Project 8

On-Site Recycled Water Retrofits Project

Supporting Documents

Letters of Support from Retrofit Customer Sites

Los Angeles Unified School District
Facilities Services Division

Los Angeles Unified School District
FACILITIES SERVICES DIVISION

OFFICE OF THE SUPERINTENDENT

FACILITIES SERVICES DIVISION

July 12, 2014

California Department of Water Resources
Division of Integrated Regional Water Management
Financial Assistance Branch
P.O. Box 942836
Sacramento, CA 94236-0001
Attn: Zaffar Eusuff

RE: In Support of West Basin Municipal Water District's Integrated Regional Water Management Program Grant Application for the On-site Recycled Water Retrofits Project

Dear Mr. Eusuff:

The Los Angeles Unified School District (LAUSD) is pleased to support West Basin Municipal Water District (West Basin) in their effort to accelerate the adoption of recycled water conversions in its service area. We understand that the conversion of the irrigation system at Animo Charter School has been identified in the application for grant funding and that this funding would help offset some of the costs associated with a recycled water retrofit.

If funded, LAUSD agrees to work with West Basin to convert the use of potable water for the irrigation system at Animo Charter School to recycled water, thus mitigating the impacts of the current drought. These grant funds will accelerate the implementation of this project.

West Basin has demonstrated years of commitment to local water reliability through the recycled water program. As a current user of recycled water, we look forward to expanding to other sites within our school district. We understand the commitment we are making to ensure water reliability by utilizing a local water source rather than imported potable water supplies.

Sincerely,

Roger Finstad, Branch Director
Maintenance and Operations

TORRANCE UNIFIED SCHOOL DISTRICT

2335 PLAZA DEL AMO
P.O. BOX 2954
TORRANCE, CALIFORNIA 90509-2954

TELEPHONE (310) 972-6500
www.tusd.org

BOARD OF EDUCATION
MARTHA DEUTSCH
DON LEE
TERRY RAGINS
MARK STEFFEN
MICHAEL WERMERS

SUPERINTENDENT OF SCHOOLS
GEORGE W. MANNON, Ed.D.

July 1, 2014

California Department of Water Resources
Division of Integrated Regional Water Management
Financial Assistance Branch
P.O. Box 942836
Sacramento, CA 94236-0001
Attn: Zaffar Eusuff

RE: In Support of West Basin Municipal Water District's Integrated Regional Water Management Program Grant Application for the On-site Recycled Water Retrofits Project

Dear Mr. Eusuff:

The Torrance Unified School District (TUSD) is pleased to support West Basin Municipal Water District (West Basin) in their effort to accelerate the adoption of recycled water conversions in its service area. We understand that the conversion of the irrigation system at Jefferson Middle School has been identified in the application for grant funding and that this funding would help offset some of the costs associated with a recycled water retrofit.

If funded, TUSD agrees to work with West Basin to convert its use of potable water for the irrigation system to recycled water, thus mitigating the impacts of the current drought. These grant funds will accelerate the implementation of this project.

West Basin has demonstrated years of commitment to local water reliability through the recycled water program. As a current user of recycled water, we look forward to expanding to other sites within our school district. We understand the commitment we are making to ensure water reliability by utilizing a local water source rather than imported potable water supplies.

Sincerely,

Donald Stabler, Ed.D.
Deputy Superintendent
Torrance Unified School District

Elise Goldman

From: Bob Smith <BSmith@watsonlandcompany.com>
Sent: Friday, May 16, 2014 5:22 PM
To: the1ronman@yahoo.com
Cc: Shivaji Deshmukh; Richard Nagel; Edward Jakubik; Jeff Jennison; Elise Goldman
Subject: RE: Dominguez Technology Center Reclaimed Water Agreement (Director Smith Contact Information)

Dear Mr. Smith,

Per a recent conversation with Mr. Shivaji Deshmukh and Mr. Richard Nagel of West Basin Municipal Water District on May 13, 2014 and on behalf of Watson Land Company and Carson Dominguez Properties, L.P., I would like to affirm it is still our intent to move forward with completing an agreement between West Basin Municipal Water District to outline the retrofitting of the irrigation system serving Dominguez Technology Center (West). Specifically, the business park located the between the streets of Wilmington Avenue, Central Avenue, Victoria Avenue and Central Avenue in Carson, California.

It is understood this is a non-binding expression of interest. However, we look forward to working with the West Basin team to get this project completed as soon as reasonably possible.

If you have any questions or if anything further is needed from our companies at this time, please let me know.

Best Regards,

Robert B. Smith
Director- Real Estate Asset Management
WATSON LAND COMPANY
22010 Wilmington Avenue
Carson, CA 90745
P. 310.952.6421 | F. 310.513.7921 | C. 310.795.2087
bsmith@watsonlandcompany.com
www.watsonlandcompany.com

WATSON
LAND COMPANY

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From: Elise Goldman [mailto:EliseG@westbasin.org]
Sent: Friday, May 16, 2014 4:45 PM

ST. JAMES CATHOLIC SCHOOL
4625 Garnet St.
Torrance, CA 90503
(310) 371-0416

July 1, 2014

California Department of Water Resources
Division of Integrated Regional Water Management
Financial Assistance Branch
P.O. Box 942836
Sacramento, CA 94236-0001
Attn: Zaffar Eusuff

RE: In Support of West Basin Municipal Water District's Integrated Regional Water Management Program Grant Application for the On-site Recycled Water Retrofits Project

Dear Mr. Eusuff:

Saint James Catholic School (St. James) is pleased to support West Basin Municipal Water District (West Basin) in their effort to accelerate the adoption of recycled water conversions in its service area. We understand that the conversion of our irrigation system has been identified in the application for grant funding and that this funding would help offset some of the costs associated with a recycled water retrofit.

If funded, St. James agrees to work with West Basin to convert its use of potable water for particular irrigation systems to recycled water, thus mitigating the impacts of the current drought. These grant funds will accelerate the implementation of this project.

West Basin has demonstrated years of commitment to local water reliability through the recycled water program. We understand the commitment we are making to ensure water reliability by utilizing a local water source rather than imported potable water supplies.

Sincerely,

Sister Mary Margaret

Sister Mary Margaret
Principal
Saint James Catholic School

Manhattan Village Homeowners Association
44 Fairway Drive, Manhattan Beach, CA 90266
(310) 546-1737 • Facsimile (310) 545-7459
Email: manager@mvhoa.com
Website: www.mvhoa.com

June 28, 2014

California Department of Water Resources
Division of Integrated Regional Water Management
Financial Assistance Branch
P.O. Box 942836, Sacramento, CA 94236-0001
Attn: Zaffar Eusuff

Dear Mr. Eusuff:

RE: Letter of Support for the Grant Application for an On-Site Recycled Water Retrofit Project, submitted by West Basin Municipal Water District's Integrated Regional Water Management Program

The Manhattan Village Home Owners Association (MVHOA) is pleased to support the West Basin Municipal Water District (West Basin) in their effort to accelerate the adoption of recycled water conversions in its service area.

MVHOA is located in the South Bay in Los Angeles on approximately 40 acres, which is mostly common area landscape that is currently irrigated with potable water. An existing underground pipe that transports recycled water along Marine Ave., just outside the walls of our community. We have been discussing the possibility of converting our irrigation to recycled water with West Basin staff for well over two years. We understand that the conversion of our irrigation system has been identified in the application for grant funding and that this funding would help offset some of the costs associated with a recycled water retrofit.

In addition to this effort and in full awareness of the current, serious drought in California, our Board is also designing a plan to steadily convert to drought-resistant, native landscaping throughout the HOA.

If funded, MVHOA is looking forward to working with West Basin to convert our use of potable water to recycled water for our irrigation system, thus mitigating the impacts of the current drought. MVHOA does plan to commit funding to implement this project but these grant funds will greatly accelerate the implementation of this project, which is urgently needed during this serious drought.

West Basin has demonstrated consistent commitment to local water reliability through the recycled water program. We understand that we are making a commitment to support water reliability by utilizing a local water source rather than imported potable water supplies.

Sincerely,

Diane M. Wallace, President
Manhattan Village Home Owners Association

DEPARTMENT OF TRANSPORTATION
DISTRICT 7
100 S. MAIN STREET, SUITE 100
LOS ANGELES, CA 90012
PHONE (213) 897-0362
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Flex your power!
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June 30, 2014

Mr Joe Walters
Manager of Business Development and Regulatory Affairs
West Basin Municipal Water District
17140 South Avalon Boulevard, Suite 210
Carson, CA 90746-1269

Dear Mr.Walters:

On behalf of the California Department of Transportation (Caltrans), I wish to express our strong support for the recycled water transmission line grant project submitted by West Basin Municipal Water District.

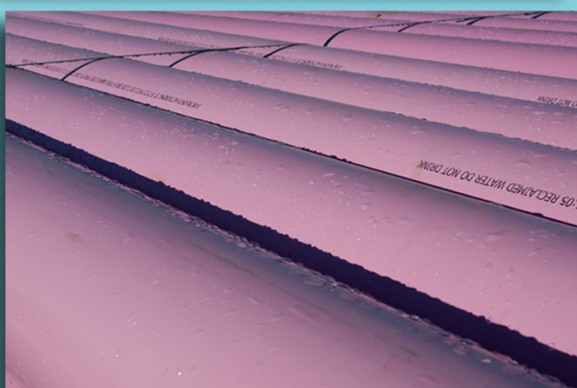
As California heads to the severe drought conditions for the fourth consecutive year, water has become precious resource to the people of California. Landscape is an important element to the transportation of this region. It provides screening, erosion run-off, and gateway to the city. Most of our landscape will require supplemental water to keep in a healthy condition. From sustainability perspective, it is wise to use recycled water as a source for irrigation while conserve potable water for other needs.

Caltrans is proud to work with West Basin Municipal Water District on this project and will support the planning process by assigning staff to actively participate in meetings, providing input, feedback and helping to guide plan development.

Please let me know if you have any questions.

Sincerely,

DEBORAH WONG, P.E.
Deputy District Director
District 7
Division of Maintenance



WEST BASIN MUNICIPAL WATER DISTRICT

Capital Implementation Master Plan for Recycled Water Systems

FINAL REPORT

June 2009

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EXP. 3-31-2011
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STATE OF CALIFORNIA

West Basin Municipal Water District

CAPITAL IMPLEMENTATION MASTER PLAN FOR RECYCLED WATER SYSTEMS

FINAL REPORT
June 2009

199 SOUTH LOS ROBLES AVENUE • SUITE 530 • PASADENA, CALIFORNIA 91101 • (626) 535-0180 • FAX (626) 535-0185

WEST BASIN MUNICIPAL WATER DISTRICT

CAPITAL IMPLEMENTATION MASTER PLAN FOR RECYCLED WATER SYSTEMS

TABLE OF CONTENTS

Page No.

TABLE OF CONTENTS (continued)

Page No.

TABLE OF CONTENTS (continued)

Page No.

TABLE OF CONTENTS (continued)

Page No.

TABLE OF CONTENTS (continued)

Page No.

TABLE OF CONTENTS (continued)

Page No.

LIST OF APPENDICES

TABLE OF CONTENTS (continued)

Page No.

LIST OF TABLES

LIST OF TABLES (continued)

Page No.

LIST OF TABLES (continued)

Page No.

LIST OF FIGURES

LIST OF FIGURES (continued)

Page No.

RECYCLED WATER DEMANDS

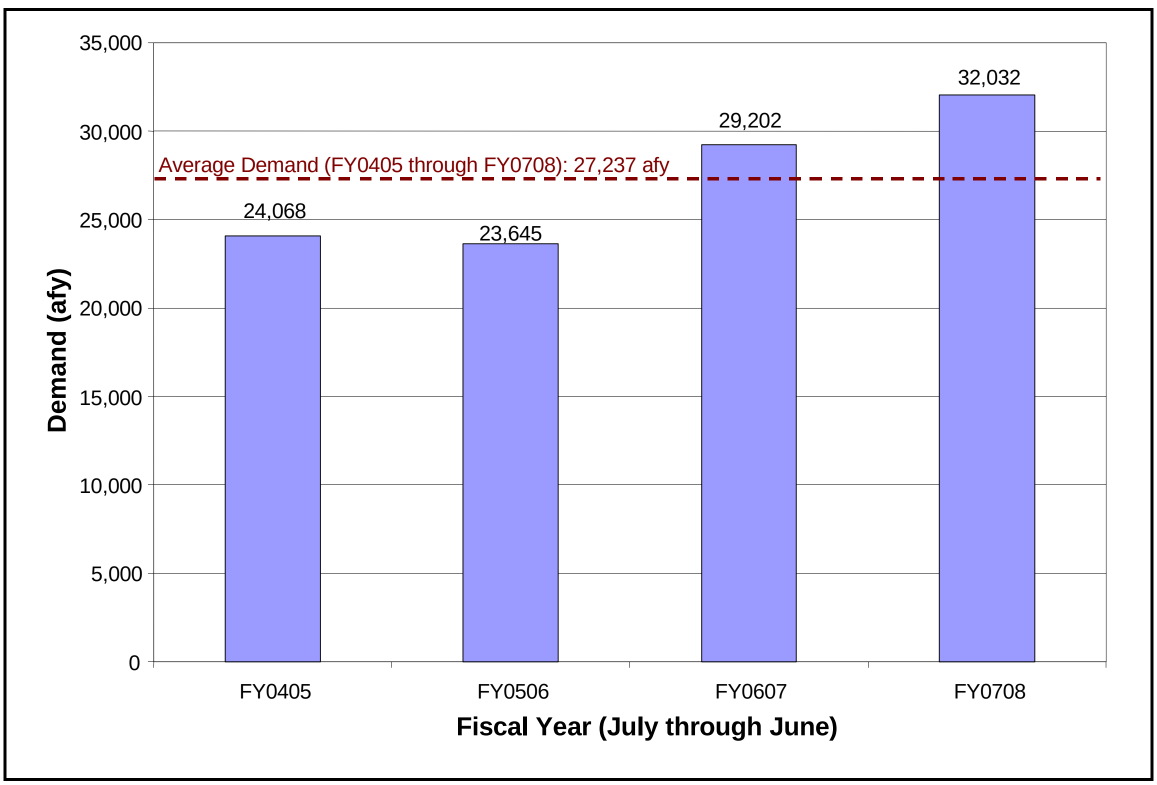
This chapter presents a discussion of the West Basin Municipal Water District (West Basin) recycled water demands. West Basin's historical recycled water demand is presented first, followed by a discussion of the recycled water demand factors and peaking factors that are used to estimate the recycled water demands of potential future recycled water customers. The projected recycled water demands are included at the end of the chapter.

3.1 HISTORICAL RECYCLED WATER DEMANDS

West Basin's existing recycled water customer sites and the existing recycled water distribution system are shown on Figure 3.2. The current recycled water customers can be divided into four user types: industrial, irrigation, mixed use, and barrier customers. Mixed use refers to customer that use recycled water for more than one usage type (e.g., irrigation and cooling towers).

The historical demand presented on Figure 3.1 is derived from West Basin's historical recycled water usage records for the last four years, fiscal year (FY) 2004/05 through FY 2007/08.

Figure 3.1
Historical Recycled Water Usage



As shown on Figure 3.1, the recycled water demands have increased from 24,068 to 32,032 acre-feet per year (afy) during this period, which equates to an average increase of nearly 7.5 percent per year. Based on FY2007/08, the existing average annual demand is 32,032 afy or 28.6 million gallons per day (mgd).

3.2 EXISTING CUSTOMERS

West Basin's customer database summarizes the historical consumption of all existing customers, and lists the customer type, water purveyor, and address information for each customer.

As of September 2008, West Basin serves over 200 customer connections with various types of recycled water qualities. The existing customer demands and usage types are summarized in Table 3.1. The distribution of the existing recycled water demand by customer type is also shown on Figure 3.3.

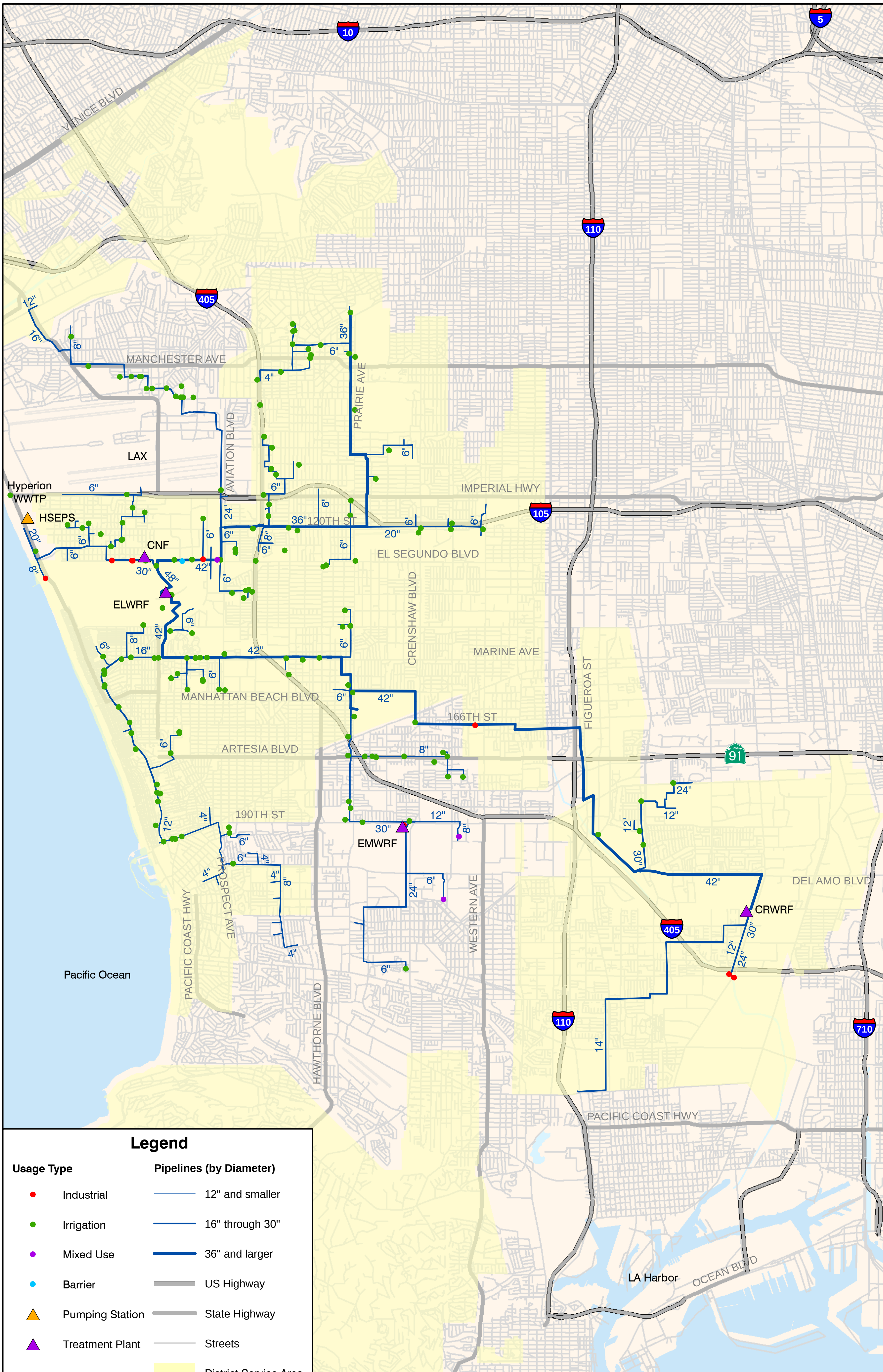
Table 3.1 Existing Demand by Usage Type
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Type	Usage Type Code	Customers	Demand[1] (afy)	Percent of Total (%)
Barrier	B	1	11,380	36
Industrial	IN	5	17,018	53
Irrigation	IR	165	3,257	10
Mixed Use	MU	4	205	<1
Total		**175**	**31,860**	**100**

Note:
(1) Based on the planning average demand (from Table 3.2)

As shown on Table 3.1 and Figure 3.3, the majority of the existing demand is categorized as Industrial, representing approximately 53 percent of the existing demand while the majority of customers are categorized as irrigation usage. This indicates that the industrial demands present a significant portion of overall recycled water usage and provide a solid baseline of usage within the West Basin's customer base.

The existing customers and their respective usage type and average annual demands are listed in Table 3.2. Table 3.2 also indicates the Database IDs that correspond with the detailed customer maps that are included in Appendix B. The customers listed in Table 3.2 are sorted based on the Database IDs to allow easy referencing with the customer maps.



Legend

Usage Type

- Industrial
- Irrigation
- Mixed Use
- Barrier
- Pumping Station
- Treatment Plant

Pipelines (by Diameter)

- 12" and smaller
- 16" through 30"
- 36" and larger
- US Highway
- State Highway
- Streets
- District Service Area

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Miles

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Figure 3.2
Existing Recycled Water Customer by User Type

Table 3.2 Existing Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Database ID(1)	Customer Name	Usage Type Code(2)	Service Area	Average Historic Demand (afy)(3)	Maximum Month Demand(3) (acre-feet)	Seasonal Peaking Factor(4)	Planning Average Annual Demand(5) (afy)	Planning Maximum Month Demand (mgd)
E1	ExxonMobil Torrance Refinery - Cooling Towers	IN	No	4,136	408	1.2	4,135	4.38
E2	Chevron Nitrification Plant	IN	Yes	3,487	399	1.4	3,500	4.27
E3	bp Carson Refinery - Industrial RO Component	IN	Yes	2,783	394	1.7	2,800	4.22
E4	Chevron El Segundo Refinery - High Pressure Boiler Feed	IN	Yes	2,804	250	1.1	2,800	2.68
E5	ExxonMobil Torrance Refinery - Boiler Feed	IN	No	2,015	223	1.3	2,015	2.38
E6	Chevron El Segundo Refinery - Low Pressure Boiler Feed	IN	Yes	1,107	139	1.5	1,100	1.49
E7	bp Carson Refinery - Nitrified Component	IN	Yes	571	65	1.3	600	0.69
E8	Inglewood Park Cemetery	IR	Yes	469	89	2.3	470	0.96
E9	Victoria Golf Course	IR	Yes	235	59	2.8	250	0.63
E10	Chester Washington Golf Course	IR	Yes	227	50	2.6	230	0.53
E11	Cal State Univ Dominguez	IR	Yes	121	26	2.1	150	0.28
E12	Chevron El Segundo Refinery - Irrigation	IR	Yes	131	20	1.8	130	0.21
E13	Anschutz So Cal Sports (Home Depot Center)	IR	Yes	109	18	2.0	109	0.20
E14	Centinela (Vincent) Park	IR	Yes	105	18	2.1	105	0.20
E15	Toyota	MU	No	94	15	1.9	95	0.16
E16	LAX @ 6400 Westchester Parkway	IR	No	89	16	2.2	89	0.17
E17	Columbia Park	IR	No	88	19	2.6	96	0.22

Table 3.2 Existing Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Database ID[1]	Customer Name	Usage Type Code[2]	Service Area	Average Historic Demand (afy)[3]	Maximum Month Demand[3] (acre-feet)	Seasonal Peaking Factor[4]	Planning Average Annual Demand[5] (afy)	Planning Maximum Month Demand (mgd)
E18	So Cal Edison - El Segundo Generating Station	IN	Yes	67	11	1.9	67	0.11
E19	Hyperion Treatment Plant	IR	No	58	18	3.7	58	0.19
E20	American Honda	MU	No	50	8	2.2	50	0.10
E21	El Segundo Golf Course	IR	Yes	49	10	2.4	50	0.11
E22	Morningside School	IR	Yes	47	10	2.4	50	0.11
E23	Goodyear Airship Station	IR	Yes	44	12	3.4	44	0.13
E24	Loyola Marymount University	IR	No	21	16	4.5	43	0.17
E25	Westchester Park	IR	No	42	10	3.0	42	0.11
E26	Mira Costa High School	IR	Yes	38	6	1.9	38	0.06
E27	Dominguez Park	IR	Yes	36	7	2.2	36	0.07
E28	Recreation Park - El Segundo	IR	Yes	34	6	2.2	34	0.07
E29	Polliwog Park	IR	Yes	33	10	3.6	33	0.11
E30	LA Airforce Base Area B	MU	Yes	29	7	2.7	30	0.07
E31	ExxonMobil Torrance Refinery - Irrigation	IR	No	29	7	2.9	29	0.08
E32	Glasgow Park	IR	Yes	73	10	4.9	24	0.10
E33	Hermosa Greenbelt	IR	Yes	23	5	2.3	23	0.05
E34	Hawthorne Blvd/Marine	IR	Yes	22	4	2.1	22	0.04
E35	Alondra Park (West)	IR	Yes	20	5	2.9	20	0.05
E36	Avalon Median N/Elsmere	IR	Yes	20	3	1.9	20	0.03
E37	Hawthorne High School	IR	Yes	21	6	3.4	20	0.06

Table 3.2 Existing Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Database ID[1]	Customer Name	Usage Type Code[2]	Service Area	Average Historic Demand (afy)[3]	Maximum Month Demand[3] (acre-feet)	Seasonal Peaking Factor[4]	Planning Average Annual Demand[5] (afy)	Planning Maximum Month Demand (mgd)
E38	LAX @ 6662 West 88th St	IR	No	20	3	1.9	20	0.03
E39	Washington Park	IR	Yes	20	4	2.6	20	0.05
E40	Hermosa Valley Park II	IR	Yes	19	4	2.7	19	0.05
E41	Marine Avenue Park	IR	Yes	19	4	2.5	19	0.04
E42	Rogers Park	IR	Yes	19	3	2.0	19	0.03
E43	Grandview Elementary / Ladera	IR	Yes	6	1	2.0	18	0.03
E44	Pennekamp Elementary School	IR	Yes	13	2	1.5	18	0.02
E45	Center Elementary School	IR	Yes	17	5	3.2	17	0.05
E46	Scattergood Power Plant	IR	No	3	1	5.0	17	0.08
E47	Carl Neilson Youth Park	IR	No	16	3	2.2	16	0.03
E48	Condon Park (Lennox Park)	IR	Yes	8	2	1.1	16	0.02
E49	Hawthorne Medians	IR	Yes	16	2	1.5	16	0.02
E50	Holly Park	IR	Yes	16	3	2.3	16	0.03
E51	Middle School (prev LA Raiders Headquarters)	IR	Yes	16	4	2.9	16	0.04
E52	El Segundo High School	IR	Yes	15	3	2.3	15	0.03
E53	Lennox Middle School	IR	Yes	15	4	3.1	15	0.04
E54	Plaza El Segundo	IR	Yes	12	3	2.5	15	0.03
E55	Sports Park	IR	Yes	15	3	2.0	15	0.03
E56	Caltrans (I-405/La Cienega)	IR	Yes	14	11	3.8	14	0.05
E57	Guenser Park	IR	No	14	3	2.6	14	0.03

Table 3.2 Existing Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Database ID(1)	Customer Name	Usage Type Code(2)	Service Area	Average Historic Demand (afy)(3)	Maximum Month Demand(3) (acre-feet)	Seasonal Peaking Factor(4)	Planning Average Annual Demand(5) (afy)	Planning Maximum Month Demand (mgd)
E58	Mar Brad Middle School - La Marina Field	IR	Yes	14	3	2.1	14	0.03
E59	Rogers Anderson Park	IR	Yes	14	4	3.8	14	0.05
E60	Valley/Ardmore Greenbelt @ 19th St	IR	Yes	14	3	2.4	14	0.03
E61	Caroline Coleman Stadium	IR	Yes	13	3	2.9	13	0.03
E62	Lawndale Union High School District	IR	Yes	13	3	2.9	13	0.03
E63	Caltrans (I-405/Imperial)	IR	Yes	12	4	3.8	12	0.04
E64	Dana-Burnett Elementary School	IR	Yes	12	5	5.4	12	0.06
E65	Del Air Park	IR	Yes	12	3	2.6	12	0.03
E66	Federal Building - Hawthorne	IR	Yes	12	3	2.5	12	0.03
E67	Hughes Way Storm Drain Plant # 18	IR	Yes	12	6	5.6	12	0.06
E68	Leuzinger High School	IR	Yes	12	5	4.8	12	0.05
E69	Manhattan Studios	IR	Yes	12	2	1.6	12	0.02
E70	MB Middle School (Bell Ave South of Park)	IR	Yes	12	2	2.0	12	0.02
E71	Sunny Glenn Park	IR	No	12	2	2.2	12	0.02
E72	Caltrans (I-405/117th)	IR	Yes	10	3	3.4	10	0.03
E73	Manhattan Village Park	IR	Yes	9	2	2.4	10	0.02
E74	Marine Avenue Median	IR	Yes	4	1	2.0	10	0.02
E75	South Park - Hermosa Beach	IR	Yes	10	2	2.4	10	0.02
E76	Torrance Business Center	IR	No	10	2	1.9	10	0.02
E77	Valley/Ardmore Greenbelt @ 2nd	IR	Yes	10	2	2.6	10	0.02

Table 3.2 Existing Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Database ID[1]	Customer Name	Usage Type Code[2]	Service Area	Average Historic Demand (afy)[3]	Maximum Month Demand[3] (acre-feet)	Seasonal Peaking Factor[4]	Planning Average Annual Demand[5] (afy)	Planning Maximum Month Demand (mgd)
E78	Anza Elementary School	IR	Yes	13	4	5.1	9	0.04
E79	Clark Park	IR	Yes	9	2	2.2	9	0.02
E80	Hawthorne Memorial Park	IR	Yes	9	1	1.9	9	0.01
E81	Inglewood City Hall	IR	Yes	9	1	1.6	9	0.01
E82	Magruder Middle School	IR	No	9	2	3.1	9	0.02
E83	Sepulveda Elementary School	IR	Yes	9	2	2.5	9	0.02
E84	Valley/Ardmore Greenbelt @ Ardmore	IR	Yes	9	3	3.6	9	0.03
E85	Aviation Park	IR	Yes	9	2	3.3	8	0.02
E86	Caltrans (I-105/Van Ness)	IR	Yes	6	2	3.3	8	0.02
E87	Caltrans (I-105/York St)	IR	Yes	8	5	7.7	8	0.05
E88	Casimir School	IR	No	8	3	3.7	8	0.03
E89	The Edge at Campus El Segundo	IR	Yes	N/A	N/A	2.5	8	0.02
E90	Hermosa Valley Elementary School	IR	Yes	8	2	2.7	8	0.02
E91	Imperial Ave. Parkway	IR	Yes	8	1	2.1	8	0.02
E92	LAX @ 5985 Westchester Parkway	IR	No	8	1	1.8	8	0.01
E93	11310 Aviation Blvd	IR	No	7	2	2.9	7	0.02
E94	Begg Elementary School	IR	Yes	7	2	3.0	7	0.02
E95	Caltrans (I-405/135th)	IR	Yes	7	3	5.1	7	0.03
E96	El Segundo Library Park	IR	Yes	7	1	2.1	7	0.01
E97	Eucalyptus Avenue School	IR	Yes	7	1	2.3	7	0.01

Table 3.2 Existing Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Database ID[1]	Customer Name	Usage Type Code[2]	Service Area	Average Historic Demand (afy)[3]	Maximum Month Demand[3] (acre-feet)	Seasonal Peaking Factor[4]	Planning Average Annual Demand[5] (afy)	Planning Maximum Month Demand (mgd)
E98	Inglewood Water Treatment Plant	IR	Yes	7	1	1.7	7	0.01
E99	Jane Addams Park	IR	Yes	7	2	2.8	7	0.02
E100	McMaster Park	IR	No	7	2	3.1	7	0.02
E101	Robinson Elementary School	IR	Yes	7	2	3.9	7	0.02
E102	Valley/Ardmore Greenbelt @ M.B.B.S.	IR	Yes	7	1	2.2	7	0.01
E103	Center Park	IR	Yes	6	1	2.3	6	0.01
E104	Eucalyptus Park	IR	Yes	6	1	2.7	6	0.01
E105	LAX @ 6100 Will Rogers Street	IR	No	6	2	4.1	6	0.02
E106	Meadows Elementary School	IR	Yes	6	1	2.7	6	0.01
E107	Nash & Continental Medians	IR	Yes	6	1	2.1	6	0.01
E108	Richmond School	IR	Yes	6	2	3.3	6	0.02
E109	Arlington School	IR	No	5	1	3.4	5	0.02
E110	Buford Elementary School	IR	Yes	5	2	5.6	5	0.02
E111	Crozier Jr. High	IR	Yes	7	2	2.9	5	0.01
E112	Descanso Park	IR	No	5	1	2.9	5	0.01
E113	Hawthorne Intermediate School	IR	Yes	5	1	2.9	5	0.01
E114	Hughes Way Median	IR	Yes	5	1	2.3	5	0.01
E115	LAX @ 6100 Westchester Parkway Park	IR	No	6	1	2.5	5	0.01
E116	Market Street Medians	IR	Yes	5	1	1.3	5	0.01
E117	Valley/Ardmore Greenbelt @ 8th St	IR	Yes	5	1	3.2	5	0.01

Table 3.2 Existing Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Database ID(1)	Customer Name	Usage Type Code(2)	Service Area	Average Historic Demand (afy)(3)	Maximum Month Demand(3) (acre-feet)	Seasonal Peaking Factor(4)	Planning Average Annual Demand(5) (afy)	Planning Maximum Month Demand (mgd)
E118	York Avenue School	IR	Yes	5	1	3.2	5	0.01
E119	Marine & Sepulveda Median	IR	Yes	5	1	2.9	4	0.01
E120	Bell Industries	IR	Yes	4	1	2.5	4	0.01
E121	Cabrillo Elementary School	IR	Yes	4	2	4.7	4	0.02
E122	Caltrans (I-405/Redondo Beach)	IR	Yes	4	3	2.4	4	0.01
E123	Florence Median	IR	Yes	4	1	2.0	4	0.01
E124	Hermosa Beach Community Center	IR	Yes	4	1	2.6	4	0.01
E125	LAX @ 5990 Westchester Parkway	IR	No	4	1	2.9	4	0.01
E126	Marine Avenue Median	IR	Yes	1	1	2.0	4	0.01
E127	MB Fire & Police Landscape	IR	Yes	1	1	3.2	4	0.01
E128	Queen Park	IR	Yes	4	1	2.5	4	0.01
E129	Caltrans (I-405/El Segundo)	IR	Yes	3	2	6.0	3	0.02
E130	El Segundo Medians	IR	Yes	3	1	2.6	3	0.01
E131	LAX @ 6101 Westchester Parkway Park	IR	No	3	1	4.7	3	0.01
E132	Lowe's	IR	Yes	3	1	3.4	3	0.01
E133	Maryland Hilltop Park	IR	Yes	2	1	1.8	3	<0.01
E134	Valley/Ardmore Greenbelt @ 15th St	IR	Yes	3	1	2.8	3	0.01
E135	190th St./Prospect Ave Medians	IR	Yes	2	0	2.1	2	<0.01
E136	Artesia Blvd / Kornblum	IR	No	2	1	3.4	2	0.01
E137	Artesia Blvd / Prairie	IR	No	2	0	2.4	2	<0.01

Table 3.2 Existing Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Database ID[1]	Customer Name	Usage Type Code[2]	Service Area	Average Historic Demand (afy)[3]	Maximum Month Demand[3] (acre-feet)	Seasonal Peaking Factor[4]	Planning Average Annual Demand[5] (afy)	Planning Maximum Month Demand (mgd)
E138	Artesia Blvd / Van Ness	IR	No	2	1	3.2	2	0.01
E139	Artesia Blvd median	IR	No	2	1	4.6	2	0.01
E140	Caltrans (I-405/Century)	IR	Yes	2	2	11.6	2	0.02
E141	Caltrans (I-405/Inglewood)	IR	Yes	2	2	12.0	2	0.02
E142	Del Taco DT895	IR	Yes	2	2	11.0	2	0.02
E143	Felton Elementary School	IR	Yes	1	1	4.2	2	0.01
E144	Holly Glen Park	IR	Yes	2	0	2.2	2	<0.01
E145	Jefferson School	IR	Yes	2	1	4.0	2	0.01
E146	LAX @ 6440 West 88th St Median	IR	No	2	1	2.7	2	<0.01
E147	LAX @ 6450 West 88th St Sound Wall	IR	No	2	0	2.2	2	<0.01
E148	Live Oak Park	IR	Yes	2	1	3.3	2	0.01
E149	Marine & Herrin Median	IR	Yes	2	0	2.0	2	<0.01
E150	MB Unified School District Admin	IR	Yes	2	1	2.5	2	<0.01
E151	Rosecrans Medians @ Pine	IR	Yes	2	1	3.4	2	0.01
E152	Sycamore Park	IR	Yes	2	1	2.9	2	0.01
E153	Washington Avenue School	IR	Yes	2	1	3.5	2	0.01
E154	190th St, 3403 - Median	IR	No	<1	<1	7.1	1	0.01
E155	Crenshaw Lumber	IN	Yes	1	1	8.8	1	0.01
E156	Del Aire Assembly of God	IR	Yes	1	1	8.0	1	0.01
E157	Falda Ave	IR	Yes	1	2	3.6	1	<0.01

Table 3.2	Existing Customers Capital Implementation Master Plan West Basin Municipal Water District							
Database ID[1]	**Customer Name**	**Usage Type Code[2]**	**Service Area**	**Average Historic Demand (afy)[3]**	**Maximum Month Demand[3] (acre-feet)**	**Seasonal Peaking Factor[4]**	**Planning Average Annual Demand[5] (afy)**	**Planning Maximum Month Demand (mgd)**
E158	Hermosa Beach Library And City Hall	IR	Yes	1	0	2.4	1	<0.01
E159	Herondo/Francisca Median	IR	Yes	1	0	3.2	1	<0.01
E160	LAX @ 6147 Westchester Parkway Park	IR	No	1	0	2.0	1	<0.01
E161	LAX @ 6525 West 88th St	IR	No	1	0	4.3	1	<0.01
E162	Marine Triangle Median	IR	Yes	1	0	4.1	1	<0.01
E163	PCH/Herondo-King Harbor Park	IR	Yes	1	1	9.7	1	0.01
E164	The Parking Spot	IR	No	1	0	1.7	1	<0.01
E165	Redondo Union High School	IR	Yes	N/A	N/A	2.7	34	0.08
E166	Aerospace	MU	Yes	N/A	N/A	2.5	30	0.07
E167	Hawthorne Municipal Airport	IR	Yes	<1	0	6.8	0	<0.01
E168	PCH/190th Street Median	IR	Yes	<1	<1	3.6	0	<0.01
E169	Redondo Technology Center	IR	Yes	4	1	2.6	4	0.01
E170	City Storm Water Detention	IR	Yes	<1	0	3.3	0	<0.01
E171	Storm Drain Plant 17	IR	Yes	<1	0	1.9	1	<0.01
E172	Caltrans (1-105 / Crenshaw)	IR	Yes	6	4	4.4	10	0.04
E173	City Service Yard	IR	Yes	<1	0	4.8	0	<0.01
E174	Grevillea Mall Park	IR	Yes	4	1	2.9	4	0.01
E175	Hollywood Park	IR	Yes	18	3	1.8	18	0.03
E176	1508 Aviation	IR	Yes	<1	0	2.1	0	<0.01
E177	2202 Aviation	IR	Yes	<1	0	2.4	1	<0.01

Table 3.2 Existing Customers
Capital Implementation Master Plan
West Basin Municipal Water District

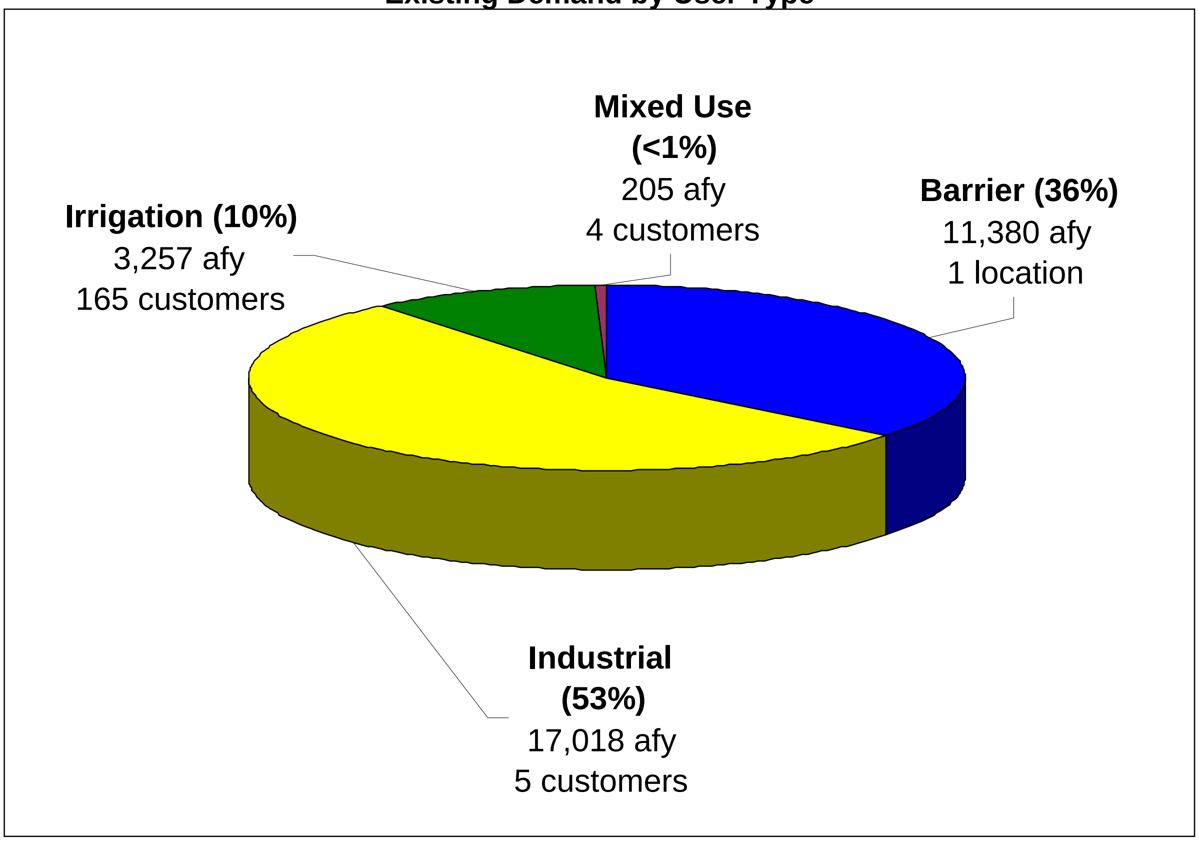
Database ID[1]	Customer Name	Usage Type Code[2]	Service Area	Average Historic Demand (afy)[3]	Maximum Month Demand[3] (acre-feet)	Seasonal Peaking Factor[4]	Planning Average Annual Demand[5] (afy)	Planning Maximum Month Demand (mgd)
E178	Dorsey Field	IR	Yes	8	2	2.2	8	0.02
E179	Voorhees Sump	IR	Yes	<1	<1	2.6	1	<0.01
E180	City of Lawndale	IR	Yes	<1	1	11.5	1	0.01
E181	West Coast Barrier	B	Yes	7,104	1,075	1.0	11,380	10.16
Total (Customers in Service Area[7])				20,495	2,910		25,037	30.01
Total (Customers Outside Service Area[7])				6,723	769		6,824	8.41
Total				**27,218**	**3,680**	**1.4[6]**	**31,860**	**38.42**

Notes:
(1) The locations of these customers are depicted on detailed customer maps in Appendix B.
(2) IR = Irrigation; IN = Industrial; MU = Mixed Use; B = Barrier
(3) Calculated using historical monthly billing records from FY2004/05 through FY 2007/08. For customers which were connected after FY2004/05, average was only calculated for period of connection. Source: Historical Usage by Customer (West Basin, 2008). N/A indicates no historical data available.
(4) Maximum Month Demand divided by Average Historic Demand, corrected for variation in the number of days in each month. In some cases, peaking factors were adjusted to correct erroneous billing data. For future planning years, seasonal peaking factors over 3.0 were reduced to 3.0.
(5) Existing Demand established in the customer database through consultation with West Basin staff. Customer Database can be found in Appendix C.
(6) Based on weighted demand of all customers by historical average use.
(7) Service area designation is included in the customer database in Appendix C and was established based on consultation with West Basin staff.

