional System Source Improvements[10]

Capital Costs Subregional System Improvement for 1000 MGY System					
Item No	**Item**	**Quantity**	**Unit**	**Unit Cost**	**Total Item Cost**
Polishing Treatment					
1	30 " Pipeline from Storage	1700	LF	$355	$603,500
2	Dissolved Air Flotation	1	LS	$2,873,281	$2,873,281
3	Conventional Filters	1	LS	$5,488,397	$5,488,397
4	Yard Piping	1	LS	$202,389	$202,389
5	Yard Electrical	1	LS	$796,806	$796,806
6	Sitework	1	LS	$468,044	$468,044
7	Diurnal Storage Tank	3.8	MG	$1,000,000	$3,800,000
8	Upgrades at Oakmont	0	LS	$2,710,000	$0
9	Satellite Treatment Facilities	0	LS	$9,386,000	$0
Transmission Pipeline					
11	24" Diameter	7700	LF	$245	$1,886,500
12	Poncia Pump Station Upgrade	1	LS	$800,000	$800,000
Subtotal Subregional System Improvements					**$40,650,000**

Seasonal Storage

The Subregional System uses seasonal storage to hold recycled water during the period of the year when supply exceeds demand for use when demand exceeds supply. The Subregional System currently has sufficient seasonal storage capacity to accommodate its existing recycled water users. However, additional seasonal storage may be required to accommodate new users. This analysis is based on the assumption that any new water recycling program would need to construct 0.625 gallons of storage for each new gallon of demand. The Subregional System has a high degree of hydraulic flexibility, which means that new seasonal storage facilities would not need to be constructed adjacent to new demands.

Because of this high degree of hydraulic flexibility, seasonal storage costs are a common cost to all recycled water networks developed to serve the urban reuse identified in the IRWP Master Plan and EIR.

The IRWP Master Plan presented a range of costs for storage depending on the location. This Study assumes a unit cost of $54,000 per MG which reflects the IRWP Master Plan unit cost of $52,000 per MG adjusted to 2006 dollars.

The Water Balance Model developed for the IRWP Master Plan revealed that, on the average, 5 gallons of seasonal storage would be required for each 8 gallons of new demand. This ratio was applied to all of the new demands for the urban system.

Distribution System Storage

This Study does not include a specific analysis of storage tanks within the recycled water distribution system.

[10] Santa Rosa Urban Reuse Project Feasibility Study, Appendix H, Alternative 1B with upsized transmission main.

Customer Connections

In order to deliver recycled water to new customers, the various customer sites must be retrofitted to comply with Title 22. Because all of the customers under consideration in this Study currently receive water through dedicated irrigation systems, it is unlikely that new onsite water systems will need to be constructed. However, the recycled water system operator will need to conduct a cross connection survey at each site (to assure that there are no connections between the potable water system and the irrigation system). It is likely that most sites will need some level of modifications to prevent overspray and runoff of recycled water and to assure compliance with Title 22 (e.g. picnic tables, barbeques, play equipment etc, may need to be relocated).

Site retrofit costs have been estimated at:

- $2,000 per AFY for sites using less than 3 AFY;
- $1,000 per AFY for sites using between 3 and 30 AFY;
- $500 per AFY for sites using over 30 AFY.

Chapter 7 provides additional information on the various entities that could ultimately operate the recycled water system and coordinate customer connections and service.

Operations and Maintenance Costs

In addition to capital costs, each alternative would have long term operational and maintenance costs. These would include the costs of treatment plant operations and maintenance, the cost of pipeline maintenance, pumping costs and program oversight costs.

The annual operations and maintenance cost for polishing treatment facilities at the Laguna WRP were estimated at 5 percent of the construction cost of the polishing treatment facilities.

Transmission pipeline operations and maintenance have been estimated at 1.5 percent of the construction cost. As indicated in Chapter 5, distribution system operations & maintenance costs have been estimated at 0.5 percent of the construction costs and pumping costs have been estimated based on horsepower used.

To estimate the level of staffing necessary to manage an urban recycled water program, several of the larger programs in northern California were contacted. In general, the program staffing requirements (over and above basic operational and maintenance requirements) were 0.5 FTEs for each 100 MGY delivered. Each FTE was estimated to have a cost of $100,000 annually.

6.3 Alternative Recycled Water Projects

The engineering criteria described in Chapter 5 were utilized to develop six alternative recycled water projects. Each project included the “common” source and seasonal storage improvements described above as well as in-city pipelines that would deliver recycled water to the users and retrofits necessary to allow users to accept recycled water.

These alternatives are described and illustrated below. Estimated costs are presented with each alternative. The convention established in Chapter 4, Market Assessment is followed here: C/I

users are illustrated with red dots; P/I users are illustrated with green dots; and residential users are illustrated with blue dots.

Alternative 1 Thomas Page School

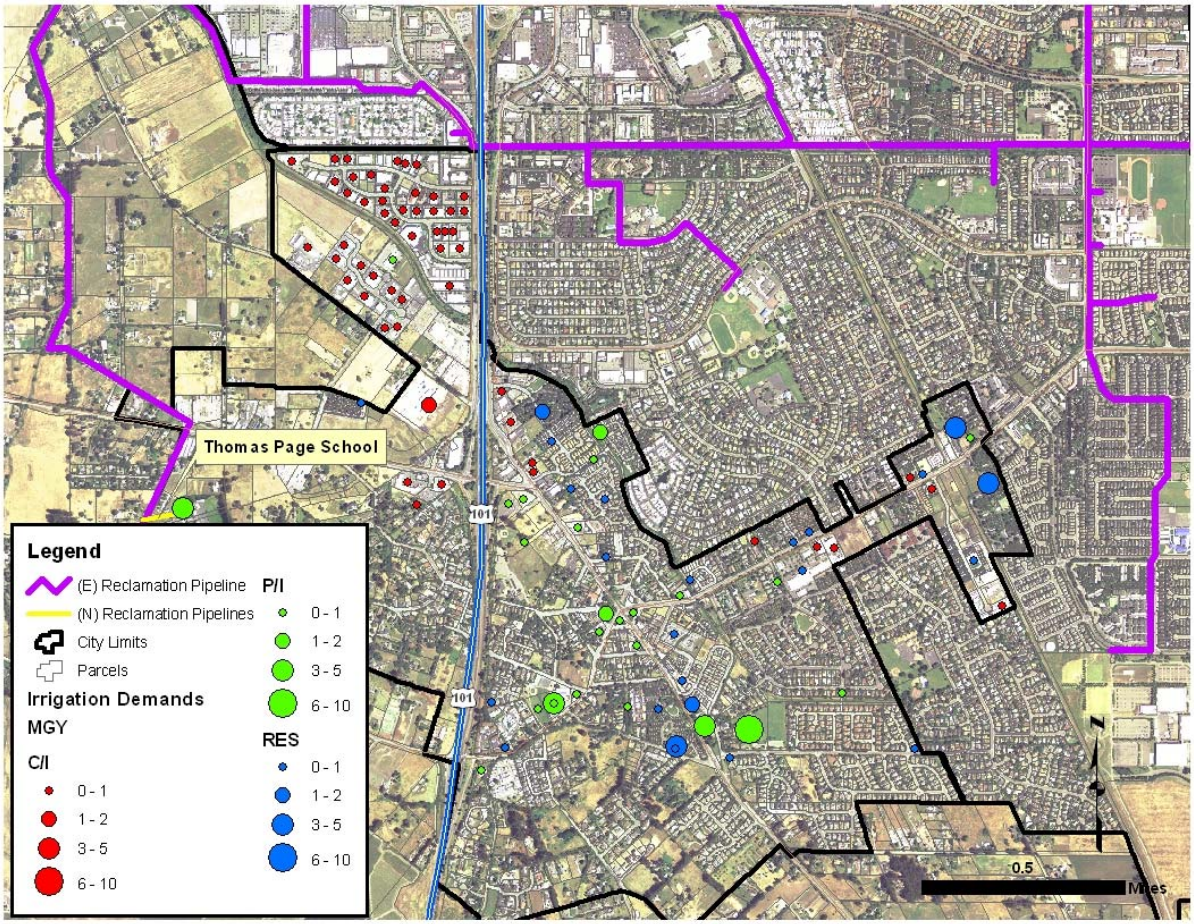
This project alternative would deliver 4.1 MGY (12.55 AFY) to one customer, Thomas Page School, located near the western City limits. Recycled water would be delivered through a connection to the existing recycled main in Madrone Avenue that provides service to the Gallo Vineyard property. Recycled water in this main is pressurized at the Rohnert Park Pump Station and hence has adequate pressure to serve urban needs. The customer could be served by a relatively small pipeline, sized at 6-inches in diameter for estimating purposes. The cost of this project alternative is estimated to be approximately $485,000 and is detailed in Table 6-2. Figure 6-2 illustrates this alternative.

Table 6-2: Summary Cost Estimate Alternative 1 Thomas Page School

Alternative 1					
Thomas Page School					
Demand in Million Gallons Per Year			4.1		
Demand in Acre Feet Per Year			12.6		
Peak Hour Demand (GPM)			80		
Peak Day Demand (GPM)			20		
% of Total Market Demand			7.82%		
% of UWMP Target			41.96%		
Capital Costs Subregional System Improvement for 1000 MGY System					
Item No	**Item**	**Quantity**	**Unit**	**Unit Cost**	**Total Item Cost**
Polishing Treatment					
1	30 " Pipeline from Storage	1700	LF	$355	$603,500
2	Dissolved Air Flotation	1	LS	$2,873,281	$2,873,281
3	Conventional Filters	1	LS	$5,488,397	$5,488,397
4	Yard Piping	1	LS	$202,389	$202,389
5	Yard Electrical	1	LS	$796,806	$796,806
6	Sitework	1	LS	$468,044	$468,044
7	Diurnal Storage Tank	3.8	MG	$1,000,000	$3,800,000
8	Upgrades at Oakmont	0	LS	$2,710,000	$0
9	Satellite Treatment Facilities	0	LS	$9,386,000	$0
Transmission Pipeline					
11	24" Diameter	7700	LF	$245	$1,886,500
12	Rohnert Park Pump Station Upgrade	1	LS	$800,000	$800,000
Subtotal Subregional System Improvements					**$40,650,000**
Cost Share of Subregion System Improvements*					**$166,665**
Capital Costs for in-City Improvements and Storage					
Distribution Pipelines					
13	6" Diameter	1000	LF	$75	$75,000
14	8" Diameter		LF	$80	$0
15	12" Diameter		LF	$110	$0
16	18" Diameter		LF	$190	$0
17	24" Diameter		LF	$245	$0
18	Land Use Corrections	1	LS	$0	$0
Subtotal					**$75,000**
Seasonal Storage					
19	Seasonal Storage Pond	2.56	MG	$54,100	$138,631
Subtotal					**$138,631**
User Site Retrofits**					
20	Volume delivered on sites using up to 3 AFY		AFY	$2,000	$0
21	Volume delivered on sites using between 3 and 30 AFY	12.6	AFY	$1,000	$12,587
22	Volume delivered on sites using over 30 AFY		AFY	$500	$0
Subtotal					**$12,587**
Budgetary Contingency		**23**	**%**		**$90,363**
Total Capital Costs					**$483,246**
Treatment O&M					$2,918
Transmission System O&M					$116
Distribution System O&M					$375
Pumping Costs					$287
Program Costs					$2,050
Total O&M Costs					**$5,746**
Total Annual Cost/MG (capital cost amortized for 30 years + O&M)					**$9,100**

* The City's Cost Share of the Subregional System Improvements is estimated by dividing the demand served by this alternative by the 1,000 MGY design capacity of the Santa Rosa Urban Reuse Project

Figure 6-2 Alternative 1 Thomas Page School



Alternative 2 Westside System

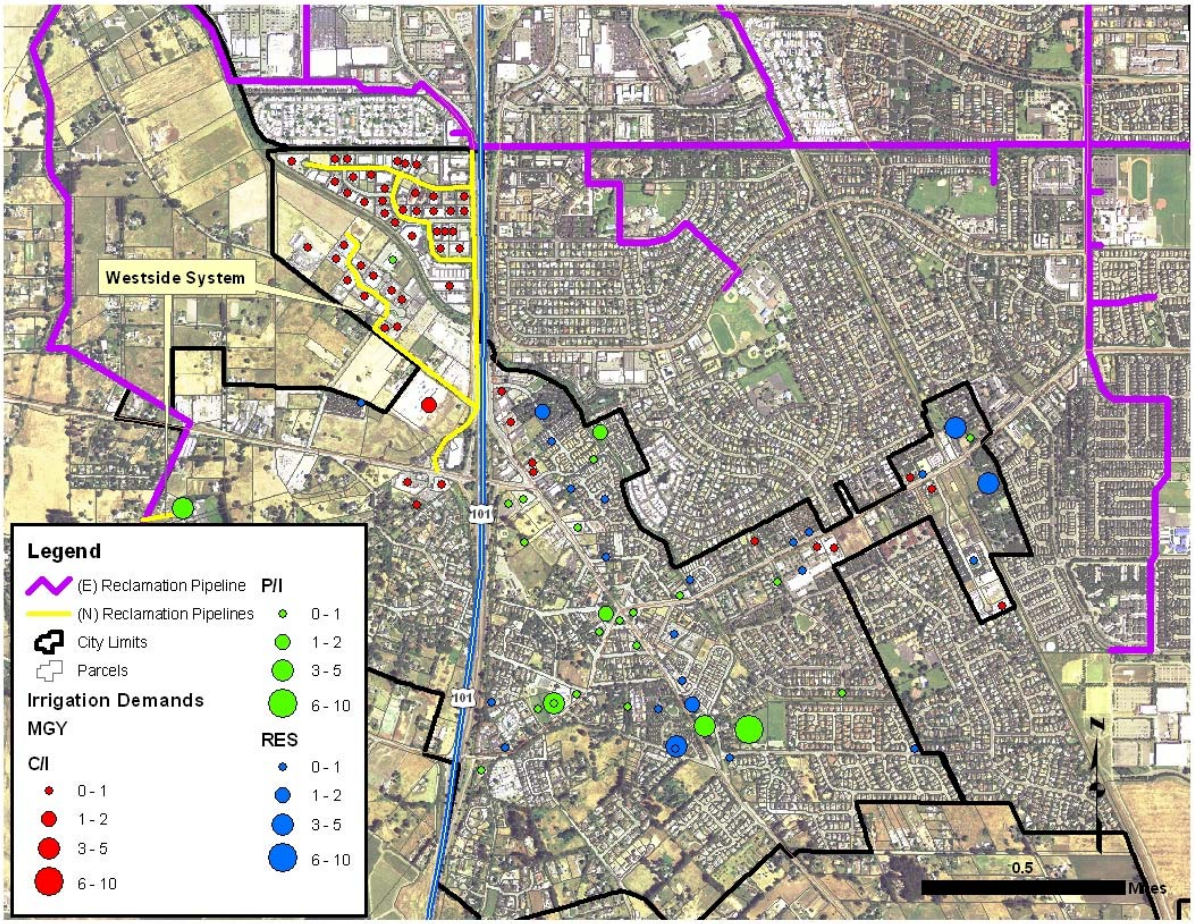
This project alternative would deliver 13.8 MGY (42.4 AFY) to approximately 46 customers, the majority of which are C/I irrigation accounts. The system includes delivery to Thomas Page School, as described above. In addition to the Madrone Avenue turnout, recycled water would be delivered into the northwest area of the City through a turn-out from 24-inch recycled water pipeline in the Copeland Creek right-of way, which it part of the Rohnert Park Urban Reuse System. A recycled water delivery pipeline (estimated at 8-inches in diameter) would be extended down Redwood Drive to State Highway 116. Recycled water distribution mains (estimated at 6-inches in diameter) would be extended up Portal Street, Aaron Street and Helman Lane to Blodget Street in order serve C/I irrigation demands. The cost of this project alternative is estimated to be approximately $2,846,000 and is detailed in Table 6-3. Figure 6-3 illustrates this alternative.

Table 6-3: Summary Cost Estimate Alternative 2 Westside System

Alternative 2 Westside System					
Demand in Million Gallons Per Year			13.8		
Demand in Acre Feet Per Year			42.4		
Peak Hour Demand (GPM)			269		
Peak Day Demand (GPM)			67		
% of Total Market Demand			26.34%		
% of UWMP Target			141.22%		
Capital Costs Subregional System Improvement for 1000 MGY System					
Item No	**Item**	**Quantity**	**Unit**	**Unit Cost**	**Total Item Cost**
Polishing Treatment					
1	30 " Pipeline from Storage	1700	LF	$355	$603,500
2	Dissolved Air Flotation	1	LS	$2,873,281	$2,873,281
3	Conventional Filters	1	LS	$5,488,397	$5,488,397
4	Yard Piping	1	LS	$202,389	$202,389
5	Yard Electrical	1	LS	$796,806	$796,806
6	Sitework	1	LS	$468,044	$468,044
7	Diurnal Storage Tank	3.8	MG	$1,000,000	$3,800,000
8	Upgrades at Oakmont	0	LS	$2,710,000	$0
9	Satellite Treatment Facilities	0	LS	$9,386,000	$0
Transmission Pipeline					
11	24" Diameter	7700	LF	$245	$1,886,500
12	Rohnert Park Pump Station Upgrade	1	LS	$800,000	$800,000
Cost Share of Subregion System Improvements*					**$40,650,000**
					$560,970
Capital Costs for in-City Improvements and Storage					
Distribution Pipelines					
13	6" Diameter	6,000	LF	$75	$450,000
14	8" Diameter	8,000	LF	$80	$640,000
15	12" Diameter		LF	$110	$0
16	18" Diameter		LF	$190	$0
17	24" Diameter		LF	$245	$0
18	Land Use Corrections	1	LS	$128,000	$128,000
Subtotal					**$1,218,000**
Seasonal Storage					
19	Seasonal Storage Pond	8.63	MG	$54,100	$466,613
Subtotal					**$466,613**
User Site Retrofits**					
20	Volume delivered on sites using up to 3 AFY	26.2	AFY	$2,000	$52,312
21	Volume delivered on sites using between 3 and 30 AFY	16.21	AFY	$1,000	$16,210
22	Volume delivered on sites using over 30 AFY		AFY	$500	$0
Subtotal					**$68,522**
Budgetary Contingency		**23**	**%**		**$532,244**
Total Capital Costs					**$2,846,349**
Treatment O&M					$9,820
Transmission System O&M					$391
Distribution System O&M					$6,090
Pumping Costs					$966
Program Costs					$6,900
Total O&M Costs					**$24,167**
Total Annual Cost/MG (capital cost amortized for 30 years + O&M)					**$15,200**

* The City's Cost Share of the Subregional System Improvements is estimated by dividing the demand served by this alternative by the 1,000 MGY design capacity of the Santa Rosa Urban Reuse Project

Figure 6-3: Alternative 2 Westside System



Alternative 3 Eastside Gateway System

Similar to Alternative 1, this project alternative would capitalize on the proximity of several large irrigation users to existing recycled water pipelines. This alternative would deliver 6.16 MGY (19.0 AFY) to three irrigation customers near the eastern City limits. Recycled water would be delivered from a turn-out on the existing recycled water main in Snyder Lane. An 8-inch recycled water line would be extended along East Cotati Avenue to the Sunflower Drive/Windmill Farms area. The cost of this project alternative is estimated to be approximately $942,000 and is detailed in Table 6-4. Figure 6-4 illustrates this alternative.

Table 6-4: Summary Cost Estimate Alternative 3 Eastside Gateway System

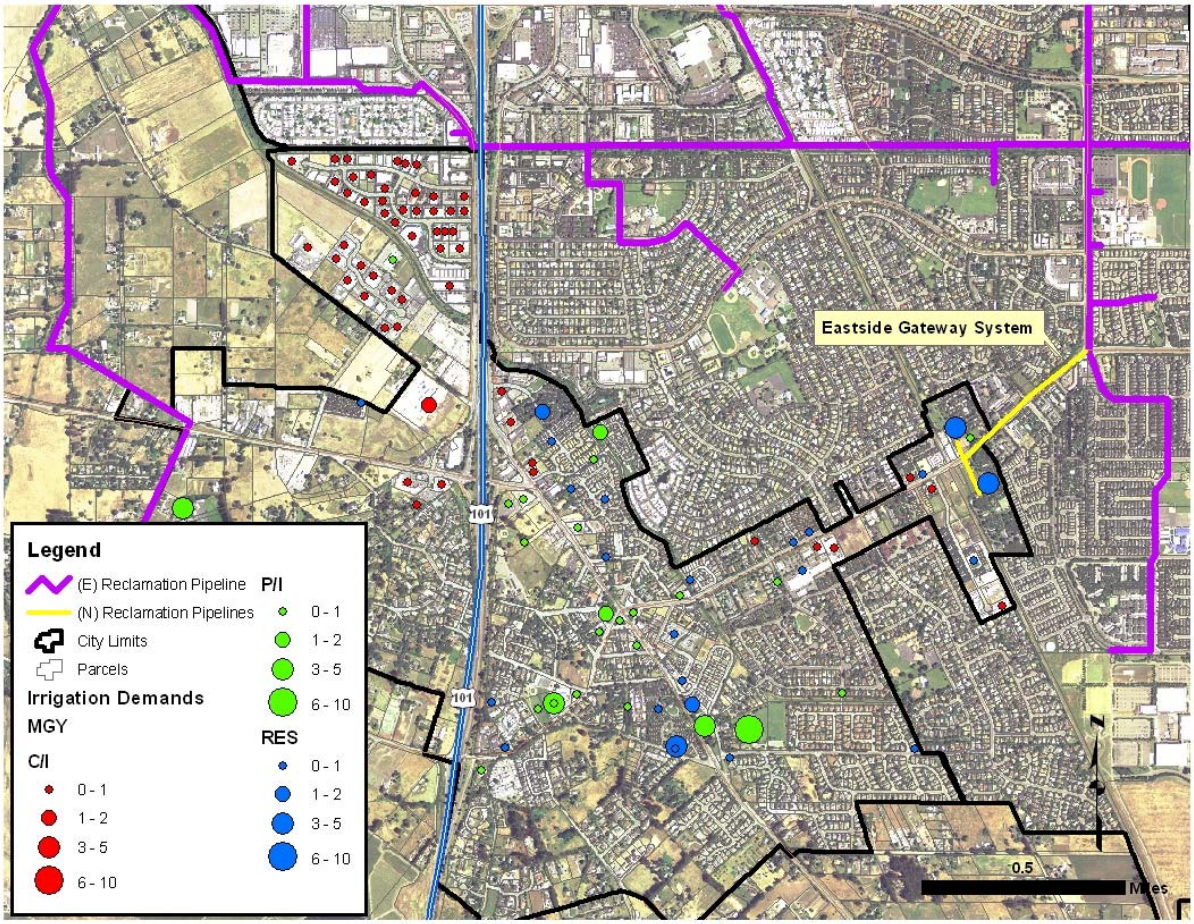
Alternative 3
Eastside Gateway System

Demand in Million Gallons Per Year	6.16
Demand in Acre Feet Per Year	18.9
Peak Hour Demand (GPM)	120
Peak Day Demand (GPM)	30
% of Total Market Demand	11.76%
% of UWMP Target	63.04%

Item No	Item	Quantity	Unit	Unit Cost	Total Item Cost
Capital Costs Subregional System Improvement for 1000 MGY System					
Polishing Treatment					
1	30 " Pipeline from Storage	1700	LF	$355	$603,500
2	Dissolved Air Flotation	1	LS	$2,873,281	$2,873,281
3	Conventional Filters	1	LS	$5,488,397	$5,488,397
4	Yard Piping	1	LS	$202,389	$202,389
5	Yard Electrical	1	LS	$796,806	$796,806
6	Sitework	1	LS	$468,044	$468,044
7	Diurnal Storage Tank	3.8	MG	$1,000,000	$3,800,000
8	Upgrades at Oakmont	0	LS	$2,710,000	$0
9	Satellite Treatment Facilities	0	LS	$9,386,000	$0
Transmission Pipeline					
11	24" Diameter	7700	LF	$245	$1,886,500
12	Rohnert Park Pump Station Upgrade	1	LS	$800,000	$800,000
Subtotal Subregional System Improvements					**$40,650,000**
Cost Share of Subregion System Improvements*					**$250,404**
Capital Costs for in-City Improvements and Storage					
Distribution Pipelines					
13	6" Diameter		LF	$75	$0
14	8" Diameter	3,000	LF	$80	$240,000
15	12" Diameter		LF	$110	$0
16	18" Diameter		LF	$190	$0
17	24" Diameter		LF	$245	$0
18	Land Use Corrections (assumes 3,000 LF with 1.2 factor)	1	LS	$48,000	$48,000
Subtotal					**$288,000**
Seasonal Storage					
19	Seasonal Storage Pond	3.85	MG	$54,100	$208,285
Subtotal					**$208,285**
User Site Retrofits**					
20	Volume delivered on sites using up to 3 AFY		AFY	$2,000	$0
21	Volume delivered on sites using between 3 and 30 AFY	18.9	AFY	$1,000	$18,900
22	Volume delivered on sites using over 30 AFY		AFY	$500	$0
Subtotal					**$18,900**
Budgetary Contingency		**23**	**%**		**$176,085**
Total Capital Costs					**$941,674**
Treatment O&M					$4,384
Transmission System O&M					$174
Distribution System O&M					$1,440
Pumping Costs					$431
Program Costs					$3,080
Total O&M Costs					**$9,509**
Total Annual Cost/MG (capital cost amortized for 30 years + O&M)					**$11,500**

* The City's Cost Share of the Subregional System Improvements is estimated by dividing the demand served by this alternative by the 1,000 MGY design capacity of the Santa Rosa Urban Reuse Project

Figure 6-4: Alternative 3 Eastside Gateway System



Alternative 4 Eastside System

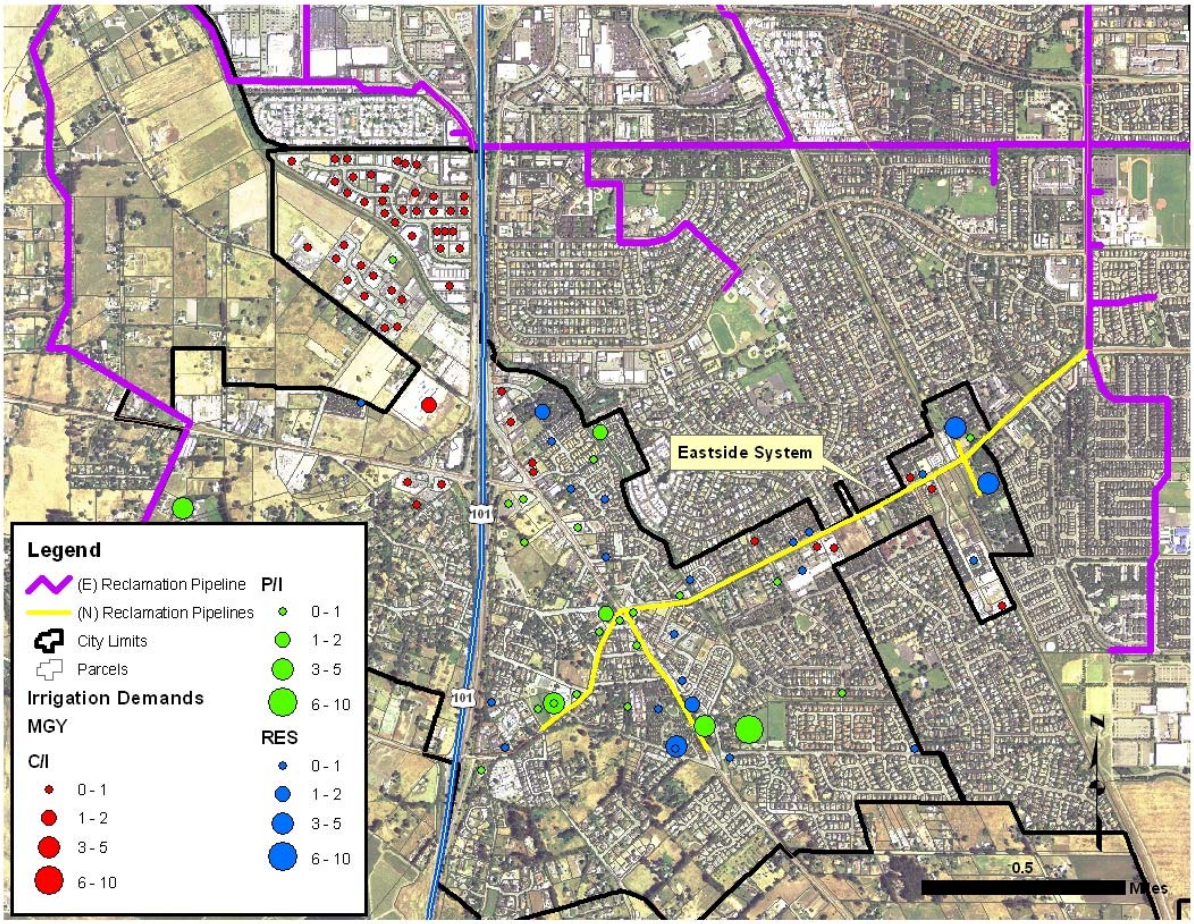
This project alternative would extend recycled water service along East Cotati Avenue to The Hub and then south along Old Redwood Highway to Helen Putnam Park and southwest along West Sierra Avenue to serve the Civic Center area. This alternative would deliver 27.5 MGY (85 AFY) to approximately 32 customers. The cost of this project alternative is estimated to be approximately $4,060,000 and is detailed in Table 6-5. Figure 6-5 illustrates this alternative.