The seasonal peaking factors listed in Table 3.2 are based on the average maximum month peaking factor obtained from historical records of the last four fiscal years.

As shown in Table 3.2, the total planning demand of the existing customers is 31,860 afy or 28.4 mgd. Using the seasonal peaking factors of each customer, this corresponds to a maximum day demand of 38.4 mgd. As shown in Table 3.2, the aggregate seasonal peaking factor representing maximum month demand for all existing customers is calculated to be 1.4. In this study, it is assumed that the seasonal peaking factors, which are based on the maximum month demand also represent the maximum day demands. Based on discussions with West Basin staff, it was determined that this was reasonable since high demand periods in West Basin's recycled water systems extend over longer periods than those experienced in potable water systems. A more detailed discussion on the use of maximum month versus maximum day demand is provided in Section 3.4.2.1.

Figure 3.3
Existing Demand by User Type



It should be noted that the number of Database IDs shown in Table 3.2 does not exactly correspond to the number of customers served by West Basin, since demands for customers receiving multiple types of recycled water are listed individually by water quality type in Table 3.2.

West Basin provides five different types of recycled water qualities specifically processed to accommodate its existing customer needs. Customers historically receiving multiple types of recycled water, as well as customers using recycled water for multiple applications, are listed in Table 3.3. Table 3.3 lists four types of recycled water qualities. The fifth type is Barrier Water, a specific water quality for injection into the West Coast Seawater Barrier.

Table 3.3 Existing Multi-Use Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Name	Title 22 Irriga-tion (afy)	Title 22 Non-Potable (afy)	Title 22 Cooling (afy)	Nitrified (afy)	Industrial RO (afy)	Industrial RO Ultra (afy)
bp Carson Refinery	0	0	0	571	2,783	0
Chevron El Segundo Refinery	131	0	0	3,487	1,107	2,804
Los Angeles Air Force Base (Area B)(1)	12	17	0	0	0	0
American Honda(1)	18	3	30	0	0	0
Toyota Campus(1)	24	14	56	0	0	0
ExxonMobil Torrance Refinery	29	0	0	4,136	2,015	0
Total	**213**	**34**	**86**	**8,194**	**5,905**	**2,804**

Note:
(1) Approximate breakdown. Exact usage for different types is not metered for billing.

As shown in Table 3.3, of the customers using multiple types of recycled water, the Nitrified water is the most significant, with nearly 8,200 afy used on average. Industrial RO water is the second most significant type, with approximately 5,900 afy used on average. Water demands shown in Table 3.3 are calculated using historical monthly billing records from FY2004/05 through FY 2007/08.

3.3 POTENTIAL FUTURE CUSTOMERS

West Basin staff provided a list of potential customers and their estimated demands. The potential demands, along with the probability and potential timing of providing recycled water services to these customers were determined in collaboration with the West Basin staff. A total of 120 potential new customers were identified, as presented in Table 3.4. The locations of these potential customers are shown on Figure 3.4, and detailed maps can be found in Appendix B showing Database IDs for all existing and potential customers. The Database IDs for the potential new customers are indicated with prefix “P”, while the Database IDs for the existing customers are indicated with a prefix “E”. Customers with an estimated demand greater than 100 afy are indicated with their Database ID on Figure 3.4. The potential customers in Table 3.4 are sorted based on Likelihood of Service from highest probability to lowest probability of service connection, then by year of anticipated service and Database ID.

The estimated demand for the potential customers is based on historical potable water usage, as available. For customers without proper historical data, demands are estimated based on discussions with the potential customer and/or water demand factors discussed in Section 3.4. The seasonal peaking factors listed Table 3.4 are based on analysis conducted on historical billing records from existing customers of similar types. It is assumed that seasonal peaking factors for existing customers with current seasonal peaking factors over 3.0 will be reduced to 3.0, based on efforts by West Basin to work with customers to manage the hours of operation to reduce excessive peaking in the system. Seasonal peaking factors were assigned by usage type and are further discussed in Section 3.4.2.1.

As shown in Table 3.4, the total estimated demand of all potential customers is 50,413 afy. However, when the likelihood of service for these customers is multiplied with the estimated demand, the combined demand of all potential customers is reduced to 33,216 afy. As it is unknown at this time which customers will not receive recycled water, the proposed systems are sized for all potential customers.

As shown in Table 3.4, the estimated demand of potential customers is evenly distributed between customers within (25,826 afy) and outside (24,587 afy) West Basin’s service area.

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Table 3.4 Potential Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Name	Database ID(1)	Usage Type Code(2)	Likelihood of Service	Anticipated Year of Service	Estimated Future Demand(3) (afy)	Seasonal Peaking Factor
Entradero Park	P1A-1	IR	90%	2009	25	2.5
West Torrance High School	P1A-2	IR	90%	2009	30	2.5
Victor Elementary School	P1A-3	IR	90%	2009	13	2.5
St. James Catholic School	P1A-4	IR	90%	2009	5	2.5
Victor Park	P1A-5	IR	90%	2009	15	2.5
Paradise Park	P1A-6	IR	90%	2009	9	2.5
Anza Elementary School	P1A-7	IR	90%	2009	9	2.5
Jefferson Middle School	P1A-8	IR	90%	2009	7	2.5
Raytheon (Hughes)	P2	IR	90%	2009	80	2.5
El Camino College	P3	IR	90%	2009	40	2.5
Inglewood High School	P41	IR	90%	2009	23	2.5
Monroe Jr High School	P49	IR	90%	2009	11	2.5
Clyde Woodworth Elem	P54	IR	90%	2009	8	2.5
Ashwood Park	P57	IR	90%	2009	5	2.5
Vincent Park	P58	IR	90%	2009	2	2.5
Cal Trans I-405 / Hillcrest (near Manchester)	P60	IR	90%	2009	10	2.5
The Pointe at South Bay	P66	IR	90%	2009	10	2.5
Jim Thorpe Park	P70	IR	90%	2009	19	2.5

**Table 3.4 Potential Customers
Capital Implementation Master Plan
West Basin Municipal Water District**

Customer Name	Database ID[(1)]	Usage Type Code[(2)]	Likelihood of Service	Anticipated Year of Service	Estimated Future Demand[(3)] (afy)	Seasonal Peaking Factor
Pier Avenue	P72	IR	90%	2009	5	2.5
El Segundo Power Plant	P13A	IN	90%	2010	325	1.0
Imperial Ave	P36	IR	90%	2010	26	2.5
Equinix	P61A	IN	90%	2010	100	1.0
Mattel Lateral	P73	IN	90%	2010	15	1.0
Chevron Expansion - Nitrification Component	P10A	IN	90%	2011	1,706	1.4
Chevron Expansion - High Pres Boiler Feed Component	P10B	IN	90%	2011	419	1.1
Chevron Expansion - Low Pres Boiler Feed Component	P10C	IN	90%	2011	210	1.5
Hollywood Park Development	P15	IR	90%	2011	200	2.5
Playa Vista	P59	IR	90%	2011	150	2.5
Equinix	P61B	IN	90%	2011	100	1.0
West Coast Barrier	P7	B	90%	2011	5,600	1.0
bp Carson Refinery - Industrial RO Component	P5	IN	90%	2012	5,980	1.3
LADWP Harbor Area	P6A-1	IN	90%	2012	9,000	1.4
LADWP Harbor Area	P6A-2	IR	90%	2012	300	2.5
bp Carson Refinery - Nitrified Component	P8	IN	90%	2012	7,111	1.3
Bishop Montgomery High School	P1B-1	IR	90%	2013	14	2.5
Lomita Park Extension	P1B-10	IR	90%	2013	5	2.5
Lomita Blvd Median	P1B-11	IR	90%	2013	1	2.5

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Table 3.4 Potential Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Name	Database ID[1]	Usage Type Code[2]	Likelihood of Service	Anticipated Year of Service	Estimated Future Demand[3] (afy)	Seasonal Peaking Factor
Bishop Montgomery Retention Basin	P1B-2	IR	90%	2013	20	2.5
Ocean Avenue Retention Basin	P1B-3	IR	90%	2013	18	2.5
La Paloma Park	P1B-4	IR	90%	2013	2	2.5
Arnold Elementary School	P1B-5	IR	90%	2013	5	2.5
Seaside Elementary	P1B-6	IR	90%	2013	6	2.5
Sea Aire Golf Course	P1B-7	IR	90%	2013	15	2.5
Calle Mayor Middle School	P1B-8	IR	90%	2013	5	2.5
South Torrance High School	P1B-9	IR	90%	2013	25	2.5
El Segundo Power Plant	P13B	IN	90%	2015	300	1.0
Kobata Nursery	P69	IR	75%	2008	20	2.5
Marriott Golf Course	P30	IR	75%	2009	42	2.5
Pet Haven	P78	IR	75%	2009	8	2.5
Cal Trans I-105 / Western	P65	IR	75%	2010	10	2.5
Grammercy Toyota	P71	IR	75%	2010	8	2.5
Carson Mall Development	P37	IR	75%	2011	25	2.5
Campus El Segundo	P62	MU	75%	2011	100	1.7
LA Southwest College	P64	IR	75%	2011	50	2.5
Victoria Park	P29	IR	75%	2014	50	2.5
Carson Medians	P99	IR	50%	2009	2	2.5
Virco	P101	IN	50%	2010	10	1.3
Alondra Golf Course	P14	IR	50%	2010	300	2.5
USD Redondo Beach	P26	IR	50%	2010	10	2.5

Table 3.4 Potential Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Name	Database ID[1]	Usage Type Code[2]	Likelihood of Service	Anticipated Year of Service	Estimated Future Demand[3] (afy)	Seasonal Peaking Factor
Torrance USD West Torrance High School	P39	IR	50%	2010	25	2.5
Toyota - North Campus	P45	IR	50%	2010	20	2.5
Toyota - North Campus Cooling Towers	P46	IN	50%	2010	20	1.3
Dominguez Tech Center	P79	IR	50%	2010	100	2.5
Del Amo Park	P48	IR	50%	2011	11	2.5
Mills Park	P52	IR	50%	2011	10	2.5
Kilroy Airport Center	P74	IN	50%	2011	30	1.0
Texollini	P17	IN	50%	2013	200	1.3
Manhattan Heights Park	P56	IR	50%	2013	4	2.5
Boeing	P67	IN	50%	2013	70	1.3
Del Amo Medians	P68	IR	30%	2010	5	2.5
Peters Nursery	P38	IR	30%	2012	25	2.5
Caltrans (110/190th St)	P50	IR	30%	2013	10	2.5
Caltrans (405/Main St)	P51	IR	30%	2013	10	2.5
Cal Trans I-405 / Artesia Blvd	P53	IR	30%	2013	8	2.5
Carson Community Center	P86	IR	30%	2013	21	2.5
City of Carson	P87	IR	30%	2013	21	2.5
Andrew Carnegie Middle School	P88	IR	30%	2013	20	2.5
Caltrans (91/Fig)	P25	IR	30%	2014	69	2.5
Caltrans (110/182nd St)	P31	IR	30%	2015	36	2.5
Rowley Park	P102	IR	30%	2018	31	2.5

Table 3.4 Potential Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Name	Database ID[1]	Usage Type Code[2]	Likelihood of Service	Anticipated Year of Service	Estimated Future Demand[3] (afy)	Seasonal Peaking Factor
City of Carson Police Station	P85	IR	30%	2018	21	2.5
Rhodia	P12A	IN	30%	2020	457	1.0
Solec	P19	IN	30%	2020	174	1.0
Marriot Textile Service (Sodexho)	P22	IN	30%	2020	100	1.2
Western Tube Corporation	P28	IN	30%	2020	56	1.3
SAMYANG USA	P32	IN	30%	2020	33	1.3
Edmund Kim Productions	P33	IN	30%	2020	31	1.3
Caltrans (D07)	P47	IR	30%	2020	13	2.5
Dominguez Gap Barrier	P9A	B	30%	2025	2,000	1.0
LADWP Westside Demand	P100	IR	30%	2030	4,000	2.5
Kenneth Hahn State Park	P117	IR	30%	2030	1,500	2.5
Dominguez Gap Barrier	P9B	B	30%	2030	1,500	1.0
Pete’s Nursery	P76	IR	25%	2012	25	2.5
MB Nursery	P77	IR	25%	2012	25	2.5
Anderson Park	P91	IR	20%	2010	19	2.5
Carson Park	P92	IR	20%	2013	15	2.5
City of Carson Corporate Maintenance Yard	P96	IR	20%	2013	10	1.5
Dolphin Park	P97	IR	20%	2013	16	2.5
Fukai (Recreation) Park	P103	IR	20%	2018	7	2.5
Freeman Park	P104	IR	20%	2018	3	2.5
Bell Park	P105	IR	20%	2018	3	2.5

Table 3.4 Potential Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Name	Database ID(1)	Usage Type Code(2)	Likelihood of Service	Anticipated Year of Service	Estimated Future Demand(3) (afy)	Seasonal Peaking Factor
Arthur Lee Johnson Memorial Park	P106	IR	20%	2018	33	2.5
Thornburg Park	P107	IR	20%	2018	4	2.5
Gardena High School	P108	IR	20%	2018	27	2.5
Serra High School	P109	IR	20%	2018	18	2.5
Vermont Medians	P114	IR	20%	2018	24	2.5
LAUSD - Peary Jr High	P44	IR	20%	2018	20	2.5
Calas Park	P89	IR	20%	2018	20	2.5
Caltrans I-405/190th St.	P93	IR	20%	2018	14	1.5
General Scott Park	P94	IR	20%	2020	14	2.5
Dominguez Hills Golf Course	P75	IR	10%	2012	25	2.5
Stephen M White Middle School	P80	IR	10%	2013	29	2.5
Caltrans I-405/Figueroa St.	P81	IR	10%	2013	28	1.5
Caltrans I-405/Edgar St.	P84	IR	10%	2013	23	1.5
LACMTA	P34	IN	10%	2017	30	1.3
Prime Wheel	P35	IN	10%	2018	27	1.3
Carson High School	P98	IR	10%	2018	41	2.5
One Hundred Fifty Third Street E	P110	IR	10%	2020	3	2.5
Crescendo Charter School	P111	IR	10%	2020	1	2.5
Roosevelt Cemetery	P112	IR	10%	2020	93	2.5
C Star Nursery	P113	IR	10%	2020	14	2.5
Rosecrans Recreation Center	P115	IR	10%	2020	24	2.5
Moneta Nursery	P116	IR	10%	2020	8	2.5

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Table 3.4 Potential Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Name	Database ID[1]	Usage Type Code[2]	Likelihood of Service	Anticipated Year of Service	Estimated Future Demand[3] (afy)	Seasonal Peaking Factor
Palos Verdes - Palos Verdes Golf Course	P11A	IR	10%	2020	188	2.5
Palos Verdes - Landfill	P11B	IR	10%	2020	150	2.5
Palos Verdes - Rolling Hills Country Club	P11C	IR	10%	2020	100	2.5
Palos Verdes - Green Hills Memorial	P11D	IR	10%	2020	233	2.5
Palos Verdes - Naval Reservation	P56	IR	10%	2020	50	2.5
Veterans Park and Sports Complex	P82	IR	10%	2020	27	2.5
Caltrans I-110 & Del Amo Blvd.	P83	IR	10%	2020	23	1.5
Stevenson Park	P90	IR	10%	2020	19	2.5
Carriage Crest Park	P95	IR	10%	2020	10	1.5
LADWP Harbor Area	P6B	IN	10%	2030	5,700	1.4
TRW - E/D Sector (Northrop Grumman Space Technology)	P18	IR	5%	2020	20	2.5
Total (Customers Located Inside Service Area[8])					**25,826**	**1.3**
Total (Customers Located Outside Service Area[8])					**24,587**	**1.6**
Total					**50,413**	**1.5**

Notes:
(1) The locations of these customers are depicted on detailed customer maps in Appendix B. Additional details are shown in the customer database in Appendix C.
(2) IR = Irrigation; IN = Industrial; MU = Mixed Use; B = Barrier
(3) Source: Customer Database Development Workshop.

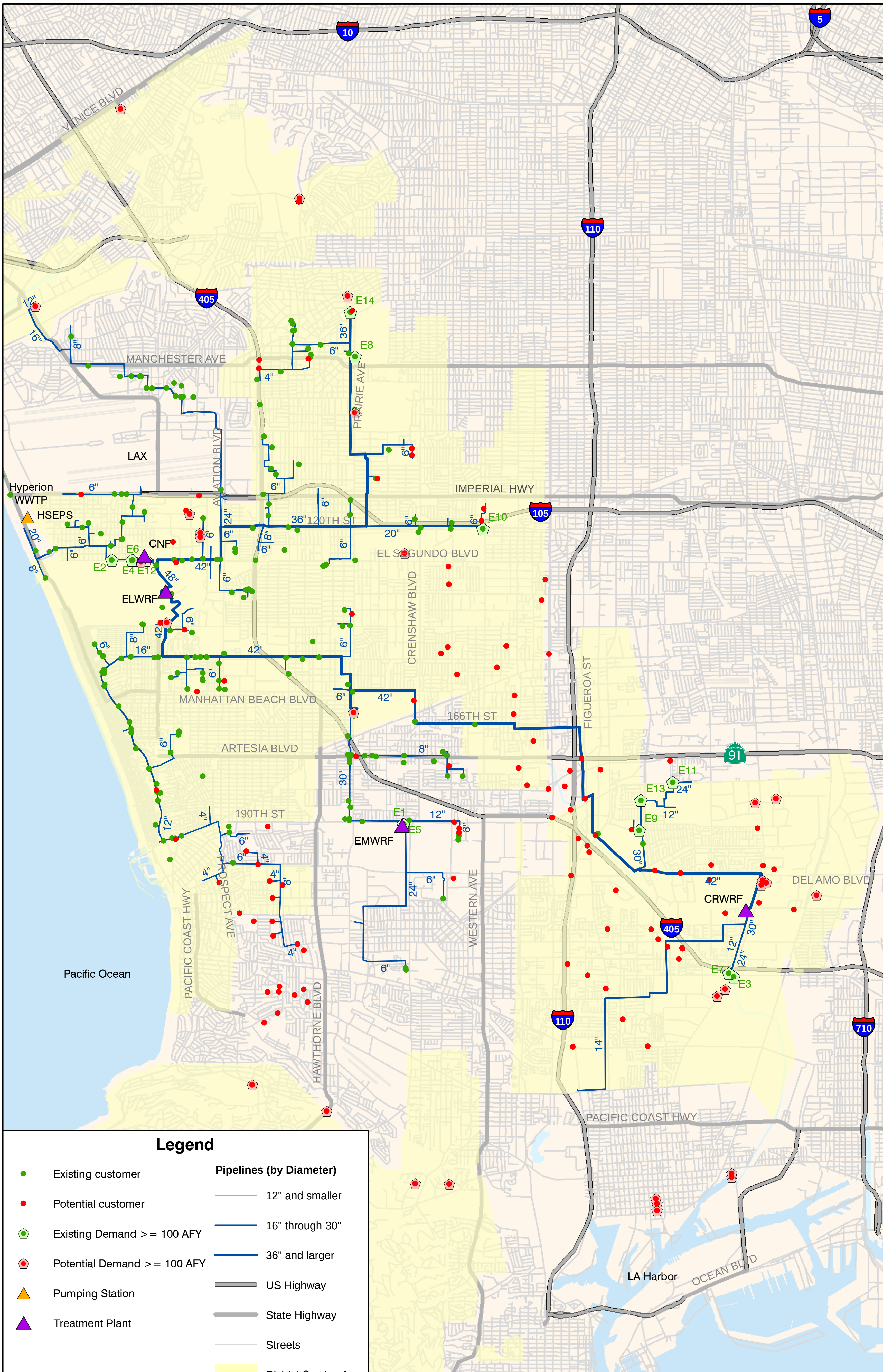


Figure 3.4
Existing and Potential Recycled Water Customers

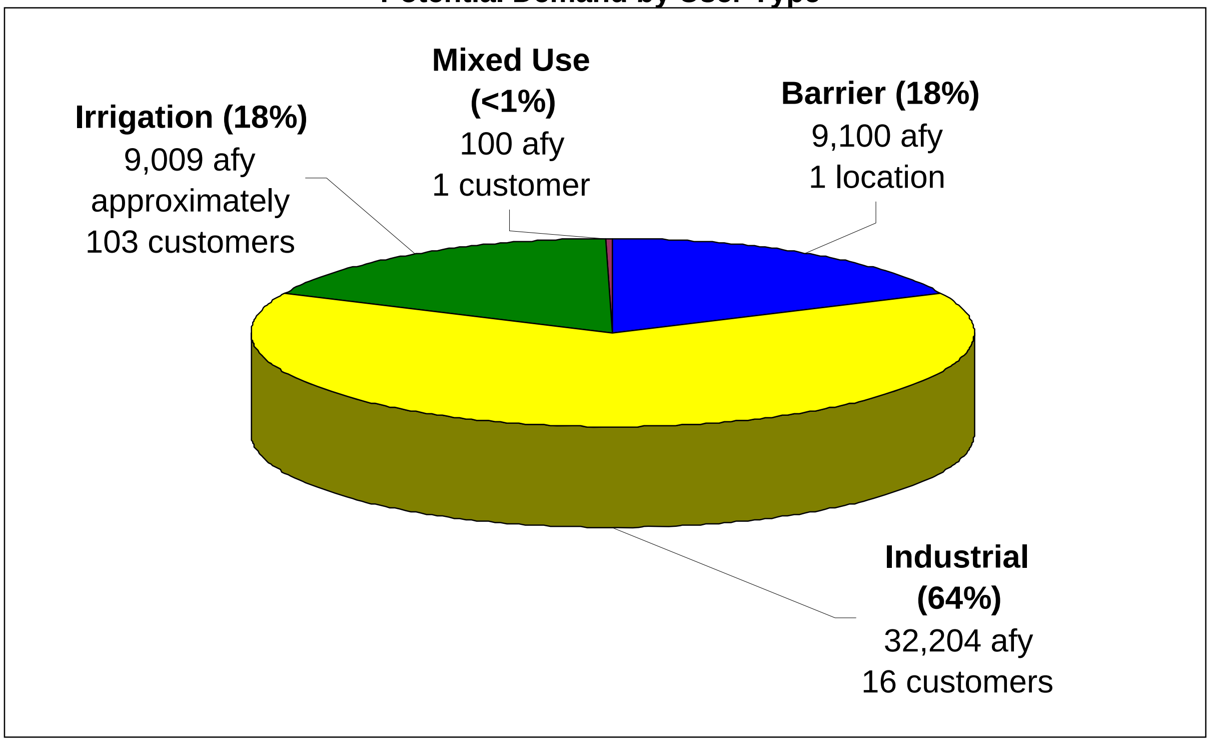
N

1 0.5 0 1
Miles

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

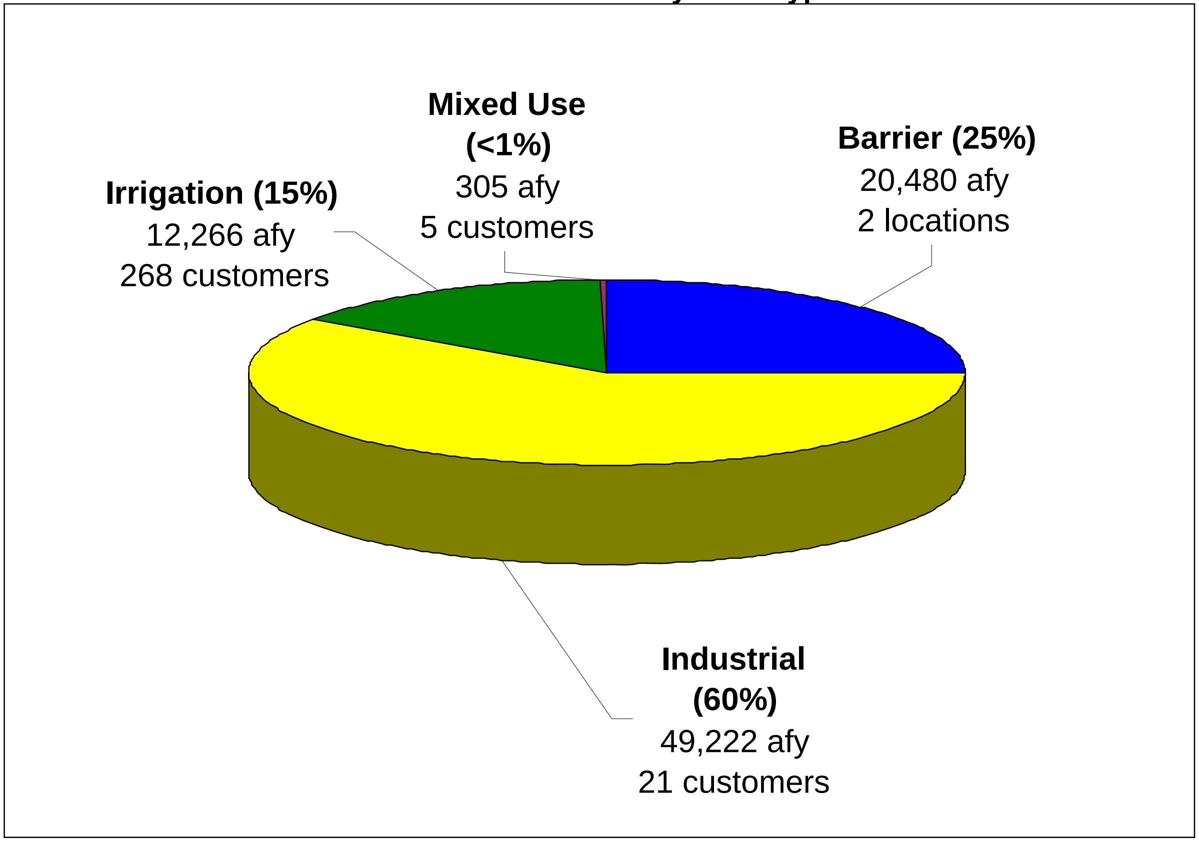
The distribution of potential demands by customer type is illustrated on Figure 3.5, which indicates that the majority of the potential demand is categorized as Industrial, representing approximately 64 percent of the potential demand. It should be noted that this figure represents the potential customers only, and excludes the existing demand distribution shown in Figure 3.3.

Figure 3.5
Potential Demand by User Type



The combined distribution of recycled water, including both existing and potential demands, by customer type is shown on Figure 3.6. This figure indicates that the majority of the demand in the future will most likely remain categorized as Industrial, representing approximately 60 percent of the future system demand. The total combined ultimate demand of all usage categories is estimated to be 82,273 afy (31,860 afy for existing customers plus 50,413 afy for potential customers).

Figure 3.6
Total Future Demand by User Type



3.4 WATER DEMAND AND PEAKING FACTORS

This section discusses the water demand factors and peaking factors that were used to estimate future recycled water demands. The definitions of these factors are discussed below.

3.4.1 Water Demand Factors

A water demand factor (WDF) is defined as the estimated amount of water usage per area of a certain land use type. WDFs are typically expressed in gallons per day per acre (gpd/ac). These factors are used to estimate the Average Day Demand (ADD) for existing and potential customer sites by multiplying the WDF with the total number of acres of the corresponding land use category. WDFs are typically determined from a combination of historical billing records and land use information using spatial GIS routines. WDFs can also be obtained and/or verified with WDFs from other agencies with similar land use and climate conditions.

3.4.1.1 Climate

Irrigation demand is dependent on climate. The climate in the West Basin service area is influenced by Santa Monica Mountains to the north and the Pacific Ocean to the south and west. The year-round highs range from the 60s to 70s and lows between the 40s and 50s. The warmest months are June through October. The average monthly precipitation and average monthly temperature from years 1944 to 2007 are presented in Table 3.5. As shown, the average precipitation for the area is 1.01 inches per month, which equates to an average annual rainfall of 12 inches.

Table 3.5 Average Monthly Precipitation and Temperature Data
Capital Implementation Master Plan
West Basin Municipal Water District

Month	Average Precipitation (inches)	Average. High Temperature (°F)	Average Low Temperature (°F)
January	2.71	65.0	47.4
February	2.72	65.4	48.9
March	1.90	65.3	50.4
April	0.79	67.4	52.9
May	0.17	69.2	56.3
June	0.05	72.0	59.6
July	0.02	75.3	62.9
August	0.07	76.4	63.8
September	0.17	76.1	62.6
October	0.36	73.6	58.5
November	1.43	70.3	52.3
December	1.72	66.1	47.9
Average:	**1.01**	**70.2**	**55.3**

Note:
Source: Western Regional Climate Center, Station No. 045114. Period of Record from August 1944 to December 2007.

3.4.1.2 Irrigation Requirements

Expected landscape irrigation requirements for the West Basin service area can be based on evapotranspiration and rainfall data for all sites where irrigable acreage was available. Calculated irrigation requirements, as defined below, were used to estimate irrigation for all existing and future sites.

The amount of irrigation water required for the potential irrigation customers is directly dependent on precipitation and evapotranspiration quantities in the region. To calculate the amount of evapotranspiration occurring in the study area, the following formula can be used:

$$ET_L = K_L * ET_o \ (1)$$

Where:

ET_L = Evapotranspiration of landscaped areas (in inches)

K_L = Landscape coefficient

ET_o = Reference Evapotranspiration (in inches)

The reference evapotranspiration used was based on the value for the Los Angeles Basin, which was obtained from the California Irrigation Management Information System (CIMIS).

To calculate the landscape evapotranspiration, the landscaped area crop coefficient was estimated using information contained in the Guide to Estimating Irrigation Water Needs of Landscape Plantings in California by the California Department of Water Resources. The landscape coefficient is the product of an average species factor (k_s), density factor (k_d), and microclimate factor (k_{mc}). These were estimated to be 0.7, 1, and 1, respectively. The landscape coefficient was then multiplied by the reference evapotranspiration to determine the average landscape evapotranspiration for the study area. The amount of precipitation, evapotranspiration, and irrigation required for irrigation customers are listed in Table 3.6.

As listed in Table 3.6, the net annual average landscape irrigation requirement in the study area is approximately 30.1 inches or about 2.5 feet per year. Based on this data, recycled water demands for potential customers could be estimated by multiplying the irrigated area in acre by 2.5 to obtain an annual demand estimate in afy. However, as part of this study, demand estimates were provided by West Basin staff and are mostly based on historical potable water demand usage and where not available using the following rule of thumb:

- 2.0-2.5 afy/acre for irrigating areas with turf
- 1.0 afy/acre for irrigating areas with shrubs

It can be concluded that the irrigation requirements listed in Table 3.6 confirm the demand factors that are typically applied to the West Basin service area when estimating potential irrigation demands.

It should be noted that as a part of this study, demands for individual potential customers were estimated by West Basin staff and historical potable water demand usage was typically available and considered more accurate than the above methodology.

Table 3.6	Average Annual Landscape Irrigation Requirements Capital Implementation Master Plan West Basin Municipal Water District			
Month	**Evapo-transpiration(1) (inches)**	**Average Rainfall(2) (inches)**	**Net Irrigation Requirement(3) (inches)**	**Percent of Annual Net Irrigation Requirement(4) (%)**
January	1.25	2.71	0.00	0%
February	1.48	2.72	0.00	0%
March	2.31	1.9	0.55	2%
April	3.14	0.79	3.18	11%
May	3.31	0.17	4.25	14%
June	3.52	0.05	4.70	16%
July	3.78	0.02	5.09	17%
August	3.77	0.07	5.00	17%
September	2.76	0.17	3.50	12%
October	2.38	0.36	2.73	9%
November	1.69	1.43	0.36	1%
December	1.55	1.72	0.00	0%
Total	**31.0 inches**	**12.1 inches**	**29.4 inches**	**100%**
			2.5 feet	

Notes:
(1) Source: The data was obtained from the California Irrigation Management Information System [2]. The ET values are adjusted for the landscape irrigation coefficient K_L, where $K_L = K_s*K_{mc}*K_d$ which accounts for the species, microclimate and vegetation density.
(2) Source: Western Regional Climate Center [1].
(3) [Evapotranspiration - Rainfall]*1.15/0.85. Where 0.85 = 85% Irrigation Factor (Average value from Carlos and Guitjens, University of Nevada) and 1.15 = 15% Leaching Fraction [3].
(4) Current month net irrigation requirement divided by total net irrigation requirement.

3.4.2 Peaking Factors

In addition to WDFs, peaking factors are used to estimate water demands for conditions other than average annual demand (AAD) conditions. Peaking factors account for fluctuations in demands on a seasonal or hourly basis.

3.4.2.1 Seasonal Peaking Factor

During hot summer days, water use is typically higher than on a cold winter day because of increased irrigation demands. Common peaking factors include Maximum Day Demands (MDD), Maximum Month Demands (MMD), and Minimum Day Demands (MinDD). In recycled water systems, the MDD factors is typically similar to the MMD factor as irrigation sprinkler systems are often changed on a seasonal basis, rather than a daily basis, unless moisture sensors are used. Because of the significant industrial demands present in West Basin's recycled water system, a comparison between MMD and MDD seasonal peaking factors for large industrial water customers is presented in Table 3.7.

Table 3.7 Comparison of MMD and MDD Seasonal Peaking Factors
Capital Implementation Master Plan
West Basin Municipal Water District

Large Industrial User	AAD (mgd)	MMD Peaking Factor	MMD (Peak Month)	MDD Peaking Factor	MDD (Peak Day)
E6 - Chevron Industrial RO	0.98	1.5	Aug 2004	1.7	19 Jul 2005
E4 - Chevron Industrial RO Ultra	2.50	1.1	Jun 2008	1.2	25 Aug 2007
E2 - Chevron Nitrified	3.12	1.4	Mar 2008	1.6	29 Sep 2005
E3 – bp Carson Refinery Industrial RO	2.50	1.7	Sep 2007	1.7	9 Feb 2006
E7 - bp Carson Refinery Nitrified	0.54	1.3	Dec 2007	1.5	9 Feb 2006
E1 - ExxonMobil Nitrified	3.69	1.2	Jul 2007	1.5	21 Nov 2006
E5 - ExxonMobil Industrial RO	1.80	1.3	Oct 2004	1.5	17 Dec 2007
Total Large Industrial User Demand[1]	**15.1**	**20.3 mgd**		**23.0 mgd**	
Total Large Industrial User Weighted Peaking Factor		1.3		1.5	

Note:
(1) The sum of each Average Annual Demand multiplied by the corresponding peaking factor.

As seen in Table 3.7, the weighted MDD seasonal peaking factor for all of the large industrial customers exceeds the MMD seasonal peaking factor by approximately 20 percent, as compared to the AAD. However, historic data suggests the likelihood of simultaneous peaking of all large industrial seasonal peaking is rather low, as the MDD and MMD of all major industrial customers did not even occur in the same month. Table 3.7 also shows that the occurrence of MMD and MDD between the customers greatly varies. Based on the peaking shown in Table 3.7, it was determined that the MMD peaking represents a conservative estimate of seasonal peaking across the industrial customers in the system. For the purpose of this master plan, the MMD/ADD ratio is used to estimate the maximum demand conditions that West Basin needs to plan for.