Table 6-5: Summary Cost Alternative 4 Eastside System

Alternative 4 Eastside System					
Demand in Million Gallons Per Year			27.5		
Demand in Acre Feet Per Year			84.43		
Peak Hour Demand (GPM)			536		
Peak Day Demand (GPM)			134		
% of Total Market Demand			52.48%		
% of UWMP Target			281.42%		
Capital Costs Subregional System Improvement for 1000 MGY System					
Item No	**Item**	**Quantity**	**Unit**	**Unit Cost**	**Total Item Cost**
Polishing Treatment					
1	30 " Pipeline from Storage	1700	LF	$355	$603,500
2	Dissolved Air Flotation	1	LS	$2,873,281	$2,873,281
3	Conventional Filters	1	LS	$5,488,397	$5,488,397
4	Yard Piping	1	LS	$202,389	$202,389
5	Yard Electrical	1	LS	$796,806	$796,806
6	Sitework	1	LS	$468,044	$468,044
7	Diurnal Storage Tank	3.8	MG	$1,000,000	$3,800,000
8	Upgrades at Oakmont	0	LS	$2,710,000	$0
9	Satellite Treatment Facilities	0	LS	$9,386,000	$0
Transmission Pipeline					
11	24" Diameter	7700	LF	$245	$1,886,500
12	Rohnert Park Pump Station Upgrade	1	LS	$800,000	$800,000
Subtotal Subregional System Improvements					**$40,650,000**
Cost Share of Subregion System Improvements*					**$1,117,875**
Capital Costs for in-City Improvements and Storage					
Distribution Pipelines					
13	6" Diameter		LF	$75	$0
14	8" Diameter	12,000	LF	$80	$960,000
15	12" Diameter		LF	$110	$0
16	18" Diameter		LF	$190	$0
17	24" Diameter		LF	$245	$0
18	Land Use Corrections (assumes 12,000 LF with 1.2 factor)	1	LS	$192,000	$192,000
Subtotal					**$1,152,000**
Seasonal Storage					
19	Seasonal Storage Pond	17.19	MG	$54,100	$929,844
Subtotal					**$929,844**
User Site Retrofits**					
20	Volume delivered on sites using up to 3 AFY	16.54	AFY	$2,000	$33,070
21	Volume delivered on sites using between 3 and 30 AFY	67.89	AFY	$1,000	$67,890
22	Volume delivered on sites using over 30 AFY		AFY	$500	$0
Subtotal					**$100,960**
Budgetary Contingency		**23**	**%**		**$759,156**
Total Capital Costs					**$4,059,835**
Treatment O&M					$19,570
Transmission System O&M					$778
Distribution System O&M					$5,760
Pumping Costs					$1,925
Program Costs					$13,750
Total O&M Costs					**$41,783**
Total Annual Cost/MG (capital cost amortized for 30 years + O&M)					**$11,100**

* The City's Cost Share of the Subregional System Improvements is estimated by dividing the demand served by this alternative by the 1,000 MGY design capacity of the Santa Rosa Urban Reuse Project

Figure 6-5: Alternative 4 Eastside System



Alternative 5 Westside Extension

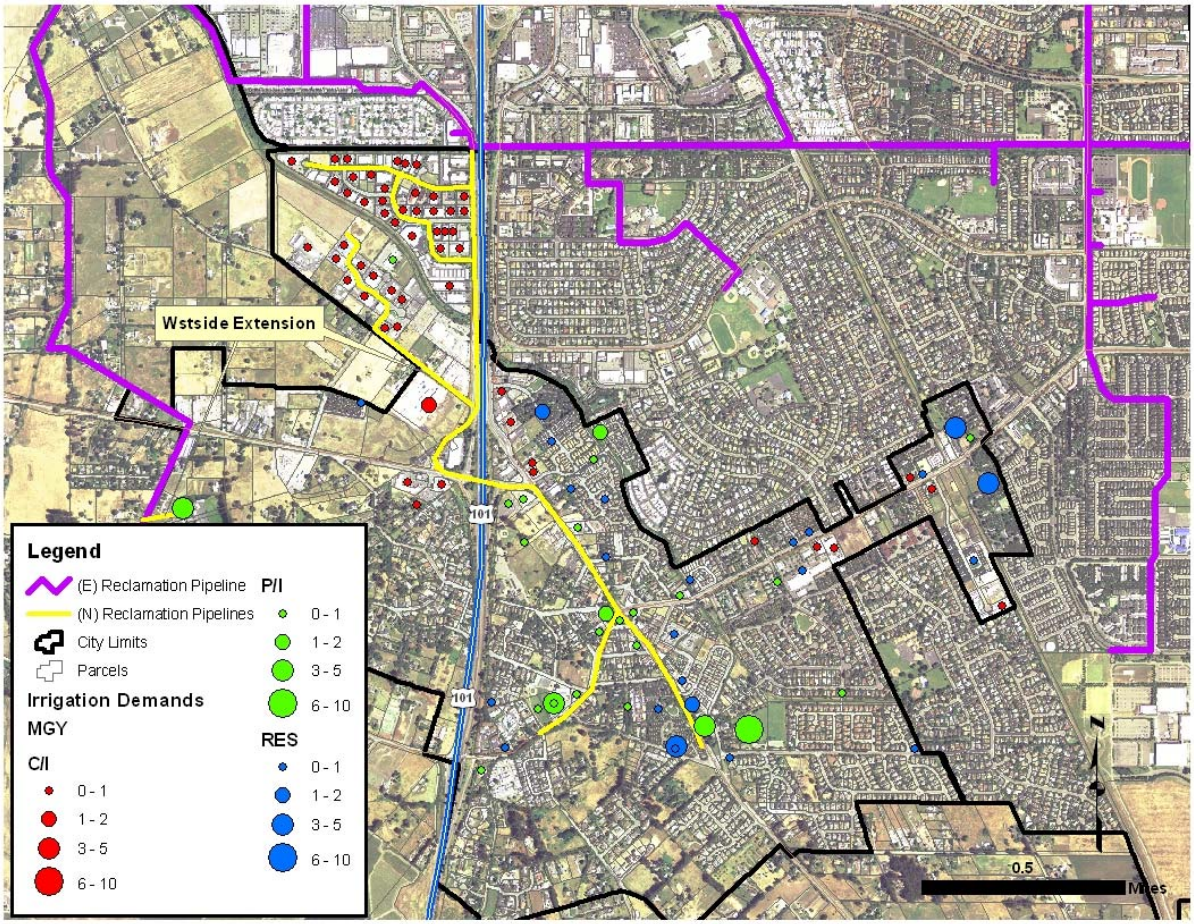
This project alternative was developed in order to analyze the potential of serving the recycled water demand in the south central portion of the system from a connection to the west side system, rather than through a pipeline extension along East Cotati Avenue. This project alternative would extend recycled water service from the intersection of Redwood Drive and Highway 116, along Highway 116 to Old Redwood Highway and then south along Old Redwood Highway to Helen Putnam Park and southwest along West Sierra Avenue to serve the Civic Center area. This alternative would deliver 33 MGY (100 AFY). The cost of this project alternative is estimated to be approximately $5,535,000 and is detailed in Table 6-6. Figure 6-6 illustrates this alternative.

Table 6-6: Summary Cost Estimate Alternative 5 Westside Extension

Alternative 5 Westside Extension					
Demand in Million Gallons Per Year			33.22		
Demand in Acre Feet Per Year			101.99		
Peak Hour Demand (GPM)			648		
Peak Day Demand (GPM)			162		
% of Total Market Demand			63.40%		
% of UWMP Target			339.95%		
Capital Costs Subregional System Improvement for 1000 MGY System					
Item No	**Item**	**Quantity**	**Unit**	**Unit Cost**	**Total Item Cost**
Polishing Treatment					
1	30 " Pipeline from Storage	1700	LF	$355	$603,500
2	Dissolved Air Flotation	1	LS	$2,873,281	$2,873,281
3	Conventional Filters	1	LS	$5,488,397	$5,488,397
4	Yard Piping	1	LS	$202,389	$202,389
5	Yard Electrical	1	LS	$796,806	$796,806
6	Sitework	1	LS	$468,044	$468,044
7	Diurnal Storage Tank	3.8	MG	$1,000,000	$3,800,000
8	Upgrades at Oakmont	0	LS	$2,710,000	$0
9	Satellite Treatment Facilities	0	LS	$9,386,000	$0
Transmission Pipeline					
11	24" Diameter	7700	LF	$245	$1,886,500
12	Rohnert Park Pump Station Upgrade	1	LS	$800,000	$800,000
Subtotal Subregional System Improvements					**$40,650,000**
Cost Share of Subregion System Improvements*					**$1,350,393**
Capital Costs for in-City Improvements and Storage					
Distribution Pipelines					
13	6" Diameter	13,000	LF	$75	$975,000
14	8" Diameter	9,500	LF	$80	$760,000
15	12" Diameter		LF	$110	$0
16	18" Diameter		LF	$190	$0
17	24" Diameter		LF	$245	$0
18	Land Use Corrections (assumes 9,500 LF with 1.2 factor)	1	LS	$152,000	$152,000
Subtotal					**$1,887,000**
Seasonal Storage					
19	Seasonal Storage Pond	20.76	MG	$54,100	$1,123,251
Subtotal					**$1,123,251**
User Site Retrofits**					
20	Volume delivered on sites using up to 3 AFY	37.33	AFY	$2,000	$74,651
21	Volume delivered on sites using between 3 and 30 AFY	64.66	AFY	$1,000	$64,660
22	Volume delivered on sites using over 30 AFY		AFY	$500	$0
Subtotal					**$139,311**
Budgetary Contingency		**23**	**%**		**$1,034,990**
Total Capital Costs					**$5,534,945**
Treatment O&M					$23,640
Transmission System O&M					$940
Distribution System O&M					$9,435
Pumping Costs					$2,325
Program Costs					$16,610
Total O&M Costs					**$52,950**
Total Annual Cost/MG (capital cost amortized for 30 years + O&M)					**$12,400**

* The City's Cost Share of the Subregional System Improvements is estimated by dividing the demand served by this alternative by the 1,000 MGY design capacity of the Santa Rosa Urban Reuse Project

Figure 6-6: Alternative 5 Westside Extension



Alternative 6 Citywide Looped Distribution System

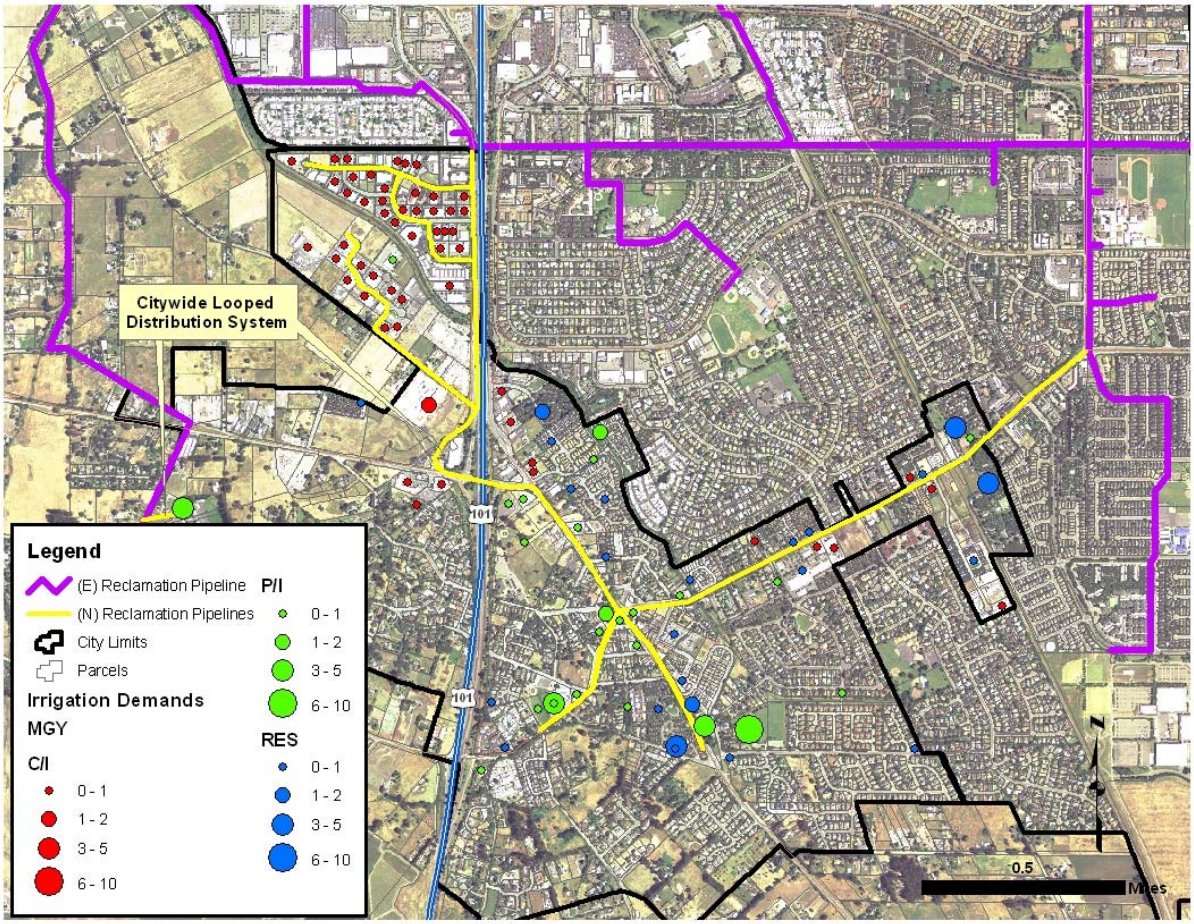
This project alternative provides for a looped distribution system. The looped system could be developed in phases that build upon an initial Westside or Eastside Gateway System. The interconnection would enhance the overall system reliability and would allow the City to ultimately deliver 43 MGY (132 AFY) or approximately 82% of its total market. The cost of this project alternative is estimated to be approximately $7,310,000 and is detailed in Table 6-7. Figure 6-7 illustrates this alternative.

Table 6-7: Summary Cost Estimate Alternative 6 Citywide Looped Distribution System

Alternative 6					
Citywide Looped system					
Demand in Million Gallons Per Year			43		
Demand in Acre Feet Per Year			132.01		
Peak Hour Demand (GPM)			839		
Peak Day Demand (GPM)			210		
% of Total Market Demand			82.06%		
% of UWMP Target			440.03%		
Capital Costs Subregional System Improvement for 1000 MGY System					
Item No	**Item**	**Quantity**	**Unit**	**Unit Cost**	**Total Item Cost**
Polishing Treatment					
1	30 " Pipeline from Storage	1700	LF	$355	$603,500
2	Dissolved Air Flotation	1	LS	$2,873,281	$2,873,281
3	Conventional Filters	1	LS	$5,488,397	$5,488,397
4	Yard Piping	1	LS	$202,389	$202,389
5	Yard Electrical	1	LS	$796,806	$796,806
6	Sitework	1	LS	$468,044	$468,044
7	Diurnal Storage Tank	3.8	MG	$1,000,000	$3,800,000
8	Upgrades at Oakmont	0	LS	$2,710,000	$0
9	Satellite Treatment Facilities	0	LS	$9,386,000	$0
Transmission Pipeline					
11	24" Diameter	7700	LF	$245	$1,886,500
12	Rohnert Park Pump Station Upgrade	1	LS	$800,000	$800,000
Subtotal Subregional System Improvements					**$40,650,000**
Cost Share of Subregion System Improvements*					**$1,747,950**
Capital Costs for in-City Improvements and Storage					
Distribution Pipelines					
13	6" Diameter	13,000	LF	$75	$975,000
14	8" Diameter	16,500	LF	$80	$1,320,000
15	12" Diameter		LF	$110	$0
16	18" Diameter		LF	$190	$0
17	24" Diameter		LF	$245	$0
18	Land Use Corrections (assumes 16,500 LF with 1.2 factor)	1	LS	$264,000	$264,000
Subtotal					**$2,559,000**
Seasonal Storage					
19	Seasonal Storage Pond	26.88	MG	$54,100	$1,453,938
Subtotal					**$1,453,938**
User Site Retrofits**					
20	Volume delivered on sites using up to 3 AFY	48.11	AFY	$2,000	$96,220
21	Volume delivered on sites using between 3 and 30 AFY	83.9	AFY	$1,000	$83,900
22	Volume delivered on sites using over 30 AFY		AFY	$500	$0
Subtotal					**$180,120**
Budgetary Contingency		**23**	**%**		**$1,366,432**
Total Capital Costs					**$7,307,439**
Treatment O&M					$30,600
Transmission System O&M					$1,217
Distribution System O&M					$12,795
Pumping Costs					$3,010
Program Costs					$21,500
Total O&M Costs					**$69,121**
Total Annual Cost/MG (capital cost amortized for 30 years + O&M)					**$12,700**

* The City's Cost Share of the Subregional System Improvements is estimated by dividing the demand served by this alternative by the 1,000 MGY design capacity of the Santa Rosa Urban Reuse Project

Figure 6-7: Alternative 6 Citywide Looped Distribution System



6.4 Alternative Analysis and Recommendations

Alternatives 1 and 3 are the most cost-effective options for the City. Both alternatives capitalize on the City's proximity to existing recycled water pipelines and both alternatives capture several large users, which increases the efficiency of the projects, reduces onsite retrofit costs and minimizes program management efforts because there are relatively few customers. Together these two alternatives deliver just over 30 AFY, allowing the City to utilize the recycled water supply in a manner that is consistent with its UWMP.

All alternatives carry a significant cost component related to improvements of the Subregional System infrastructure. The Subregional System is currently engaged in predesign work related to expanded urban reuse and these costs may be refined over time. The City should actively track this process and review the alternative evaluation as more refined design concepts and costs are developed. Should costs related to the Subregional System be reduced, the City could consider extending additional pipelines and capturing more of its recycled water market.

Chapter 7 Project Economics and Implementation

7.1 Introduction

This chapter includes the preliminary economic review of a Cotati Urban Reuse Project. Because the Project could create both water supply and wastewater disposal supply benefits, costs could be reasonably allocated to both the City's water utility and the Subregional System. This chapter provides an overview of the economics related to recycled water within the Subregional System's service area; describes potential outside funding sources that could fund some portion of project construction; outlines utility policy issues that the City will need to address; and discusses implementation issues.

7.2 Project Economics

As described in Chapter 3, the City's UWMP projects that recycled water could become a portion of the City's water supply portfolio, in order to both enhance reliability and meet future demand. As indicated in Chapter 2, the Subregional System has analyzed urban water recycling as one of a host of alternatives to meet future wastewater disposal needs. A successful urban recycled water project will meet both water supply and wastewater disposal needs cost effectively. This section briefly recaps the cost of various alternative water supply and wastewater disposal alternatives and analyzes the cost-sharing potential between utilities.

Alternative Water Supply Options

The City's UWMP identifies the following future water supply options, in addition to recycled water:

- The Agency's Water Project. The Water Project involves increasing the Agency's diversion rights and expanding its transmission system capacity. In order to expand its diversion rights, the Agency is considering three distinct diversion alternatives, Aquifer Diversion and two variations on a Surface Water Treatment (SWT). Each of these alternatives will allow the Agency to expand its water rights by 26,000 AFY to 101,000 AFY (8,470 MGY)[11]
- Water Conservation. The City's ongoing water conservation program is expected to yield 43 MGY in water savings.

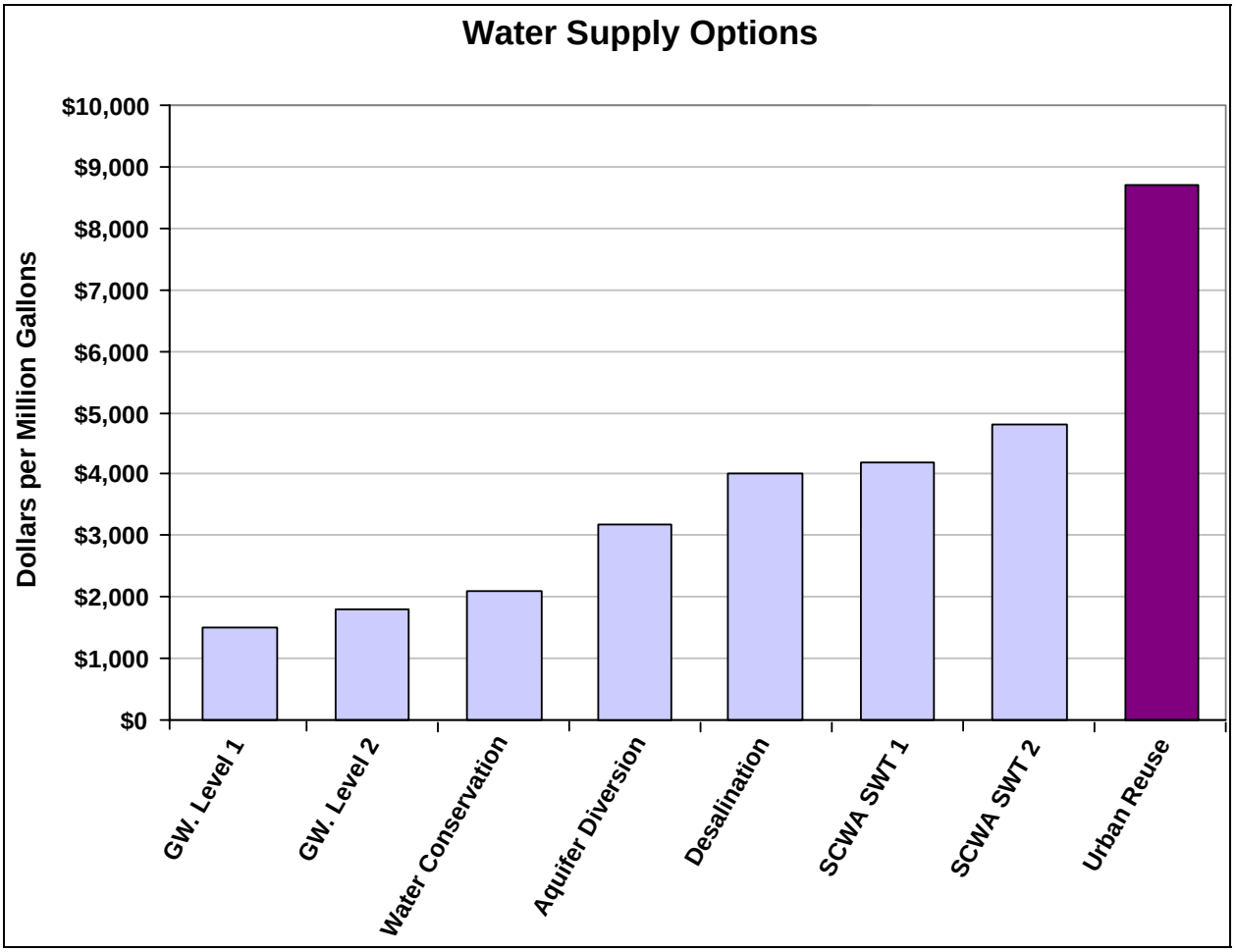
For the purposes of providing a comprehensive economic analysis, this study also includes review of cost and economic data for groundwater development and desalination. While these supplies are not currently under consideration by the City, other Water Contractors and Customers have developed data that can be used to expand the economic comparison.

[11] Based upon the Agency's EIR for its WSTSP. These alternatives may be revised during the EIR process for the water project. The economic analysis should be updated based upon revisions in the Agency's alternatives or costs.

- Groundwater. For the purposes of economic comparison, this Study evaluates the option of developing additional groundwater supplies. The costs and yields developed by the City of Santa Rosa have been used in the economic analysis.
- Desalination. For the purposes of economic comparison, this Study evaluates the option of participating in a desalination project similar to that proposed by Marin Municipal Water District. The costs and yield for Marin Municipal Water District's project as outlined in its Proposition 50 funding application have been used in the economic analysis.

Figure 7-1, below, illustrates the normalized costs (in dollars per MG) for the various water supply options, including urban reuse.

Figure 7-1: Water Supply Options and Unit Costs



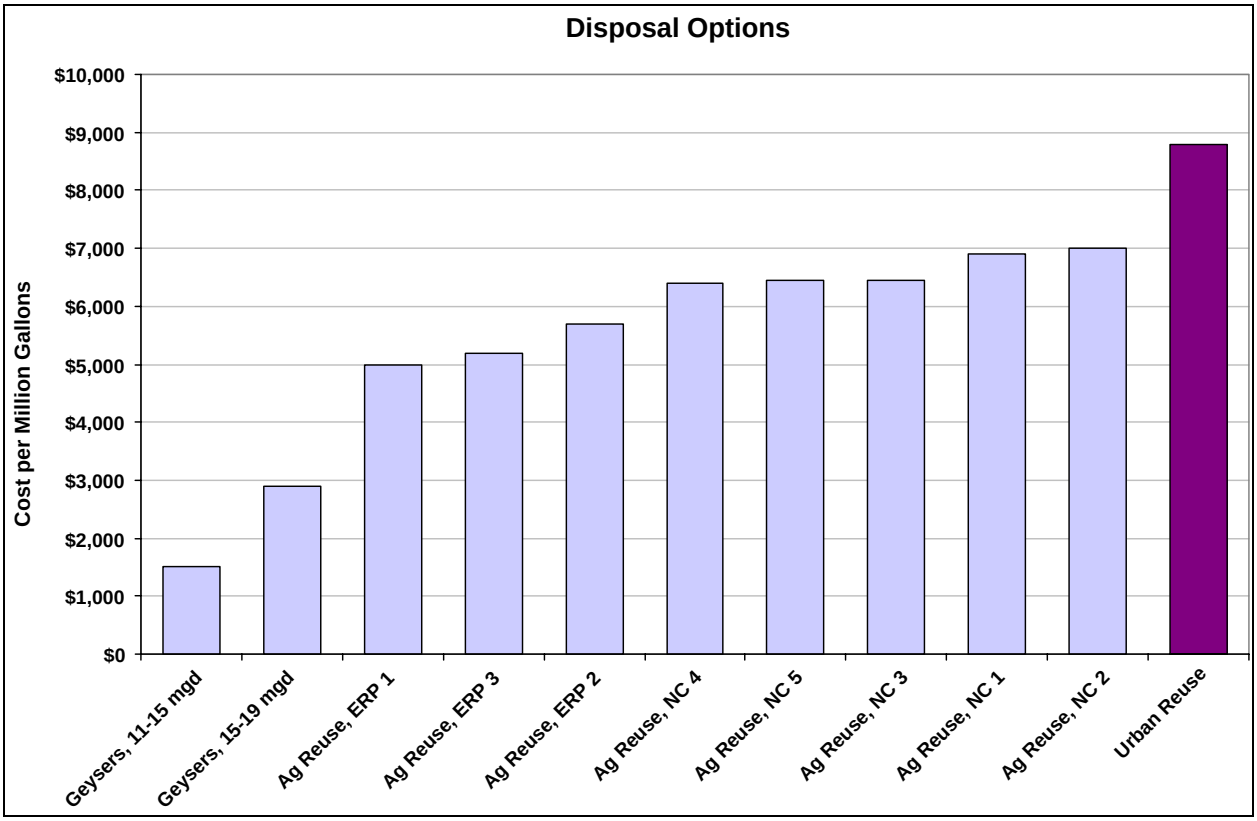
Alternative Disposal Options

While the City has not requested additional wastewater disposal capacity beyond its current allocation, the Subregional System is pursuing the IRWP to meet the needs of two member agencies, the cities of Santa Rosa and Rohnert Park. In addition to the urban reuse, the IRWP identified that additional wastewater disposal capacity could be secured by:

- Developing new agricultural reuse in north Sonoma County (Ag Reuse NC) or East of the City of Rohnert Park (Ag Reuse ERP). According to the IRWP Master Plan Ag Reuse NC could be developed in up to 5 increments and provide up to 2,200 MG of capacity. Ag Reuse ERP could be developed in three increments and is limited to 783 MG.
- Expanding the Geysers Recharge Project. According to the IRWP Master Plan, the Geysers Expansion could be accomplished in 2 increments and provide up to 2,200 MG of capacity.