The seasonal variation in demand of existing customers, as listed in Table 3.3, was used to estimate the average seasonal peaking factors by user type. These factors are listed in Table 3.8 and are used to estimate the maximum month demands of the potential customers, except for those customers that have a specific peaking factor (as listed in Table 3.4).

Table 3.8 Seasonal Peaking Factors Based on Historic Data
Capital Implementation Master Plan
West Basin Municipal Water District

Usage Type	Historical Seasonal Peaking Factor (Weighted Average)	Historical Seasonal Peaking Factor (Average)	Planning Seasonal Peaking Factor
Irrigation	2.5	3.1	2.5
Industrial	1.3	2.2	1.3
Mixed Use	1.7	1.7	1.7
Barrier	1.0	1.0	1.0
Aggregate	**1.4**(1)	**2.0**	**1.4**(1)

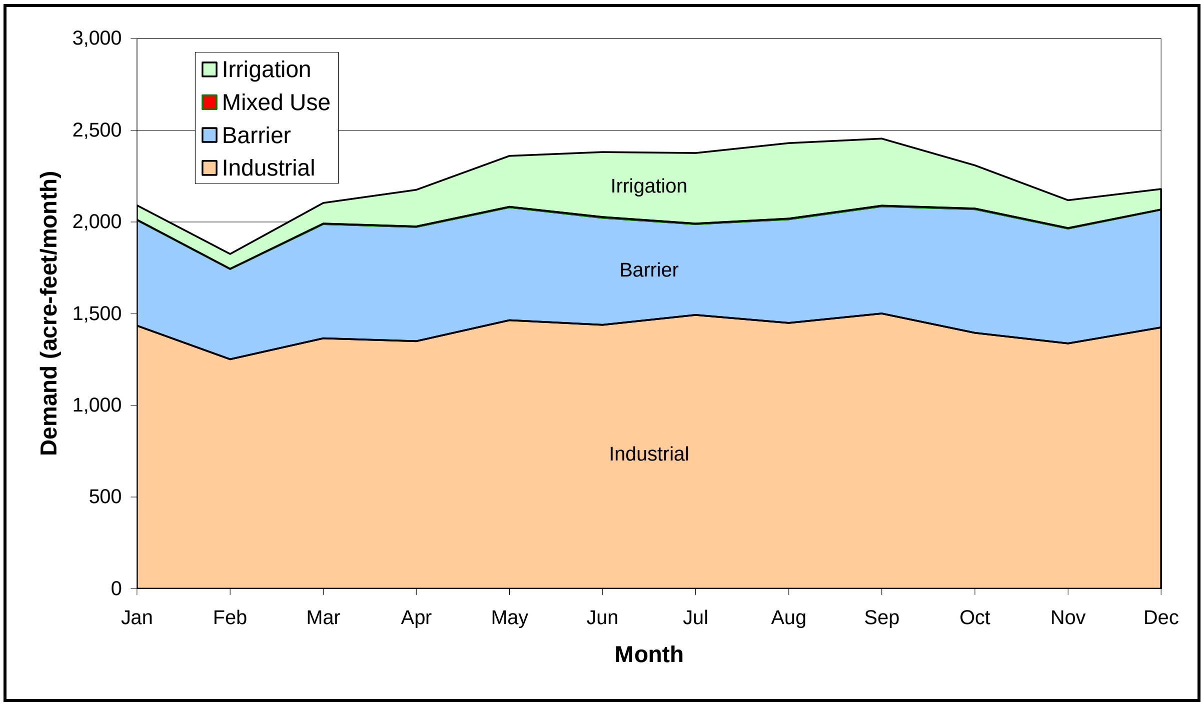
Note:
(1) Based on the demand weighted average of all usage types.

Based on historical data, the weighted average of seasonal peaking factors for irrigation customers was 2.5. This indicates that, on average, the maximum monthly demand for typical irrigation customers is 2.5 times the average annual demand. This same seasonal peaking factor was selected for analysis of future systems. This factor will be applied to all potential irrigation customers for the future system analysis. For existing customers, the historical seasonal peaking factors are used for each individual customer, with the exception of existing customers with seasonal peaking factors over 3.0, which are assumed to be reduced to 3.0 for future planning years through efforts conducted by West Basin to work with customers to reduce excessive seasonal peaking. Seasonal peaking factors for both existing and future analysis are listed in the customer database in Appendix C.

Based on historical data, the weighted average of seasonal peaking factors for industrial customers is 1.3. This indicates that, on average, the maximum monthly demand for typical industrial customers is 1.3 times the average annual demand. This factor will be applied to all potential industrial customers for the future system analysis. For existing customers, the historical seasonal peaking factors are used for each individual customer, as listed in the customer database in Appendix C. Thus, for the existing and potential customers, the overall seasonal peaking factor corresponds to the weighted average industrial factor of 1.3, as shown in Table 3.8.

It should be noted that the factors presented in Table 3.8 are based on the maximum month peaking factors of each individual customer and that these factors do not always coincide with the same calendar month. As a result, the average seasonal peaking factor per usage type may result in an overly conservative maximum monthly demand. The aggregate peaking factor listed in Table 3.8 is based on the demand weighted average of all peaking factors. Due to the large contribution of industrial and barrier water demands, the aggregate peaking factor is relatively low. This effect is also illustrated on Figure 3.7.

Figure 3.7
Seasonal Variations by Usage Type



As shown on Figure 3.7, the peak irrigation demand occurs in the summer months, while for the demand of barrier and industrial customers are relatively constant throughout the year. Figure 3.7 illustrates that the significant peaking of irrigation demand is buffered by the much more significant industrial “anchor” customers, whose low seasonal variability provide a consistent baseline of required demand throughout the year.

3.4.2.2 Hourly Peaking Factors / Diurnal Curves

Variations in water demands also occur during a 24-hour period. Customers irrigating non-restricted areas typically experience peak demand periods late at night through the early morning hours, while industrial customers experience peaking consistent with their industrial production patterns.

Recycled water systems are characterized by substantial variations in demand during the day. The demand patterns, which are also referred to as diurnal curves, were developed for each of the large customers based on field measurements obtained for the hydraulic model calibration. The flow monitoring conducted as part of this study provided customer specific diurnal curves for the 15 customers listed in Table 6.1 of Chapter 6 and shown in Appendix E. For other smaller and potential customers, generic diurnal curves were developed for each user type. Figure 3.8 depicts the generic curve developed for golf course, school, and park irrigation customers. Figure 3.9 depicts the generic curve developed for greenbelt irrigation customers.

Figure 3.8
Irrigation (Golf Course, School, and Park) Diurnal Curve

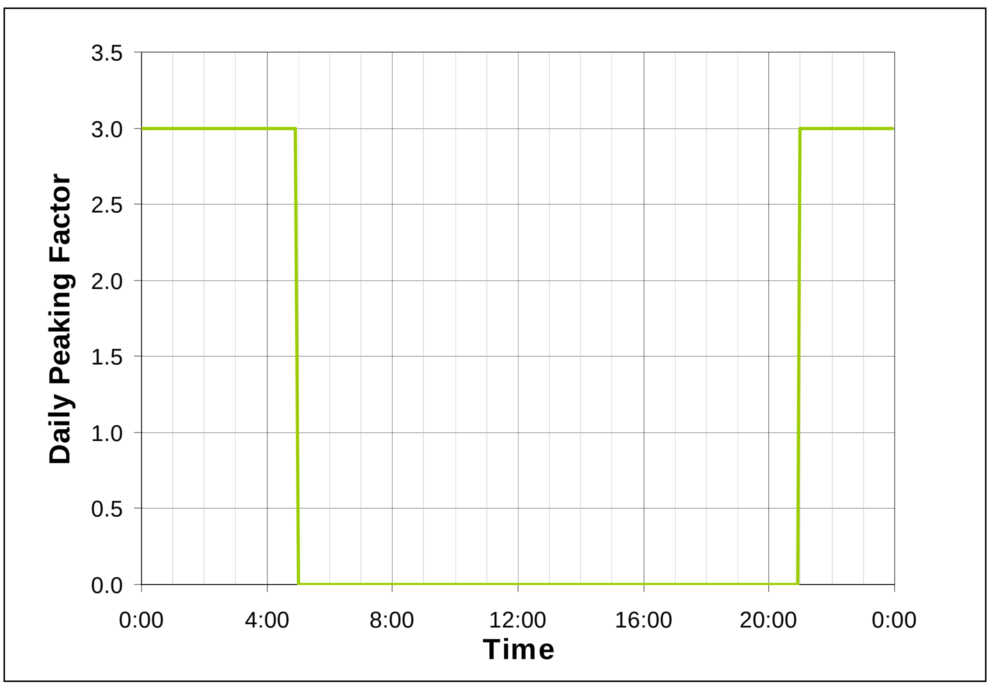
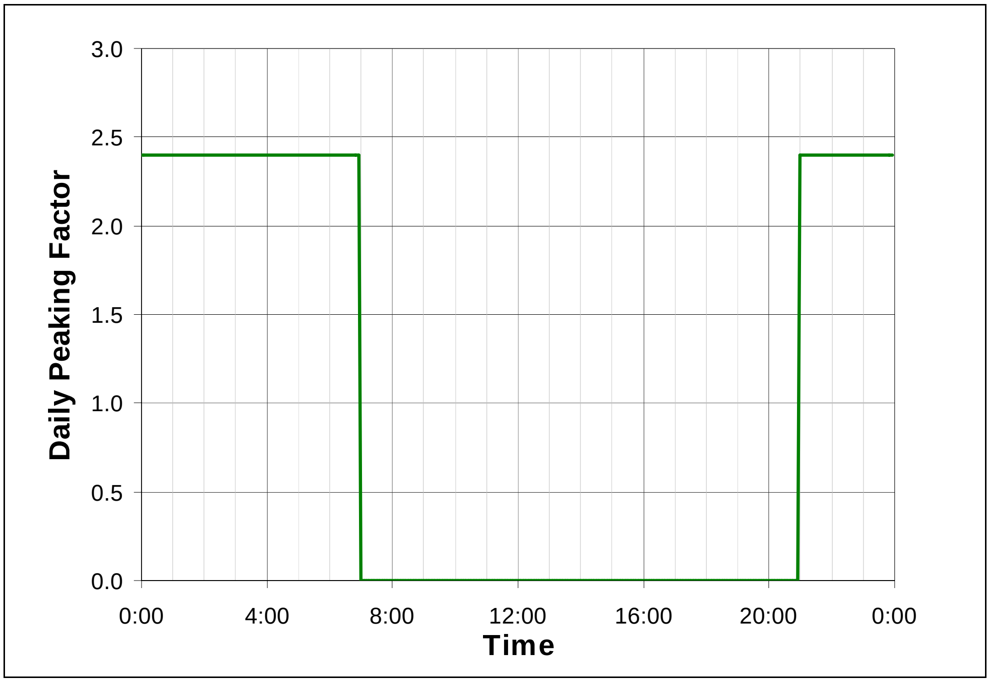


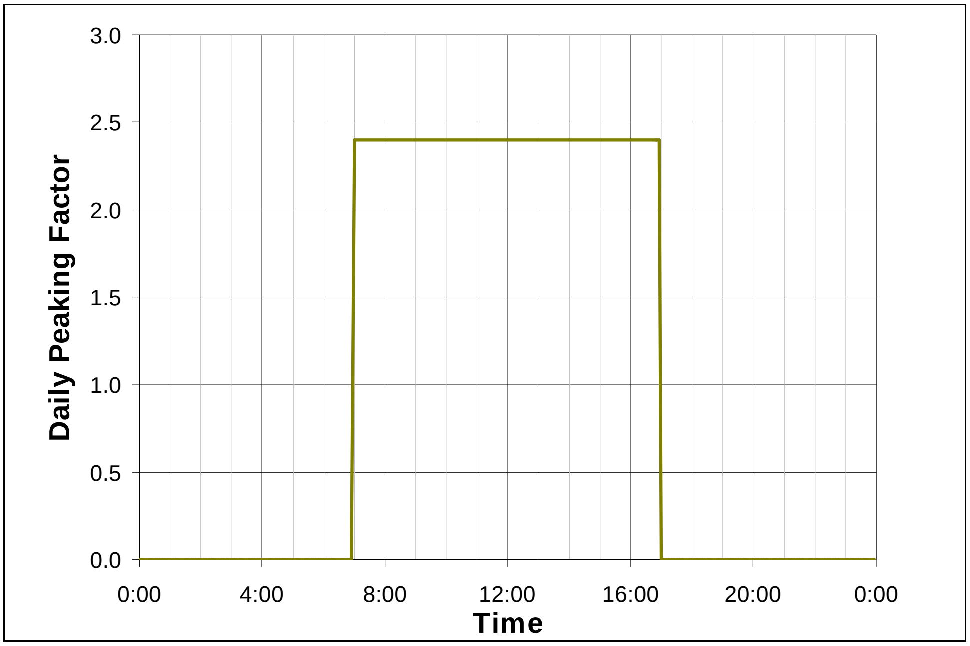
Figure 3.9
Irrigation (Greenbelt) Diurnal Curve



The irrigation demand patterns shown on Figure 3.8 and Figure 3.9 were developed based on observations of cycles in the calibration data. In Los Angeles County, irrigation customers are generally required to limit irrigation to the hours of 10 pm through 6 am (LACRWAC 2005) on sites open to the public. Existing usage patterns observed for golf courses, schools, and parks generally seemed to operate for about 4 hours starting around 9 pm. However, West Basin is planning to work with customers in the future to extend the demand pattern to limit the significant peaking placed on the distribution system when irrigation is only conducted for 4 hours, which results in a peaking factor of 6.0. Figure 3.8 shows a demand pattern for 8 hours, starting around 9 pm and ending at 5 am, incorporating estimates for future usage patterns. Usage patterns observed for greenbelt customers (transportation landscaping) generally ran for longer periods of time, starting around 9 pm and ending around 7 am.

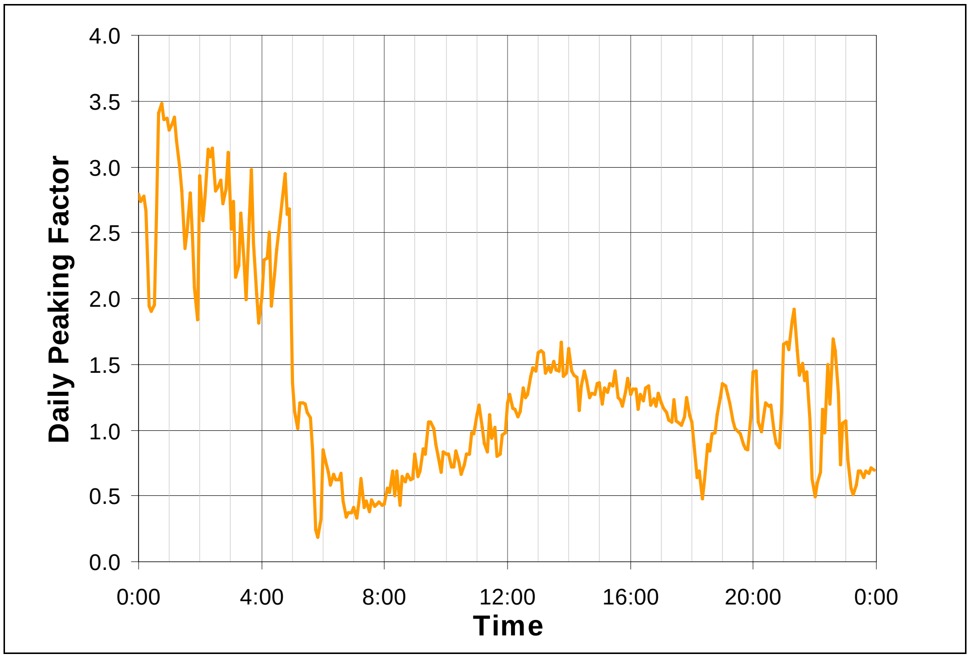
Other than the large refineries that were given user-specific demand patterns due to their size, only one existing user is classified as an industrial customer (Crenshaw Lumber). Based on typical operation of industrial customers, a generic demand pattern was developed that was assumed to begin at 7 am and run until 5 pm. This demand pattern is shown on Figure 3.10.

Figure 3.10
Industrial Diurnal Curve



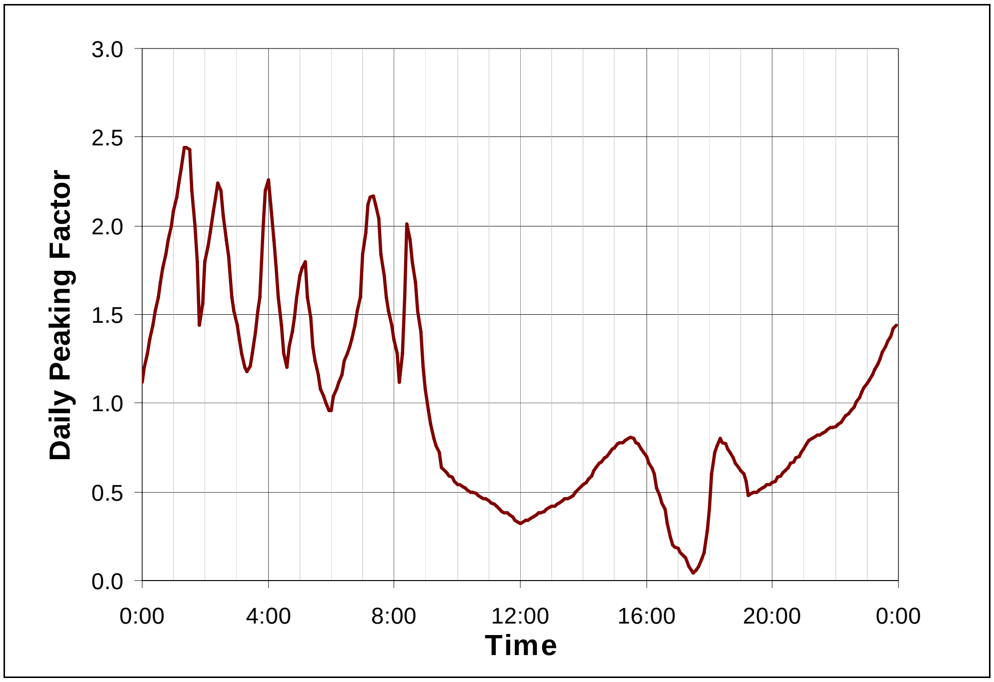
Based upon the demand pattern at Toyota, a separate generic diurnal curve was developed for the Mixed Use (MU) customers, who use recycled for multiple purposes including irrigation, dual plumbing, and cooling towers, based upon the demand pattern at Toyota. This demand pattern is shown on Figure 3.11.

Figure 3.11
Mixed Use Diurnal Curve



The “other” demand pattern, shown on Figure 3.12, was developed from a mass balance of the flow entering the system during the calibration period. The resulting pattern was adjusted to represent a relatively consistent use period reflecting the demands for the calibration day. This pattern is intended to represent all customers that do not fall into any of the other specific categories.

Figure 3.12
Other Diurnal Curve



3.5 FUTURE DEMAND ESTIMATES

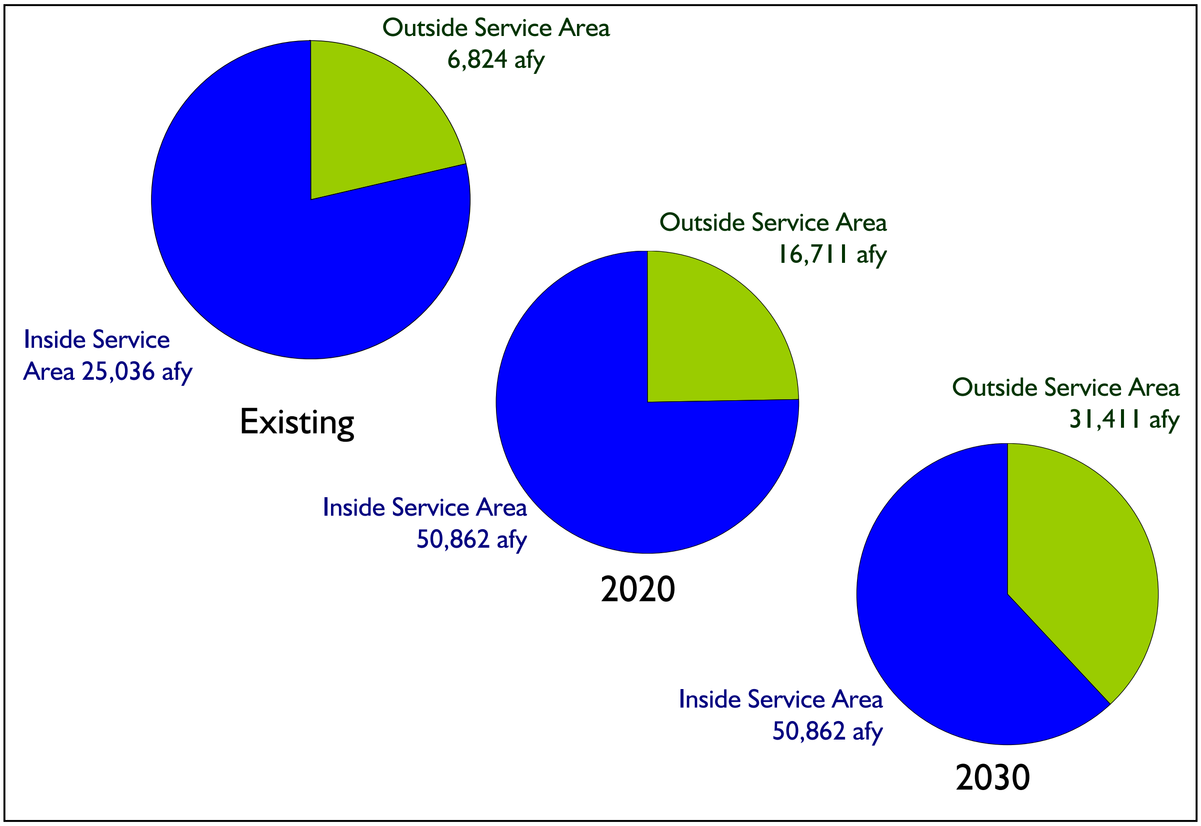
To project the development of future demands, the anticipated phasing of potential customers was forecasted in collaboration with West Basin staff. The “Anticipated Year of Service” listed in Table 3.4 was used to summarize the potential demands by planning period in Table 3.9.

Table 3.9 Phasing of Potential Demand Capital Implementation Master Plan West Basin Municipal Water District			
	Demand (afy))		
Planning Period	**Inside Service Area**	**Outside Service Area**	**Total**
Existing	25,036	6,824	31,860
FY2008/10	1,273	118	1,391
FY2010/15	22,575	9,583	32,158
FY2015/20	1,978	186	2,164
FY2020/25		2,000	2,000
FY2025/30		12,700	12,700
Total Potential (FY2008/10 – FY2025-30)	25,826	24,587	50,413
Total Ultimate Demand (Existing and Potential)	**50,862**	**31,411**	**82,273**

As listed in Table 3.9, the recycled water demands are projected to increase from 31,860 afy to 82,273 afy. This equates to an average demand increase of about 4.4 percent per year through 2030. As stated earlier, this projection assumes that all existing customers maintain their current usage and all potential customers will be connected to future system expansions of the recycled water system and use the estimated amounts of recycled water. When the likelihood of service as listed in Table 3.9 is taken into consideration for the potential customers only, the projected demand (including both existing and potential users) will be reduced from 82,273 afy to 64,231 afy, a 3.3 percent per year growth rate. A few very large potential customers with a low likelihood of service primarily cause this significant demand reduction. These customers are LADWP Harbor (5,700 afy with 10% likelihood), LADWP Westside (4,000 afy with 30% likelihood), and the Dominguez Gap Barrier (3,500 afy with 30%). Due to the low likelihood, these customers are all phased in the period 2020-2030.

As shown in Table 3.9, the majority of West Basin's demand growth is anticipated to occur within West Basin's service area. Figure 3.13 presents a projected breakdown of West Basin's demands with respect to West Basin's service area boundary under the existing system, at the year 2020, and at the planning horizon of 2030.

Figure 3.13
Demand Breakdown by Location



As shown in Figure 3.13, the demand portion from customers located outside West Basin's service area is anticipated to increase from 21 percent to 38 percent of the total demand.

The projected AAD and MDD for the primary planning years are summarized in Table 3.10. The numbers presented in this table assume that all potential customers will be connected, and the likelihood of service is not taken in to consideration.

As shown in Table 3.10, the total potential future demand of all existing and potential customers listed in Table 3.2 and Table 3.10 is 82,273 afy. When the seasonal peaking factors for each of the usage types are applied, the MDD is estimated at 105 mgd.

Table 3.10 Potential Future Recycled Water Demand
Capital Implementation Master Plan
West Basin Municipal Water District

Usage Type	2008		2010		2020		2030	
	AAD (afy)	MMD (mgd)	AAD (afy)	MMD (mgd)	AAD (afy)	MMD (mgd)	AAD (afy)	MMD (mgd)
Irrigation	3,257	7.6	4,178	9.1	6,766	14.8	12,266	27.1
Industrial	17,018	20.2	17,488	20.7	43,522	51.4	49,222	58.6
Mixed Use	205	0.4	205	0.4	305	0.6	305	0.6
Barrier	11,380	10.2	11,380	10.2	16,980	15.2	20,480	18.3
Total	**31,860**	**38.4**	**33,251**	**40.4**	**67,573**	**82.0**	**82,273**	**104.5**

Note:
(1) MMD is calculated by applying the peaking factor for each individual customer, as detailed in the customer database presented in Appendix C.

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RECYCLED WATER SUPPLIES

This chapter presents a discussion of the West Basin Municipal Water District (West Basin) recycled water supplies. West Basin's historical overall supplies are presented first, followed by a discussion on the supplies of each type of recycled water usage. The projected recycled water supply requirements are described at the end of the chapter.

4.1 HISTORICAL AND EXISTING SUPPLIES

The City of Los Angeles' Hyperion Wastewater Treatment Plant (HWWTP), located at the southeast corner of Vista Del Mar and Imperial Highway, is currently the sole source of supply for the West Basin's treatment facilities and recycled water distribution systems.

4.1.1 Hyperion Wastewater Treatment Plant Supplies

The HWWTP treats sewage from approximately 4 million residents, serving about two-thirds of the City of Los Angeles (CLA 2009) and many other cities in Los Angeles County.

According to the Hyperion Secondary Effluent Pump Station Feasibility Study (CDM 2004), the HWWTP has the following design flows:

- Minimum flow of 160 million gallons per day (mgd)
- Maximum monthly flow of 550 mgd

According to flow records provided by the City of Los Angeles, secondary effluent flows from the HWWTP averaged 330 mgd for the year 2007, with a minimum monthly flow of 299 mgd and a maximum monthly flow of 471 mgd. The minimum hourly flow for the same time-period was about 95,800 gpm (equivalent to 138 mgd).

The HWWTP treats wastewater from two separate sources, with distinctive water quality characteristics:

- Coastal sewers having higher total dissolved solids (TDS)
- Inland sewers having lower TDS

While the feasibility study (CDM 2004) did not explicitly state the ranges of TDS concentrations in each source, it did conclude that the secondary effluent with higher TDS levels could not be used as a recycled water supply source for treatment by West Basin without additional treatment at the Edward C. Little Water Recycling Facility (ELWRF).

The treatment processes at the HWWTP have been designed to maintain independent treatment of the two distinct sources between the headworks to the clarifiers. In general, the south reactors and clarifiers receive the higher quality (lower TDS) water, constituting about 75 percent of the total plant flow. The average TDS in this water is approximately 900 mg/L.

To reduce treatment costs, the majority of water pumped into the West Basin system through the Hyperion Secondary Effluent Pumping Station (HSEPS) consists of this lower TDS water. However, as demands increase a greater proportion of higher TDS water could be conveyed to West Basin, which could have significant impacts to recycled water quality and costs. West Basin bears the costs associated with removing any excess TDS and other constituents from the pumped secondary effluent (SE) required to meet the water quality needs of their customers.

An effluent channel near the southeast corner of the HWWTP site collects the SE from the clarifiers that are a part of the lower TDS process train. This lower TDS effluent channel merges with another effluent channel that collects the SE from clarifiers that are a part of both the lower and higher TDS process trains, before reaching the HWWTP outfall. The slope of both of these effluent channels is flat, allowing for flow in two directions. The HSEPS currently pulls source water from the lower TDS effluent channel, but future growth in supply requirements may require flows from the higher TDS effluent channel. The Hyperion Secondary Effluent Pump Station Feasibility Study (CDM 2004) explored several alternatives for accessing flows in the second channel while maintaining supply only from Hyperion's lower TDS process train.

4.1.2 Historical Flows

In 2007, West Basin received on average of 32.4 mgd or 36,300 acre-feet per year (afy) of SE, with a maximum day supply of 40.5 mgd. During 2008, the average day SE supply was 32.7 mgd, with a maximum day supply of 41.8 mgd on September 6, 2008. This represents a seasonal supply variation of approximately 1.3, which is similar to the seasonal demand factor of 1.4 presented in Table 3.2. It should be noted that the historical supplies exceed the historical demands due to system losses during treatment and conveyance.

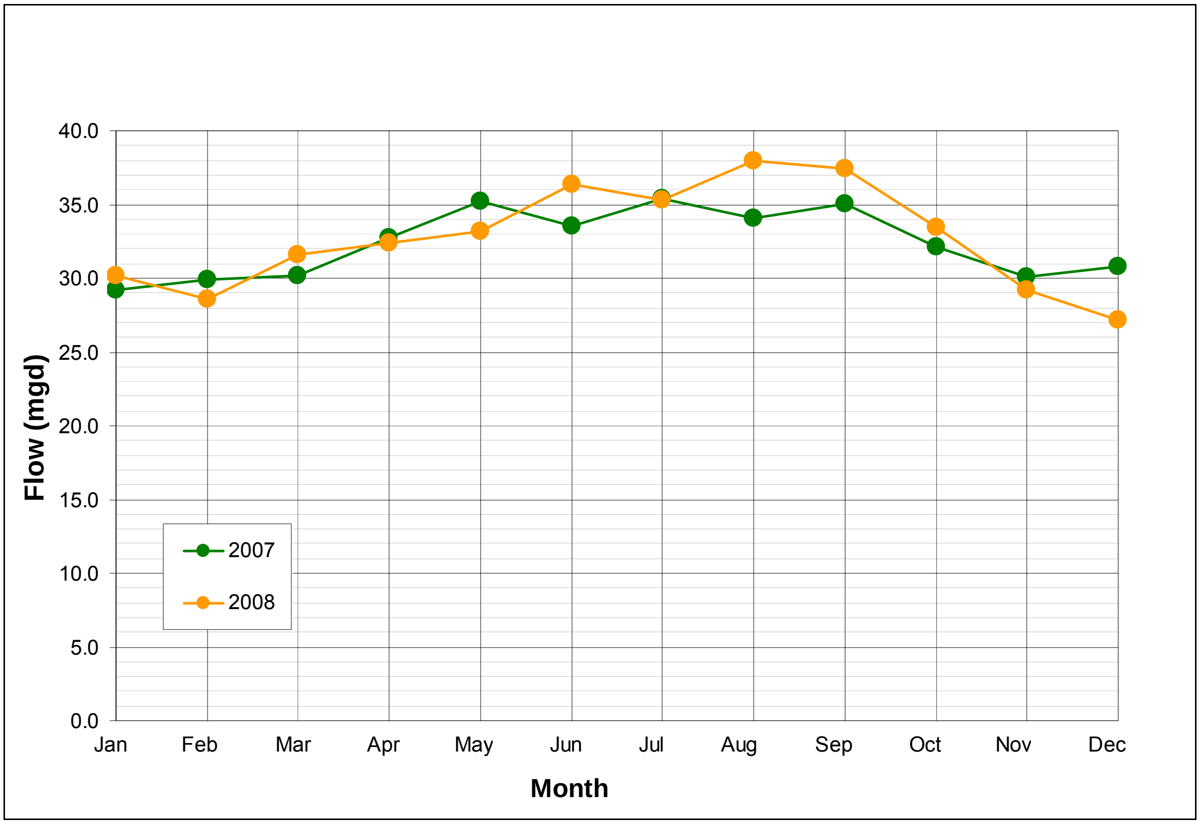
4.1.3 Monthly Peaking

The monthly variation in supplies observed between during 2007 and 2008 is presented on Figure 4.1. As expected due to the additional irrigation demand discussed in Chapter 3, supplies are higher during the summer months.

As shown on Figure 4.1, the maximum supply flows during 2007 occurred in July, averaging 35.4 mgd. The demand data for the same time period showed a customer demand of 28.6 mgd, resulting in an overall 81 percent recovery ratio. This ratio accounts for water loss in the distribution system as well as process waste and indicates that the required supply is equal to approximately 1.23 times the system demand.

An 81 percent recovery ratio may indicate that there is some unaccounted for water. This study identified some discrepancies in the flow measurement capacity in the Title 22 distribution system. However, for the supply planning in this study it is assumed that the future supply required equals 125 percent of the future demand to account for treatment and distribution system losses.

Figure 4.1
Seasonal Variation in Supplies



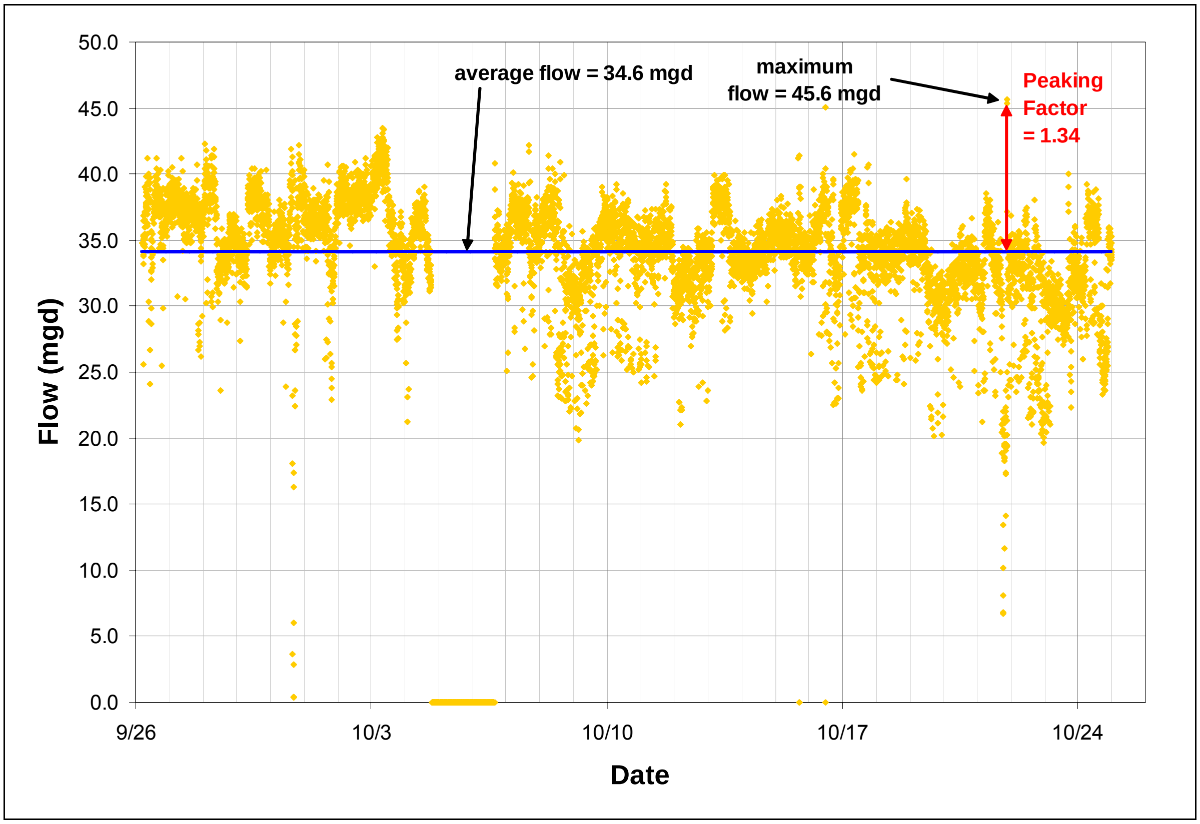
The actual maximum day demand (MDD) observed in supply flows during the calendar year 2007 occurred on May 9, 2007 with a total flow of 40.5 mgd, resulting in a daily supply seasonal peaking factor of 1.25.

4.1.4 Daily Peaking

Since detailed Distributed Control System (DCS) data (hourly time intervals or smaller) was not available for an entire year, daily peaking of supply sources was examined using the calibration data gathered in five-minute intervals between September 26, 2008, and October 24, 2008. Figure 4.2 presents the flow through the HSEPS over the calibration period in five-minute intervals.

The peak flow observed from HSEPS during the calibration period was 31,694 gpm (equivalent to 45.6 mgd) at 4:10 pm on October 21, 2008. Using the average flow for the entire calibration period, of 34.6 mgd, a peaking factor of 1.34 was calculated. However, using the average flow on October 21, 2008 (31.0 mgd or 21,540 gpm), a daily supply peaking factor of 1.47 was calculated.

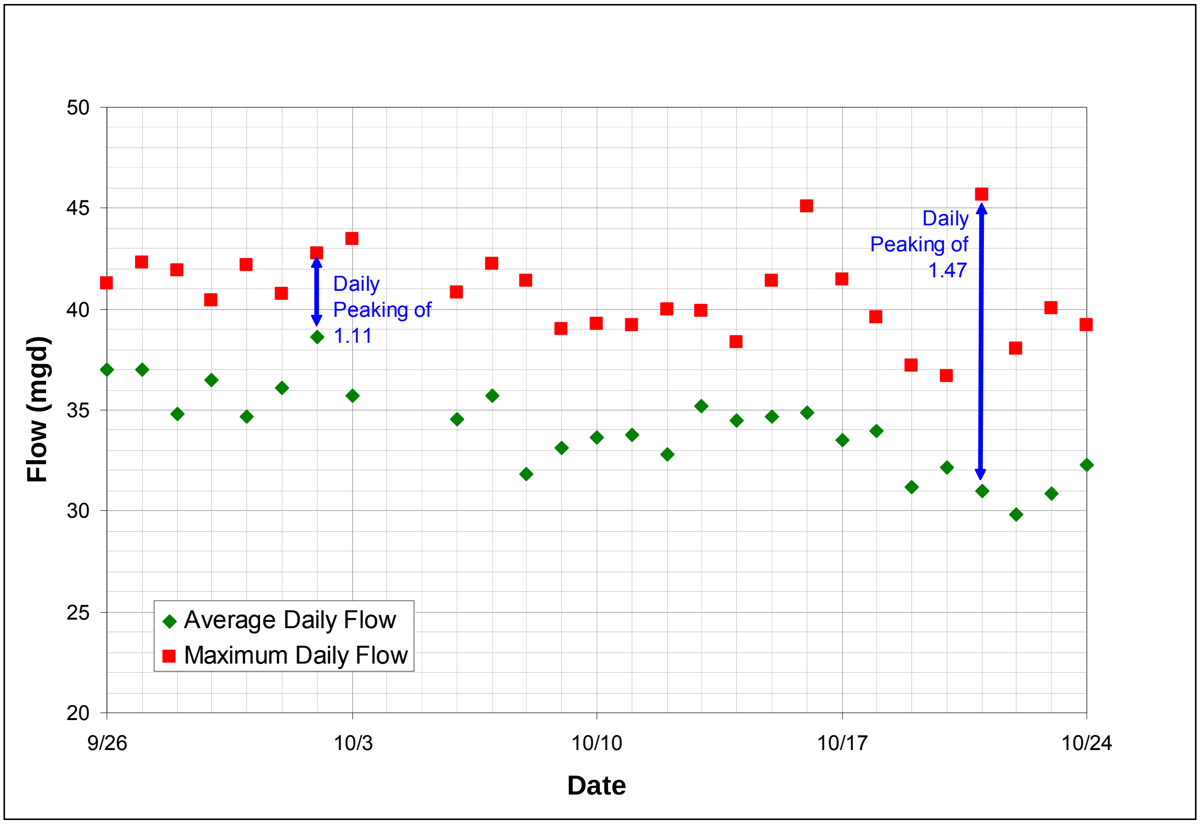
Figure 4.2
Variation in Hyperion Supplies



As shown on Figure 4.3, the ratio of peak daily flow to average daily flow varies significantly from day to day. During the calibration period, daily peaking was observed between 1.11 and 1.47.