Figure 7-2, below, illustrates the normalized costs (in dollars per MG) for the various wastewater disposal options, including the recommended Project (Alternative 2a – 1000 MGY West-South).

Figure 7-2: Wastewater Disposal Options and Unit Costs



Utility Cost Allocation

Urban reuse is not a cost-effective alternative when viewed as solely a water supply or wastewater disposal alternative. However, if costs were shared between the two utilities, the urban reuse becomes much more competitive. If the City were to fund 40 percent of an urban reuse project through its water utility as a potable water offset, the remaining projects costs would be allocated as a disposal cost and this portion might be supported by the Subregional System as a relatively cost-effective disposal option. This partnership could also be attractive to the Subregional System because the City would be a willing recycled water customer. Figures 7-3a and 7-3b, below illustrate this cost allocation approach.

The ultimate cost sharing arrangement between the City and the Subregional System will depend on the timing of the project. The Subregional System's strategy for pursuing IRWP

projects is to pursue the least cost alternatives first and the more expensive alternatives later during implementation. Because the Geysers Expansion increments are the least expensive disposal alternatives, the City may need to contribute more towards the cost of its urban reuse project if it wished to pursue the project during the time when the Subregional System still had these lower cost disposal alternatives available. The ultimate cost-sharing arrangement between the City and the Subregional System will need to be negotiated within the framework of the Subregional System Agreement.

Figure 7-3a: Water Supply Options

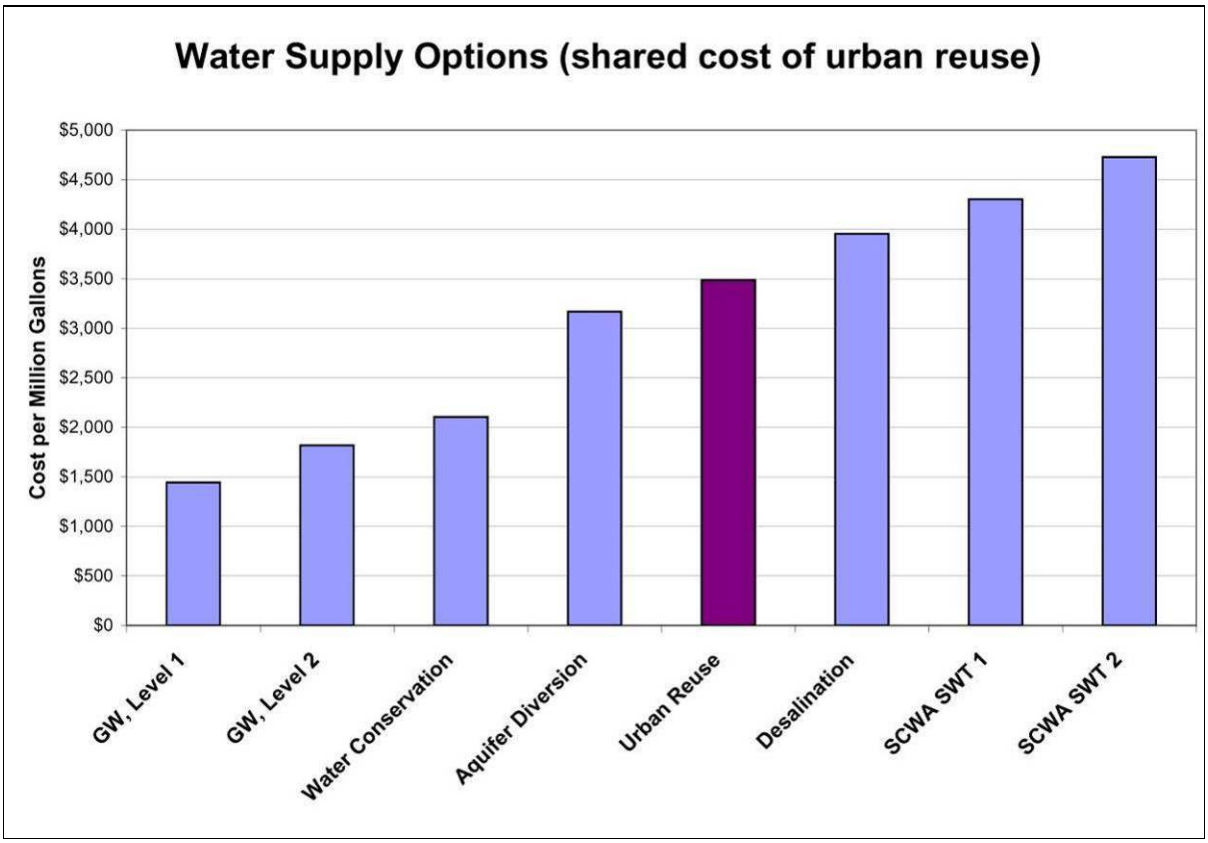
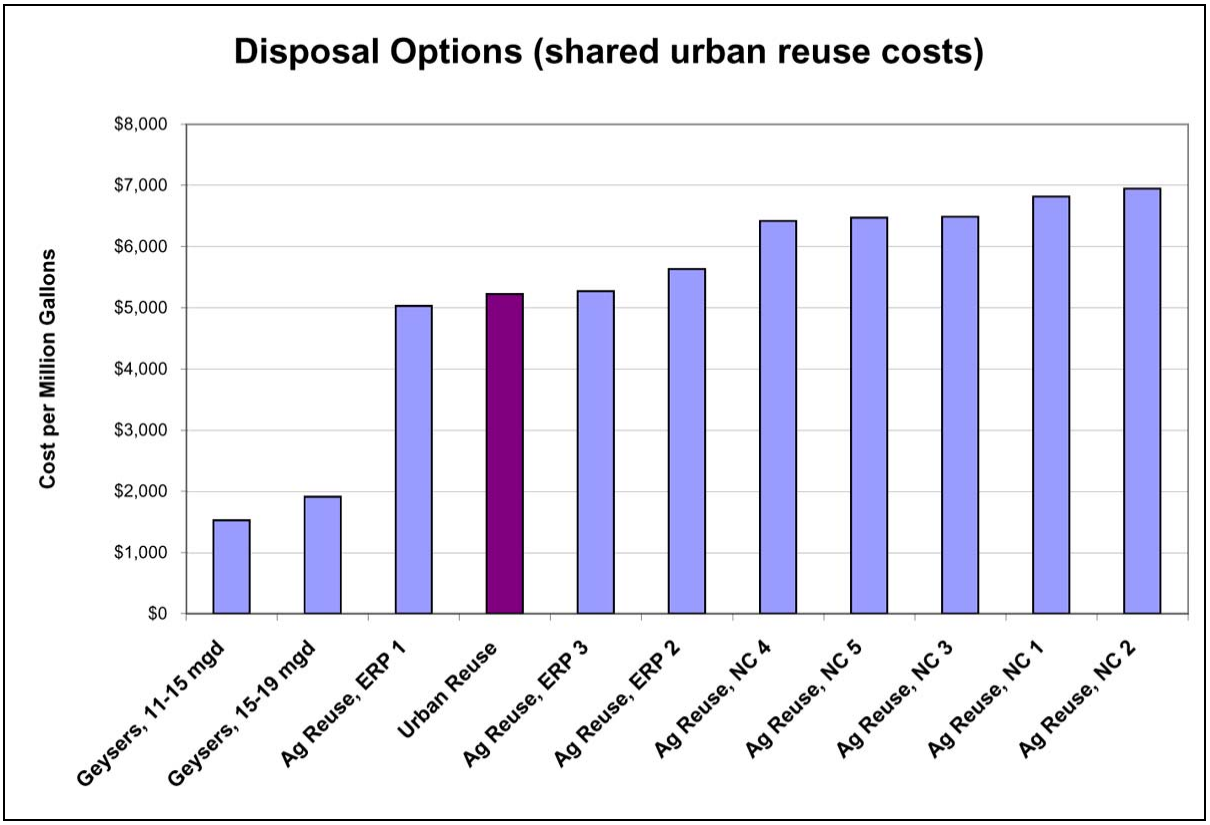


Figure 7-3b: Disposal Options



7.3 Funding Sources

Any urban reuse will require funding sources for both capital construction costs and long-term operations and maintenance costs. The economic analysis illustrated that these costs can be equitably split between the City's water utility and the Subregional System. This section provides a brief overview of the funding sources that could be utilized.

Local Funding Sources

Certificates of Participation: Certificates of Participation (COPs) are a long-term financing mechanism, typically secured by the revenues (rates) of water and sewer utilities. COPs are the most common funding mechanism used in California for financing larger, local utility infrastructure projects. COPs can be used in combination with State loans and outside grants.

Demand (Connection) Fees: Demand fees are expenditures that developers are required to make as a precondition to approval of their project. These fees, typically established under the Authority of Government Code Section 66000, are calculated to provide the funding necessary to construct new capacity for new development. The City currently collects demand fees for both its water and wastewater utilities and could collect a Recycled Water Demand Fee. The City may establish or updated its demand fees based on the current planning level cost estimates for urban reuse and can begin to collect the funds after holding a noticed public hearing. Demand fee revenue can be used to fund project construction directly (which is known as a Pay-as-you-go Program) or it can be used to make debt service payments. Demand fee revenue can be volatile, because it is tied to development applications, over which the City has

no control. Because of this volatility, demand fee revenue typically cannot be used as the only security for debt, although it can be part of an overall program that balances utility rates with funding from new development.

Because the test for establishing or updating demand fees is "reasonableness", agencies have the ability to craft these fees to address local issues and concerns. The Cities of Santa Rosa and American Canyon, carry a recycled water component in their Sewer Impact Fees. The Dublin San Ramon/East Bay MUD Recycled Water Authority (DERWA) has a separate Recycled Water Impact Fee that it charges to new development.

Regional Funding Sources

Local Supply Recycled Water and Tier II Water Conservation Funding: The Agency provides funds to Water Contractors for the development of local supplies, recycled water and conservation programs. The Agency prioritizes these funds for construction efforts rather than planning or environmental review.

State Funding Sources

The funding sources could be pursued by the City, but the City's activities may be more effective if they are undertaken in partnership with the Subregional System.

State Water Resources Control Board Planning Grants: The State Water Resources Control Board (SWRCB) provides planning grants up to $75,000 to fund master planning and CEQA documentation for recycled water projects. The planning grant program, unlike the Recycled Water Construction Grant Program, it does not rely on new bond sales. Also, unlike the Construction Grant Program, the planning grant program does not require that funded projects be located in the CalFed Solution Area (which the City is not). Application to this program requires completion of a one-page standard form and detailed work plan. Applications are processed and approved at a staff level, which typically takes 3 to 5 months.

Integrated Regional Water Management Plan Grants (IRWMP Grants provided by Propositions 50 and 84): The Subregional System is currently working with the North Coast Integrated Regional Water Management Program (NCIRWMP) and has included Urban Reuse in its Sonoma County Water Recycling and Habitat Conservation Program (SCWRHCP) which is part of the Regional Plan. Phase 1 of SCWRHCP has been included in the North Coast's Phase 1 IRWMP Grant application, which has been awarded $25 million in grant funding by the Department of Water Resources and the State Water Resources Control Board. The recently approved Proposition 84 includes funding earmarks for specific regions that have been developing plans under the IRWP Program. The North Coast Region has an earmark of $37,000,000, which would provide additional funding for NCIRWMP implementation, including urban reuse projects.

Federal Funding Sources

This funding source could be pursued by the City, but the City's activities may be more effective if they are undertaken in partnership with the Subregional System.

United States Bureau of Reclamation Title XVI Funding: Title XVI is a program that can provide up to 25 percent matching grants for qualifying water recycling projects. The program requires the preparation of a Feasibility Study and environmental documentation under both

CEQA and National Environmental Policy Act (NEPA). Planning documentation is reviewed by Bureau staff and if approved, project applicants begin a two-step legislative process where the project is first approved by Congress and then funded through an appropriations bill. The Title XVI program has been notoriously difficult to access, however current Federal Legislation, the "Reclaiming the Nations Water Act" (Feinstein/Murkowski), is intended to simplify this process and allow more projects to receive federal funding.

7.4 Utility Policy Considerations

Developing a recycled water utility may require the City to address a broad range of policy issues related to user participation and cost sharing. Historically the Subregional System has developed its recycled water program on a voluntary basis and has provided rate incentives for participation. As the water supply benefits provided by recycled water are increasingly recognized and local partner agencies work to secure these benefits for their communities, other models for pricing and delivering recycled water need to be considered to address questions such as:

- Who will operate the system?
- Who will pay for the system?
- Who will the customers be?
- Will participation be voluntary or mandatory?
- How will the recycled water be priced?
- Who will operate and maintain the system?