West Basin does not currently operate any source equalization facilities to accommodate daily peaking in source supplies. Flow equalization storage is not currently necessary due to the significantly larger source of supply available at the HWWTP compared to the existing demands. Even the minimum flows observed in daily flow patterns at the HWWTP (138 mgd) currently exceed West Basin's firm pumping capacity of 51 mgd at the HSEPS. If demand for the Hyperion SE by West Basin and/or other agencies increases significantly in the future, flow equalization storage facilities may have to be considered to meet the future recycled water demands.

Figure 4.3
Peak Daily Flows in Hyperion Supplies



4.1.5 Source Water Quality

The supply from the HSEPS is continuously monitored for pH and turbidity and sampled daily for suspended solids, twice weekly for TOC, and weekly for carbonaceous biochemical oxygen demand (CBOD). Table 4.1 presents average, maximum, and minimum results for each of these constituents for calendar year 2007.

Ranges for suspended solids, pH, and CBOD shown in Table 4.1 all fall well within federal limits for SE. While the water quality data shown in Table 4.1 is from 2007, West Basin has monitored additional feedwater quality to ELWRF for several years. Figures 4.4 through 4.6 show the yearly average values for conductivity, hardness and alkalinity, and sodium, chloride and sulfate for the period 2001 through 2008.

Table 4.1 HWWTP Effluent Water Quality Capital Implementation Master Plan West Basin Municipal Water District					
Constituent	**Units**	**Average**	**Maximum**	**Minimum**	**National Standards for Secondary Effluent**
Suspended Solids	mg/L	9.87	20.00	3.00	30
Turbidity	NTU	6.97	16.04	0.98	N/A
pH	PH	6.90	8.50	6.50	6.0 – 9.0
CBOD	mg/L	9.35	11.00	8.00	25
TOC	mg/L	12	13	11	N/A
Conductivity	µmho/cm	1,495	1,620	1,340	N/A
Alkalinity	mg/L (as $CaCO_3$)	235	287	169	N/A
Sulfate	mg/L	215	336	138	N/A
Chloride	mg/L	148	156	116	N/A
Calcium	mg/L	44	50	40	N/A
Magnesium	mg/L	25	28	22.5	N/A
Hardness	mg/L (as $CaCO_3$)	211	237	199	N/A
Sodium	mg/L	132	145	111	N/A
Silica	mg/L	21	23	19	N/A

From Figures 4.4 and 4.5, there appears to be an increasing trend in conductivity, as well as hardness and alkalinity. The implication of these trends is discussed in Chapter 8, Future System Analysis.

4.2 EXISTING TREATMENT FACILITIES

West Basin owns the following four treatment facilities:

- Edward C. Little Water Recycling Facility (ELWRF)
- Carson Regional Water Recycling Facility (CRWRF)
- Chevron Nitrification Facility (CNF)
- ExxonMobil Water Recycling Facility (EMWRF)

The locations of these facilities are shown on Figure 4.7.

Figure 4.4
Conductivity Trend 2001 - 2008

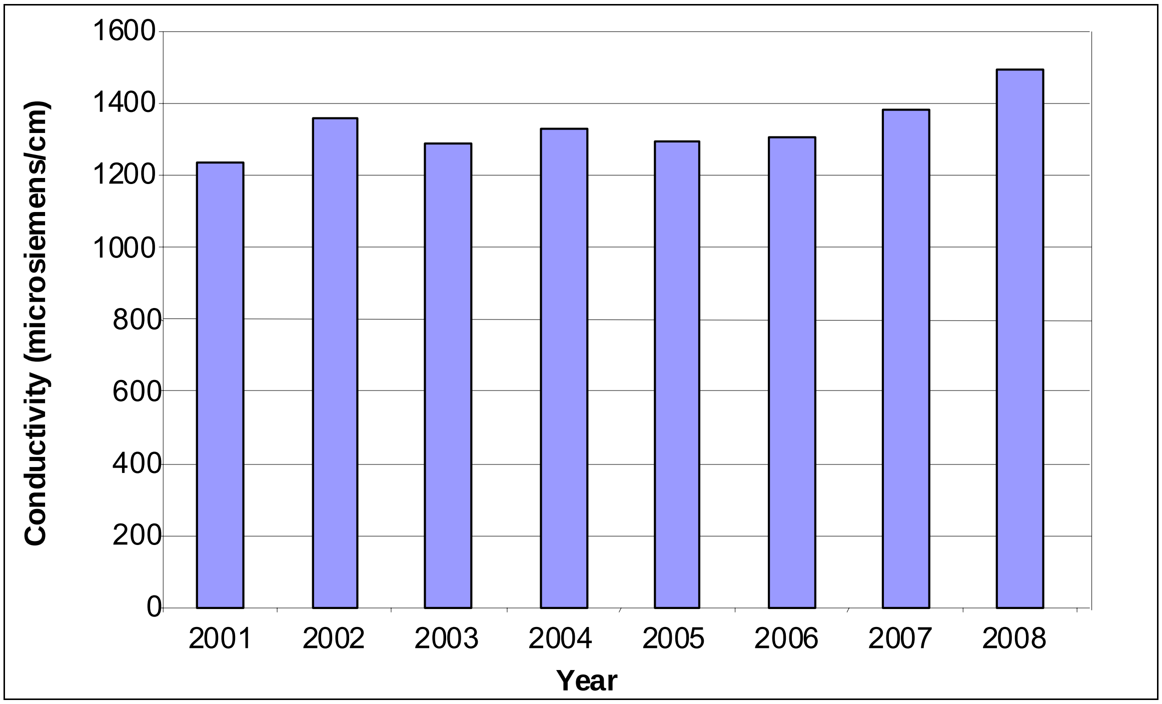


Figure 4.5
Hardness and Alkalinity Trends 2001 - 2008

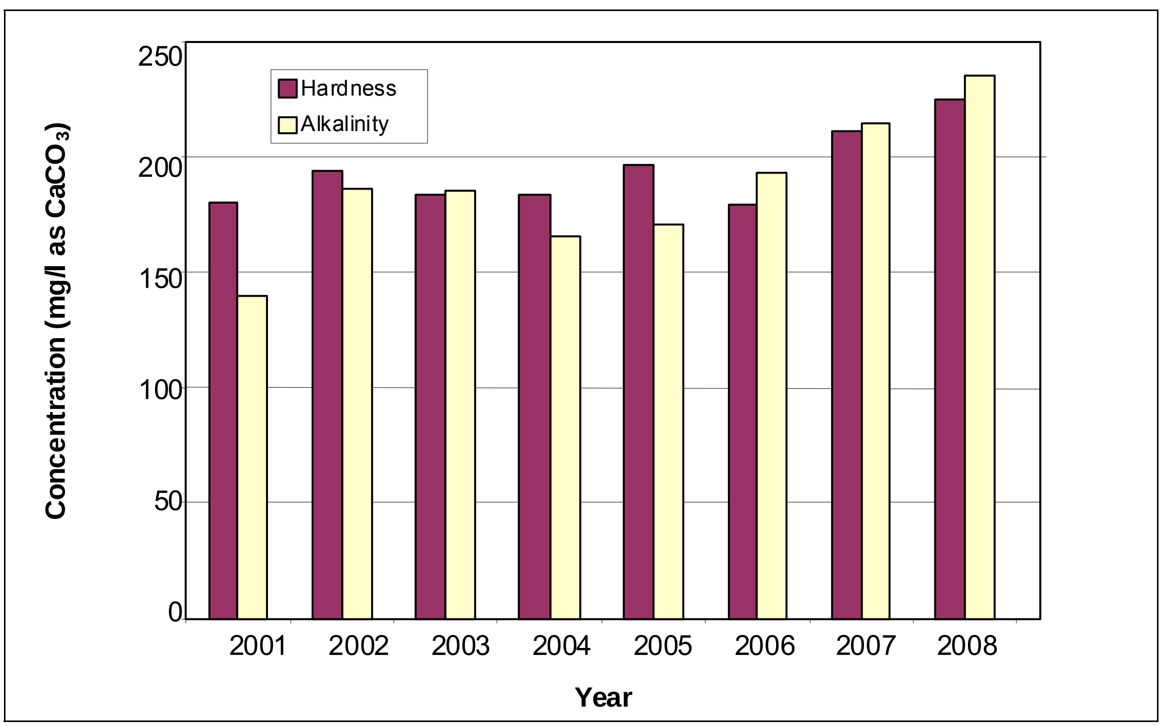
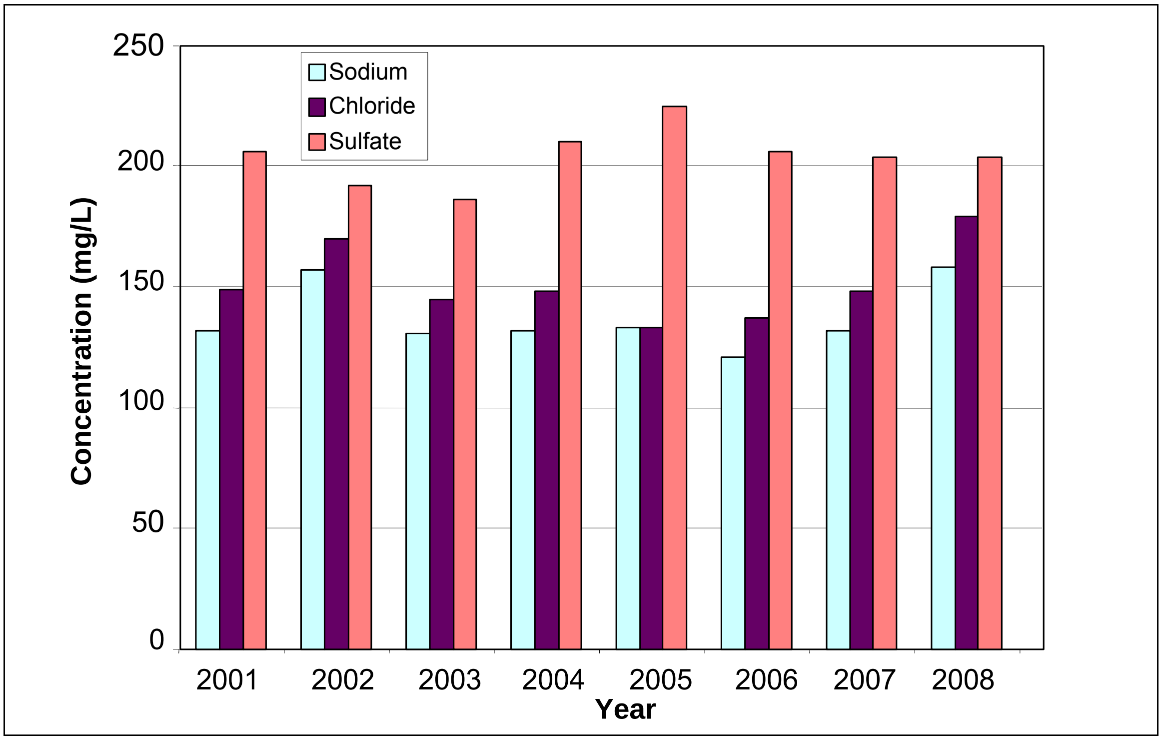


Figure 4.6
Trends in Sodium, Chloride and Sulfate 2001 – 2008



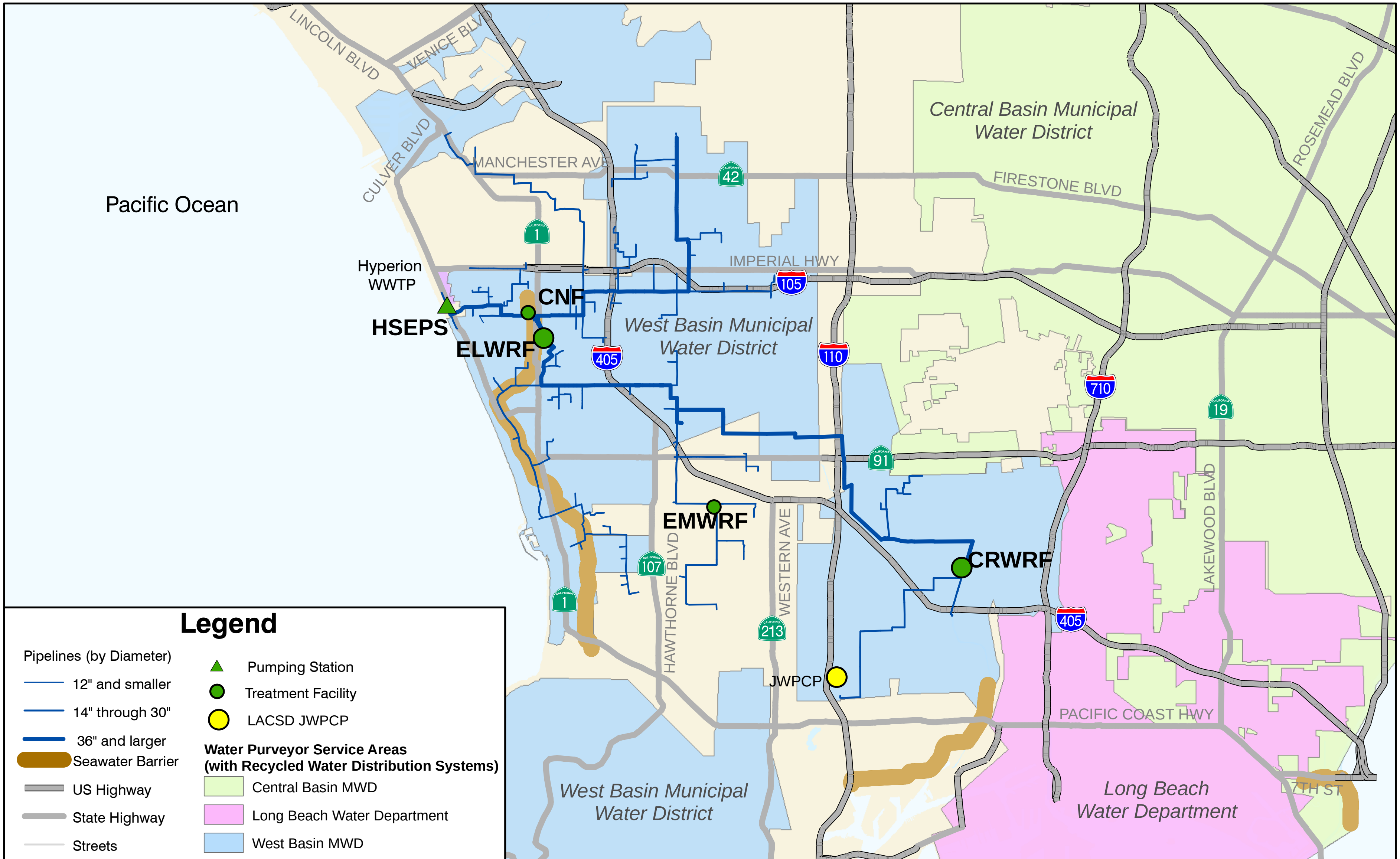
4.2.1 Existing Treatment Capacities

ELWRF is the only treatment plant that receives supply from the HWWTP. The remaining facilities rely on Title 22 recycled water from ELWRF as a supply source. The existing capacities of West Basin's treatment facilities are summarized in Table 4.2.

Table 4.2 Treatment Facility Capacities
Capital Implementation Master Plan
West Basin Municipal Water District

	Existing Capacity (mgd)	Expansion Capacity (mgd)	Near-Term Capacity (mgd)	Expansion Phase
ELWRF	56.8	6.5(1)	63.3	Phase V
CRWRF	6.0	17.0(2)	23.0	Phase II
CNF	4.9	1.5	6.4	-
EMF	8.1	-	8.1	-

Notes:
(1) Anticipated demand increase from feasibility study (HDR 2008). Does not include additional Title 22 demand to supply CNF facility or treatment process waste.
(2) Anticipated demand increase based on discussion with West Basin staff.



carollo
in association with
AKM SPi

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

N

1 0.5 0 1 2 3 4
Miles

Figure 4.7
Recycled Water Supplies

It should be noted that the treatment capacities listed in Table 4.2 refer to all finished water qualities produced by each facility. For the Title 22 treatment processes at ELWRF, the current capacity is limited by the high rate clarifier to 30.0 mgd and the Title 22 filters to 40.0 mgd. Expansion of any of West Basin's systems requiring Title 22 water in excess of 30.0 mgd will require expansion of the Title 22 treatment processes.

4.2.2 Discharge and Process Wastes

Process discharges include reverse osmosis (RO) process concentrate, nitrification and microfiltration (MF) backwash, MF and RO clean in place, chemical clean in place, and plant drains. Waste and discharge flows are included in the facility schematics found in Chapter 2. The RO concentrates from ELWRF and CRWRF are discharged to dedicated brine lines. The brine flows from ELWRF are discharged into the Hyperion Outfall system located at the City of Los Angeles' HWWTP, and the brine flows from CRWRF are discharged into the Los Angeles County Sanitation District's (LACSD) Joint Water Pollution Control Plant (JWPCP) outfall system in the City of Carson. Discharge requirements for these brine lines are regulated by the California Regional Water Quality Control Board (RWQCB) and the United States Environmental Protection Agency (USEPA). Details of the discharge permits for each line are discussed below.

4.2.2.1 ELWRF Brine Line

Concentrate from the RO processes at ELWRF is discharged into the HWWTP 5-mile outfall via the ELWRF brine line system. The brine line consists of 18-inch diameter high-density polyethylene (HDPE) pipe that extends 3.0 miles west and north from ELWRF to the Hyperion outfall. Discharge from this system is regulated by NPDES CA0063401, which states that discharge is limited to a maximum flow of 4.5 mgd. The discharge permit contains effluent limitations on oil and grease, pH, temperature, TSS, ammonia, settleable solids, and turbidity. This discharge permit became effective on September 18, 2006, and is set to expire on September 17, 2011. During the calendar year 2007, an average flow of 2.5 mgd (2,800 afy) was observed in the ELWRF brine line, averaging 7.7 percent of the total influent to ELWRF.

4.2.2.2 CRWRF Brine Line

Concentrate from the RO process at the CRWRF is discharged into one of the four JWPCP outfalls via the CRWRF brine line system. The brine line consists of 14-inch diameter HDPE and PVC pipe that extends 5.4 miles south and west from CRWRF to the JWPCP outfall. Discharge from this system is regulated by NPDES CA0064246, which sets a maximum flow of 0.9 mgd. This discharge permit became effective on February 10, 2007, and is set to expire on December 10, 2011. During the calendar year 2007, an average flow of 0.54 mgd (606 afy) was observed in the CRWRF brine line, averaging 12.5 percent of the total influent to CRWRF.

4.2.2.3 EMWRF Concentrate

Concentrate from the RO process at the EMWRF is discharged into the ExxonMobil Torrance Refinery In-Plant Sewer System. Annual flow data for the concentrate stream was not available; however, the design flow for all four RO trains operating is 388 gpm, or about 0.6 mgd.

4.2.2.4 Solids Handling and Disposal of Solids

At ELWRF, solids streams from the various clarifiers are routed to two gravity thickeners, which feed a filter press. Dewatered sludge is directly loaded from the filter press to trucks for landfill disposal.

4.3 TREATMENT PLANT EXPANSION PROJECTS

West Basin has identified three near-term treatment plant expansion projects. These are:

- ELWRF Phase V
- CRWRF Phase II
- CNF

Each of these expansions is still in the preliminary phases of planning or design. Once completed, these projects will increase the existing treatment capabilities for expected growth in existing customer demand. The projected expansion capacities are listed in Table 4.2

4.3.1 ELWRF Phase V

To serve additional demand for both existing and future customers, the ELWRF Phase V Expansion Project will add MF and RO treatment capacity to increase production of Barrier water, Industrial RO water to the Chevron El Segundo Refinery and the El Segundo Power Plant, as well as Industrial RO Ultra water to Chevron. This expansion project is anticipated to be completed in 2011.

4.3.2 CRWRF Phase II

As part of the CRWRF Phase II Expansion Project, additional MF and RO units are anticipated to produce added Industrial RO product water for the bp Carson Refinery. Also, additional Nitrified water will be produced for the bp Carson Refinery cooling towers. This expansion is associated with the Amoco and Watson Cogeneration facilities.

4.3.3 CNF

Two additional Biofor units will be added to the CNF and facility improvements, such as pump station and electrical upgrades, will be performed to accommodate an additional 1.5 mgd of nitrified water demand. In addition to the facility improvements, the expansion of the CNF will also include implementation of an emergency backup potable water supply to the nitrification storage tank for reliability.

4.4 FUTURE SUPPLY REQUIREMENTS AND CONSIDERATIONS

As shown in Figure 4.9, the current HSEPS firm capacity limits the supply available from HWWTP to 51.0 mgd (57,100 afy). As discussed in Section 4.1.1, current utilization of this capacity is approximately 33 mgd, or about 65 percent of the total firm capacity available. To accommodate planned growth in potential customers discussed in Chapter 3, West Basin is considering expanding HSEPS for additional supply capacity.

4.4.1 Required Supply Projections

Projected supply requirements are presented in Table 4.3. Projected average annual supply requirements are shown on Figure 4.8, and projected maximum month supply requirements are shown on Figure 4.9. These projections assume a recovery ratio of 80 percent, and are based on the customer demand projections presented in Chapter 3.

Table 4.3 Phasing of Potential Supply
Capital Implementation Master Plan
West Basin Municipal Water District

			Projected Average Annual Supplies(2) (afy)			Projected Maximum Month Supplies(2) (mgd)		
Year	Projected Average Annual Demand(1) (afy)	Projected Maximum Month Demand(1) (mgd)	Inside Service Area	Outside Service Area	Total	Inside Service Area	Outside Service Area	Total
2008	31,860	38.4	31,295	8,530	39,825	37.5	10.5	48.0
2010	33,251	40.4	32,886	8,678	41,564	40.3	10.8	51.1
2020	67,573	82.0	63,578	20,889	84,466	76.2	27.0	103.1
2030	82,273	104.5	63,578	39,264	102,841	76.2	55.1	131.3

Notes:
(1) Demands from potential customer demand projections in Table 3.10.
(2) Supply projections assume 80% recovery ratio from aggregate of all processes (80% of supplies able to be delivered to customers, or 20% lost to processes, evaporation, overhead, and distribution water loss). Based on ratios of supplies to customer billing records in calendar year 2007 historical data.

As shown below in Figure 4.8 and Figure 4.9, West Basin's existing firm pumping capacity of 51.0 mgd is sufficient to meet both average annual demands and maximum month demands through the first two planning periods. However, an annual supply shortfall of approximately 27,500 afy is anticipated to occur by 2020. Moreover, a supply shortfall to meet the projected maximum demand is expected to occur much earlier as the maximum month demand is reaching the 51 mgd supply capacity in year 2010. The addition of new customers is therefore dependent upon West Basin's ability to increase the supply capacity from HWWTP and/or the development of a new supply source.

Figure 4.8
Projected Average Annual Supply Requirements

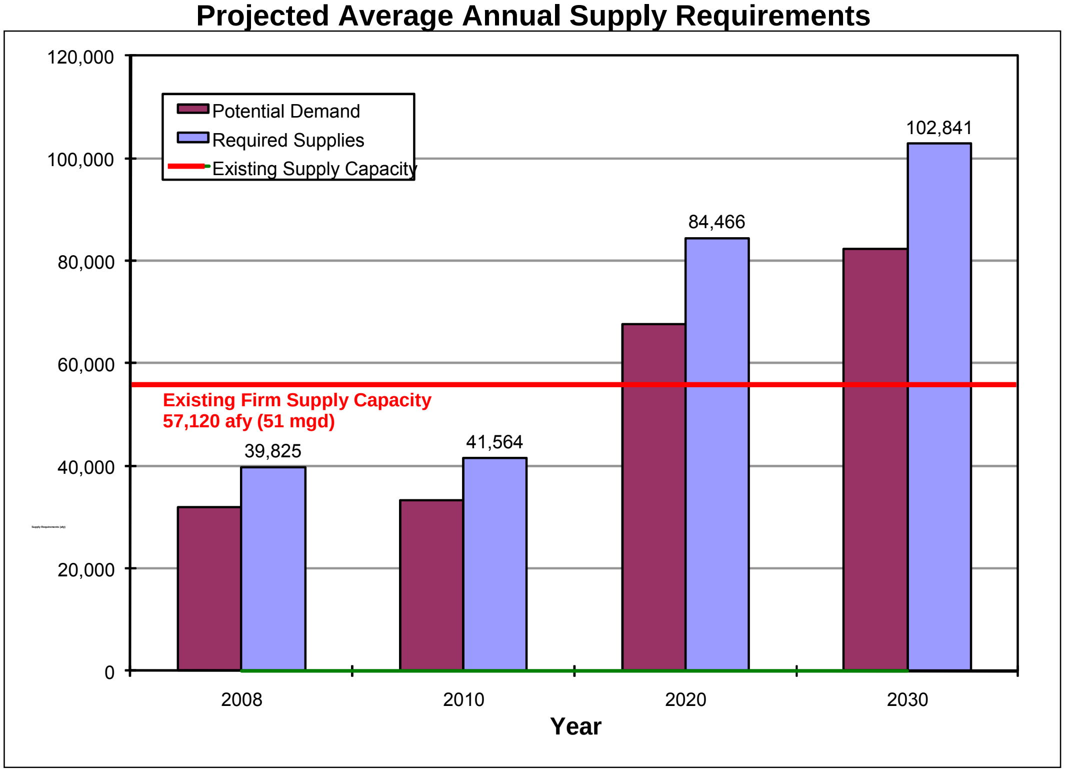
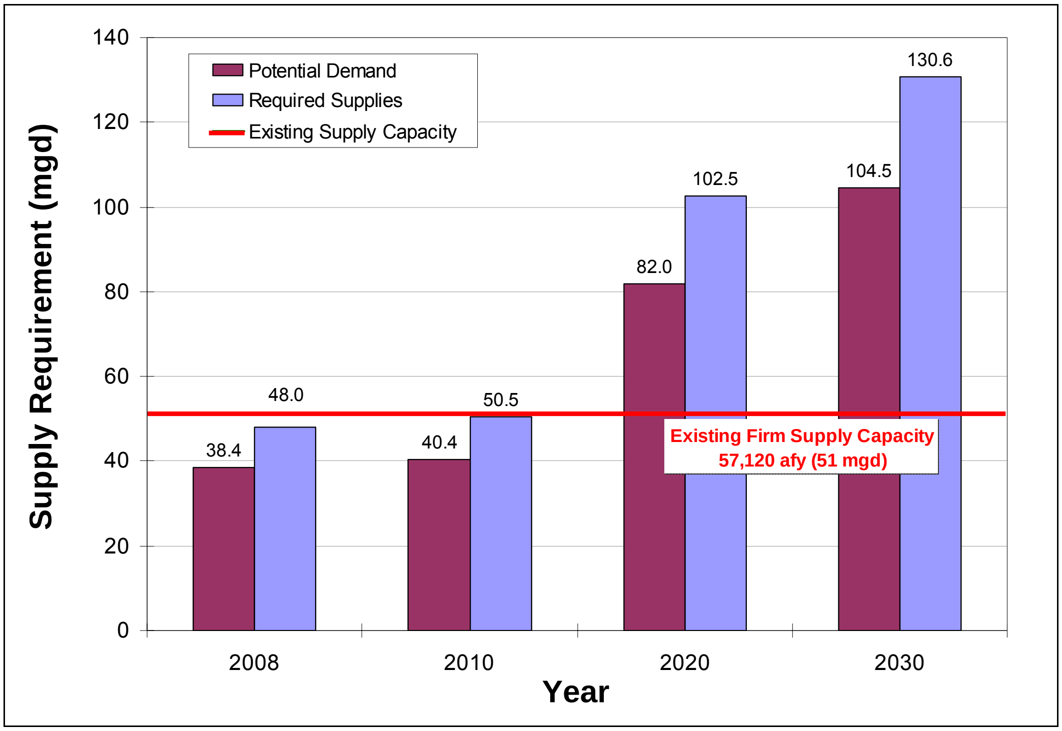


Figure 4.9
Projected Maximum Month Supply Requirements



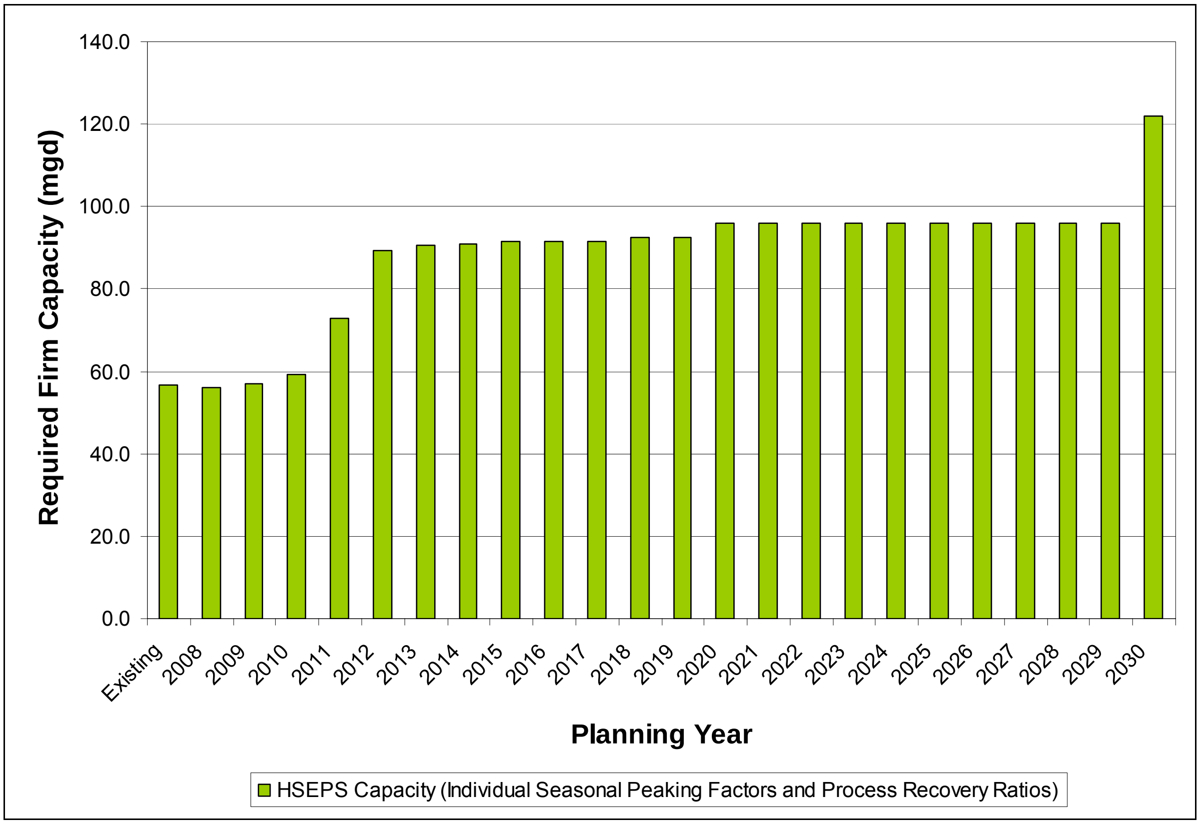
It should be noted that Figure 4.9 does not account for daily peaking. Actual firm capacity requirements of the HSEPS will be covered in greater detail in Chapter 8.

4.4.2 HSEPS Capacity Expansion

As Figure 4.9 indicated, the required capacity of the HSEPS will exceed the existing capacity during within the planning horizon.

Figure 4.10 presents the required firm capacity at HSEPS based on the customer phasing described in Chapter 3. The firm capacity was calculated based on applying individual seasonal peaking factors to each customer demand and including an additional fifteen percent for demands associated with advanced treatment (e.g., Chevron LPBF). The daily supply peaking factor was then applied to determine the total firm capacity requirement.

Figure 4.10
HSEPS Capacity Requirements



As shown on Figure 4.10, the most significant increase in capacity requirements at HSEPS is anticipated to occur between 2010 and 2012. This is due to several significant demands served by Hyperion becoming active in those years, including the LA Harbor Nitrified Water project and the ELWRF Phase V expansion (but not the bp expansion, as further discussed in Chapter 8). Hydraulic analysis and recommendations to accommodate projected demands will be discussed in further detail in Chapter 8.

It should be noted that Figure 4.10 includes the individual peaking factor as well as a daily peaking of 1.34 discussed in Section 4.1.4, while Figure 4.9 only includes the seasonal peaking factor (from individual customers). Firm capacity requirements shown in Figure 4.10 also assume simultaneous seasonal peaking of all demands, as discussed in Chapter 3.

4.4.3 Potential Additional Sources of Supply

To provide redundancy and reliability in supply of recycled water to existing and potential customers, West Basin has identified the LACSD as a potential additional source of supply. LACSD has 11 treatment facilities, including 10 water reclamation plants across Los Angeles County. LACSD's treatment plants produced a total annual average effluent of 486 mgd during Fiscal Year (FY) 2006-07, including 175 mgd of recycled water (LACSD 2008). LACSD's total reclamation capacity is currently 252 mgd.

LACSD's JWPCP is located about 4 miles southwest of the West Basin's CRWRF and treats a majority of the flow from the Joint Outfall System prior to discharge into the ocean. The location of the JWPCP in relation to West Basin's facilities is shown on Figure 4.7. In FY 2006/07, the JWPCP discharged 311 mgd of SE to the ocean. As the JWPCP treats only to SE levels, additional treatment and conveyance would be required.

The use of this supply source from JWPCP for West Basin's Title 22 system could be accomplished by adding tertiary treatment capabilities on the southeast side of the West Basin's recycled water system. This treatment capacity could be added to a plant located near the CRWRF, between the JWPCP and the CRWRF, or near the JWPCP. Based on discussions with West Basin staff, treatment of JWPCP's SE to Title 22 standards for irrigation would require more significant treatment than HWWTP's SE due to the higher TDS levels (approximately 1,300 mg/L at JWPCP versus 900 mg/L at HWWTP). The cost of these extra facilities, as well as the water quality of the SE from the JWPCP, is evaluated in more detail in Chapter 8 of this report.

4.4.4 Reliability and Redundancy

West Basin currently has only a single source of supply in the existing system; therefore, reliability is accomplished within the individual facilities and by backup potable water connections. The HSEPS and the Hyperion Secondary Effluent Force Main system represent critical elements whose failure would prevent operation of all West Basin facilities. Establishing additional water supplies across multiple points in the distribution system, along with backup power supply to each of the treatment facilities, or critical portions of each of the treatment facilities, would greatly increase reliability and redundancy in the system.

Current backup connections within the West Basin's treatment facilities and distribution systems consist of connections to potable water supplies. Based on the Los Angeles County Recycled Water Advisory Committee's *R□□□□□ W□□□□ □□ M□□□□*, connections to potable supplies are required to maintain separation between the potable water distribution system and the recycled water distribution system. Separation requirements are not satisfied by only a backflow prevention device. Devices satisfying this requirement include:

- **Air-gap Separation**: A physical separation between the systems usually accomplished through use of a floating reservoir. Such a connection prevents pressurization of the connection. Due to the lack of floating reservoirs in West Basin's distribution system, such a connection will often require downstream pumping to maintain pressure.
- **Swivel-ell Assembly**: Under "stringent requirements", an assembly is allowed to directly connect the two systems providing the assembly does not allow simultaneous connections. Such an assembly requires physical modifications to the facility in question during downtime. Assemblies of this type are located at West Basin's EMWRF and CRWRF. United Water staff estimated six to eight hours to switch connections under current configurations at West Basin facilities.

Potable water backup connections are intended to function as a supply source in an event of emergency such as brief recycled water supply interruptions.

Additional backup supply alternatives may include connections to neighboring recycled water systems. The closest neighboring recycled water systems to West Basin's distribution systems include the Central Basin Municipal Water District, the Long Beach Water Department, the City of Los Angeles distribution system served by Terminal Island Water Reclamation Plant (WRP), and the City of Santa Monica distribution systems served by Santa Monica WRP (LACRWAC 2008). Each of the service areas for neighboring recycled water systems is shown on Figure 4.7.

West Basin currently does not have backup power generators to operate any facilities. As a part of the most recent expansion of the HSEPS, an independent connection to electrical power was recommended as a backup power source (CDM 2004). Chapter 8 includes a discussion of options to establish redundancy using backup power sources.

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PLANNING AND EVALUATION CRITERIA

This chapter summarizes the criteria established for the development of the West Basin Municipal Water District's (West Basin) hydraulic model and for the analysis of the master plan facilities. The planning and evaluation criteria discussed in this chapter are separated into four subsections, including hydraulic criteria, water quality criteria, facility sizing criteria, and cost estimating criteria.

5.1 HYDRAULIC CRITERIA

The hydraulic criteria described in this section include model simulation requirements, peaking factors, delivery pressure, system losses, and pipeline velocity. While specific analysis criteria for each distribution system will be detailed in Chapter 7, Existing System Analysis, each of these criteria is discussed below in general.

5.1.1 Model Simulation Requirements

The recycled water system was evaluated using hydraulic models that were calibrated for hydraulic parameters measured in the field. With the exception of the Edward C. Little Water Recycling Facility (ELWRF) Brine Line, these models were developed to conduct 24-hour extended period simulation (EPS) analyses to allow the evaluation of the impact of demand variations on pipeline, pump station, and reservoir performance.

5.1.2 Peaking Factors

5.1.2.1 Average Day Demands

Average annual demands (AAD) for existing customers shall be based on historical customer water use data from the past five years, if available. Significant variations in average annual demands will be verified with West Basin staff to identify the reasons. These variations may result from limited usage throughout a year, or very dry and very wet years. The average demands will be determined with consideration of all the available data. Future average day demands for industrial users and the West Coast Barrier will be based on individual customer requests. Future average day irrigation demands will be based on existing potable water use by the potential customers.

5.1.2.2 Maximum Month Demands

Maximum month demand (MMD) depends on the type of user. MMD for existing customers shall be based upon the historical seasonal peaking factors for existing system analysis. For future system analysis of existing customers, historical seasonal peaking factors greater than 3.0 will be reduced to 3.0. For future customers, MMD shall generally be based on the following:

Irrigation Customers:	2.5 * ADD
Industrial Use:	1.3 * ADD
Mixed-Use:	1.7 * ADD
Barrier Water Injection:	1.0 * ADD

A more detailed description of peaking factors is provided in Chapter 3.

5.1.2.3 Peak Demand Factors

Peak demand factors are determined from a combination of maximum month peaking factors and diurnal curves, which describe the typical hourly demand variation of a customer type.