State of California Water and Code

The State of California has very specific findings in the Water Code which guide local agencies regarding the use of recycled water. Water Code section 13550 speaks to the obligation to use recycled water if it is available in the following excerpt: "The Legislature hereby finds and declares that the use of potable domestic water for nonpotable uses, including, but not limited to, cemeteries, golf courses, parks, highway landscaped areas, and industrial and irrigation uses, is a waste or an unreasonable use of the water …"

Perspective on the water supply role of recycled water in California is addressed in section 13511 which reads: "The Legislature finds and declares that a substantial portion of the future water requirements of this state may be economically met by beneficial use of recycled water. The Legislature further finds and declares that the utilization of recycled water by local communities for domestic, agricultural, industrial, recreational, and fish and wildlife purposes will contribute to the peace, health, safety and welfare of the people of the state. Use of recycled water constitutes the development of "new basic water supplies."

Policy and Institutional Alternatives Overview

The following discussion provides a range of alternatives that could be considered by the City as it works to define the policy framework and institutional structure around a recycled water utility.

Who will operate the system? The Subregional System currently operates urban reuse systems with Rohnert Park and Santa Rosa corporate limits. Under this current operational strategy, the Subregional System holds all permits, contracts directly with recycled users, performs all training and oversight functions required by Title 22 of the California Code of Regulations and bills users for recycled water. Currently, the Subregional System functions as a recycled water retailer.

As Cotati, Santa Rosa and Rohnert Park contemplate partnering with the Subregional System to expand urban reuse, this operational model could be retained or the various project partners could develop a different operational model. Namely, the Subregional System could wholesale recycled water to each city and the individual cities would perform retailer responsibilities including customer contracting, training, oversight and billing. This model would require more activity and responsibility for each city, but it would also provide the local water retailer with the opportunity and authority to fully integrate the recycled water resource into its water management strategy. Under this wholesaler-retailer model, the individual cities would have the authority to set rates and fees for recycled water, to mandate its use (if appropriate) and to work directly with customers.

Who will pay for the system? Urban recycled water systems throughout the State are funded in varied ways. Where disposal of treated effluent is the goal, the wastewater utility typically pays for the cost of the system. The Town of Windsor and the Subregional System's current urban irrigation are examples of the wastewater or reclamation utility paying for the cost of the system. Where developing a new water supply is the goal, the water utility typically pays for the cost of the system. Marin Municipal Water District and Redwood City are examples of the water utility funding the system.

This Study has developed a preliminary economic framework which indicates a cost-share between the City's water utility and the Subregional System would result in an equitable allocation of costs and benefits. Implementing this type of cost allocation system would likely require an Agreement between the City and the Subregional System.

Who will the customers be? State law allows the use of recycled water for many urban water uses, including landscape irrigation, car washing, industrial processes, cooling towers, and toilet flushing. For the City, the various alternatives carry different costs. Variables such as proximity to the existing recycled water pipelines, complexity of the customer's on-site system, and the customer's total demand influence the cost effectiveness of each connection.

An urban reuse project would likely be developed first in those parts of the City in close proximity to recycled water sources. The greatest opportunity throughout the City is landscape irrigation. For existing customers that convert to recycled water, good irrigation management practices and systems that keep the water on the landscaped areas would be required; these systems would also need to undergo some retrofit to be suitable for recycled water use.

Will participation be voluntary or mandatory? From State law, any water utility has the authority to require the use of recycled water instead of potable water if recycled water is available. A utility may instead choose to promote the use of recycled water through incentive-based rates or other means. The Subregional System has historically used incentives. The City has the option to mandate connection to the recycled water system.

How will the recycled water be priced? As the recognition that recycled water is a new source of water supply grows, trends state-wide show the price of recycled water becoming closer to the price of potable water. In addition, rate structures that are used on potable systems that include tiers and/or low fixed charges are now being applied to recycled water rates as well as potable rates. The regulatory requirements for minimizing runoff and overspray with recycled water could also be supported by the rates. Table 7-1 is a representative sampling of recycled water rates and rate structures from other utilities.

Table 7-1: Summary of Phasing and Costs including Seasonal Storage

Agency	Potable Rate (per 1,000 gal.)	Recycled Rate (per 1,000 gal.)	Comments
Windsor	$2.02	$0.72–1.62	Potable rate has inclining tiers; recycled differs for residential and non-residential
EBMUD	$2.21-3.35	$2.53	Potable rate has inclining tiers; recycled is greater than lowest potable tier
MMWD	$3.25-12.95	$1.80-7.23	Potable and recycled have inclining tiers; recycled is ~ 55% of potable rate
Fairfield	$2.44	$2.11	Simple commodity rate; recycled is ~ 85% of potable
Redwood City	$1.57-5.75	To be determined	Potable rate has inclining tiers; recycled rate is expected to be 75% of lowest tier

Who operates and maintains the system? The Subregional System has historically operated and maintained its recycled water infrastructure, including the recycled water infrastructure located within the city-limits of Rohnert Park and Santa Rosa, and has essentially functioned as recycled water retailer. Should urban reuse expand within the Subregional System service area, the Subregional System could continue this practice, or it could move to wholesaler-type relationship, where it would contract with the various cities, which would then retail water to their customers. If the City assumed a "retailer" role for recycled water, it would have a better ability to fully integrate this resource into is water supply portfolio; however it would also accept a number of responsibilities for permit compliance and user training, as detailed under Additional User Outreach and Permitting below. Like the issue of cost-sharing, the relationship between the Subregional System as the producer, and the City as the ultimate beneficiary of the water supply, needs to be developed and codified formally through an Agreement.

Table 7-2 summarizes policy issues and alternatives discussed above and provides the City with options to consider if it elects to move forward with an urban reuse project.

Table 7-2: Policy Options – Cotati Urban Reuse Project

Policy/Institutional Topic	Options For Consideration
Funding capital cost of Project	The Project can be funded by the reclamation utility, the water utility, or a combination of both utilities. Combined funding will require an Agreement with the Subregional System. The cost can be born by new users, existing users or some combination of both.
Defining customers	Any water user within the City water utility service area that has use which can be served with recycled water (irrigation, carwash, industrial process, etc) could become a customer. The service area can be as large as the water utility service area or some subset of it.

Policy/Institutional Topic	Options For Consideration
Enlisting customers	Connection to the system can be mandatory for all users, voluntary for all users, or mandatory for some and voluntary for others. New users and existing users do not need to have the same options. Incentives can be used to attract customers.
Demand fees (cost for connection)	The cost to connect to the system can range from zero to as much or more than the cost of connecting to the potable water system. Current potable water users when connecting to recycled water do not have to be treated the same as new users who have never paid a water demand fee.
User rates and rate structure	Based on experience with other urban recycled water systems, the water can cost from very little to as much or more than potable water. The rate structure can be a simple commodity rate, a tiered rate, or a flat fee, and the fixed charge can vary. If the system does not cover its own costs, it will be subsidized by either the water utility or the reclamation utility or both. The rate structure may help achieve regulatory compliance.
Ownership and Operation of Recycled Water Distribution System	The Subregional System could own and operate the recycled water distribution system within the City limits. Alternatively, the Subregional System could wholesale recycled water to the City, who would then operate the retail distribution system within its limits.

7.5 Project Implementation Issues

In addition the policy issues related to bringing a new water source into its service area, the City will need to address project implementation issues such as Environmental Review, User Outreach and Permitting and Project Design. Depending on the decisions made related to system ownership and operation, the City may need to pursue some of these activities as the lead agency, or it may be in a cooperative and supporting role to the Subregional System.

Environmental Review Requirements

Implementation of an urban reuse project would be consistent with the IRWP Master Plan. Approval of policies related to a project that could have direct or indirect environmental effects, as well as construction and operation of a project would be subject to CEQA and require environmental documentation. The policies and project alternatives described in this Feasibility Study are intended to carry out the IRWP Master Plan, and therefore would undergo project-level environmental review that tiers off the Program EIR for the IRWP. This review could be completed by the City as the Lead Agency or by the Subregional System as the Lead Agency.

When the Lead Agency is ready to move forward with a project, it would prepare a Checklist to document the evaluation of the proposed activity and would use the Checklist to determine the appropriate type of tiered environmental review document. If new significant impacts are anticipated, then an EIR must be prepared; if new less-than-significant effects would occur that were not examined in the Program EIR, then a Negative Declaration should be prepared; if no new effects would occur or no new mitigation measures would be required, then the Lead Agency could approve the activity as being within the scope of the Project covered by the Program EIR. In any case, the Lead Agency is required to incorporate feasible mitigation measures developed in the Program EIR into the project-level review. Environmental review of alternatives, cumulative impacts and program-wide mitigation measures have already been developed and evaluated in the Program EIR.

Additional Market Outreach and User Permitting

Market Analysis

The Study Area includes distinct customer bases that could affect the way in which the City pursues its market. Specifically, the Westside System is almost exclusively C/I customers while the Eastside System includes a mix of P/I and Residential Customers. Chapter 4 categorized potential recycled water users into user classes based on land use and potential users' decision-making structure. This was an important step in the outreach process because it provides the City with a systematic way of contacting these users and tracking their responses and concerns. With a clear understanding of potential user profiles, the City could then work with key anchor users to advance recycled water project interests and standards.

The City's implementation strategy should include user surveys to identify any other unique site conditions that would affect program implementation.

User Permitting

The Subregional System has an established water recycling program which it currently implements under a National Pollutant Discharge Elimination System (NPDES) Permit issued by the North Coast Regional Water Quality Control Board (NCRWQCB). The permit functions in a "master producer-user" style, meaning that the Subregional System, not the individual recycled water users, holds the permit from the NCRWQCB. The Subregional System transfers responsibility to the individual users through its User Agreements. The Subregional System's September 2004 Engineering Report for Master Recycling Permit Application (the Title 22 Report), provides a comprehensive listing of the existing system and each customer site.

To connect additional recycled water users, the Subregional System could update its Title 22 Report and secure permit coverage, likely under the existing permit. Alternatively, if the City is ultimately to become the recycled water retailer, it may wish to develop an independent Title 22 Report and secure individual permit coverage. Because the City would only be delivering recycled water to irrigation users, and not discharging recycled water, it could apply for permit coverage under the Porter-Cologne Water Quality Act and receive Water Recycling Requirements (WRRs) or Waste Discharge Requirements (WDRs). A potential advantage to this strategy is that neither WRRs nor WDRs are subject to the Clean Water Act's citizen lawsuit provisions that do apply to NDPES permits.

Regardless of the permitting strategy pursued, connecting new recycled water users will require:

- User Site Reconnaissance Efforts
- User Site Design and Approval Efforts
- User Site Construction and Inspection Efforts
- User Site Supervisor Training

Each of these is described below.

User Site Reconnaissance: This Study provides a feasibility-level analysis but does not include specific user site investigations. The City should investigate the setup of existing landscape irrigation systems to assess feasibility of separating the potable and non-potable uses. Unless

the proposed site is already dual-plumbed for recycled water, detailed cross-connection testing of each customer's system, prior to retrofit construction, would need to be performed. As appropriate for each customer site, detailed reconnaissance should consider the following items:

- Site Characteristics
  - ✓ Type of soil, landscape or crop to be irrigated
  - ✓ Area of recycled water use
  - ✓ Potential areas of overspray, ponding or runoff
  - ✓ Location of existing meters and backflow preventers
  - ✓ Location of drinking fountains, hose bibs and other potable water facilities
  - ✓ Location of picnic tables and playground equipment
  - ✓ Park animals
  - ✓ Appropriate locations for advisory signs
  - ✓ Surrounding land use or other site restrictions (e.g., wells)
  - ✓ Site drainage and sub-drains
- Irrigation Facilities
  - ✓ Irrigation system record drawings (if available)
  - ✓ Potential cross connections between potable and other services
  - ✓ Reservoirs, pumps, strainers, filters, piping and control systems
  - ✓ Valves, quick couplers, irrigation components (e.g., drip or spray)
  - ✓ Number of desired controls
- Customer Management Practices
  - ✓ Maintenance personnel duties and training programs
  - ✓ Irrigation system inspection and repair procedures
  - ✓ Recycled water demands / irrigation schedules / service pressure
  - ✓ Schedule of operation and record keeping (e.g., water application)
  - ✓ Accommodation of events during scheduled irrigation (i.e. evening baseball games)

Available site maps, as-built or record drawings of the existing water use systems should be obtained. Aerial photos and utility maps should be reviewed for utility locations in the general vicinity of the recycled water hook-up.

User Site Design and Approval: The Subregional System is currently developing on-site guidelines for the design, installation and inspection of recycled water facilities. These on-site rules and regulations are expected to address:

- Design Requirements at the Service Connection
  - ✓ Exceptions for Existing Irrigations Systems: Replumbing with purple pipe is not required if appropriate cross connection tests demonstrate complete separation of water systems.
  - ✓ Pressure: the recycled water system needs to provide adequate pressure for irrigation use. The City may wish to have the recycled water system operated at a slightly lower pressure than the potable water system to reduce the potential for cross-connections.

- ✓ Required Wye Strainer and Pressure Regulator: Recycled water may be stored in open ponds prior to delivery and these details will help assure that water quality and pressure always meet the needs of customers.
- ✓ Point of Connection Location: The City will need to provide some oversight and inspection of the recycled water connections. Consistent criteria for connection points will facilitate this oversight.
- ✓ Separation Requirements: DHS has set minimum separation requirements for potable and nonpotable water facilities.
- ✓ Backflow Prevention: Backflow prevention is required by CCR Title 17 for every site that receives both potable and nonpotable water service.

- Design Requirements for On-Site Facilities

  - ✓ No Cross-Connections and Separation Requirements: These on-site requirements should parallel the off-site requirements.
  - ✓ Pipe Class, Depth of Cover and Thrust Blocking: The permit holder (either the Subregional System or the City) is ultimately responsible for leaks on-site and should require designs that will ensure system performance.
  - ✓ Prevention of Overspray, Runoff and Ponding: The permit holder is ultimately responsible for site runoff (though the State Water Board has provided clear guidance on tolerable "Incidental Runoff") and should require designs that will ensure system performance.
  - ✓ Protection of Drinking Fountains and Outdoor Eating Areas: The permit holder is ultimately responsible for the protection of public health and should require designs that will ensure system performance.
  - ✓ Protection of Wellheads: Title 22 of the California Code of Regulations outlines setbacks between recycled water use areas and wellheads. These setbacks are 100-feet for irrigation wells and 500-feet for potable water wells.
  - ✓ Hose Bibs: The recycled water system will need to be adequately marked and equipped with quick-couplers rather than hose bibs to prevent inadvertent use of recycled water for potable purposes.