Hourly fluctuations in the demands are experienced due to variations in seasonal conditions, industry demands, and maintenance operations. The peak demand factors for the largest customers were determined individually based on field data. These diurnal curves were then evaluated to develop a set of generic diurnal curves that were applied to all remaining customers based on the water usage types listed in Chapter 3. The generic diurnal curves are shown in Chapter 3, while the 15 customer specific demand patterns are included in Appendix E.

5.1.3 Delivery Pressure

The Title 22 distribution system should typically be designed to provide a minimum service pressure of 65 pounds per square inch (psi). Under special circumstances, a higher service pressure may be required. For instance, the Anza Avenue Lateral services, located in the City of Torrance, require a minimum service pressure of 80 psi, because the existing irrigation systems at certain customer sites are old and need a minimum pressure of 75 psi to adequately irrigate these sites.

The pump station control discharge pressures for each of the remaining West Basin recycled water systems are summarized in Table 5.1.

Table 5.1 Control Discharge Pressures
Capital Implementation Master Plan
West Basin Municipal Water District

System Description	Control Discharge Pressure (psi)
Hyperion Secondary Effluent Pumping System	59
Barrier System	73
Chevron Industrial RO System	34
Chevron Industrial RO Ultra System	34
Chevron Nitrified Water System	100
bp Industrial RO System	50
bp Nitrified System	50
Title 22 Pump Station at ELWRF	87

5.1.4 System Frictional Losses

The pressure in the system at any given point for a particular flow is dependent on a number of variables including pipe size, roughness and length. These components all contribute to the magnitude of energy losses in the system and consequently, pressure. The system should be designed and operated to maintain system losses below 10 feet for each 1,000 feet of pipe length under any conditions, subject to satisfying all other criteria.

5.1.5 Pipeline Velocity

The distribution systems should be sized and designed to provide service at adequate pressures with the maximum day demands. To maintain adequate system pressures and prolong the life of the pipe, flow velocities should be limited. The system should operate at velocities of 1 to 3 feet per second (fps) normally, with a maximum velocity of 7 fps at intermittent peak flows.

5.2 WATER QUALITY CRITERIA

The water quality criteria described in this section are separated into irrigation guidelines and disinfection guidelines.

5.2.1 Irrigation Guidelines

Water quality guidelines for irrigation were developed by the University of California Committee of Consultants. These criteria are presented in Table 5.2. According to Salt-Affected Turfgrass Sites: Assessment and Management, the combination of high nitrogen levels and frequent irrigation has several adverse effects including:

- Excessive growth and mowing requirements;
- Reduced heat stress tolerance;
- Reduced cold and drought tolerances;
- Reduced wear-resistant turf;
- Increased opportunity for invasive plant infestation (e.g., *Poa annua*); and
- Increased disease and weed problems.

The successful long-term use of irrigation water depends more on rainfall, leaching, soil drainage, irrigation water management, salt tolerance of plants, and soil management practices than upon water quality itself.

Since salinity problems may eventually develop from the use of any water, the following guidelines are given, should they be needed, to assist water users to better manage salinity in either agricultural or community-based irrigation:

- Irrigate more frequently to maintain an adequate soil water supply.
- Select plants that are tolerant of an existing or potential salinity level.
- Routinely use extra water to satisfy the leaching requirements.
- If possible, direct the spray pattern of sprinklers away from foliage. To reduce foliar absorption, try not to water during periods of high temperature and low humidity or during windy periods. Change time of irrigation to early morning, late afternoon, or night.
- Maintain good downward water percolation by using deep tillage or artificial drainage to prevent the development of a perched water table.
- Salinity may be easier to control under sprinkler and drip irrigation than under surface irrigation. However, sprinkler and drip irrigation may not be adapted to all qualities of water and all conditions of soil, climate, or plants.

Table 5.2 Irrigation Water Quality Guidelines
Capital Implementation Master Plan
West Basin Municipal Water District

Key Irrigation Water Quality Parameter		Units	Established Criteria Degree of Use Restriction[(2) (3) (4)]		
			None	**Slight to Moderate**	**Severe**
Salinity	EC	DS/m	<0.7	**0.7-3.0**	>3.0
	TDS	mg/L	<450	**450-2000**	>2000
Permeability[(5)]				EC	
aSAR = 0-3 and EC			>0.7	0.7-0.2	<0.2
= 3-6 and EC			>1.2	1.2-0.3	<0.3
= 6-12 and EC			>1.9	**1.9-0.5**	<0.5
= 12-20 and EC			>2.9	2.9-1.3	<1.3
= 20-40 and EC			>5.0	5.0-2.9	<2.9
Sodium (Na)					
Surface		SAR	<3	**3-9**	>9
Sprinkler		mg/L	<70	**>70**	
Chloride (Cl)					
Surface		mg/L	<140	**140-355**	>355
Sprinkler		mg/L	<100	**>100**	
Boron (B)		mg/L	**<0.7**	0.7-3.0	>3.0
Bicarbonate		mg/L	<90	**90-500**	>500
PH		---		**6.5-8.4 (normal range)**	
Ammonia (NH_3)		mg/L		(see combined N values below)	
Nitrate (NO_3)		mg/L		(see combined N values below)	
Total Nitrogen (N)		mg/L	<5	5-30	**>30**

Notes:
(1) Adapted from University of California Committee of Consultants (1974), and Ayers and Westcot (1984).
(2) Method and Timing of Irrigation: Assumes normal surface and sprinkler irrigation methods are used. Water is applied as needed, and the plants utilize a considerable portion of the available stored soil water (50% or more) before the next irrigation. At least 15 percent of the applied water percolates below the root zone (leaching fraction [LF] > 15%).
(3) Site Conditions: Assumes soil texture ranges from sandy loam to clay with good internal drainage with no uncontrolled shallow water table present.
(4) Definitions of "The Degree of Use Restriction" terms:
None = Reclaimed water can be used similar to the best available irrigation water.
Slight = Some additional management will be required above that with the best available irrigation water in terms of leaching salts from the root zone and/or choice of plants.
Moderate = Increased level of management required and choice of plants limited to those which are tolerant of the specific parameters.
Severe = Typically cannot be used due to limitations imposed by the specific parameters
(5) Permeability is evaluated based on the combination of the adjusted sodium adsorption ratio (aSAR) and electrical conductivity (EC) values.

5.2.2 Disinfection Guidelines

The California Code of Regulations, Title 22, Division 4, Chapter 3, Recycling Criteria, specify treatment processes for ensuring proper disinfection of recycled water. They also specify requirements for limiting public contact with recycled water to protect public health.

Disinfected tertiary recycled water means a filtered and subsequently disinfected wastewater that meets the following criteria:

- The filtered wastewater has been disinfected by either:
  - A chlorine disinfection process following filtration that provides a CT (the product of total chlorine residual and modal contact time measured at the same point) value of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes, based on peak dry weather design flow; or
  - A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999 percent of the plaque-forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as poliovirus may be used for purposes of the demonstration.
- The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed an MPN of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 200 milliliters in more than one sample in a 30 day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 milliliters.

According to *Water Reuse: Issues, Technologies, and Applications*, a minimum analysis criteria of 1.0 mg/L is recommended to limit the regrowth of microorganisms within the distribution system.

5.2.3 Barrier Water Quality

The State of California Regional Water Quality Control Board (RWQCB) for the Los Angeles Region has issued a permit to West Basin for injection of recycled water from the microfiltration/reverse osmosis/advanced oxidation process (MF/RO/AOP) at ELWRF into the West Coast Basin Barrier. This water has been shown to meet all the requirements of the California Drinking Water Primary and Secondary Standards and the Maximum Contaminant Levels (MCLs). However, the permit requires total Nitrogen of less than 5 mg/L as total nitrogen rather than the MCL of less than 10 mg/L for nitrate. Similarly, the maximum TOC concentrate allowed in the permit is less than 0.5 mg/L. It has also been shown that selected pharmaceutically active compounds and other toxic contaminants not included in the drinking water standards are removed or reduced to low levels in the product water.

5.2.4 Industrial RO and Industrial RO Ultra Water Quality

The contractual limits for the water quality of each of the Industrial RO and Industrial RO Ultra water demands supplied by the Chevron Low Pressure Boiler Feed, Chevron High Pressure Boiler Feed, EMWRF, and CRWRF are shown in Table 5.3.

Table 5.3 Water Quality Criteria RO Products
Capital Implementation Master Plan
West Basin Municipal Water District

System	Recycled Water Type	Product Water Quality Limits
Chevron Low Pressure Boiler Feed System	Industrial RO	Hardness <0.3 mg/L Silica < 1.5 mg/L TDS < 60 mg/L
Chevron High Pressure Boiler Feed System	Industrial RO Ultra	Hardness < 0.03 mg/L Silica < 0.1 mg/L TDS < 5 mg/L
bp Reverse Osmosis System (CRWRF RO Product Water)	Industrial RO	Calcium 1.0 mg/L Magnesium 1.0 mg/L Ammonia 4 mg/L Silica 1 mg/L TDS 35 mg/L
EMWRF RO Product Water	Industrial RO	Conductivity 50 µmho/cm TOC 0.7 mg/L Ammonia 1.9 mg/L Silica 1.0 mg/L

Notes:
Hardness as mg/L as $CaCO_3$
Individual ions where indicated are as the species.

5.2.5 Nitrified Water Quality

The water quality goals for the Nitrified water supplied by CRWRF and EMWRF are shown in Table 5.4.

At the current time there are no water quality goals in place for the Nitrified water supplied by the Chevron Nitrification Facility.

Table 5.4 Water Quality Goals for Nitrification Systems Capital Implementation Master Plan West Basin Municipal Water District		
Parameter	**EMWRF[(1)]**	**CRWRF[(2)]**
Conductivity, μmho/cm	3,000	1,000 (average) 1,350 (max)
Alkalinity, as $CaCO_3$	350	N/A
Sulfate, mg/L	600	N/A
Chloride, mg/L	450	N/A
Calcium, mg/L	80	60 (average) 100 (max)
Magnesium, mg/L	40	24 (average) 29 (max)
Hardness, as $CaCO_3$	360	N/A
Potassium, mg/L	20	N/A
Silica, mg/L	35	22 (average) 28 (max)
Ammonia, mg/L as N	1.6	0.1 (average) 0.1 (max)
Iron, mg/L	1.0	N/A
Phosphate, mg/L	15	N/A
Total Suspended Solids, mg/L	5	N/A
COD, mg/L	90	N/A

Notes:
(1) Listed limits for EMWRF are maximum concentrations
(2) CRWRF limits established by bp

5.3 FACILITY SIZING CRITERIA

The facility sizing criteria described in this section are separated into pump station sizing and storage requirements.

5.3.1 Pump Station Sizing

All pump stations should have flow meters, suction and discharge pressure gauges, and remote telemetry units. They should be tied to the central DCS system.

Pump stations should be constructed with fireproof materials. Power to the pump stations should be provided through underground service to minimize possibility of damage during fires.

5.3.1.1 Source of Supply Pump Station

Hyperion Secondary Effluent Pump Station (HSEPS) delivers secondary effluent from the Hyperion Wastewater Treatment Facility (HWWTP) to the ELWRF. HSEPS should have the capability to deliver the peak hour demands via one standby pump in an event the largest pump is out of service. The HSEPS shall also be equipped with back-up power connection and manual transfer switch or alternate power supply, in event there is a loss of main power supply.

5.3.1.2 Booster Pump Stations at ELWRF

The booster pump stations supplying recycled water from ELWRF include the Title 22 Pump Station, the Barrier Pump Station, the Low Pressure Boiler Feed Pump Station, and the High Pressure Boiler Feed Pump Station.

These pumping stations should be sized to deliver the peak hour demands via one standby pump in an event the largest pump is out of service.

The Title 22 Pump Station should be designed to deliver the expected overall peak hour demand with the largest pump out of service, because it pumps into a closed system. Back-up power should be provided to operate the pump station during commercial power outages.

The Barrier Pump Station should deliver the future maximum demand of 15.2 mgd with the largest pump out of service. Back-up power is not required because potable water is available through the Metropolitan Water District of Southern California's West Coast Feeder.

The Chevron Low Pressure Boiler Feed Pump Station should deliver the maximum day demand with the largest pump out of service. Back-up power is not needed for service to Chevron since there is an on site storage tank at the Chevron El Segundo Refinery. Under future maximum day demands, this tank would provide emergency storage for over 9 hours. However, back-up power requirement should be reviewed based upon the future service requirements at the El Segundo Power Plant.

The Chevron High Pressure Boiler Feed Pump Station should have the firm capacity to deliver the maximum day flow. Back-up power is not required because there is approximately 1.2 million gallons of emergency storage in the on-site storage tank at the Chevron El Segundo Refinery, which provides over 8 hours of storage under future maximum day demands.

5.3.1.3 Chevron Nitrified Water Pump Station

The difference between the future maximum day and maximum month demand is 0.83 million gallons, which is more than the available forebay storage at CNF. Therefore, this pump station should deliver the maximum day demand with the largest pump out of service. Because potable water connection from the City of El Segundo's distribution system is available to supply all the cooling towers, back-up power is not necessary.

5.3.1.4 Booster Pump Stations in Title 22 Distribution System

The pumping stations in the Title 22 Distribution System should be sized to deliver the peak hour demands with the largest pump out of service (one standby pump). Pump stations should be equipped with portable generator connections and manual transfer switches.

5.3.1.5 Booster Pump Stations at CRWRF

The future maximum day demands for RO industrial and nitrified water are significantly greater than the maximum month demands. Therefore, the bp RO and bp Nitrified Water Pump Stations should be designed to deliver the maximum day demands with the largest pump out of service.

West Basin will provide potable water back-up supply through an air gap at the CRWRF. If this capacity is sufficient for the maximum month demands of the future customers, no additional storage will be necessary. However, either portable power with manual transfer switches, or a secondary source of supply should be provided to operate the pump stations during an outage of the primary power supply.

5.3.2 Storage Requirements

Storage for West Basin's recycled water systems is necessary for:

- Pump station forebay providing operational storage accommodating variations in water production and demand, and retention time for the product water.
- Emergency supply during interruption of treatment or primary supply source.
- Providing break tanks that separate CRWRF and EMWRF from the Title 22 System to minimize the transient pressures (surges) that result from the significant flow changes during the microfiltration backwash cycles.

Forebay storage should be evaluated for each pump station during the preliminary and final design stages.

Emergency storage for each system should be sufficient to allow West Basin transfer customers or treatment facilities to potable water. Potable water should be supplied through an air gap to minimize the required duration.

Break tanks should be sized to accommodate the variations in influent flows and backwash cycles.

5.4 COST ESTIMATING CRITERIA

The cost estimates presented in this Capital Implementation Master Plan (CIMP) are opinions developed from bid tabulations, cost curves, information obtained from previous studies, and Carollo Engineers, P.C. (Carollo) experience on other projects. The costs estimated for each recommended facility are opinions included in the CIP tables developed with this study. The tables are intended to be used to facilitate revisions to West Basin's CIP and ultimately to support determination of the user rates and connection impact fees. Recommendations for cost criteria of pipelines, pump stations, and reservoirs are also presented.

5.4.1 Capital Improvement Project Costs

Cost estimates presented in this master plan are based on the current Engineering and News Record (ENR) cost index for the Los Angeles metropolitan area of 9811 published in January 2009. In this report, the costs presented as Total Project Costs are present worth costs at this ENR number.

Total Project Cost estimates include estimated costs for construction, construction cost contingency, engineering, design, construction management, and miscellaneous cost, such as environmental fees.

5.4.2 Cost Estimating Accuracy

The cost estimates presented in the CIP have been prepared for general master planning purposes and for guidance in project evaluation and implementation. The actual costs of a project will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule, and other variable factors such as: preliminary alignment generation, detailed utility surveys, and environmental and local considerations.

The Association for the Advancement of Cost Engineering (AACE) defines an order of magnitude estimate for master plan studies as an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within +50 percent to -30 percent. This section presents the assumptions used in developing order of magnitude cost estimates for recommended facilities.

For the development of the Capital Improvement Program (CIP), a construction cost contingency and other markups will be applied consistent with Table 5.5. The markups are intended to account for costs of engineering, design, administration and construction management. Separate percentages were used for contingency and markups for different types of projects, as detailed in Table 5.5.

Table 5.5	**General Cost Estimating Assumptions Capital Implementation Master Plan West Basin Municipal Water District**				
Description	**Treatment Facility**(1)	**Distribution System**(2)	**Condition Assessment**(3)	**Membrane Replacement**	**Land Acquisition**
Construction Cost	100.0%	100.0%	100.0%	100.0%	100.0%
Construction Cost Contingency	15.0%	30.0%	20.0%	0.0%	20.0%
Engineering and Design	12.5%	12.5%	0.0%	0.0%	0.0%
Public Outreach	0.0%	2.0%	0.0%	0.0%	0.0%
Project Administration	2.5%	2.5%	0.0%	0.0%	0.0%
Construction Management	10.0%	10.0%	0.0%	0.0%	0.0%
Total Project Cost(2)	**140.0%**	**157.0%**	**120.0%**	**100.0%**	**120.0%**

Notes:
(1) Applies to projects at treatment facilities (“inside the fence”).
(2) Applies to projects outside treatment facilities (“outside the fence”).
(3) Equipment replacement costs.

The cost estimates are based on current perceptions of conditions at the project locations. These estimates reflect Carollo’s professional opinion of costs at this time and are subject to change as the project details are defined. Carollo has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor’s methods of determining prices, competitive bidding, or market conditions, practices, or bidding strategies. Carollo cannot, and does not, warrant or guarantee that proposals, bids, or actual construction costs will not vary for the costs presented herein.

5.4.3 Unit Construction Cost

The construction cost estimates presented in this report are based on the unit construction costs listed in Table 5.6. Construction costs for recycled water system pipelines include pipe material, valves, appurtenances, excavation, installation, bedding material, backfill material, transport, and paving where applicable. While no pipe material is specified in the unit construction costs, pipe materials used in comparable bid tabs for diameters through 12 inches were PVC and DIP is assumed for larger pipelines. The costs of acquiring easements for pipeline construction are not included in this estimate.

Table 5.6 Unit Construction Cost Capital Implementation Master Plan West Basin Municipal Water District	
Category	**Unit Construction Cost**
Pipelines	**$/lineal ft**
4-inch diameter	165
6-inch diameter	200
8-inch diameter	240
10-inch diameter	275
12-inch diameter	310
14-inch diameter	350
16-inch diameter	390
18-inch diameter	420
20-inch diameter	460
24-inch diameter	530
30-inch diameter	650
36-inch diameter	750
54-inch diameter	1,100
72-inch diameter	1,400
Special Pipeline Construction(1)	**Markup (%)**
Arterial Street (A)	125% of standard unit cost
Jack-and-Bore Crossings (F, R)	200% of standard unit cost
Booster Pumping Stations – New Construction	**$/hp**
<100 hp	$10,000
100-500 hp	$7,500
500-3,000 hp	$6,500
3,000-5,000 hp	$3,200
> 5,000 hp	$3,000
Booster Pumping Stations – Pump Replacement	**$/hp**
<100 hp	$3,000
100-500 hp	$2,500
500-1,000 hp	$2,250
1,000-2,500 hp	$2,000
>2,500 hp	$1,750
Storage	**$/gallon**
< 1 MG	$2.00
1-2 MG	$1.75
2-5 MG	$1.50
> 5 MG	$1.25
Treatment Capacity	**$/gallon/day (gpd)**

Table 5.6 Unit Construction Cost Capital Implementation Master Plan West Basin Municipal Water District	
Category	**Unit Construction Cost**
From Secondary Effluent to Title 22 (conventional treatment)	$2.00/gpd
From Secondary Effluent to Title 22 (with MF/RO for TDS reduction)	$6.00/gpd
From Title 22 to Nitrified Water (Nitrification)	$1.05/gpd
Single Pass RO (treating Title 22 water with MF/RO)	$2.25/gpd
Double Pass RO (treating Single Pass RO feedwater)	$4.50/gpd
Barrier (treating Secondary Effluent with MF/RO/UV)	$6.25/gpd
Backup Power	**$/site**
ELWRF (on-site generating station; 95,000 kWh at 66,000 volts)	$8.0 million
CRWRF (on-site generator; 3,600 kWh at 480 volts)	$1.8 million
HSEPS (secondary feed)	$1.8 million
CNF (on-site generator for product water PS)	$0.5 million
EMWRF (on-site generator for product water PS)	$0.5 million
Miscellaneous	**$/unit**
Enclosure Structures	$300.00 $/sf
PRV (in pre-existing vault)	$50,000.00 $/valve
Cleaning Access Ports	$100,000.00/port
Disinfection Stations	$280,000.00/station
Surge Tank	$500,000.00 $/tank
Surge Protection at ELWRF	$1,500,000.00/site
Surge Protection at CRWRF	$1,750,000.00/site
Pumping Station building	$300.00/sft
Potable Water Backup Connection	$250,000.00/site
Land Acquisition	$2,000,000.00/acre

Notes:
(1) Abbreviations in parenthesis apply to the CIP. A or ART: Arterial street requiring significant additional temporary traffic control or alternate construction hours; F or FWY: Freeway crossing requiring jack and bore construction; R or RR: Railroad crossing requiring jack and bore construction.

As shown in Table 5.6, markups have been included for special construction considerations. A 200 percent markup is included for jack and bore construction, to be considered for improvements crossing the freeway or a railroad. A 125 percent markup is also included for construction in arterial streets, to account for the increased costs of temporary traffic control, reduced construction hours, and alternate construction phasing associated with working on arterial streets.

For booster pumping stations (PS), different unit costs are included based on the required horsepower and whether the project involves a new PS requiring new piping and all associated appurtenances or simply the replacement or addition of a pump to an existing PS. Unit costs are estimated per horsepower of design size.

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MODEL DEVELOPMENT

This chapter presents an overview of the activities undertaken to develop and calibrate the hydraulic models for West Basin Municipal Water District's (West Basin) recycled water distribution systems. This chapter contains the following sections:

- Hydraulic Modeling Overview – This section explains the purpose of hydraulic models and their uses and limitations.
- Hydraulic Model Creation – This section describes the model development and the data and processes used to create each hydraulic model.
- Hydraulic Model Calibration – This section describes the processes used to gather field data and calibrate each model in order to establish a level of confidence in the model results.

Detailed information on the creation and calibration of each of the models are included in Appendix E, Model Development and Calibration, and Appendix H, Model User Manual.

6.1 HYDRAULIC MODELING OVERVIEW

A hydraulic computer model is an important tool for many analyses of water systems. Models are used as a part of distribution system master plans to identify deficiencies in distribution systems, and to plan capital improvements.

The Hydraulic Model is composed of three main parts:

- The data file storing geometry for geographic location of facilities.
- The database that defines the physical system. The database for West Basin's models is linked to the geographic data file.
- A computer program "calculator" that solves a series of hydraulic equations to define the performance of the water system in terms of pressure and flow.

The geographic data file provides water system facility locations and is typically represented as an AutoCAD or a Geographic Information Systems (GIS) file. Elements used in this file to model system facilities include pipes, junction nodes (connection points for pipes and location of demands), control valves, pumps, tanks, and reservoirs.

The database includes distribution system facility information such as facility size and geometry, operational characteristics, equivalent performance characteristics, and production/consumption data. Facility size and geometries include length and diameter of pipe, tank dimensions, size of valve, and pump curves. Operational characteristics include parameters that control how facilities move water through the system, such as on and off settings for pumps, pressure or flow controls for hydraulically actuated valves, or main line valve closures. Equivalent performance characteristics are used to represent equivalent facilities where detailed information is unavailable or unnecessary. Data for production and consumption determine where the water enters and exits the distribution system.

The computer program "calculator" analyzes the hydraulic information in the database file and generates results for pressures, flow rates, and operating statuses. The key to maximizing benefits from the hydraulic model is to correctly interpret results and understand how the recycled water distribution system is affected by the various components of the model. This understanding enables the engineer to be proactive in developing solutions to existing and future water system goals and objectives. With this approach, the hydraulic model is then used as a tool to identify the adequacy of system performance and identify solutions to have the water system operate according to established performance criteria.

Developing a good computer model begins with entering the best available information into the database and calibrating the model to match existing conditions in the field. Once the model has been calibrated, it becomes an invaluable tool to solve planning and operational problems. It can simulate the existing and future systems, identify system deficiencies, analyze impacts from increased demands or changes to supplies, and determine the appropriateness of proposed improvements for the system.

Ten (10) hydraulic models were developed as part this project. These models are:

- Hyperion Secondary Effluent Pumping Station System
- Title 22 Distribution System
- West Coast Barrier Water System
- Chevron High Pressure Boiler Feed System
- Chevron Low Pressure Boiler Feed System
- Chevron Nitrified Water System
- Edward C. Little Water Recycling Facility Brine Line
- bp Reverse Osmosis System
- bp Nitrified Water System
- Carson Regional Water Recycling Facility Brine Line

As specified by West Basin, the hydraulic model analyses were conducted in H_2OMAP® Water. The one exception to this is the model of the Edward C. Little Water Recycling Facility (ELWRF) brine line. Los Angeles County's Water Surface Pressure Gradient (WSPG) software was used to model the brine line due to the fact that it was found to flow as an open channel in some portions of the pipe. This is further discussed in Section 6.3.3.6.

6.2 HYDRAULIC MODEL CREATION

The hydraulic models were created through the use of existing GIS files, as-built drawings, record drawings, construction plans, the customer database and demands developed from record information, the diurnal use curves developed from field and distributed control system (DCS) information during the calibration period, manufacturer pump curves, and operational controls provided by West Basin.

The first step in creating each model was to set up the geometry of the system. This was done by drawing each component of the model and giving it a unique identification number that was assigned in a logical manner. The next step was to input the facility information. This includes diameter, length, and roughness for pipes; elevations, demands, and use patterns for nodes; dimensions and water levels for tanks; size and minor losses for valves; and pump curves for pumps. The last step was to define the operational controls for each model element. This includes pump on and off settings, valve controls, and maximum and minimum tank levels.

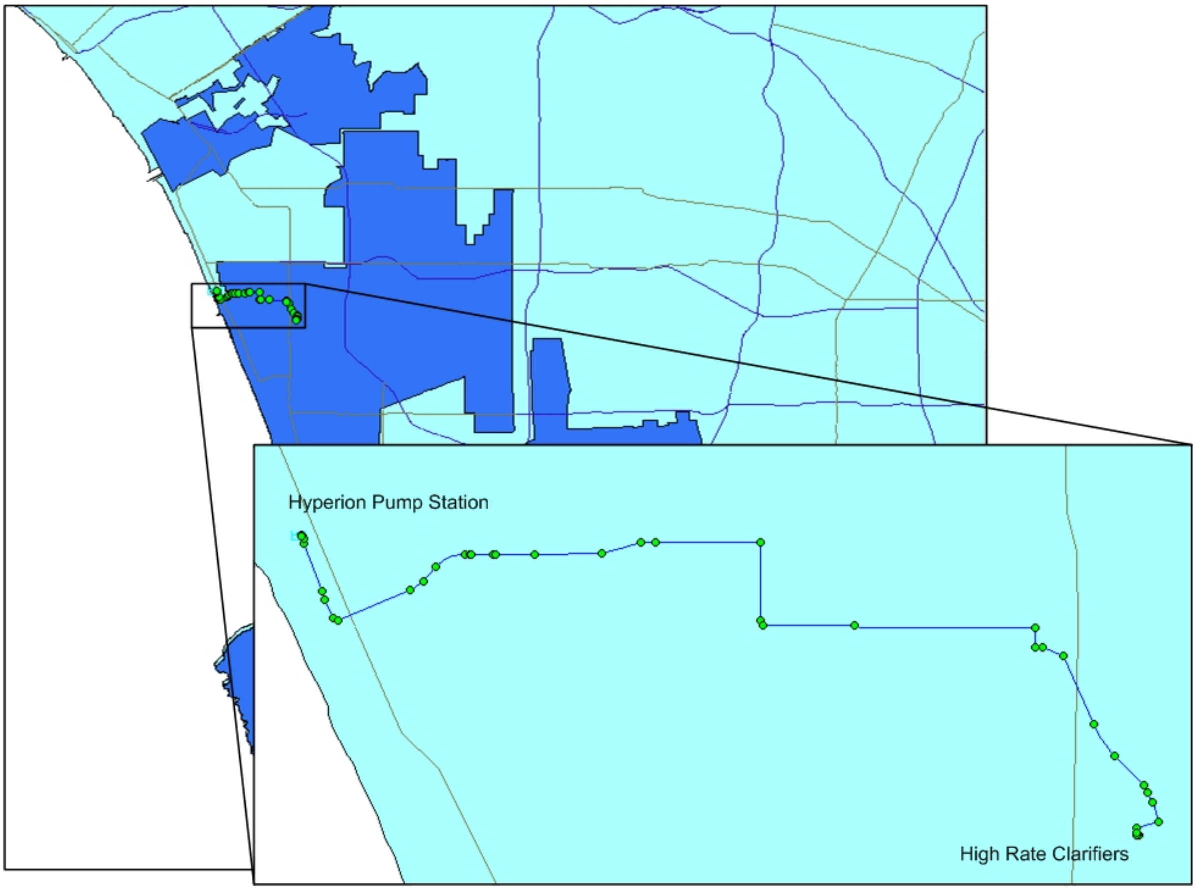
The following sections provide a brief description of the hydraulic model creation for each system. For more detailed information, refer to Appendix H, the Model User's Manual. The demand conditions for the model scenarios are detailed in Section 7, Section 8, and Appendix H, the Model User's Manual.

6.2.1 Hyperion Secondary Effluent Pumping System

The Hyperion Secondary Effluent Pumping System includes Hyperion Secondary Effluent Pump Station (HSEPS) and the Hyperion Secondary Effluent Force Main (HSEFM) conveying the secondary effluent from Hyperion Wastewater Treatment Plant (HWWTP) to ELWRF. As shown in Figure 6.1, the Hyperion Secondary Effluent Pumping System hydraulic model starts at West Basin's HSEPS, located at southeast corner of HWWTP, and ends at the secondary effluent inlet connections at ELWRF. These secondary effluent inlet connections are upstream of the pre-treatment high rate clarifiers, converted Title 22 influent, and microfiltration feed system. The model includes the following components:

- HSEPS wet well
- HSEPS with two constant speed pumps and two variable speed pumps and a firm capacity of 35,200 gpm (51 mgd)
- 15,445 feet of 48-inch diameter (discharge header) and 60-inch diameter force main

Figure 6.1
Hyperion Secondary Effluent Pump Station and Force Main



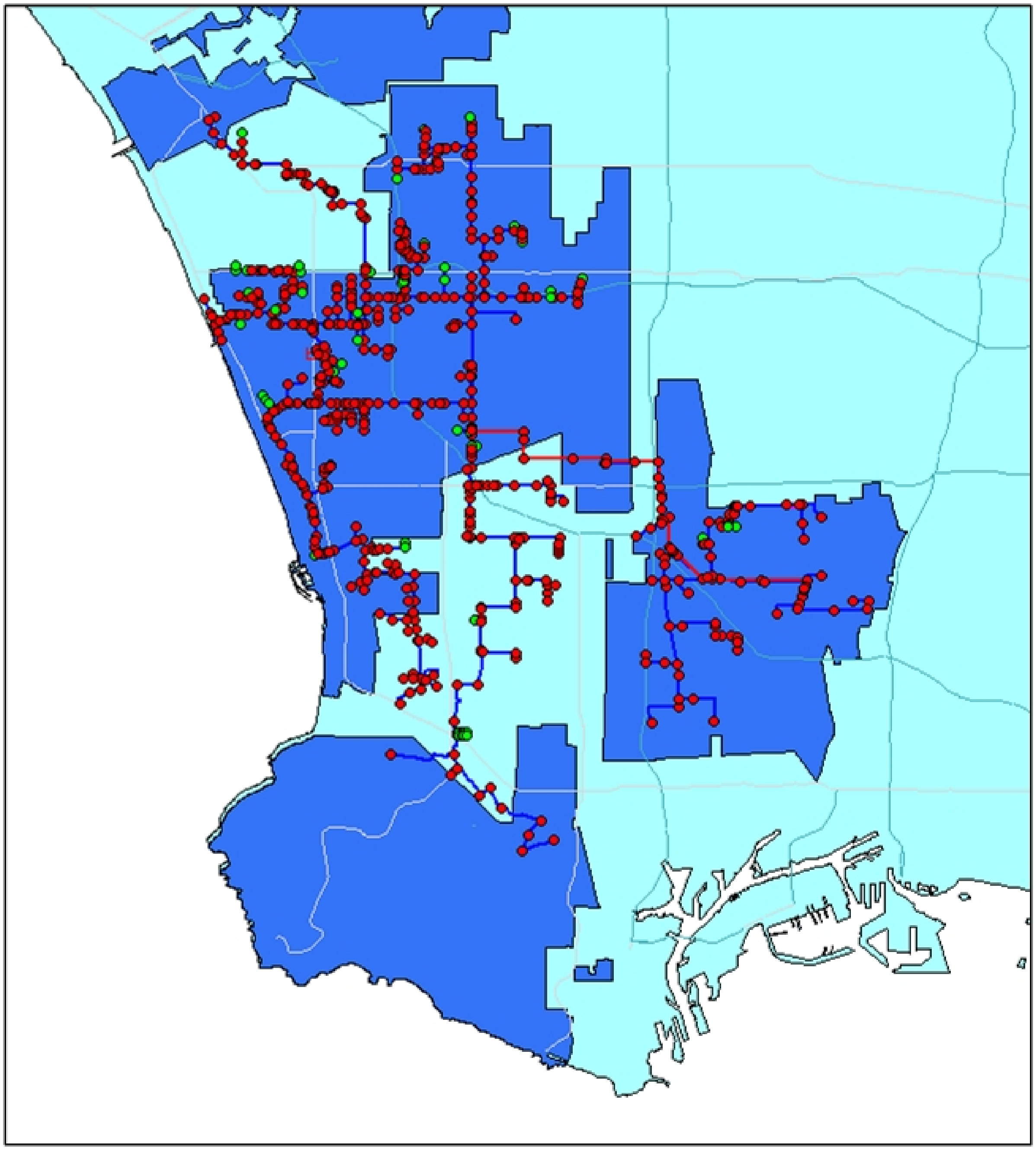
6.2.2 Title 22 Distribution System

The Title 22 Distribution System hydraulic model starts at the ELWRF Title 22 product storage tanks and pump stations. It then branches out to all existing and potential customers, covering 19 cities and unincorporated Los Angeles County areas. A screenshot of the Title 22 Distribution System hydraulic model is shown in Figure 6.2.

The model includes the following components:

- Two 5.0 million gallon Title 22 product storage tanks at ELWRF
- Title 22 Tank 1 Product Pump Station with two constant speed pumps and two variable speed pumps
- Title 22 Tank 2 Product Pump Station with two constant speed pumps and two variable speed pumps
- 78 miles of existing pipeline ranging from 4-inches to 60-inches in diameter
- 48 miles of potential pipeline ranging from 4-inches to 42-inches in diameter

Figure 6.2
Title 22 Distribution System Hydraulic Model



The firm capacity of the two pump stations, without one of the largest pumps in operation, is calculated to be 43,500 gpm (62.6 mgd).

Customer demands developed as described in Section 3 were input into the model at nodes in proximity of the service location. Diurnal patterns were developed based upon DCS flow data and flowmeter data collected in the field. DCS flow data was provided for the following satellite plants:

- Carson Regional Water Recycling Facility
- Chevron Nitrification Facility
- ExxonMobil Water Recycling Facility

Data was collected via flowmeters at 15 customer meters as shown in Figure 6.3 and listed on Table 6.1

Table 6.1 Title 22 Distribution System Flowmeter Locations
Capital Implementation Master Plan
West Basin Municipal Water District

Site Number	Location	City or County
1A	Home Depot Center	City of Carson
3	Goodyear	City of Carson
4	Victoria Golf Course	City of Carson
6	El Segundo Golf Course	City of El Segundo
9A	Southern California Edison Generation Station	City of El Segundo
10	Centinela Park	City of Inglewood
1A	Inglewood Park Cemetery	City of Inglewood
12	Morningside High School	City of Inglewood
13	Mira Costa High School	City of Manhattan Beach
16	Columbia Park	City of Torrance
17	Toyota Motor Sales	City of Torrance
8A	Chester Washington Golf Course	Los Angeles County
19	Hyperion Treatment Plant	City of Los Angeles
20	LAX @ 6400 Westchester Parkway	City of Los Angeles
21	Loyola Marymount University	City of Los Angeles

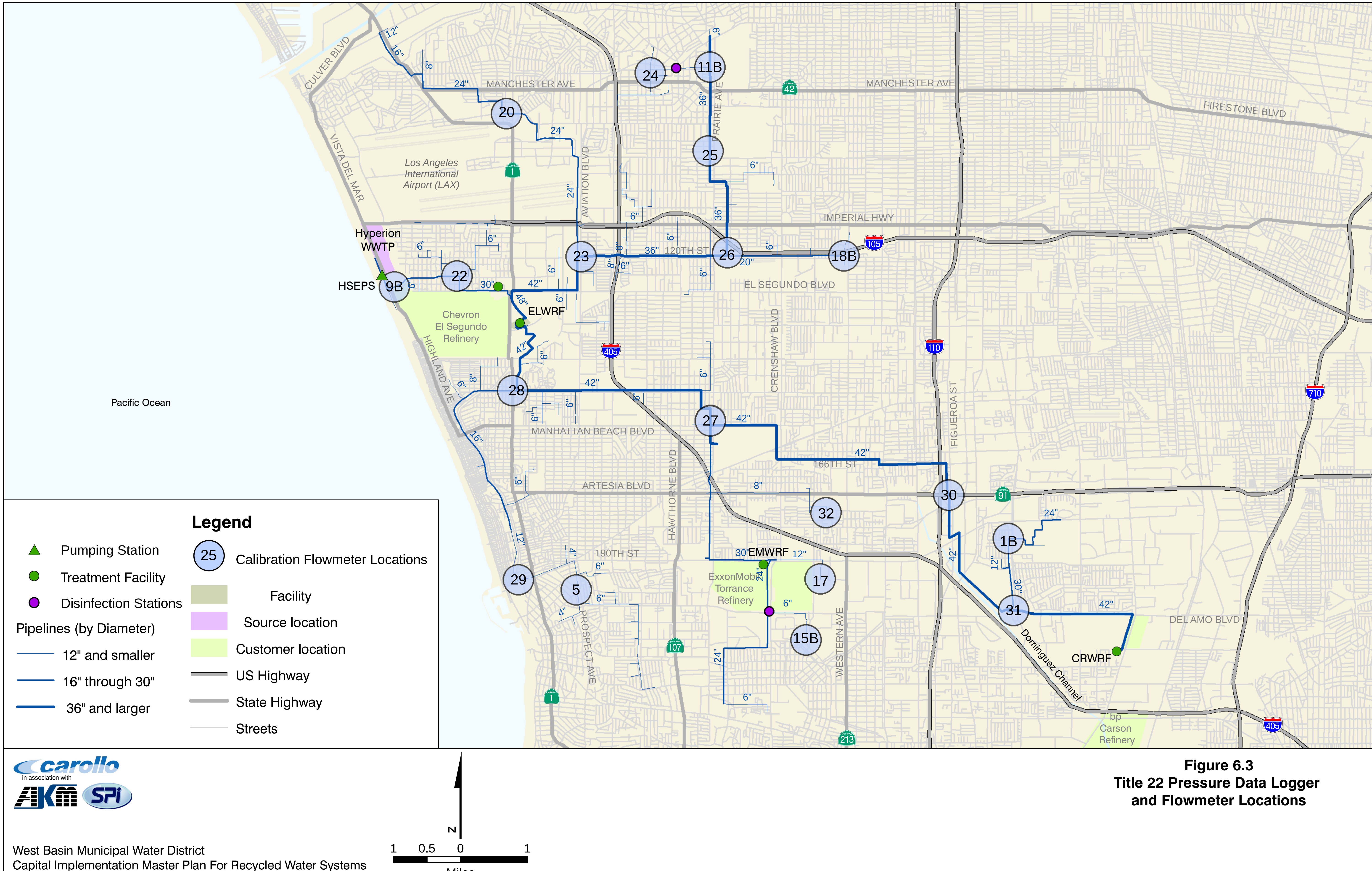


Figure 6.3
Title 22 Pressure Data Logger and Flowmeter Locations

carollo
in association with
AKM SPi

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Individual diurnal patterns were developed for each of the three satellite plants and 15 customers listed above. Additional generic diurnal patterns were developed from this data to represent the following types of users:

- Greenbelt Irrigation – customers that provide landscape irrigation along streets and highways
- Golf Course / School / Park Irrigation – neighborhood and community parks, elementary, jr. high, and high schools
- University – large schools or universities (CSUDH, LMU, etc.)
- Industrial – industries having consistent usage during business hours
- Mixed use – customers with multiple uses (landscape irrigation, non-potable uses, cooling towers)
- Other – all other customers that do not fall into one of the categories listed above

Detailed graphs of all recycled water diurnal patterns can be found in Appendix H, the Model User's Manual, while five of the generic patterns are shown in Chapter 3.

6.2.3 West Coast Barrier Water System

The West Coast Barrier Water System hydraulic model starts at the Barrier Pump Station at ELWRF and ends at the Barrier Blend Station located on El Segundo Boulevard within the City of El Segundo. Figure 6.4 is a screen capture of the West Coast Barrier Water System hydraulic model. The inset shows a more detailed view of the five pumps in the Barrier Pump Station as represented in the model. The model includes the following components:

- 55,000 gallon clearwell
- West Coast Barrier Water Pump Station with five constant speed pumps and a firm capacity of 10,500 gpm (15.1 mgd)
- Flow control valve on pump discharge
- 4,780 feet of 30-inch diameter transmission pipeline

6.2.4 Chevron High Pressure Boiler Feed System

The Chevron High Pressure Boiler Feed System model starts at the HPBF Product Pump Station located at ELWRF and ends at the Chevron High Pressure Boiler Feed Storage Tank located within Chevron El Segundo Refinery property. A screen capture of the Chevron High Pressure Boiler Feed System hydraulic model is shown in Figure 6.5.

Figure 6.4
West Coast Barrier Water System Hydraulic Model & Barrier Water Pump Station

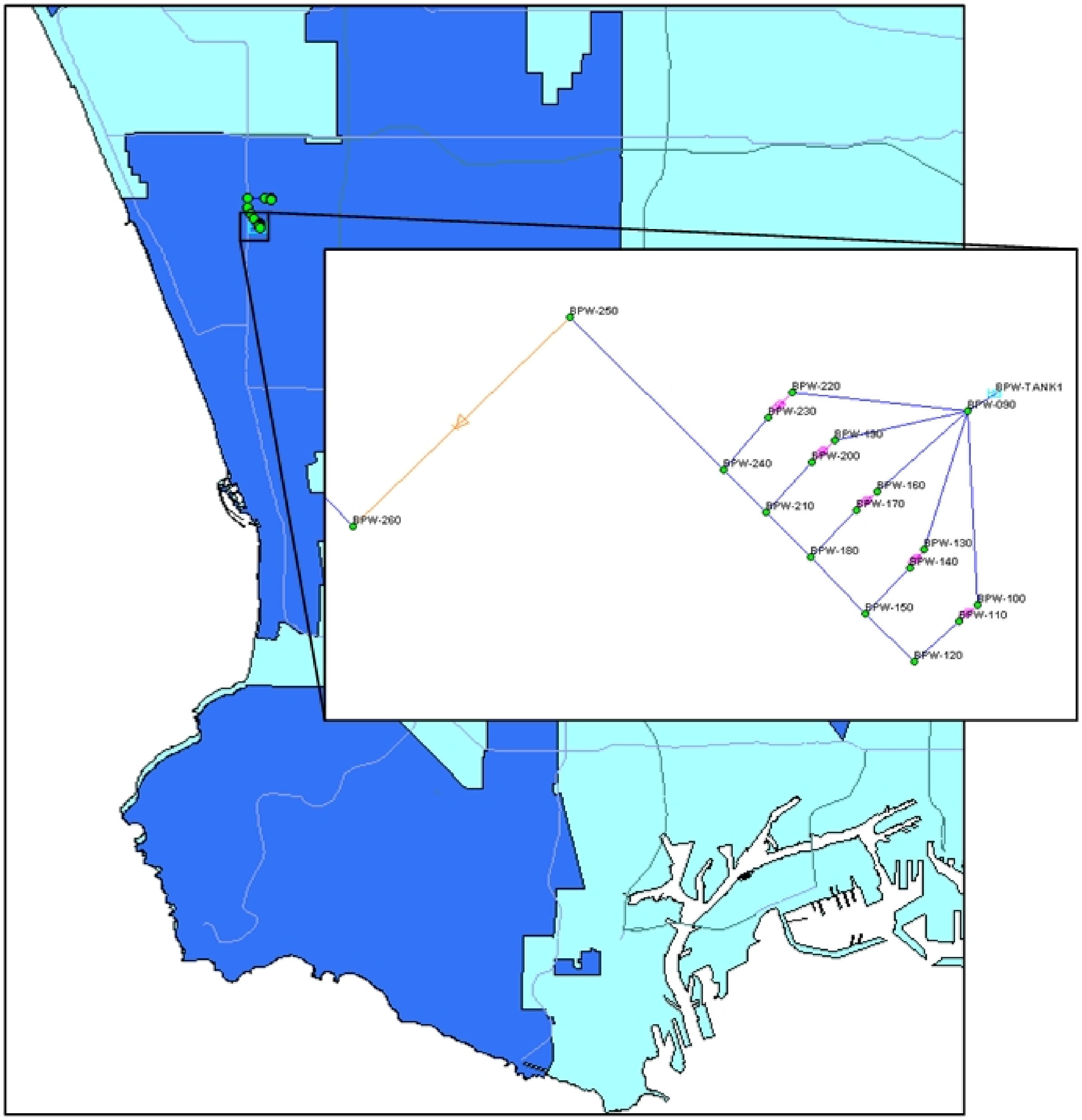
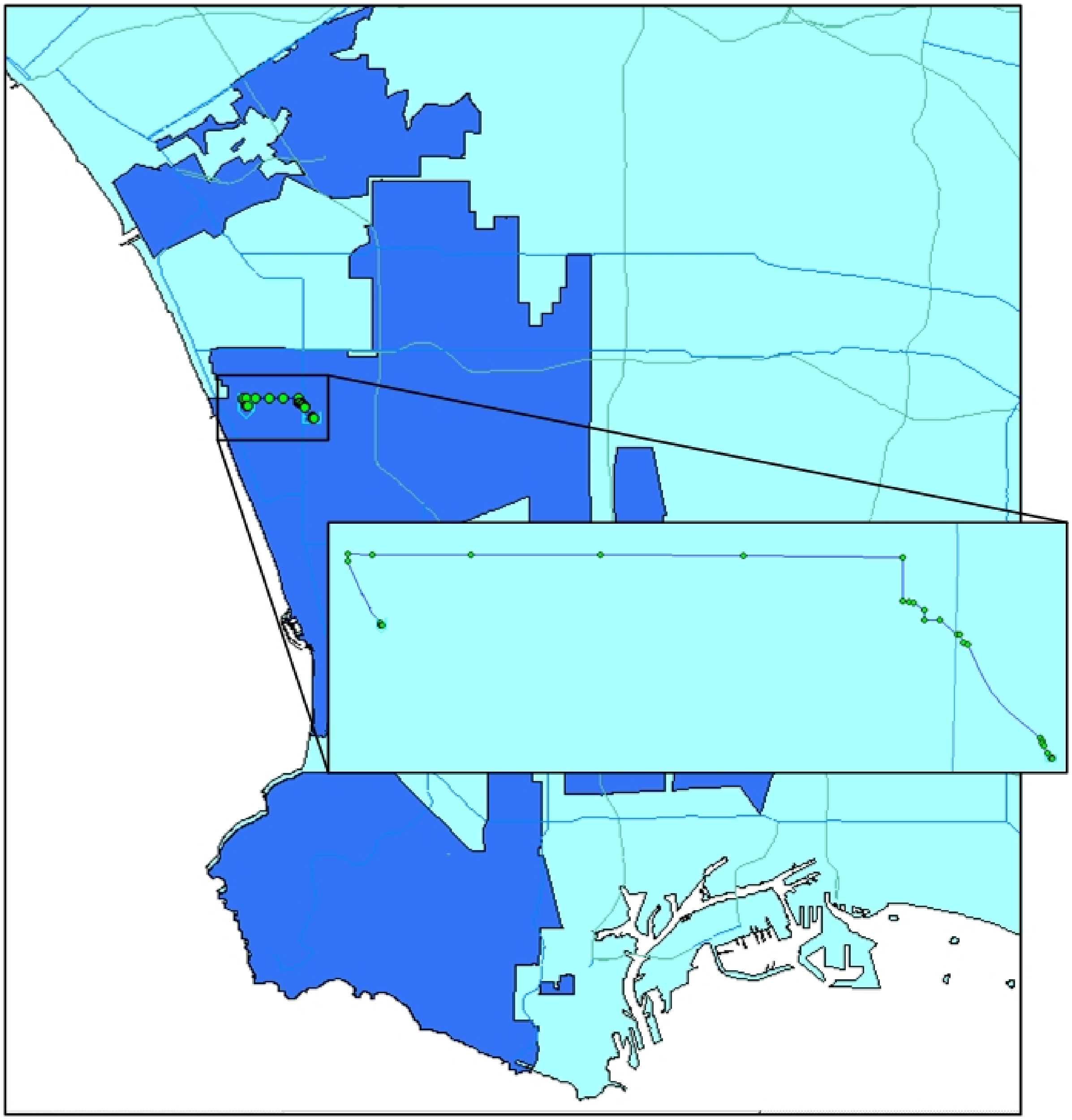


Figure 6.5
Chevron High Pressure Boiler Feed System Hydraulic Model



The model includes the following components:

- 50,000 gallon HPBF clear well
- HPBF Product Pump Station with two variable speed pumps and a firm capacity of 1,800 gpm
- 10,300 feet of 12-inch diameter transmission main
- Chevron on-site High Pressure Boiler Feed Storage Tank with an operating volume of 1,344,000 gallons

6.2.5 Chevron Low Pressure Boiler Feed System

The Chevron Low Pressure Boiler Feed System model starts at the LPBF Product Pump Station located at ELWRF and ends at the Chevron Low Pressure Boiler Feed Storage Tank located within Chevron El Segundo Refinery. The model includes the following components:

- 50,000 gallon LPBF clear well
- LPBF Product Pump Station with three variable speed pumps and a firm capacity of 1,800 gpm
- 10,400 feet of 10-inch diameter and 12-inch diameter transmission main
- Chevron on-site Low Pressure Boiler Feed Storage Tank with an operating volume of 890,000 gallons

A screen capture of the Chevron Low Pressure Boiler Feed System hydraulic model is shown in Figure 6.6.

6.2.6 Chevron Nitrified Water System

The Chevron Nitrified Water System model starts at the Nitrified Product Water Storage Tank located at the CNF in the City of El Segundo and ends at the property boundary of the Chevron El Segundo Refinery at Lomita Street. A screen capture of the Chevron Nitrified Water System hydraulic model is shown in Figure 6.6.

The model includes the following components:

- Nitrified Product Water Storage Tank with operating volume of 564,000 gallons
- Chevron Nitrified Water Product Pump Station with one variable speed and two constant speed pumps and a firm capacity of 3,600 gpm
- 2,970 feet of 20-inch diameter transmission main

Figure 6.6
Chevron Low Pressure Boiler Feed System Hydraulic Model

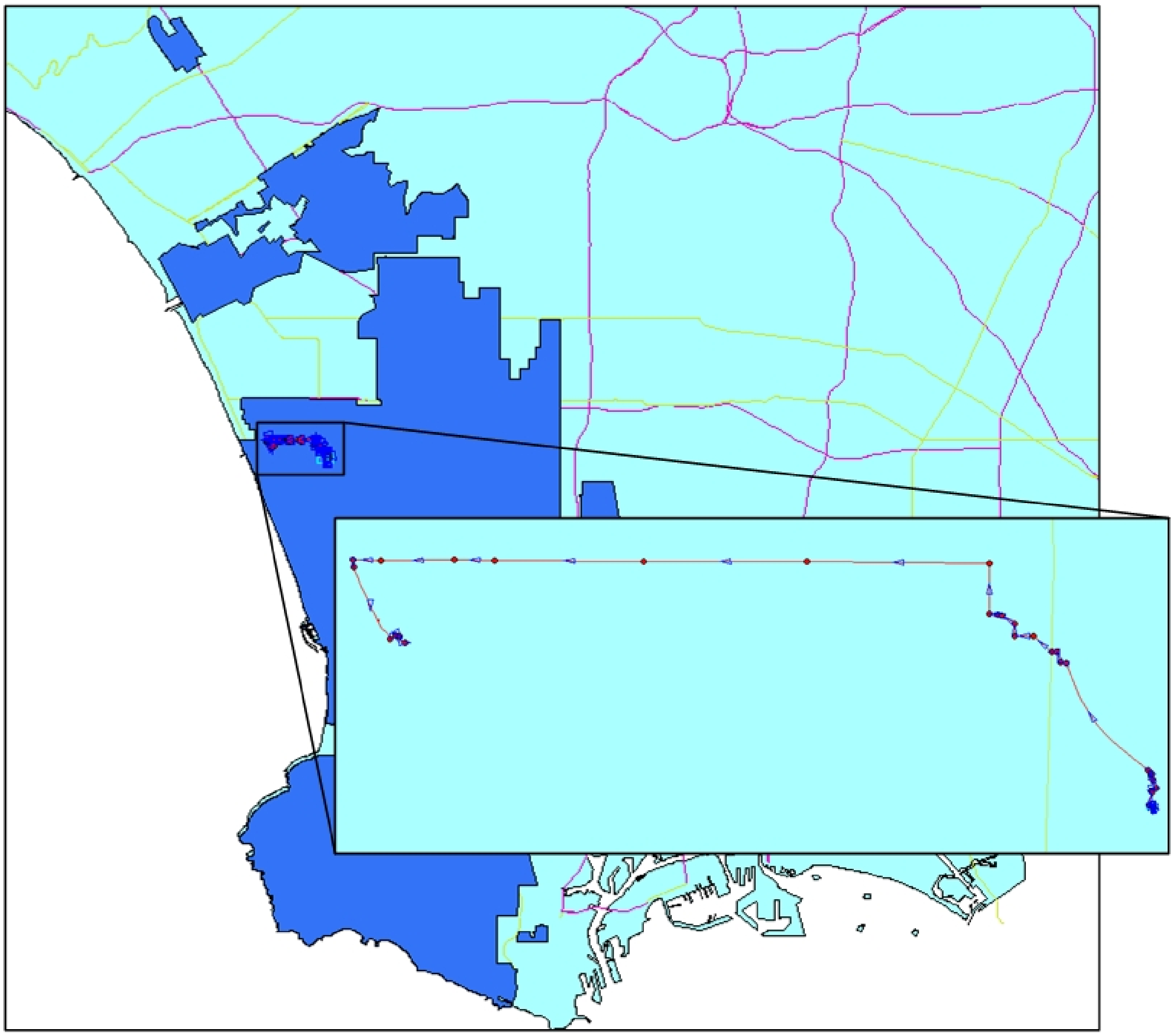
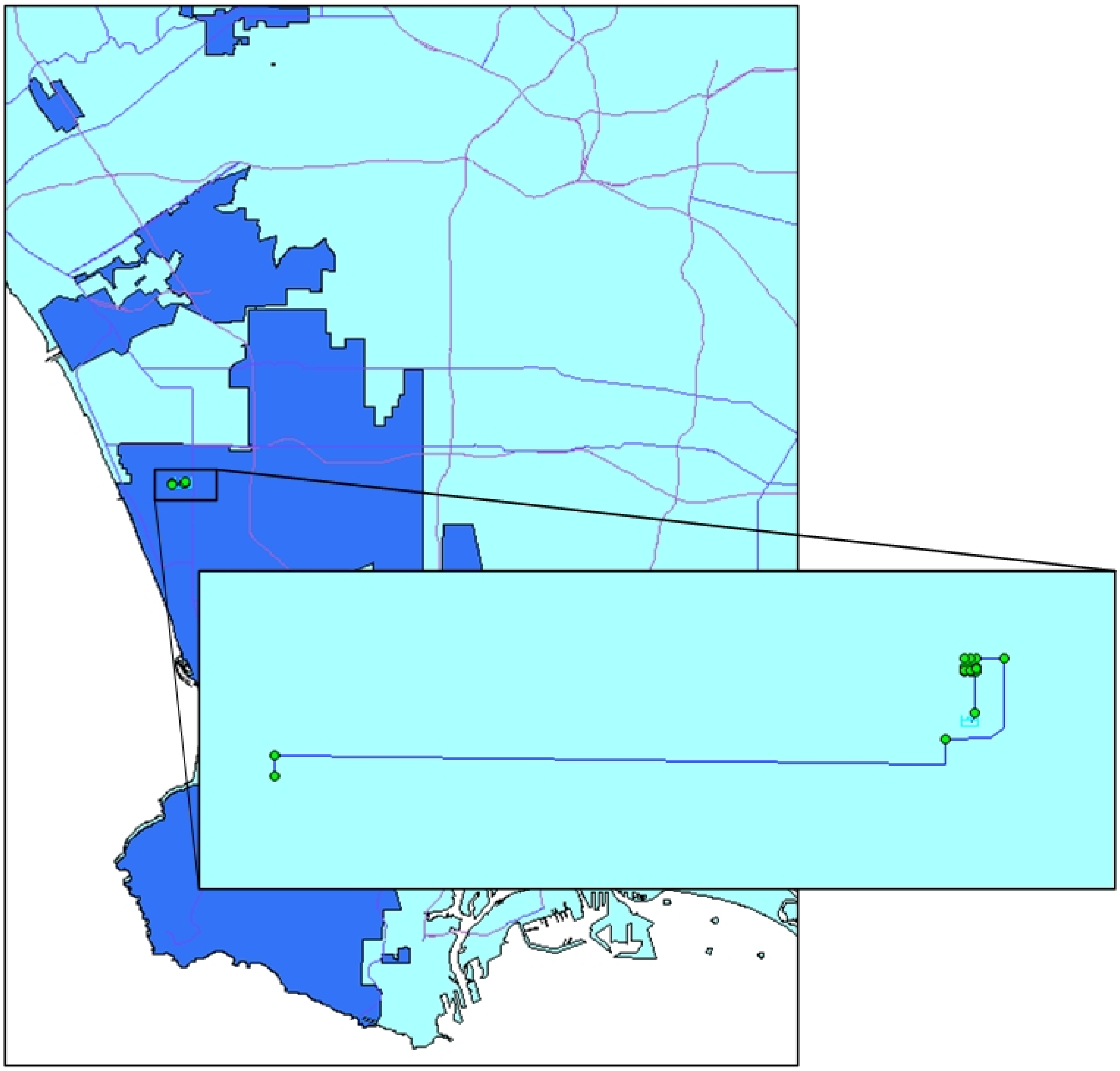


Figure 6.7
Chevron Nitrified Water System Hydraulic Model



6.2.7 Edward C. Little Water Recycling Facility Brine Line

The ELWRF Brine Line model starts at ELWRF and ends at the City of Los Angeles' HWWTP's ocean outfall.

The model includes the following components:

- 17,880 feet of 18-inch diameter pipeline

Because the brine line has several high points, and reported low pressure at the outlet, it was modeled utilizing the Los Angeles County Department of Public Works' WSPG program. One of the high points is located along El Segundo Boulevard east of Center Street, and another one is located along Grand Avenue west of Loma Vista Street. These high points form hydraulic controls, where flows go through critical depth. Downstream of these controls, the flows become supercritical with high velocities. As a result, hydraulic jumps occur at the point where the pipe profile flattens.

6.2.8 bp Reverse Osmosis System

The bp Reverse Osmosis (RO) System model starts at the RO Product Water Storage Tank at the CRWRF and ends at the bp Carson Refinery meter vault within bp property boundaries, located on the southeast corner of Wilmington Avenue and 223rd Street. A screen capture of the bp Reverse Osmosis System hydraulic model is shown in Figure 6.8.

The model includes the following components:

- 1.16 million gallon RO Product Water Storage Tank at CRWRF
- bp RO Product Water Pump Station with three variable speed pumps and a firm capacity of 3,450 gpm
- 6,030 feet of 24-inch diameter and 30-inch diameter distribution pipeline

6.2.9 bp Nitrified Water System

The bp Nitrified Water System starts at the Nitrified Product Water Storage Tank at CRWRF and ends at the meter vault within the bp Carson Refinery property, located on the southeast corner of Wilmington Avenue and 223rd Street. A screen capture of the bp Nitrified Water System hydraulic model is shown in Figure 6.9.

Figure 6.8
bp Reverse Osmosis System Hydraulic Model

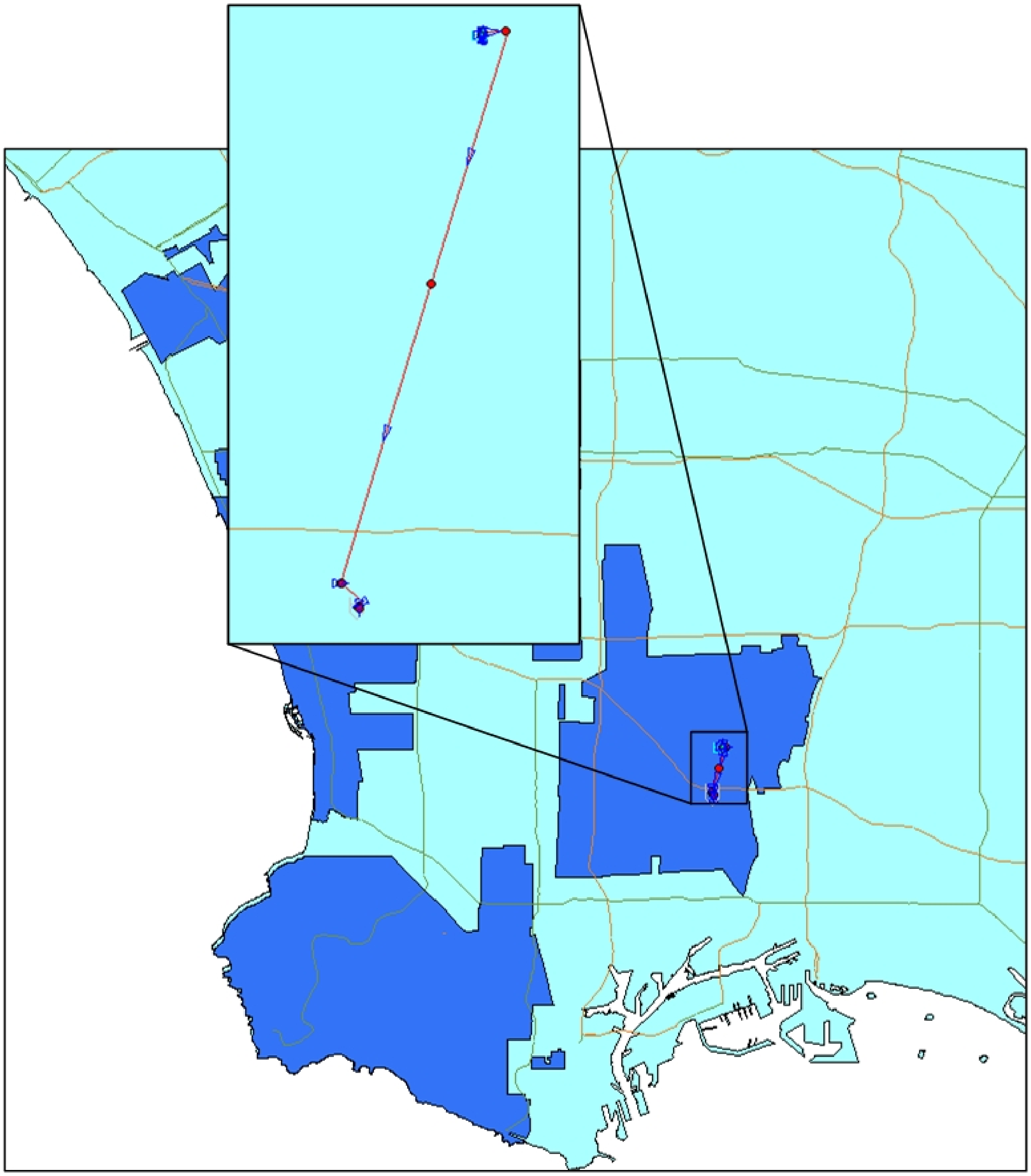
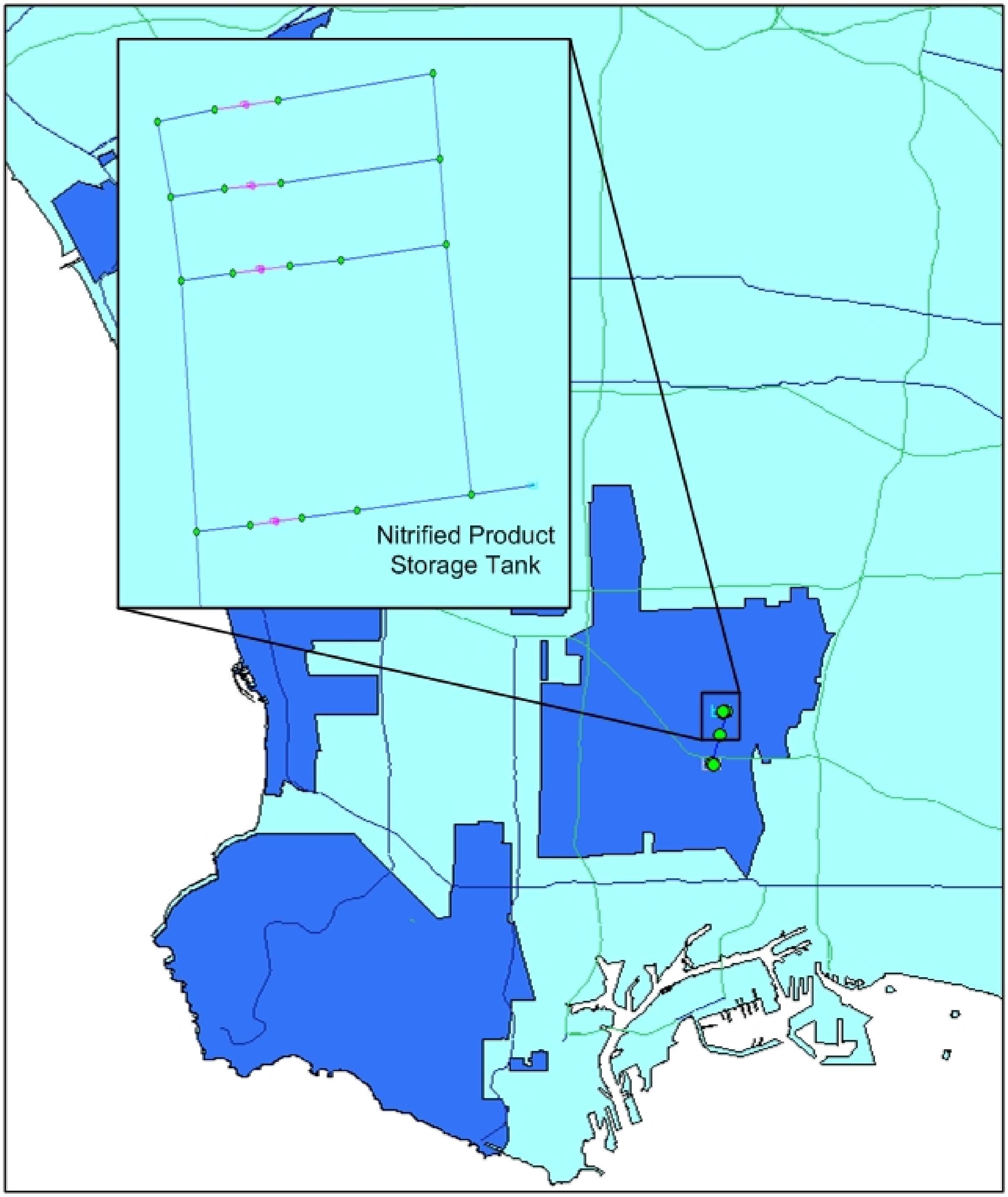


Figure 6.9
bp Nitrified Water System Hydraulic Model



The model includes the following components:

- 25,000-gallon Nitrified Product Water Storage Tank at CRWRF
- bp Nitrified Product Water Pump Station with two variable speed pumps and a firm capacity of 625 gpm
- 6,710 feet of 12-inch diameter distribution pipeline

6.2.10 Carson Regional Water Recycling Facility Brine Line

The RO concentrate collected from the Carson Regional Water Recycling Facility (CRWRF) is discharged to CRWRF Brine Line, which starts at the CRWRF and terminates at the Los Angeles County Sanitation District (LACSD) Joint Water Pollution Control Plant (JWPCP) Outfall Surge Tower located in the City of Carson. A screen capture of the CRWRF Brine Line hydraulic model is shown in Figure 6.10.

The model includes the following components:

- Variable-head reservoir modeling backpressure from RO trains
- 28,406 feet of 14-inch diameter pipeline

Constant-head reservoir modeling JWPCP outfall

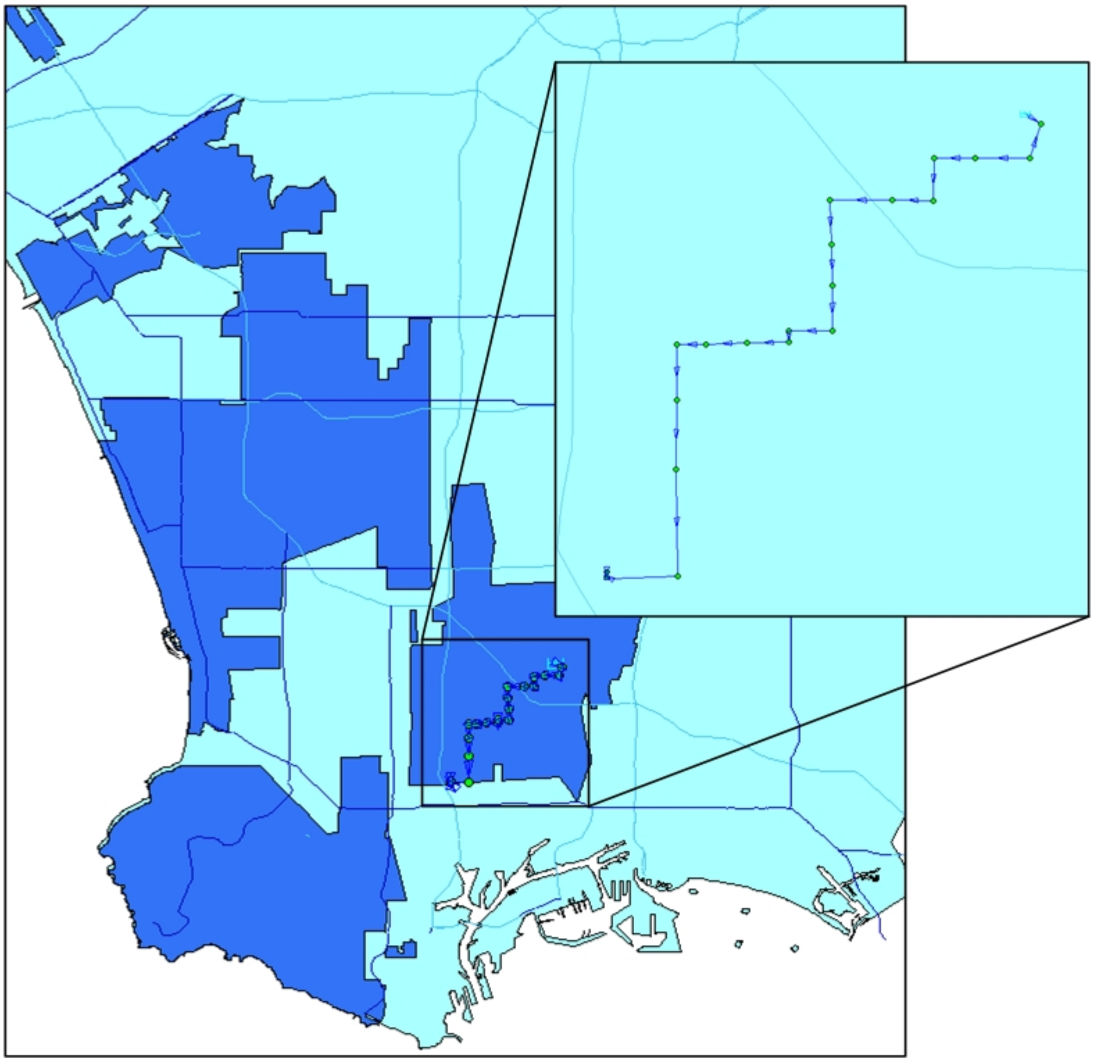
6.3 HYDRAULIC MODEL CALIBRATION

6.3.1 Calibration Methodology

The general calibration methodology was to gather as much system information as possible from customer sites and West Basin facilities for each model, from either DCS information or flow and pressure measuring equipment temporarily installed in the field. Generally, information gathered included the following:

- Tank levels
- Pump station flows
- Pump station discharge pressures
- Individual pump on/off settings
- Individual pump speeds
- Pressures at key locations where tanks do not exist
- Flows and pressures for all satellite plants, refineries, and other high water users

Figure 6.10
Carson Regional Water Recycling Facility Brine Line Hydraulic Model



The data was recorded in 5-minute intervals. Based on the data gathered, a time period was selected where the information gathered indicated flows and pressures without significant variation. The dates and times varied for each model and are discussed further in Section 6.3.2. Demands, tank levels, pump speeds, and pump on/off times were inputted exactly as the recorded DCS information, where available. Flows and pressures were also verified with the provided DCS information. Several pressure measurements were compared at the downstream end of the system to validate the data collected in the field. The friction factors for the distribution system were adjusted until pressures matched within reason.

6.3.2 Field Data Gathering

Field data was gathered over a two-week period from October 3, 2008 through October 19, 2008. Due to equipment malfunction, some data was recollected from November 4, 2008 to November 14, 2008. The data collected in the field included flows, pressures, tank levels, pump on/off times, and pump speeds for the various system models discussed in Section 6.2.2. West Basin's DCS system data was utilized as much as possible for accuracy. Some additional equipment was installed in the field to obtain specific customer flow and pressure information.

All equipment (pressure data loggers and flowmeters) was calibrated prior to installation in the field and synchronized to West Basin's DCS system so that all data collected was on the same time basis. The time interval selected for the models was 5 minutes.

Most of the equipment installed in the field was on the Title 22 distribution system. Brainard Meter Master equipment (FSBC, 2008) was installed at 15 customer meters to record flows as listed in Table 6.1. The customer sites were selected for flow metering purposes based on highest water use and representing different types of recycled water usages. The flow information was used to develop usage patterns (diurnal curves). Dickson pressure loggers were installed at 19 locations in the Title 22 distribution system, the Barrier blend station vault, the Barrier pump station discharge at ELWRF, the ELWRF brine line, the CRWRF brine line, and the RO and Nitrified water lines providing service to bp Carson Refinery. Specific information regarding the flowmeter and pressure gauge locations and field data collected can be found in Appendix E, the Model Calibration Results.

6.3.3 Calibration Process and Results

The calibration process and results are briefly described here. For more detailed information, please refer to Appendix E, Model Calibration Results.

6.3.3.1 <u>Hyperion Secondary Effluent Pumping System</u>

The Hyperion Secondary Effluent Pumping System was calibrated over a 24-hour period. The DCS and field information used in the calibration process correlates to October 14, 2008. The pump station flow and discharge pressure, the pump on/off status, pump speeds, and the pressure at ELWRF were utilized in calibrating the model.

The hydraulic model was run and the friction factor within the 60-inch Hyperion Secondary Effluent Force Main was adjusted until the pressures at ELWRF matched within reason. The selected C-factor for the Hyperion Secondary Effluent Force Main is 150, which is reasonable for this size pipe. The pressure at ELWRF was approximately 23.0 psi. The average difference in pressures at ELWRF between the model and the field data was 1.2 psi.

6.3.3.2 Title 22 Distribution System

The Title 22 Distribution System was calibrated over a 24-hour period. The DCS and field information used in the calibration process correlates to October 14, 2008.

Initially, it was attempted to model the Title 22 tanks and pump stations. Upon running the hydraulic model, a large discrepancy was found between the combined Title 22 pump station flow and the estimated demands of the Title 22 users. DCS data recorded an average pump station flow of 14,283 gpm on October 24, 2008. The estimated average demand for the same time period is 12,673 gpm. Although the total average flow and demand differs by only 534 gpm (14,238 gpm – 12,673 gpm), the difference in demand over the 24-hour model simulation averaged 1,611 gpm.

The measured flows versus the estimated demand for the Title 22 system were looked at for the time period October 7, 2008 through October 19, 2008. The measured flows per the District's DCS system were consistently higher than the estimated demands. The average difference each day ranged from 900 gpm to 1,650 gpm. With the total demand ranging from 13,000 gpm to 15,000 gpm, the percentage difference ranged from 7 to 12 percent. This is a significant difference in flow for calibration of a hydraulic model.

In order to balance the flows in the hydraulic model, the discrepancy in measured flow versus estimated demands would have to be reconciled. Significant effort was made to explain the discrepancy and adjust the demands. Ultimately, a reasonable conclusion was not found.

It is also suspected that the flowmeter on the discharge pipe of the Title 22 pump station may not be calibrated. As a check, the flowmeter records were compared to the monthly billing records. The difference in volume ranged from 9 MG to 154 MG (193 gpm to 3,565 gpm) with the flowmeter volume being higher.

Since, the flow discrepancy could not be reconciled without additional investigation, an alternative modeling methodology was utilized to model pressure delivered by the Title 22 pump station while establishing demands through the satellite flow information and field measured flow data, which was assumed to be more reliable than the Title 22 pump station flowmeter data. Therefore, the calibrated model was set up using an average demand of 12,673 gpm and the Title 22 pump station is modeled as an equivalent variable-head reservoir with associated water levels that provide the recorded DCS discharge pressures.

The DCS data collected at the three satellite facilities and the field pressure data collected throughout the distribution system were compared to the model pressures at the same locations. The model was deemed calibrated when the pressures matched within reason. C-factor values within the calibrated model range from 120 to 140. Detailed calibration results are shown in Appendix E.

6.3.3.2 West Coast Barrier Water System

The West Coast Barrier Water System was calibrated over a 12-hour period. The DCS and field information used in the calibration process correlates to November 4, 2008 from 5 am to 5 pm. The pump station flows, pump on/off controls, clearwell levels, the flow control valve setting of 73 psi, and the pressures at the blend station were utilized in calibrating the model.