- Design Approval and Information Required on Plans: The design standards outlined above should be included as required information on all site plans for recycled water users. As required by the NCRWQCB a recycled water use area drawing should be prepared for each customer. These drawings should show the irrigation areas, locations of all public facilities and play areas, and the location of both the potable and recycled water distribution systems as developed during the detailed site reconnaissance. The sketch of each site should be scaled to fit on 11" x 17" sheets.

Site Construction and Inspection: The City should ensure the design standards outlined above are met through an inspection program that covers the following:

- ✓ Pipe Identification
- ✓ Valve Boxes
- ✓ Quick Coupling Valves
- ✓ Other Valves and Devices
- ✓ Identification Tags and Stickers
- ✓ Irrigation Controllers

- ✓ Irrigation and Water Feature Advisory Signs
- ✓ Temporary Connection to Potable Water Service
- ✓ Cross-Connection Test
- ✓ Coverage Test and Final Inspection
- ✓ Record Drawings

The City should conduct a final on-site inspection to satisfy NCRWQCB and Department of Health Services requirements. This inspection will be coordinated with the final cross-connection test and will cover the following:

- ✓ Check for use of proper equipment for retrofit installation
- ✓ Placement of all required tags, labels and onsite signage
- ✓ Check for runoff or windblown spray outside the approved use area
- ✓ Check for ponding of recycled water within the use area
- ✓ Check spray patterns for encroachment on public facilities

Supervisor Training: Each customer would need to designate a Recycled Water Supervisor and a Supervisor Backup to be a liaison with the City, the Subregional System and the regulatory agencies. The City should provide training to each Recycled Water Supervisor and a Supervisor Backup for ongoing operations and maintenance and prevention of potential hazards on the recycled and potable water systems. This could be accomplished through a cooperative program with the Subregional System.

The training sessions would need to address the provisions contained in Title 17 and Title 22 relating to the safe use of recycled water and the maintenance of accurate records; attaining knowledge of basic concepts of backflow and cross-connection prevention, system testing and related emergency procedures; undertaking a preventive maintenance program involving regular inspections of the entire recycled water system; inspection and replacement of all damaged or missing warning signs, tags, stickers, and pipe markings; inspection of spray patterns, possible ponding and runoff: periodic cross-connection testing; maintaining accurate records of all inspections, modifications and repair work; and review of required report submittals to local and state agencies summarizing periodic inspections.

Public Information

Should the City elect to implement an urban reuse project, it would need to communicate the benefits of water recycling to its customers and the community at large. At the early stages of project implementation, the communication does not need to focus on specific project alternatives or phases, but rather it should continue to emphasize the value of all the City's water resources, especially how recycled water has the potential to expand future water supply.

This communication could be integrated with the City's existing customer outreach and education strategies, such as its Web site, various newsletters, utility bill inserts and the IRWP's email broadcast system. Key messages that could be communicated at this time include:

1. Water recycling, like water conservation, is a natural extension of the community's effort to conserve a valuable resource.
2. Water recycling provides major benefits in terms of "drought-proofing" the community's water supply without the need for new water diversions from the environment.

3. Recycled water is safe. The water is highly treated and carefully tested and the production process is approved and monitored by government public health professionals.
4. Many local examples of beneficial water recycling exist, including Finley Park, A Place to Play, Sonoma State University and the Mountain Shadows Golf Course. These local success stories can be linked back to the volume of potable water conserved for potable use.

The City should update the general message regarding recycled water as its project develops.

Design

In addition to the various policy and outreach tasks described above, the project phase would need to be designed, potentially in phases before it could be constructed. Project design would include two distinct activities: predesign and final design.

Predesign

Predesign activities would include detailed hydraulic modeling, evaluation of various pipeline alignments and siting analyses for potential tanks. Predesign activities should be summarized in report form and would result in updated project descriptions and cost estimates that should be coordinated with the CEQA and rate setting processes. Predesign activities should be undertaken for the complete Project (not just the first phase) so that the various interrelated system components can be sized for optimum performance.

Final Design

Final design activities would include the preparation of detailed plans and specifications for each Project phase. Final design may result in multiple bid packages to allow work to be performed most efficiently (i.e., upgrades to the treatment plant or construction of new pump stations may be bid separately from pipeline installations).

Coordination with Caltrans

Based on the alternatives developed in Chapter 6, it is likely that a recycled water system developed in the City would require some construction in Caltrans right-of-way. In September of 2006, the Governor signed Assembly Bill 371 (Goldberg), which provides direction to Caltrans to cooperate with local agencies installing recycled water infrastructure. Appendix 3 includes a sample “Notice to Caltrans” for the City’s use.

APPENDIX 1
H2ONET ANALYSIS OF THE ROHNERT PARK URBAN REUSE SYSTEM

Cotati Recycled Water System Hydraulic Analysis

PREPARED FOR: Winzler and Kelly

PREPARED BY: Mahesh Yedluri/CH2M HILL

COPIES: Doug Smith/CH2M HILL

DATE: March 2, 2007

This technical memorandum outlines the preliminary results for the proposed recycled water system for City of Cotati (Cotati). The hydraulic analysis was performed based on the recycled water usage data provided by Winzler and Kelly (W&K). This technical memorandum outlines the transmission main and connection requirements for the proposed recycled water system. The memorandum describes the assumptions, demands, and hydraulic analysis; and then provides conclusions for the system.

Model Assumptions

The following are the assumptions for the hydraulic analysis:

- The proposed users were consolidated into fewer demand nodes for hydraulic analyses purposes. The consolidated number of nodes is 44. The demand node locations are shown on Figure 1
- Only the transmission mains within the proposed system were evaluated; distribution mains to individual customers were not evaluated
- Minimum transmission pipeline size is 8-inch diameter
- Maximum velocity within the pipelines of the proposed system is 5 feet per second
- Minimum pressure within the proposed system is 40 psi
- The transmission main system was established based on the proposed demands provided by W&K, but the transmission main capacity needs to be verified if the demands increase in future
- Water supply to the proposed system will be provided from the existing Rohnert Park reuse system, from the 24-inch pipeline adjacent to Copeland Creek.

System Demands

The hourly demand pattern established for the City of Santa Rosa's Urban Reuse Water System was used for the proposed City's system evaluation. This provides for a peak day

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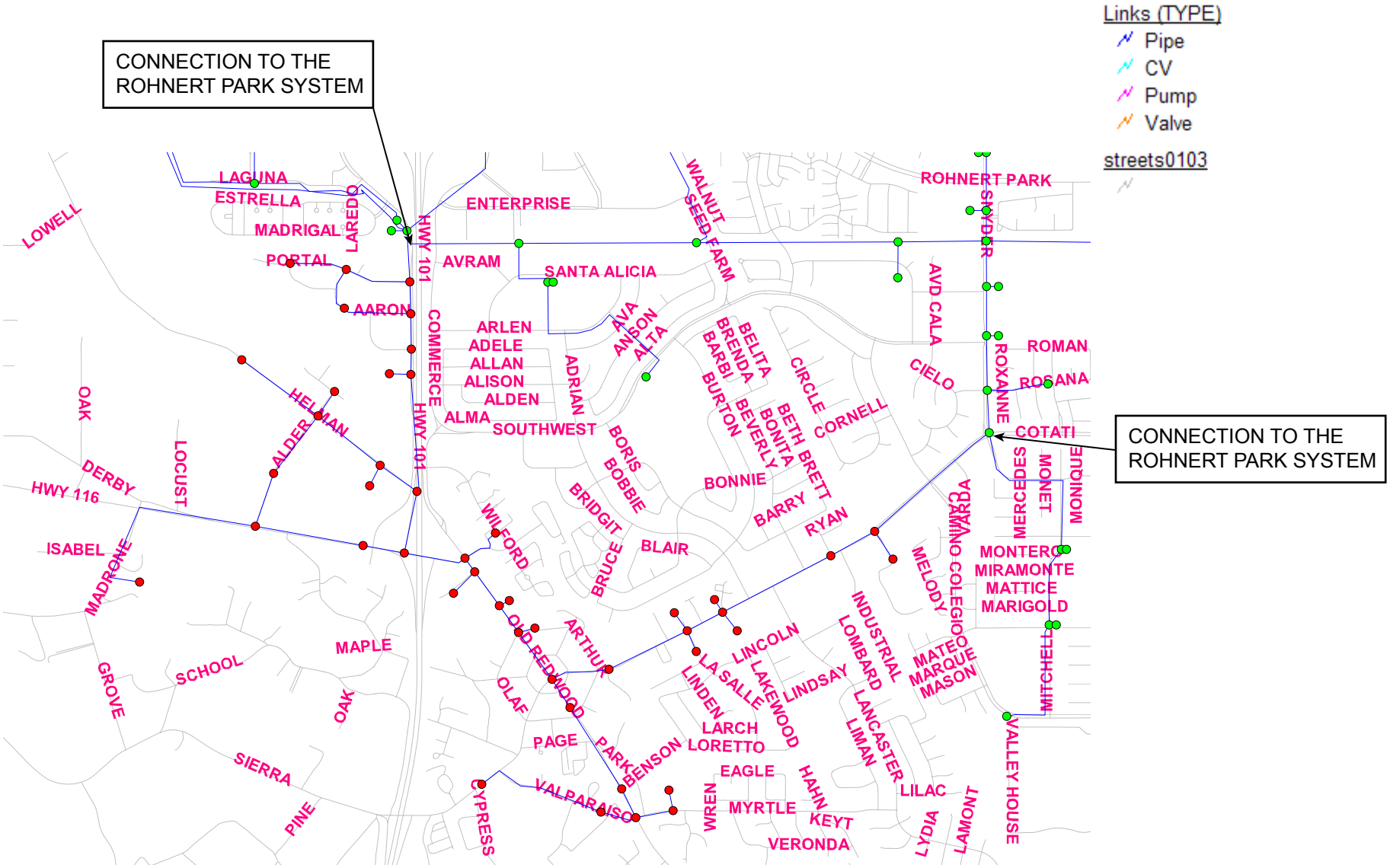

FIGURE 1
Cotati Urban Reuse System Hydraulic Analysis
City of Cotati

CH2MHILL

demand to average annual demand factor of 2.5:1 and a peak hour demand to peak day demand factor of 4.0:1.

The following demands are therefore calculated for the proposed Cotati distribution system:

- Annual demand: 40 MGY (million gallons per year)
- Maximum day demand: 0.28 mgd (million gallons per day)
- Peak hour demand: 1.1 mgd

Hydraulic Analysis

The system was evaluated based on the assumptions and demands described above. The hourly demand pattern used for the current analysis is shown on Figure 2 of this technical memorandum. This demand pattern was extended for 72 hours for the purpose of hydraulic analysis. The water supply to the proposed system is from the Rohnert Park system as indicated on Figure 1. The analysis of the proposed system provided the following results:

- The transmission mains required to supply recycled water to the proposed City's system consists of 15,500 feet of 8-inch-diameter pipeline.
- Looping the proposed 8-inch transmission main system with the Rohnert Park system on Snyder Lane will marginally benefit the pressures within the proposed system. The low pressure during peak hour at the most easterly Cotati demand node (on East Cotati Ave. near Snyder Lane) without the connection is 56 psi whereas it is 62 psi with the connection between the Cotati and Rohnert Park near Snyder Lane. There is 2 psi drop in pressure within the Rohnert Park system because of this loop. This connection is indicated on Figure 1.

Conclusions

The transmission main system indicated on Figure 1 was sufficient to supply demands to Cotati's proposed recycled water system. If Cotati anticipates demands different from the demands presented within this technical memorandum, the results presented within this technical memorandum need to be verified with the updated demands.

Looping of the Cotati's system with Rohnert Park system will provide slightly better pressures within the Cotati system.

There may be other opportunites to provide looping with the Subregional System's existing reclamation system or the Rohnert Park Reuse system. Many of those options are planned to be investigated as part of the Rohnert Park Urban Reuse expansion project. However, for the purposes of this study, one feasible looping scenario was investigated and shown to be feasible and somewhat beneficial to Cotati. Other scenarios may be beneficial to Cotati, but may provide additional benefits to the Subregional partners (Rohnert Park and Santa Rosa).

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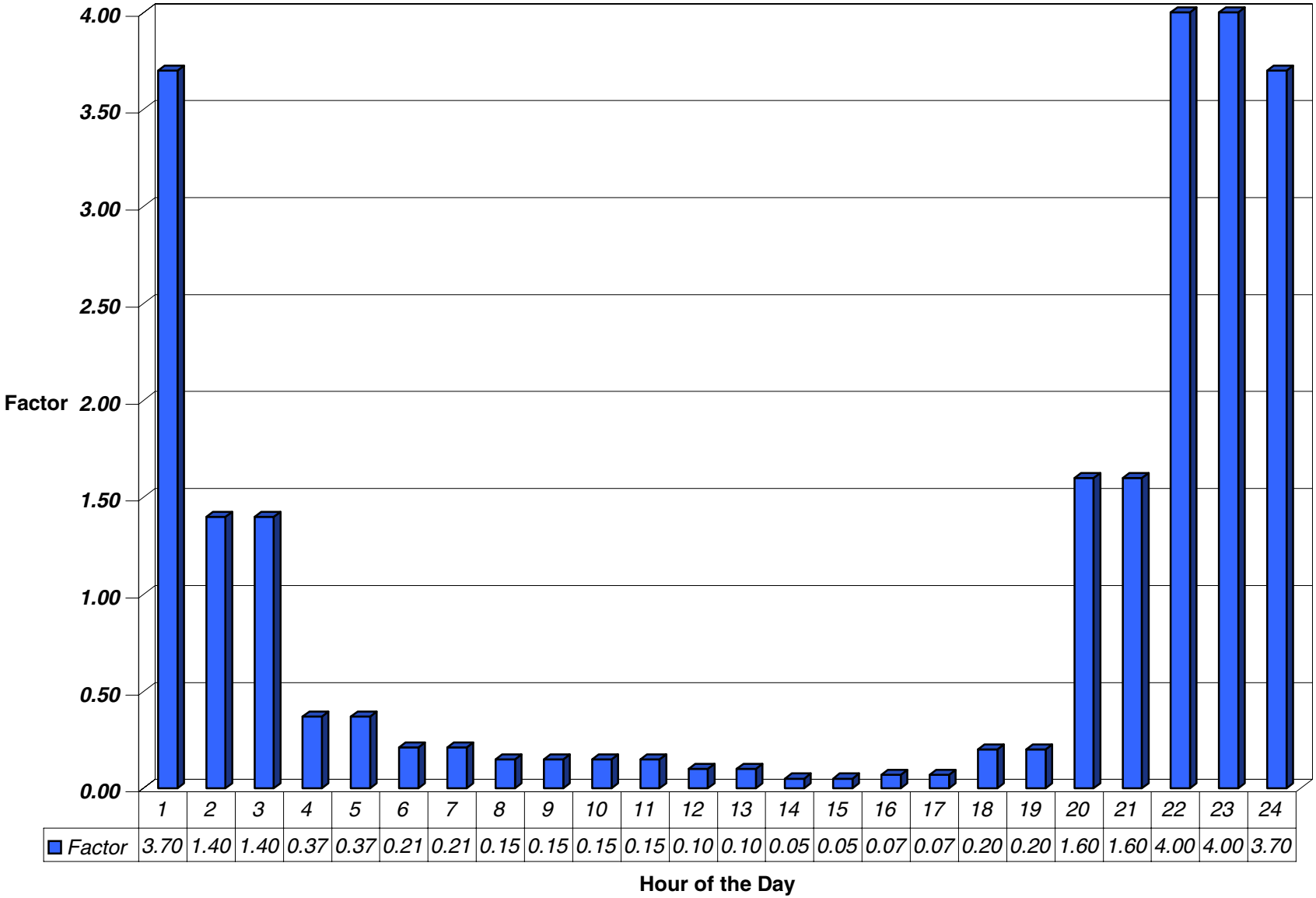

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Factor	3.70	1.40	1.40	0.37	0.37	0.21	0.21	0.15	0.15	0.15	0.15	0.10	0.10	0.05	0.05	0.07	0.07	0.20	0.20	1.60	1.60	4.00	4.00	3.70

Notes: Demands factors for the 24-Hour Period during the Maximum Day Demand, that is, 1.0 demand factor equates to Maximum Day Demand.

FIGURE 2
24-Hour Demand Pattern Hydraulic Analysis
City of Cotati

CH2MHILL

Santa Rosa Urban Reuse

Rohnert Park Hydraulics

TO: Marc Solomon
Mary Grace Pawson

COPIES: Don Marske

Ben Romero

FROM: Doug Smith

DATE: December 9, 2005

This memorandum describes the hydraulic capacities available from the Rohnert Park Reuse System for the Santa Rosa Urban Reuse System.

The Wilfred Ave. pipeline was designed for 125 psi operating pressure.

Hydraulic analyses simulated in H2ONET are summarized as follows:

Scenario Description	Inputs	Results
Base	Terre Linda on, Foxtail on, no looping, no new demands, constant head reservoir at Poncia PS supplying both Wilfred Ave. Pipeline (18") and Rohnert Park Reuse Pipeline (24"). No new south Santa Rosa demand.	P exceeds 65 psi at all locations.
1 – Terre Linda off	Terre Linda demand (1200 gpm) off. New demand for south Santa Rosa (3000 to 5000 gpm).	P drops to 65 psi at Foxtail GC and South SRS at 4000 gpm.
2 – Terre Linda and Foxtail off	Terre Linda and Foxtail (2000 gpm) off. New demand for south Santa Rosa (3000 to 6000 gpm).	P drops to 70 psi to South SRS at 5000 gpm. P drops to 50 psi at 6000 gpm.
3 – Terre Linda and Foxtail off with 12" loop to Dorotea Park	Terre Linda and Foxtail off. New demand for south Santa Rosa (3000 to 6000 gpm). Add 12" loop to Dorotea Park.	P results from Scenario 2 improve by 2 psi
4 – Terre Linda and Foxtail off	Terre Linda and Foxtail off. New demand for south Santa Rosa	P is sustained in south SRS up to 7000 gpm with 64 psi. Foxtail P is 96 psi, so

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with loop to Copeland Creek	(3000 to 7000 gpm). Add 18″ or 24″ loop to Copeland Creek.	south SRS P could easily be designed to exceed 65 psi. 24″ loop adds 3 psi.
5 – Add new developer demands for RP, turn off Terre Linda and Foxtail, add 24″ connector to Copeland Creek.	Terre Linda and Foxtail off. New demand for south Santa Rosa at 7000 gpm (10 mgd). Add 24″ loop to Copeland Creek. Add new 300 AF reservoir with pump station at Petaluma Hill Rd and RP XPWY. New RP parks on. All new RP SPAs on.	NW SPA and Wilfred Dowdell SPA consume 3000 gpm of 5000-gpm Wilfred Pipeline capacity. Of 7000 gpm total to south Santa Rosa, 1225 gpm is supplied by Wilfred Pipeline and 5775 gpm comes via the new connector up from Copeland Creek 24″ mainline. Poncia PS operates at 8550 gpm (12 mgd), and Pet. Hill PS operates at 15,450 gpm (22 mgd).

Conclusions

<u>Without New Developer Demands in Rohnert Park:</u>

1. With Terre Linda off, 3000 to 4000 gpm is possible to South SRS.
2. With Terre Linda and Foxtail off, 5000 gpm (about 7 mgd) is possible.
3. Loop to Dorotea is not advised.
4. Loop to Copeland Creek could increase flows to 7000 gpm with 18″ size. Length is 7700′. Estimated cost is $1.46 million based upon the standard cost assumptions used in ADM. Flow benefit estimated at 2000 gpm.

<u>With New Developer Demands in Rohnert Park:</u>

1. Up to 7000 gpm (10 mgd) could be supplied to south Santa Rosa with new PS at Peteluma Hill Reservoir, and 24″ connector to Copeland Creek.
2. With addition of Northwest SPA and Wilfred Dowdell SPA onto the Wilfred Pipeline, 3000 gpm of its 5000-gpm capacity are consumed. This leaves approximately 2000 gpm (about 3 mgd) of capacity that would be available if no connector is installed between the existing 24″ and 18″ mainlines.
3. The above conclusions assume that both Terre Linda and Foxtail use daytime irrigation or pond filling.
4. The flow benefit of the new 24″ connector under this scenario is the difference between 7000 gpm and 2000 gpm. The connector becomes more significant with developer demands included because much of the Wilfred pipeline capacity is consumed by the development in northwest Rohnert Park. Estimated cost of the 7700′ of 24″ pipeline is $1.89 million, again using the ADM costing guidelines.
5. The above scenarios assume that adequate capacity is established at the Petaluma Hill Reservoir, assumed to have 300 AF (98 MG) capacity. Under Scenario 5, its pump station would empty the reservoir at 15,450 gpm. An 8-hour volume at this

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rate is 7.4 MG, so the reservoir would be emptied in 13 days without refilling. However, the reservoir could be refilled from the existing 24" mainline which does not currently have any daytime demands. Assuming 16 hours of refilling time available and a capacity of 8000 gpm on the mainline, the system could essentially stay in balance because the refill rate is half the withdrawal rate but there is twice as much time to fill. The 13 days of storage would then become an operational buffer. A significant pump station, approaching 1500 HP, would be required at Petaluma Hill to provide this flow. In addition, the Poncia PS operational parameters would change. By night, it would serve in its current function of providing water at sprinkler pressure into Rohnert Park. By day, it would serve to boost flow from the Laguna plant into the Petaluma Hill Rd. reservoir, which would be a much lower head operation.

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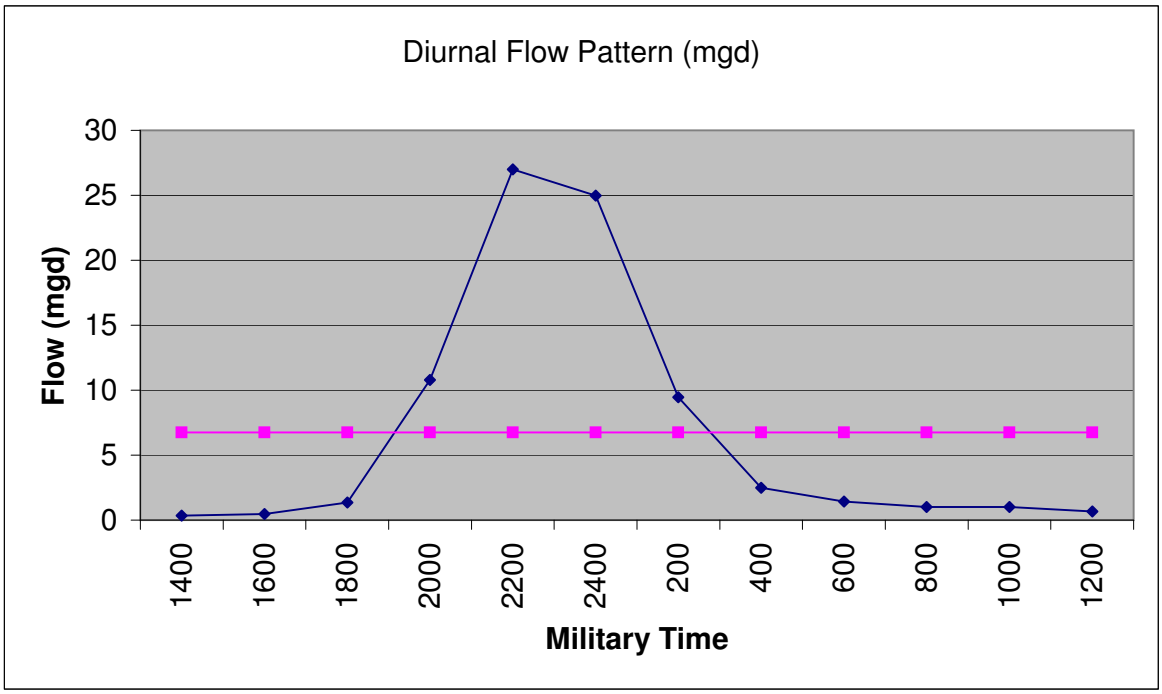
SOUTHEAST SPECIFIC PLAN AREA
AGILENT TECHNOLOGIES
LADYBUG PARK
MONTE VISTA SCHOOL
MAGNOLIA PARK
WALDO ROHNERT SCHOOL
BENICIA PARK
MTN SHADOWS JR HIGH SCHOOL
RAINBOW PARK
SONOMA STATE UNIVERSITY
RANCHO COTATE HIGH SCHOOL
COLEGIO VISTA PARK
JOHN REED SCHOOL
ALICIA PARK
COMMUNITY CENTER
SHURGUARD STORAGE
TURNOUT
STATE FARM
PUBLIC SAFETY
UNIVERSITY DISTRICT SPECIFIC PLAN AREA
CREEKSIDE MIDDLE SCHOOL
NORTHEAST SPECIFIC PLAN AREA
COMMUNITY FIELDS
PRIVATE LINE
EAGLE PARK
EVERGREEN SCHOOL
DOROTEA PARK
FOXTAIL GOLF COURSE
S/E POND
VALVE STATION
MTN SHADOWS APT
NORTH FOXTAIL GOLF COURSE
HONEYBEE PARK
GOLIS PARK
SOUTH SANTA ROSA DEMAND
FRESH CHOICE
WILFRED DOWDELL SPECIFIC PLAN AREA
NORTHWEST SPECIFIC PLAN AREA
TERRA LINDA
COMPUMOTOR
PRESS DEMOCRAT
RHOHNERT PARK TREATMENT PLANT
EL CAMINO H/S
R.P. STADIUM
PIMENTEL
NOT IN USE
RHOHNERT PARK PUMP STATION
PONCIA POND
PONCIA
TOMROSE
B/O & VALVE
IBLETO POND
IBLETO
MORRISON
LOCA 470861

APPENDIX 2
STORAGE TANK SIZING CALCULATIONS

Santa Rosa Recycled Water Storage--Diurnal Demand Curve and Storage Volume ADD 6.75 mgd

Percent Demand	Time (Military)	Fill Rate (mgd)	Demand (mgd)	Cumulative Volume (MG)	Storage In/Out (MG)	Storage Volume (MG)	Estimated Storage, MG
0.05	1400	6.75	0.34	0	0.53	2.80	
0.07	1600	6.75	0.47	0.03	0.52	3.32	
0.20	1800	6.75	1.35	0.11	0.45	3.77	← size @ 3.8 MG
1.60	2000	6.75	10.80	0.62	-0.34	3.43	
4.00	2200	6.75	27.00	2.19	-1.69	1.74	
3.70	2400	6.75	24.98	4.36	-1.52	0.22	
1.40	200	6.75	9.45	5.79	-0.23	0.00	
0.37	400	6.75	2.50	6.29	0.35	0.35	
0.21	600	6.75	1.42	6.45	0.44	0.80	
0.15	800	6.75	1.01	6.55	0.48	1.28	
0.15	1000	6.75	1.01	6.64	0.48	1.76	
0.10	1200	6.75	0.68	6.71	0.51	2.26	
				6.75			



APPENDIX 3
SAMPLE "NOTICE TO CALTRANS" UNDER AB 371

Date

Name
Address
City State ZIP

Re: Notice of Intent to Provide Recycled Water

Dear _____:

In accordance with Section 13555.5 of the Water Code, the City of Cotati is providing notice that intends to deliver recycled water along the Highway 10 and Highway 116 corridors within its City limits.

Such deliveries are expected to occur with the next ten (10) years. In accordance with Section 13555.5 of the Water Code, all irrigation piping installed by the California Department of Transportation shall comply with Title 22 of the California Code of Regulations and shall be suitable for use with recycled water.

The City looks forward to the opportunity to coordinate with Caltrans in developing a sustainable water supply for the City.