The hydraulic model was run and the friction factor within the 30-inch diameter distribution pipeline for barrier water was adjusted until the pressure at the blend station matched within reason. A C-factor value of 140 was selected for the West Coast Barrier Water System. The pressure at the blend station was approximately 76.4 psi. The average difference in pressures at the blend station between the model and the field data was 0.50 psi.

6.3.3.3 Chevron High Pressure Boiler Feed System

The Chevron High Pressure Boiler Feed system was calibrated over a 24-hour period. The DCS and field information used in the calibration process correlates to October 10, 2008. The clearwell level, pump station flow and discharge pressure, the pump on/off status, pump speeds, and the Chevron product storage tank percentage full were utilized to calibrate the model.

The hydraulic model was run and the friction factor within the 16-inch diameter HPBF pipe was adjusted until the product storage tank percentage full matched field conditions within reason. A C-factor value of 120 was selected for the HPBF system.

6.3.3.4 Chevron Low Pressure Boiler Feed System

The Chevron Low Pressure Boiler Feed system was calibrated over a 24-hour period. The DCS and field information used in the calibration process correlates to October 10, 2008. The clearwell level, pump station flow and discharge pressure, the pump on/off status, pump speeds, and the Chevron product storage tank percentage full were utilized to calibrate the model.

The hydraulic model was run and the friction factor within the 12-inch diameter LPBF distribution pipe was adjusted until the product storage tank percentage full matched field conditions within reason. A C-factor value of 120 was selected for the 12-inch diameter LPBF distribution system.

6.3.3.5 Chevron Nitrified Water System

The Chevron Nitrified Water system was calibrated over a 24-hour period. The DCS and field information used in the calibration process correlates to October 14, 2008. The product storage tank level, pump station flow and discharge pressure, pump on/off status, pump speeds, and the pressure at Chevron's El Segundo Refinery were utilized to calibrate the model.

The hydraulic model was run and the friction factor within the 20-inch Chevron Nitrified Water System pipe was adjusted until the pressure at the Chevron El Segundo Refinery matched within reason. A C-factor value of 140 was selected for this system. The resulting average delivery pressure at the entrance to the Chevron El Segundo Refinery was 73.6 psi in the model. The reported field measured pressure is between 78 and 80 psi.

6.3.3.6 <u>ELWRF Brine Line</u>

Because ELWRF Brine Line has several high points, and reported low pressure at the outlet, it was modeled utilizing the Los Angeles County Department of Public Works' WSPG program. Pressure data loggers were installed at the ELWRF and at five locations along the brine line alignment from November 20, 2008 to November 23, 2008. Pressures to the brine line are provided off the ELWRF RO concentrate trains and average about 22 psi. The ground surface elevation at ELWRF is approximately 100.5 feet. The five other pressure locations are as follows:

1. Station 32+00 - Vista Del Mar north of Grand Avenue, approximate ground elevation = 34 feet
2. Station 56+95 – Grand Avenue east of Vista Del Mar, approximate ground elevation = 138 feet
3. Station 71+65 – Grand Avenue at Concord Avenue, approximate ground elevation = 128 feet
4. Station 100+65 – Sierra Street at Grand Avenue, approximate ground elevation = 160 feet
5. Station 124+25 - El Segundo Boulevard at Center Street, approximate ground elevation = 151 feet

Each of these locations recorded atmospheric pressure at some period indicating open channel flow within the brine line. The only exception was at Station 71+65, which recorded pressures ranging from 0.5 psi to 4.0 psi. The brine system was analyzed with Manning roughness coefficients (Manning's "n" values) of 0.009, 0.011, and 0.013 to test the sensitivity of the internal condition of the pipe.

6.3.3.7 <u>bp Reverse Osmosis System</u>

The bp Reverse Osmosis system was calibrated over a 24-hour period. The DCS and field information used in the calibration process correlates to November 22, 2008. The RO product water storage tank level, pump station flow and discharge pressure, pump on/off status, pump speed, and pressure at the bp meter vault were utilized in calibrating the model.

The hydraulic model was run and the friction factor within the 24-inch and 30-inch diameter reverse osmosis distribution pipeline was adjusted to match the pressures. It was found that the change in C-factor did not change the results significantly. A C-factor value of 140 was selected for the bp Reverse Osmosis system. The average difference in pressures at the pump station between the model and the field data was less than 1 psi.

6.3.3.8 bp Nitrified Water System

The bp Nitrified Water system was calibrated over a 24-hour period. The DCS and field information used in the calibration process correlates to November 22, 2008. The Nitrified product water storage tank level, pump station flow and discharge pressure, pump on/off status, pump speed, and pressure at the bp meter vault were utilized in calibrating the model.

The hydraulic model was run and the friction factor within the 12-inch diameter nitrified water distribution pipeline was adjusted to match the pressures. It was found that the change in C-factor did not change the results significantly. A C-factor value of 120 was selected for the bp Nitrified Water System. The average difference in pressures at the pump station between the model and the field data was less than 1 psi.

6.3.3.9 CRWRF Brine Line

The CRWRF Brine Line system was calibrated over a 24-hour period. The DCS and field information used in the calibration process correlates to November 10, 2008. The RO train concentrate flow, the pressure at CRWRF, and the pressure on the brine line riser at the surge tower at LACSD's JWPCP in Carson were utilized to calibrate the model.

The hydraulic model was run and the friction factor within the 14-inch CRWRF brine line was adjusted until the pressure at LACSD's JWPCP matched within reason. A C-factor value of 120 was selected for this system. The model results in pressures at LACSD's JWPCP ranging from 10.4 psi to 15.1 psi.

EXISTING SYSTEM EVALUATION

This chapter presents the results of the evaluation of the West Basin Municipal Water District's (West Basin) existing distribution systems. The hydraulic models were used to analyze the existing distribution systems to determine any deficiencies according to the planning and evaluation criteria and conditions outlined in Chapter 5. Any deficiencies found are discussed and recommendations are made to resolve the deficiencies.

7.1 DISTRIBUTION SYSTEM HYDRAULIC ANALYSES

7.1.1 Hyperion Secondary Effluent Pumping System

7.1.1.1 Criteria

The general analysis criteria used to evaluate the Hyperion Secondary Effluent Pumping System includes the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length
- Maximum velocity of less than 7 fps in the force main.
- Surge pressures that will not cause pumps to operate outside of their allowable operating range

Analysis criteria specific to the Hyperion Secondary Effluent Pumping System includes:

- Sufficient firm capacity to deliver the maximum demand at the ELWRF

These criteria were used to evaluate the Hyperion Secondary Effluent Pumping System under existing demand conditions.

7.1.1.2 Analysis Conditions

The Hyperion Secondary Effluent Pumping System consists of the booster pump station and the 60-inch diameter PVC lined reinforced concrete pressure pipe force main that conveys secondary effluent the ELWRF. The pump station has two constant speed pumps (No. 1 and No. 4), and two variable speed pumps (No. 2 and No. 3). Normally, one constant speed pump is operated along with one variable speed pump on automatic control and the second variable speed pump on manual control to maintain a discharge pressure of 59 psi. As a result, the manually operated pump turns off and on due to near shut-off head conditions at low speeds, causing hydraulic transients (surge) in the system.

West Basin pumped an average flow of 32.4 mgd of secondary effluent from the Hyperion Wastewater Treatment Plant (HWWTP) in 2007. During the model calibration period, the average, maximum instantaneous, and minimum flows at the pump station were recorded as follows: 34.5 mgd, 45.6 mgd, and 6.75 mgd. It should be noted that the minimum flow occurred when the only variable speed pump shut off due to low speed (high pressure from the operating constant speed pump). The analyses were conducted with the existing firm capacity (reported to be 51 mgd), as well as the average and maximum instantaneous flows recorded during the calibration period. The existing firm capacity of the pump station is about 51.0 mgd, greater than the existing peak demand of 31,695 gpm (equivalent to 45.6 mgd).

Table 7.1, shows the average annual flows, as well as the maximum month and minimum month demands.

Table 7.1 Hyperion Secondary Effluent Pumping System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Average Annual	Average Daily	Average Instantaneous
Average Annual Demand[1]	36,300 afy	32.4 mgd	22,505 gpm
Average Demand - Calibration[2]	N/A	34.5 mgd	23,961 gpm
Maximum Demand - Calibration[2]	N/A	45.6 mgd	31,695 gpm
Minimum Month Demand[3]	N/A	6.75 mgd	4,688 gpm
Firm Capacity	N/A	51.0 mgd	35,417 gpm

Notes:
(1) Average annual demand from the 2007-2008 flow records
(2) October 14, 2008
(3) Minimum month demand (February) from the 2007-2008 flow records

The average flows recorded during the calibration period are slightly higher than the average flow pumped in 2007.

7.1.1.3 Analysis Results

The results from the analyses performed for each of the demand conditions described in Table 7.1 are presented below in Table 7.2.

As shown in Table 7.2, the velocities in the pipeline vary from 2.6 fps (average flow conditions) to 4.0 fps (firm design capacity conditions). This range of velocities is well below the maximum desired velocity of 7 fps. The head losses are well within acceptable limits with average unit headloss ranging from 0.1 feet to 2.9 feet per 1,000 feet of pipe.

The operation of the existing pump station should be further reviewed in detail to eliminate the need for continuous manual operation, which results in pumps turning on and off, resulting in surges in the system. While the surge pressures are not high enough to damage the system, the pumps operate outside their preferred operating range. Additionally, a secondary power supply should be provided to power the pump station during commercial/emergency power outages.

Table 7.2 Hyperion Secondary Effluent Pumping System Analyses Capital Implementation Master Plan West Basin Municipal Water District					
Condition	**Total Headloss(1)**	**Average Unit Headloss (ft/1,000 ft)**	**Pressure at Pump Discharge**	**60" Pipe Velocity**	**Maximum Travel Time(2) (Water Age)**
Average Day Demand(3)	5.0 ft	1.3 ft	59.1 psi	2.6 fps	1.7 hr
Average Day Demand - Calibration	5.5 ft	1.4 ft	59.7 psi	2.7 fps	1.6 hr
Maximum Day Demand - Calibration(4)	9.3 ft	2.4 ft	58.9 psi	3.6 fps	1.2 hr
Minimum Month Demand(5)	0.2 ft	0.1 ft	59.4 psi	0.8 fps	0.8 hr
Firm Capacity (51 mgd)	11.5 ft	2.9 ft	59.7 psi	4.0 fps	1.1 hr

Notes:
(1) Maximum headloss predicted by model over 24-hour simulation period.
(2) Based on length of 15,445 feet.
(3) Pump 2 running at 75 percent speed and Pump 1 running at 71 percent speed to maintain ~59 psi discharge pressure at the pump station.
(4) Pump 2 running at 85 percent speed and Pump 1 running at 79 percent speed to maintain ~59 psi discharge pressure at the pump station.
(5) Pump 3 running at 70 percent speed to maintain ~59 psi discharge pressure at the pump station.

7.1.2 Title 22 Distribution System

7.1.2.1 Criteria

The general analysis criteria used to evaluate the existing Title 22 Distribution System include the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length
- Velocities of 1 to 3 feet per second (fps) under normal operations, with maximum velocities of 7 fps. A minimum velocity of 1 fps is desired under average annual demands.
- Minimum pressure of 65 pounds per square inch (psi) at customer meter connections.
- Surge pressures within 10 percent of the operating pressures. (It should be noted that West Basin staff indicated surge tanks connected to the system are designed for a 10 psi deviation from the operating pressure, which may or may not be less than 10 percent, depending on the operating pressure.)
- Minimum chlorine residual of 1.0 mg/L.

Analysis criteria specific to the Title 22 Distribution System includes:

- Ability to deliver the peak hour flow of 37.2 million gallons per day (mgd) (as detailed in Chapter 4) with the largest pump out of service

These criteria were used to evaluate the Title 22 distribution system under existing demand conditions.

7.1.2.2 Analysis Conditions

The Title 22 Distribution System consists of two 5 million gallon (MG) storage tanks (Tank 1 and 2), a pump station with two constant speed and two variable speed pumps each on tank, and the distribution system consisting of about 83 miles of pipe varying from 4 inches to 60 inches in diameter.

Currently, a combination of variable speed and constant speed pumps are operated at each tank to meet the varying demands. During the calibration period between September 26 and October 24, 2008, one constant speed and one variable speed pump was operated at each tank except between October 16, 16:30 and October 17 00:25, when one pump operated at each tank. During the lower demand periods, the variable speed pumps are capable of supplying the entire system demands. The controls are set to maintain a pressure of 87 psi at the discharge pipe near Tank 1, with a desired variation of ± 5 psi.

The existing peak hour demand is estimated at 25,806 gallons per minute (gpm) or 37.2 mgd. The existing pump station has ample capacity (approximately 69 mgd) to meet this demand, even with one of the large capacity pumps out of service.

The analyses were conducted with the maximum month demands, including the peak hour period. The current maximum month demand is estimated at 24.0 mgd, with an associated peak hour demand of 25,806 gpm.

Table 7.3 shows the average annual demands, as well as the maximum month and associated peak hour demands.

7.1.2.3 Analysis Results

The Title 22 recycled water distribution system is able to provide the peak hour demands to most existing customers with adequate pressures. Figure 7.1 illustrates the pressure contours in the system with the peak hour demands.

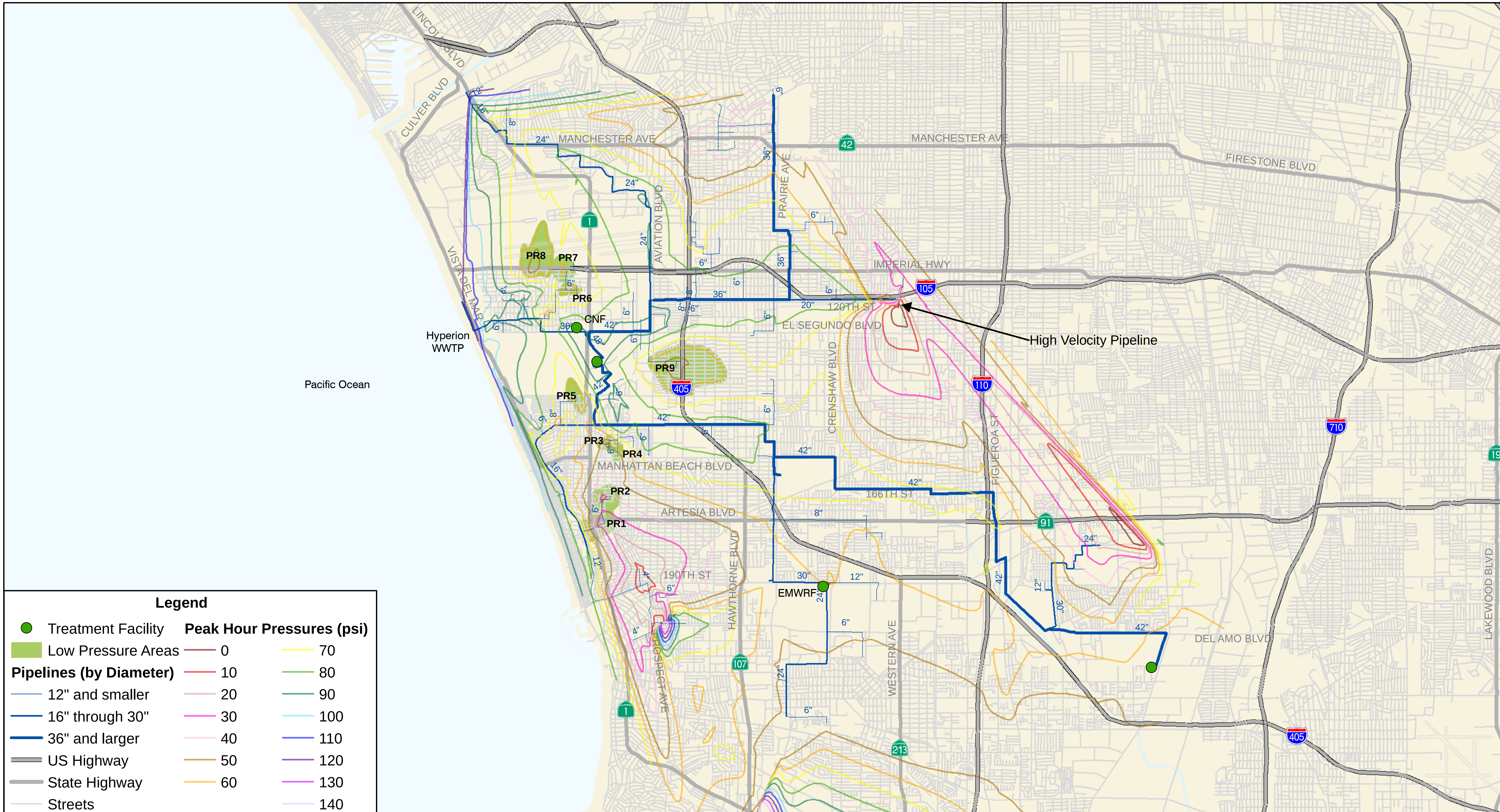


Figure 7.1
Title 22 Maximum Day, Peak Hour Pressure Contours

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Table 7.3 Title 22 Distribution System Demands Capital Implementation Master Plan West Basin Municipal Water District			
Condition	**Average Annual**	**Average Daily**	**Average Instantaneous**
Average Annual Demand[1]	17,392 afy	15.5 mgd	10,781 gpm
Maximum Month Demand[2]	N/A	24.0 mgd	16,671 gpm
Maximum Month, Peak Hour Demand[3]	N/A	37.2 mgd	25,806 gpm

Notes:
Recovery at ExxonMobil Water Recycling Facility (EMWRF) and Carson Regional Water Recycling Facility (CRWRF) is estimated at 85%. These demand estimates do not include the additional water required at EMWRF and CRWRF to produce the Industrial reverse osmosis (RO) and Industrial RO Ultra water. The additional water requirement is included in the hydraulic model for analysis.
(1) Average annual demand from the 2007-2008 flow records.
(2) Determined from flow records and peaking factors developed in Section 5.
(3) Determined from maximum month demands and the diurnal curves developed for this study.

The model indicates a few low pressures generally at higher elevations where the distribution system piping is small. With the Title 22 pump station discharge pressure maintained at 87 psi, the areas identified with pressures less than 65 psi during maximum month conditions are shown on Figure 7.1 and are listed in Table 7.4

Table 7.4 Title 22 Low Pressure Areas Capital Implementation Master Plan West Basin Municipal Water District			
Location	**City**	**Map ID**	**Average Pressure (psi)**
The area near Mira Costa High School	Manhattan Beach	PR1	43
The area near Pennekamp Elementary School	Manhattan Beach	PR2	49
The area near Meadows Elementary School	Manhattan Beach	PR3	54
The area near Polliwog Park	Manhattan Beach	PR4	52
The area near Rosecrans Avenue and Pine Avenue	Manhattan Beach	PR5	60
The area near Washington Park	El Segundo	PR6	61
The area near Sycamore Park	El Segundo	PR7	62
The area near Storm Drain Plant No. 17	El Segundo	PR8	59
The area near Holly Glenn Park	Hawthorne	PR9	40

Although the hydraulic model indicates these areas having pressures less than 65 psi during maximum month demand conditions, West Basin does not report any customer complaints. It is therefore not recommended to take any action to increase the pressures in these areas.

Velocities in the distribution system are generally within the range of the criteria specified in Chapter 5. The one exception to this is the 6-inch diameter lateral in Western Avenue south of 120th Street, feeding Chester Washington Golf Course in the incorporated Los Angeles County area east of Hawthorne. This pipeline is indicated on Figure 7.1. The model estimates velocities of up to 25 fps with peak flows at about 2,200 gpm (maximum month, peak hour). During the calibration period (October 2008), peak flows were measured up to 1,860 gpm. The calibration period demands are estimated to be slightly lower than the peak month demands. Therefore, it does not seem unreasonable that the actual peak flows could reach 2,200 gpm as simulated by the model. The diurnal curve developed for the golf course includes a peaking factor of nearly 5.8 for a period of 2-1/2 hours. It is recommended that West Basin review the existing golf course irrigation schedule with the customer to reduce their daily peak demands to a more reasonable level. This will reduce the stress on West Basin's overall system and will extend the useful life of the 6-inch diameter lateral on Western Avenue.

In addition to these low pressure areas and the high velocity pipeline, there are three primary problems with the existing Title 22 system. These are:

- Pressure Surges
- Title 22 Pump Station Operation
- Water Quality

These three key issues are detailed below.

<u>Pressure Surges</u>

Surge pressures are experienced throughout the system and throughout the day. The surge pressures occur due to sudden changes in flows at the Carson Regional Water Recycling Facility (CRWRF), and the ExxonMobil Water Recycling Facility (EMWRF) during the microfiltration (MF) backwash cycles. Hydraulic transient analysis of the Title 22 system has been conducted independently of this study. However, the field pressure measurements at 5-minute increments indicated pressure variations of over 70 psi throughout the day. While these may be acceptable for ductile iron and steel pipe, the system includes a significant amount of PVC pipe, which is likely to experience fatigue failure due to frequent pressure variations. Therefore, it is essential that a proper method of surge control be implemented.

The Siemens continuous microfiltration (CMF) systems currently used at both the EMWRF and CRWRF are identical systems, which utilize compressed air backwash. It is important to understand that the MF units at both plants operate off the existing Title 22 Distribution line pressure, albeit reduced by pressure regulators at each site. No MF feed pumps are needed with this design and the MF units are hydraulically connected to the Title 22 distribution system.

A discussion of the CMF backwash process is useful to understand the causes of the pressure surges that are observed. Figure 7.2 shows the CMF unit schematic during normal filtration mode. The CMF units backwash on a 20-minute frequency interval at EMWRF and 30-minute interval at CRWRF. The entire backwash cycle takes approximately 2.5 to 3 minutes. Systems are controlled so that only one unit can backwash at once.

During normal filtration, unit feed valves are open, feedwater passes through the fibers and filtrate exits through another valve. During the next step, the feed valves are quickly closed (within seconds) as shown on Figure 7.3.

Figure 7.2
Normal Filtration Mode

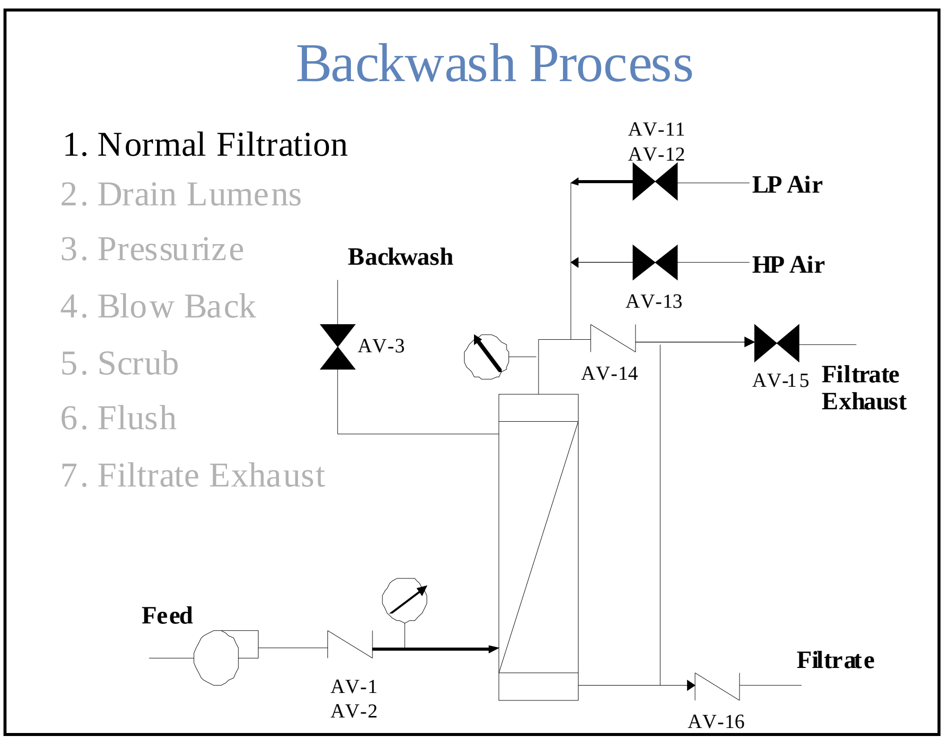
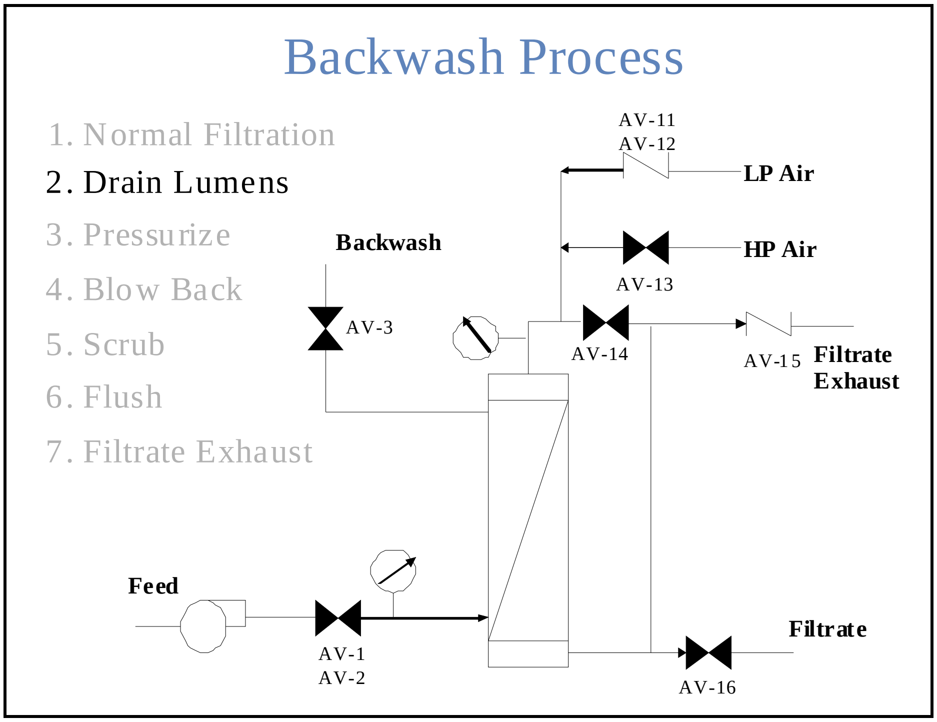


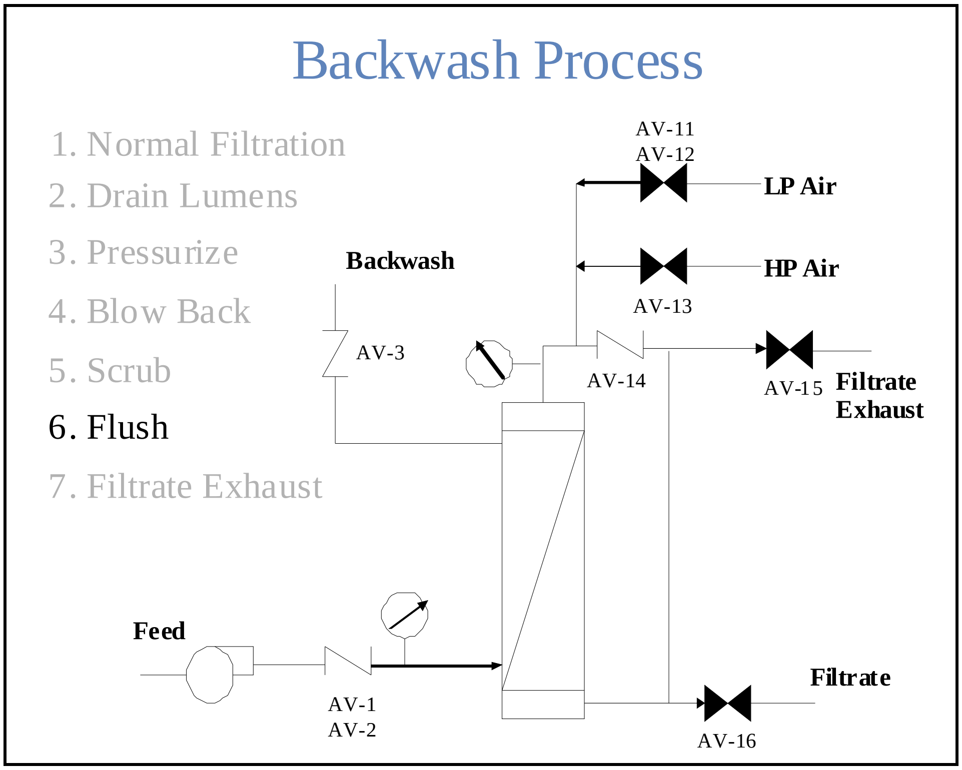
Figure 7.3
Closing of MF Feed Valves



An individual MF unit (of which there are six at EMWRF and nine at CRWRF) treats approximately 500 to 600 gpm of feedwater. The result of the feed valves closing quickly is that flow to the MF units is quickly reduced from approximately 3,000 gpm at EMWRF to 2,500 gpm. At CRWRF, the typical flow rate drops from 4,500 gpm to 4,000 gpm with in a few seconds. As these flows are quickly reduced, the change in momentum of the water in the feed line to the MF units creates pressure waves (surges), which propagate upstream into the Title 22 system.

Additional steps occur in the CMF backwash process, including lumen pressurization and pressure release. However, these steps do not create additional pressure surge problems. After the membrane fibers have been pressurized and depressurized, the solids that have been released from the fibers are removed from the fiber bundle in a flush or sweep flow step. In this step, feedwater is introduced into the shell side of the fiber bundle at 1.5 times normal filtration feed flow by once again quickly opening the feed valves, as shown on Figure 7.4.

Figure 7.4
Flush Step



Solids are carried out of the unit through the backwash valve AV-3. Since the resistance to flow through the shell side of the MF module is significantly less than that through the membrane, the flow rate during the flush or sweep step is significantly higher (1.5 times) than during normal filtration. For example, recent backwash snapshots at the CRWRF show sweep flows ranging from 900 to 2,500 gpm. The typical value is 1,500 gpm. As the feed valves open to provide this sweep flow, the water flow can quickly increase from the reduced level of 2,500 and 4,000 gpm for EMWRF and CRWRF respectively, to 4,000 gpm and 6,000 gpm, respectively. This dramatic and rapid increase in flow to the MF units can result in rapid reduction in pressure, which again can propagate through the Title 22 system.

Rapid changes in flows were captured in the data generated during the monitoring portion of the hydraulic modeling effort. Figure 7.5 and Figure 7.6 show the flows measured at EMWRF and CRWRF, respectively. Note that at each site, there are normally 432 individual MF backwash events occurring over any 24-hour period.

Figure 7.5
Flows Measured at EMWRF

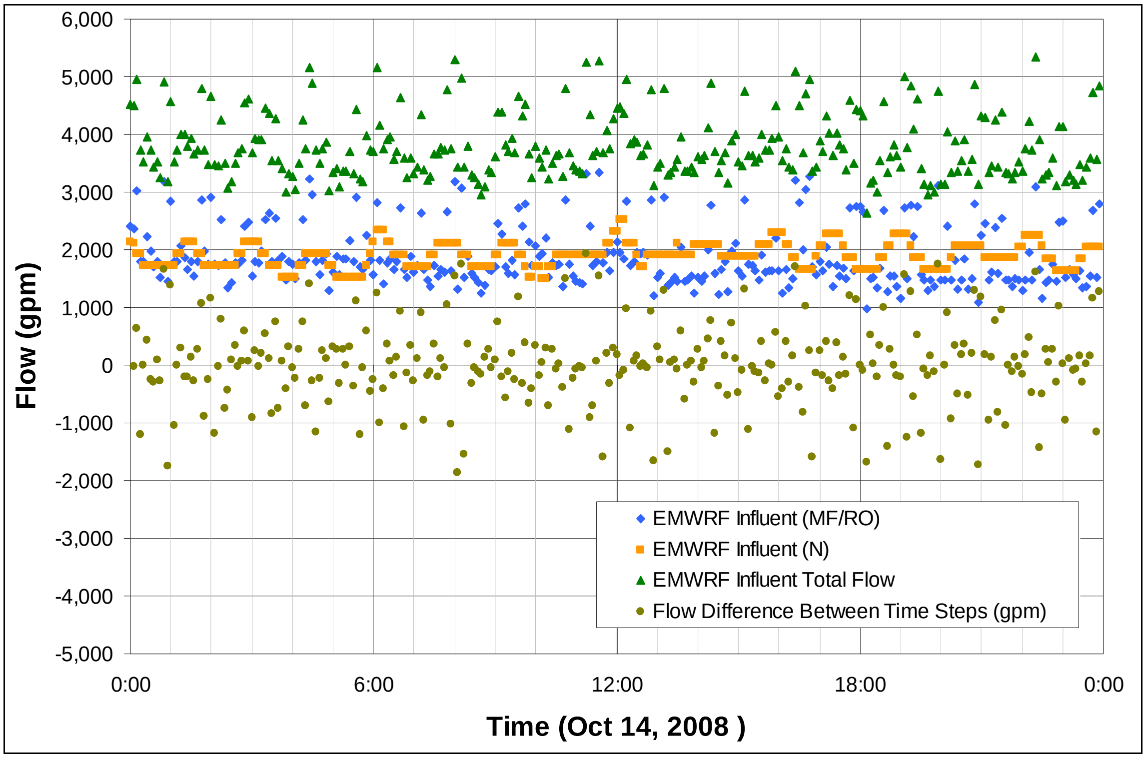
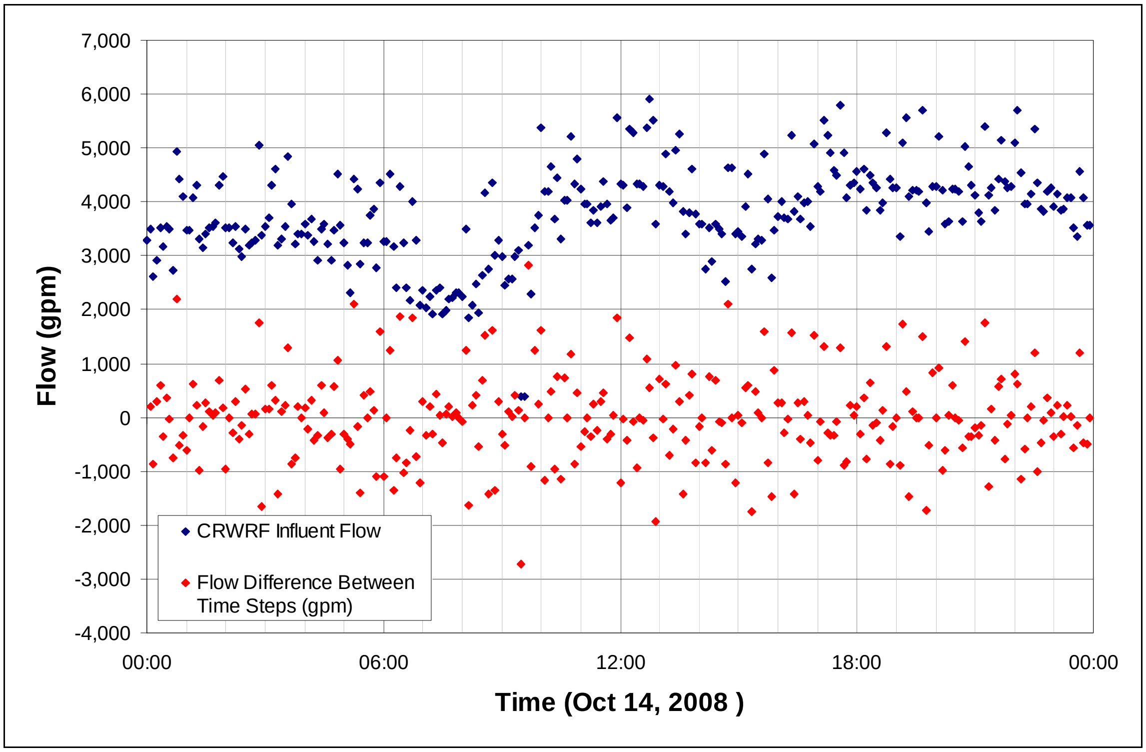


Figure 7.6
Flows Measured at CRWRF



These figures show the flow rates measured at 5-minute intervals over a 24-hour period on October 14, 2008. For EMWRF, the flows shown are total influent as well as influent to both the MF units and nitrification system. Also shown is the change in MF feed flow (Delta) observed between two successive data points. Negative Delta's indicate that the flow decreased from the previous data point, which can represent a unit that goes into backwash between data points. A positive Delta indicates an increase in flow from previous data point that can capture the increase in flow during the MF "Flush" portion of the backwash process. As shown on Figure 7.5, the change in flow at EMWRF ranges from -2,000 to +2,000 gpm in a 5-minute interval. Figure 7.6 shows that this range is even greater at CRWRF with a change in flows from -3,000 to +3,000 gpm. In order to fully analyze the pressure swings this change in flow causes, continuous pressure sampling would be required.

The results captured on Figure 7.5 and Figure 7.6 show, as expected, significant changes in flow. Decreases correspond to the initiation of the backwash process as well as the increases related to the membrane flush flows. These rapid changes in MF feed flow appear to be capable of producing the pressure surges observed in the Title 22 system. The magnitude of the changes in flow observed are consistent with the expected changes in flow understood to be occurring during the CMF backwash cycles. A further example of this is shown on Figure 7.7, which is obtained from the CRWRF flow and pressure data available on a finer time scale than what was recorded during the flow modeling data capture period.

Figure 7.7
Carson Feed Water Flow and Pressure during Backwash Cycle

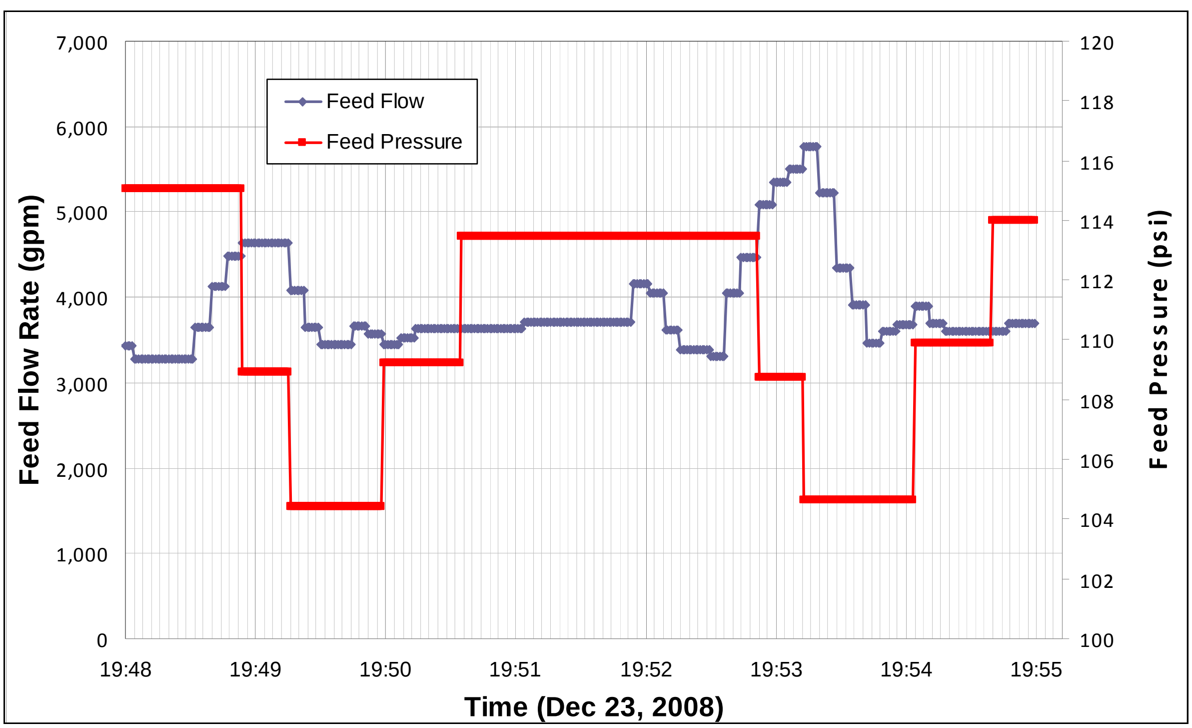


Figure 7.7 shows total feed to the MF system and pressure during a flush and subsequent membrane rewet cycle. As flows to the unit undergoing backwash increases, feed pressure to all units drop.

There appear to be several options for reducing the magnitude of the observed pressure surges. These include:

- Continued investigation of the existing surge tanks to verify and improve performance.
- Reducing valve closing and opening speed during the microfiltration backwash cycle. It was suggested that it may be possible to reduce the speed at which the feed valves close during initiation of backwash cycle as well as how quickly they open during the flush step in the backwash cycle. This is a relatively insignificant fix in terms of capital expense. These changes would need to be tested to ascertain that no negative impacts are introduced in the backwash efficiency as well as overall MF recovery. (Further investigation and West Basin staff indicated that this option had been discussed with the manufacturer and that it was not recommended due to reductions in backwash efficiency.)

Because simple adjustment of the backwash valve opening sequence is likely not feasible, additional options can be considered. These include:

- Construction of a dedicated flush line so that flush water is supplied by a dedicated tank and pump system. This would isolate the flush demand from the Title 22 supply. This would involve an additional tank, pumps, piping, valves and controls at both the CRWRF and EMWRF.
- Construction of break tank and feed pumps to physically isolate the MF units from the Title 22 system. This would result in additional capital expense as well as operating expense in that the available head from the Title 22 line pressure would be lost unless energy recovery were incorporated as is done at the Chevron Nitrification Facility where a hydraulic turbine recovers the energy provided by the Title 22 line pressure.
- Replacement of the CMF units at EMWRF and CRWRF using technology that does not induce pressure surges such as submerged membrane systems or pressure units that don’t operate with a feed shell sweep sequence.

A detailed study of the various methods should be conducted in selecting the most feasible method during the design of the improvements to the CRWRF and the EMWRF. For planning purposes, it is assumed that the second-most expensive of these options is selected, adding break tanks and pumps to isolate the MF units from the Title 22 system.

Operation of the Title 22 Pump Station

Currently, each Title 22 product storage tank has four pumps. Two of these pumps are variable frequency drive operated with rated capacities of 4,500 gpm, and reported total dynamic head of 280 feet. The other two pumps are constant speed equipment with rated capacities of 8,000 gpm and similar total dynamic head. According to the record information, the shut-off head of the constant speed pumps (458 feet) are significantly greater than that of the variable speed pumps (387 feet). Field testing conducted during this study verified the shut-off head of the constant speed pumps. Only the shut-off head of one variable speed pump could be measured at Tank 1, which was 361 feet. This is 26 feet lower than the shut-off head indicated on the certified pump curve. At low demands, the variable speed pumps are operated at speeds that can be adjusted to deliver similar flow rates. At higher demand periods, one constant speed pump is operated with one variable speed pump on automatic control, and one variable speed pump on manual control. Review of the DCS data during the calibration period indicated one constant speed pump operating with one variable speed pump at each tank nearly the entire time. During this time, it was observed that the variable speed pumps quite often operate to the left of the preferred operating range, sometimes near the shut-off conditions. This will likely result in frequent physical pump failure.

The operation of the Title 22 pumping system should be studied in detail based upon the annual, seasonal, and daily variation in demands, following the formulation of a solution to the surge problem. The study should develop an efficient pumping system that allows operation of the pumps within the preferred operating ranges.

Water Quality

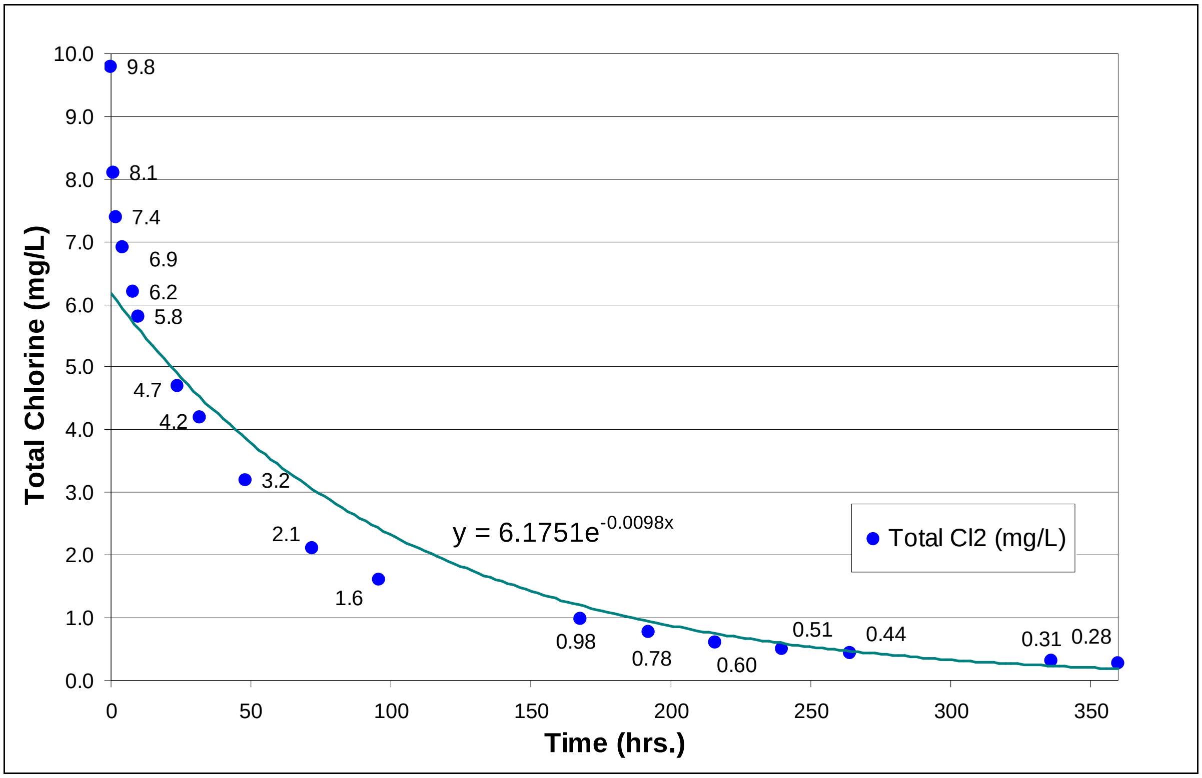
Water treated at ELWRF is disinfected with chlorine prior to distribution. In addition, there are two existing disinfection stations that add chlorine as needed. Operational logs for the two disinfection stations indicated a target chlorine residual level of about 3.0 mg/L at the station when stations were functional. These locations are depicted on Figure 7.9. However, as water travels through the distribution system, the chlorine is consumed and residual levels are reduced to nearly zero in the extreme location (dead-end) of the distribution system. Water age and biological growth, in particular nitrification, are two key factors in chlorine decay.

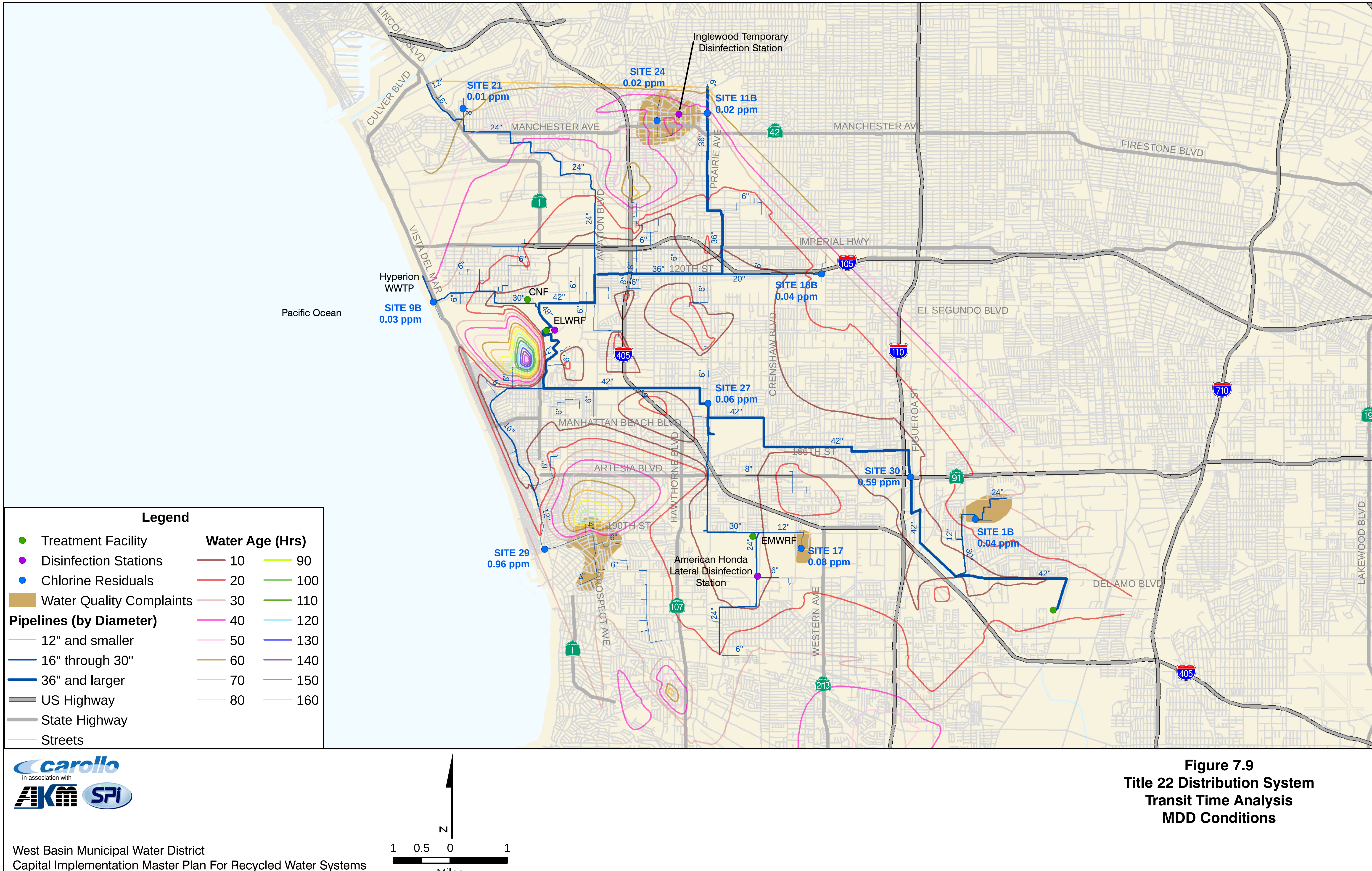
Water samples were collected at the 10 sites listed in Table 7.5 and tested for total chlorine.

Figure 7.8 depicts the chlorine decay measured in the Title 22 filter effluent at the bench scale in laboratory conditions. Figure 7.9 shows the water age during maximum month demand conditions.

Table 7.5	Title 22 Water Quality Calibration Locations Capital Implementation Master Plan West Basin Municipal Water District		
Site Number	**Location**	**Sampled Residual (mg/L)**	**Distance to Nearest Disinfection Station (mi)**
1B	Anschutz So Cal Sports (Home Depot)	0.04	3.7
9B	So. Cal Edison - El Segundo Generation Station	0.03	5.3
11B	Inglewood Park Cemetery	0.02	0.5
17	Toyota Motor Sales	0.08	0.9
18B	Chester Washington Golf Course	0.04	3.8
21	Loyola Marymount University	0.01	3.8
24	S/E corner Queen Ave. @ Eucalyptus	0.02	0.4
27	S/W corner Prairie Ave. @ 154th St.	0.06	3.0
29	On Greenbelt - Valley Dr @ 21st St.	0.96	3.8
30	17201 Figueroa St. (On Figueroa south of 168th St.)	0.59	3.2

Figure 7.8
Chlorine Residual Decay in Title 22 Effluent
(Bench Scale Results)





West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Figure 7.9
Title 22 Distribution System
Transit Time Analysis
MDD Conditions

As shown in Table 7.5, the initial chlorine concentration of 10 mg/L in the filter effluent decreases rapidly to 3 mg/L after 50 hours. It should be noted that the decay in the distribution pipelines is expected to occur even faster as the decay curve presented in Figure 7.9 represents a laboratory test rather than an actual pipeline with the potential of established biological growth, which will accelerate decay, sometimes in a non-linear way.

It is evident from the sample results shown in Table 7.5 that there is significant chlorine decay and residual loss in the system, indicating possible growth and nitrification in the distribution system pipes. Sample results for all locations indicated chlorine residuals below the minimum analysis criteria of 1.0 mg/L. While chlorine booster facilities may alleviate this problem, it is first recommended that West Basin initiate a pipe cleaning test program and assess its effectiveness in improving water quality and maintaining chlorine residuals. One possible method is to install pig launching and retrieval facilities in a section of the system and test it. Chlorine booster stations can then be added to evaluate the combined effectiveness. For conservative planning purposes, five chlorine booster stations are included in the CIP.

As mentioned in Chapter 2, the disinfection stations provide effective means of mitigating chlorine loss issues. However, the ability to maintain effective chlorine residual and water quality depends on consistent usage of recycled water to limit water age, hydraulic optimization of the system, as well as management of biogrowth in pipelines.

7.1.3 West Coast Barrier Water System

7.1.3.1 <u>Criteria</u>

The general analysis criteria used to evaluate the West Coast Barrier Water System includes the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length
- Maximum velocity of 7 fps

Analysis criteria specific to the West Coast Barrier Water System includes:

- Adequate pressure at the Blend Station, approximately 78 psi
- Ability to deliver the maximum daily flow of 12.5 mgd with firm pumping capacity.
- Ability to deliver potable MWD water from the Blend Station to the RO Units when the Phase III Microfiltration units are out of service, and to the Title 22 System during an outage of the Title 22 Treatment System

These criteria were used to evaluate the existing West Coast Barrier Water System under existing demand conditions.

7.1.3.2 Analysis Conditions

The West Coast Barrier Water System consists of the Barrier Product Water Pump Station and the 30-inch diameter cement mortar lined and coated (CMLC) transmission main that conveys Barrier Water from ELWRF to the Barrier Blend Station, located north of the treatment facility on El Segundo Boulevard west of Nash Street in the City of El Segundo. The transmission main is approximately 4,720 feet in length.

The Barrier Product Water Pump Station was upgraded during the ELWRF Phase IV expansion by adding two 3,500-gpm pumps to the existing five pumps (with 10,500 gpm of firm capacity) to deliver up to 12.5 mgd of Barrier Water. During the 2007-2008 Fiscal Year, West Basin delivered a total of 11,129 acre-feet (af) of Barrier Water for injection into the West Coast Barrier. Currently, a control valve on the discharge pipe of the pump station maintains an approximate pressure of 73 psi on the downstream side of the valve. The existing system analysis was conducted with various pump flows, including the existing maximum demand of 12.5 mgd at this valve setting.

Table 7.6 shows the average annual flows, as well as the maximum month and minimum month demands.

Table 7.6 West Coast Barrier Water System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Average Annual	Average Daily	Average Instantaneous
Average Annual Demand(1)	11,000 afy	9.82 mgd	6,820 gpm
Maximum Month Demand(2)	N/A	11.30 mgd	7,846 gpm
Minimum Month Demand(3)	N/A	8.92 mgd	6,197 gpm
Design Demand	N/A	12.50 mgd	8,681 gpm

Notes:
(1) Calculated from historical billing records as detailed in Chapter 3.
(2) Maximum month demand (July) from the 2007-2008 flow records.
(3) Minimum month demand (February) from the 2007-2008 flow records.

The average, maximum and minimum flows recorded during the calibration period (6,595 gpm, 7,389 gpm, and 5,826 gpm) were verified and found to be similar to the average annual, maximum month, and minimum month values from the historical customer data.

7.1.3.3 Analysis Results

The results from the analyses performed for each of the demand conditions described in Table 7.6 are presented in Table 7.7.

Table 7.7 West Coast Barrier Water System Analyses
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Total Maximum Headloss(1)	Average Unit Headloss (ft/1,000 ft)	Pressure at Flow Control Valve	Velocity	Maximum Travel Time(2) (Water Age)
Average Day Demand(3)	4.2 ft	0.9 ft	73.0 psi	3.10 fps	25.4 min
Maximum Month Demand(4)	5.5 ft	1.2 ft	73.0 psi	3.56 fps	22.1 min
Minimum Month Demand(5)	3.5 ft	0.8 ft	73.0 psi	2.81 fps	28.0 min
Design Demand	6.6 ft	1.4 ft	73.0 psi	3.94 fps	20.0 min

Notes:
(1) Maximum headloss predicted by model over 24-hour simulation period.
(2) Based on length = 4,720 feet.
(3) Pump 3 and Pump 5 on.
(4) Pump 2, Pump 3, and Pump 5 on.
(5) Pump 3 and Pump 5 on.

As shown in Table 7.7, the velocities in the pipeline vary from 2.8 fps with the minimum month flows to 3.9 fps with the current design flows. These are well below the maximum desired velocity of 7 fps. The head losses are well within acceptable limits with the average unit head loss ranging from 0.8 to 1.4 feet per 1,000 feet of pipe.

The existing pump station has the firm capacity (13.5 mgd) to deliver 12.5 mgd to the West Coast Barrier System with a pump station discharge pressure of 98 psi. However, there is a significant loss of pressure at the control valve, where the pump station discharge pressure is reduced from approximately 98 psi to 73 psi. At the average flow of 6,700 gpm, this is a loss of approximately 638,000 kilowatt-hours per year. Assuming an average unit power cost of $0.10 per kilowatt-hour, this would equate to a financial cost of approximately $63,800 per year. It is recommended that the operational condition of the pump station be evaluated through a detailed study, and that a more efficient method of operation be developed to accommodate the ultimate demand (15.2 mgd) of the system in a cost effective manner. This may consist of replacing the existing pumps with lower head pumps, adding variable frequency drives to the existing pumps, or replacing the existing pumps with lower head pumps and adding variable frequency drives. Further evaluation of a revised method of operation should be conducted during the Phase V expansion.

7.1.4 Chevron High Pressure Boiler Feed System

7.1.4.1 Criteria

The general analysis criteria used to evaluate the Chevron High Pressure Boiler Feed (HPBF) System includes the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length.
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps.
- Firm capacity at HPBF pump station should meet peak demands.

These criteria were used to evaluate the existing Chevron High Pressure Boiler Feed System under existing demand conditions.

7.1.4.2 Analysis Conditions

The Chevron High Pressure Boiler Feed System consists of the booster pump station and the 12-inch diameter HDPE and 16-inch diameter PVC transmission main that conveys Ultra Pure RO water to the Chevron El Segundo Refinery on-site High Pressure Boiler Feed Storage Tank. The transmission main is approximately 2 miles, or 10,030 feet, in length.

Under existing conditions, the Chevron High Pressure Boiler Feed system supplies 2.50 mgd of Industrial RO Ultra water to the Chevron El Segundo Refinery on an average annual basis. This average annual demand was established from historical billing records. Maximum month demands are calculated using the maximum monthly peaking factor of 1.1. As detailed in Table 7.8, the analyses were conducted during the average, maximum, and minimum demand conditions of 1,735 gpm, 1,882 gpm, and 1,590 gpm, respectively.

Table 7.8 Chevron High Pressure Boiler Feed System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Average Annual	Average Daily	Average Instantaneous
Average Annual Demand(1)	2,800 afy	2.50 mgd	1,735 gpm
Maximum Month Demand(2)	N/A	2.71 mgd	1,882 gpm
Minimum Month Demand(3)	N/A	2.29 mgd	1,590 gpm

Notes:
(1) Calculated from historical billing records as detailed in Chapter 3.
(2) Calculated by applying a seasonal peaking factor of 1.1 to the average annual demand, based on historical billing records and discussions with District staff.
(3) Minimum month demand from 2007-2008 billing records.

This analysis was conducted utilizing the aforementioned flow conditions, assuming a constant demand pattern.

7.1.4.3 Analysis Results

Table 7.9 presents model results for the analysis conducted under each of the demand conditions listed in Table 7.8.

Table 7.9 Chevron High Pressure Boiler Feed System Analyses
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Total Headloss[(1)]	Average Unit Headloss (ft/1,000 ft)	Pressure at Delivery Point	Velocity in 10" Pipe	Velocity in 12" Pipe	Maximum Travel Time[(2)] (Water Age)
Average Day Demand	27.8 ft	4.3 ft	17.3 psi[(3)]	4.9 fps	2.8 fps	1.0 hrs
Maximum Month Demand	32.3 ft	5.0 ft	16.3 psi[(4)]	5.3 fps	3.0 fps	0.9 hrs
Minimum Day Demand	23.6 ft	3.7 ft	20.1 psi[(5)]	4.5 fps	2.5 fps	1.0 hrs

Notes:
(1) Maximum headloss predicted by model over 24-hour simulation period.
(2) Based on length = 10,030 feet.
(3) One pump running at 81 percent speed to maintain 34 psi discharge pressure at pump station.
(4) One pump running at 84 percent speed to maintain 34 psi discharge pressure at pump station.
(5) One pump running at 79 percent speed to maintain 34-psi discharge pressure at pump station.

As shown in Table 7.9, the average unit headloss per 1,000 feet of pipe ranged from 3.7 feet to 5.0 feet, well below the analysis criteria of 10 feet per 1,000 feet. The maximum velocity ranged from 4.5 fps to 5.3 fps. Although the velocities are slightly higher than 3 fps under minimum and average day demand conditions, the velocities are not extreme and no recommendations are made at this time for increasing pipeline sizes.

Pressure at the point of delivery is dictated by the pressure at the discharge side of the HPBF pump station, which is currently maintained at 34 psi.

With one pump on stand-by, the firm capacity of the pump station is 1,800 gpm or 2.59 mgd. This is the design capacity of one pump. Although this firm capacity is less than the maximum demand of 2.71 mgd, analysis of the pump curve indicates that the pump can still provide this demand within its normal operating range. The difference between the existing maximum day demand and maximum month demand can be made up from storage at the Chevron El Segundo Refinery

Based on the above analyses, it is shown that the existing pipeline and pump station has sufficient capacity for the existing demand conditions evaluated.

7.1.5 Chevron Low Pressure Boiler Feed System

7.1.5.1 Criteria

The general analysis criteria used to evaluate the Chevron Low Pressure Boiler Feed (LPBF) System includes the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length.
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps.
- Firm capacity at LPBF Pump Station should meet the maximum day demands.

These criteria were used to evaluate the Chevron Low Pressure Boiler Feed System under existing demand conditions.

7.1.5.2 Analysis Conditions

The Chevron Low Pressure Boiler Feed System consists of the booster pump station and the 10-inch diameter high-density polyethylene (HDPE) and 12-inch diameter PVC transmission main that conveys Pure RO water to the Chevron El Segundo Refinery on-site Low Pressure Boiler Feed Storage Tank. The transmission main is approximately 2 miles, or 10,400 feet, in length.

Under existing conditions, the Chevron Low Pressure Boiler Feed System supplies 0.98 mgd of Pure RO water to the Chevron El Segundo Refinery on an average annual basis. This average annual demand was established from historical billing records. Maximum month demands are calculated using the maximum monthly peaking factor of 1.5. Table 7.10 details the existing flow conditions for the Chevron Low Pressure Boiler Feed System.

Table 7.10 Chevron Low Pressure Boiler Feed System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Average Annual	Average Daily	Average Instantaneous
Average Annual Demand(1)	1,100 afy	0.98 mgd	681 gpm
Maximum Month Demand(2)	N/A	1.46 mgd	1,014 gpm
Minimum Month Demand(3)	N/A	0.39 mgd	274 gpm

Notes:
(1) Calculated from historical billing records as detailed in Chapter 3.
(2) Calculated by applying a seasonal peaking factor of 1.5 to the average annual demand, based on historical billing records and discussions with West Basin staff.
(3) Minimum month demand from 2007-2008 billing records.

This analysis was conducted utilizing the aforementioned flow conditions, assuming a constant daily demand pattern.

7.1.5.3 Analysis Results

Table 7.2 presents model results for the analysis conducted under each of the demand conditions listed in Table 7.11.

Table 7.11 Chevron Low Pressure Boiler Feed System Analyses
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Total Headloss(1)	Average Unit Headloss (ft/1,000 ft)	Pressure at Delivery Point	Velocity in 10" Pipe	Velocity in 12" Pipe	Maximum Travel Time(2) (Water Age)
Average Day Demand	18.1 ft	2.5 ft	20.2 psi(3)	2.8 fps	1.9 fps	1.4 hrs
Maximum Month Demand	37.8 ft	5.1 ft	11.6 psi(4)	4.1 fps	2.9 fps	1.0 hrs
Minimum Month Demand	3.3 ft	0.5 ft	27.1 psi(5)	1.1 fps	0.8 fps	3.6 hrs

Notes:
(1) Maximum headloss predicted by model over 24-hour simulation period.
(2) Based on length = 10,400 feet.
(3) One pump running at 77 percent speed and one pump running at 53 percent speed to maintain 34 psi discharge pressure at pump station.
(4) One pump running at 90 percent speed and one pump running at 60 percent speed to maintain 34 psi discharge pressure at pump station.
(5) One pump running at 60 percent speed to maintain 34 psi discharge pressure at pump station.

As shown in Table 7.11, the average unit headloss per 1,000 feet of pipe ranged from 0.5 feet to 2.5 feet, well below the analysis criteria of 10 feet per 1,000 feet. The maximum velocity ranged from 1.1 fps to 4.1 fps, which is also within the range of analysis criteria of 7 fps.

Pressure at the point of delivery is dictated by the pressure on the discharge side of the LPBF pump station, which is currently maintained at 34 psi.

With one pump on stand-by, the firm capacity of the pump station is 1,200 gpm or 1.73 mgd. This is also sufficient to meet the maximum day demand of 1.67 mgd.

Based on the above analyses, it is shown that the existing pipeline and pump station have sufficient capacity for the existing demand conditions evaluated.

7.1.6 Chevron Nitrified Water System

7.1.6.1 Criteria

The general analysis criteria used to evaluate the Chevron Nitrified Water System includes the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length.
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps.

Analysis criteria specific to the Chevron Nitrified Water System includes:

- Adequate pressure at the Chevron Refinery for the cooling towers, of at least 80 psi.
- Ability to deliver potable water from the City of El Segundo's water system when Title 22 water is not available.
- Sufficient firm pumping capacity to deliver the existing maximum demands. Currently, the pump station is operated in the remote automatic mode with the variable speed high service pump adjusting speed to maintain a pre-set pressure. If the variable speed pump cannot maintain the pressure without dropping below 90 percent of full speed, one constant speed pump is started so that the two pumps maintain the set pressure.

These criteria were used to evaluate the existing Chevron Nitrified Water System under existing demand conditions.

7.1.6.2 Analysis Conditions

The Chevron Nitrified Water System consists of the following:

- An 80-foot diameter, 24-foot high, product water storage tank operated between a high level of 17.5 feet and a low level of 2.0 feet
- Nitrified Water Pump Station with one variable speed and two constant speed pumps, which are referred to as the High Service Pumps
- A surge tank on the discharge side of the pump station
- Approximately 2,970 feet of 20-inch diameter discharge pipe that extends to the Chevron El Segundo Refinery (El Segundo Boulevard and Lomita Street). The water is then supplied to the cooling towers.
- Estimated delivery point elevation of 143 feet.

Under existing conditions, the Chevron Nitrified Water System provides 3.12 mgd of nitrified water to cooling towers at the Chevron El Segundo Refinery. On an average annual basis, the maximum month demand of 4.19 mgd is obtained from West Basin's monthly billing records for March 2008.

As detailed in Table 7.12, the analyses were conducted with the average annual demands, as well as the maximum month and minimum month demands.

Table 7.12 Chevron Nitrified Water System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Average Annual	Average Daily	Average Instantaneous
Average Annual Demand(1)	3,500 afy	3.12 mgd	2,170 gpm
Maximum Month Demand(2)	N/A	4.19 mgd	2,912 gpm
Minimum Month Demand(3)	N/A	2.33 mgd	1,617 gpm
Instantaneous Maximum Demand(4)	N/A	5.40 mgd	3,754 gpm

Notes:
(1) Calculated from historical billing records as detailed in Chapter 3.
(2) Historical maximum month demand (March 2008) from billing records.
(3) Minimum monthly demand (February) from the 2007-2008 flow records.
(4) Instantaneous maximum demand from the calibration period records

Analyses were conducted with the average day, maximum month, and minimum month demands under the normal operating conditions and with the one constant speed pump out of service.

7.1.6.3 Analysis Results

The results of analyses for each of the demand conditions described in Table 7.12 are presented below in Table 7.13.

Table 7.13 Chevron Nitrified Water System Analyses
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Total Headloss	Average Unit Headloss (ft/1,000 ft)	Average Pressure at Delivery Point	Velocity	Maximum Travel Time(2) (Water Age)
Average Day Demand	2.3 ft	0.8 ft	74.6 psi	2.2 fps	22.5 min
Maximum Month Demand	4.0 ft	1.4 ft	73.8 psi	3.0 fps	16.5 min
Minimum Month Demand	1.3 ft	0.5 ft	75.8 psi	1.7 fps	29.1 min

As shown in Table 7.13, the velocities in the pipeline vary from 1.7 fps with the minimum month flows to 3.0 fps with the maximum month flows. These are well below the analysis criteria of 7 fps. The unit head loss per 1,000 feet of pipe ranged from 1.3 feet to 4.0 feet, which are also well within the analysis criteria of 10 feet per 1,000 feet.

The existing pump station has a total capacity of 4,300 gpm, and thus, can deliver the maximum month demand of 2,912 gpm. However, its firm capacity of 2,200 gpm is lower than the maximum month demand instantaneous maximum flows of up to 3,754 gpm observed during the calibration period. The existing pump station can provide the 80-psi pressure desired by Chevron at the entrance to the refinery when all three pumps operate with the maximum month demand. A detailed analysis of this pump station should be conducted to determine the most feasible means to provide the firm capacity, taking into account the potential increase in nitrified water demand.

The Chevron El Segundo Refinery cooling towers have back-up connections to the City of El Segundo's domestic water system. Therefore, additional storage or a new potable water connection to the nitrified water storage tank is not needed.

7.1.7 ELWRF Brine Line

7.1.7.1 Criteria

Analysis criteria for the ELWRF Brine Line consists the following:

- Maximum pipeline velocity of 10 fps

7.1.7.2 Analysis Conditions

The ELWRF Brine Line consists of an 18-inch diameter HDPE pipe that extends approximately 3.0 miles north and west from ELWRF, conveying concentrate from the ELWRF reverse osmosis trains to the HWWTP in El Segundo. The brine line discharges to the Hyperion Ocean Outfall.

Under existing conditions, the ELWRF brine line operates off the RO concentrate pressure, which averages approximately 22 psi at the plant. The existing average brine flow is 980 gpm. During the calibration data collection period, brine flows averaged 971 gpm, with a maximum flow of 1,261 gpm, and minimum flow of 530 gpm. The analysis was conducted with the average flow of 971 gpm, the flow patterns from the SCADA/DCS, and the pressure recordings at the plant, as shown in Table 7.14.

Table 7.14 ELWRF Brine System Flows
Capital Implementation Master Plan
West Basin Municipal Water District

Flow Type	Average Annual	Average Daily	Average Instantaneous
Average Flow	N/A	1.40 mgd	971 gpm
Maximum Instantaneous Flow	N/A	N/A	1,261 gpm
Minimum Instantaneous Flow	N/A	N/A	530 gpm

The brine line starts as a short section of 12-inch diameter pipeline constructed of HDPE, and increases to 18-inch diameter SDR 17 HDPE. Below elevation 83 feet, the pipe changes to SDR 15.5, and below elevation 58 feet, it changes to SDR 13.5. The pipeline has several high and low points along its alignment, which result in sections of the pipe flowing with a free surface. To accurately model the system, the Water Surface and Pressure Gradients (WSPG) computer program developed by the Los Angeles County Department of Public Works was utilized. The brine line terminates at the Hyperion Ocean Outfall through a manifold with six connections. The HWWTP staff indicated that the brine system and the Outfall are at atmospheric pressure.

7.1.8.3 Analysis Results

The average velocity within the sections of the pipe under full flow is 1.57 fps. The minimum and maximum full pipe velocities were 0.85 fps and 2.04 fps, respectively. These velocities are well below the maximum desired velocity of 7 fps. However, the low velocities in this pipeline may lead to build-up of materials and is cause for concern for occurrence of scaling.

Due to the steep slopes within the brine line (up to 9.2 percent on Grand Avenue), velocities reach as high as 13.75 fps with a Manning roughness coefficient of 0.009, and 12.22 fps with a Manning roughness coefficient of 0.011. These velocities exceed the maximum desired velocity of 10 fps. While the high-density polyethylene pipe manufacturer catalogues indicate resistance to abrasion with up to 25 fps velocities, the pipe should be inspected periodically to assess its condition.

The record documents do not show any access ports for pipe inspection. The brine line is an essential element of the overall recycled water system. In case of its failure, West Basin and its customers will have to convert to the use of potable water supplies. It is recommended that West Basin design and install inspection ports on the brine line so that its condition can be assessed, and corrective actions can be taken proactively. For conservative planning purposes, 12 access ports are included in the CIP.

To mitigate the high velocities, it is recommended that the downstream pressure near the Hyperion Ocean Outfall be increased. This would require installing a series of pinch valves or pipe restrictions to reduce the pressure gradually prior to discharge to the Outfall. A detailed study of this system should be conducted to develop the appropriate project. For conservative planning purposes, 10 pinch valves/reducers are included in the CIP.

7.1.8 bp Reverse Osmosis System

7.1.8.1 Criteria

Analysis criteria for the bp Carson Refinery (bp) RO system includes the following general criteria:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps
- Capacity should be met with at least one booster pump kept in reserve.

No analysis criterion specific to the bp RO system is included. These criteria were used to evaluate the existing bp RO system.

7.1.8.2 Analysis Conditions

The bp RO system consists of the booster pump station and the 30-inch diameter DIP and 24-inch diameter DIP transmission main that conveys Industrial RO water to the bp Carson Refinery. The transmission main is approximately 1.1 miles, or 5,980 feet, in length.

Under existing conditions, the bp RO system supplies the bp Carson Refinery with 3.1 mgd of RO recycled water on an average annual basis. This average annual demand was established from historical billing records. Maximum month demands are calculated using the maximum monthly peaking factor of 1.7. Minimum instantaneous demands were obtained from the minimum flows observed during the calibration data gathering period. As detailed in Table 7.15, this analysis was conducted during the average, maximum, and minimum demand conditions of 2,162 gpm, 3,675 gpm, and 1,473 gpm, respectively.

Table 7.15 bp RO System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Demand Type	Average Annual	Average Daily	Average Instantaneous
Average Annual Demand(1)	3,488 afy	3.11 mgd	2,162 gpm
Maximum Month Demand(2)	N/A	5.29 mgd	3,675 gpm
Minimum Instantaneous Demand(3)	N/A	N/A	1,473 gpm

Notes:
(1) Calculated from historical billing records as detailed in Chapter 3.
(2) Based on a seasonal peaking factor of 1.7 applied to the average annual demand, based on discussions with District staff.
(3) Based on a seasonal peaking factor of 0.7 applied to the average annual demand, obtained from minimum flow observed during calibration period. For conservative planning purposes, it was assumed this was the average flow during a 24-hour period using the same demand pattern as the other scenarios.

This analysis was conducted utilizing average conditions observed during the calibration period, including daily demand patterns.

7.1.8.3 Analysis Results

Table 7.16 presents model results for the analysis conducted under each of the demand conditions listed in Table 7.15.

**Table 7.16 bp RO System Analysis
Capital Implementation Master Plan
West Basin Municipal Water District**

Condition	Total Maximum Headloss(1)	Average Unit Headloss (ft/1,000 ft)	Pressure at Delivery Point	Maximum Velocity	Maximum Travel Time(2) (Water Age)
Average Annual Demand	1.7 ft	0.3 ft/kft	50.0 psi(3)	1.8 fps	2.3 hrs
Maximum Month Demand	4.6 ft	0.8 ft/kft	50.0 psi(3)	3.0 fps	1.8 hrs
Minimum Day Demands	0.8 ft	0.1 ft/kft	50.0 psi(3)	1.2 fps	3.0 hrs

Notes:
(1) Maximum headloss predicted by model over 24-hour simulation period.
(2) Travel time verified for 1-week simulation time.
(3) CRWRF RO Product Water pumps controlled by VSP analysis set to 50.0 psi delivery pressure.

As seen in Table 7.16, the average unit headloss per 1,000 feet ranged from 0.1 feet to 0.8 feet, well below the analysis criteria of 10ft/kft. The maximum velocity ranged from 1.2 fps to 3.0 fps, within the range of analysis criteria. Pressure at this site is regulated by the pump station, resulting in the 50 psi pressure maintained under all scenarios. Two of the three pumps were required under each of the scenarios.

Based on the above analyses, it is shown that the existing pipeline is predicted to have sufficient capacity for anticipated demands during each evaluated existing system conditions, and no additional recommendations are made.

7.1.9 bp Nitrified Water System

7.1.9.1 Criteria

Analysis criteria for the bp Nitrified Water System includes the following general criteria:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length.
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps.
- Capacity should be met with at least one booster pump kept in reserve.

No analysis criterion specific to the bp Nitrification system is included. These criteria were used to evaluate the existing bp Nitrification system.

7.1.9.2 Analysis Conditions

The bp Nitrified Water system consists of the booster pump station and the 12-inch diameter DIP transmission main that conveys Nitrified water to the bp Carson Refinery. The transmission main is approximately 1.2 miles, or 6,110 feet, in length.

Under existing conditions, the bp Nitrified Water system supplies the bp Carson Refinery with 3.1 mgd of recycled water on an average annual basis. This average annual demand was established from historical billing records. Maximum month demands are calculated using the maximum monthly peaking factor of 1.7. Minimum instantaneous demands were obtained from the minimum flows observed during the calibration data-gathering period. As detailed in Table 7.17, this analysis was conducted during the average, maximum, and minimum demand conditions of 374 gpm, 486 gpm, and 302 gpm, respectively.

Table 7.17 bp Nitrified Water System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Demand Type	Average Annual	Average Daily	Average Instantaneous
Average Annual Demand(1)	603 afy	0.53 mgd	374 gpm
Maximum Month Demand(2)	N/A	0.69 mgd	486 gpm
Minimum Instantaneous Demand(3)	N/A	N/A	302 gpm

Notes:
(1) Calculated from historical billing records as detailed in Chapter 3.
(2) Calculated by applying a seasonal peaking factor of 1.3 to the average annual demand, based on discussions with District staff.
(3) Obtained from minimum flow observed during calibration period. For conservative planning purposes, it was assumed this was the average flow during a 24-hour period using the same demand pattern as the other scenarios.

This analysis was conducted utilizing average conditions observed during the calibration period, including daily demand patterns.

7.1.9.3 Analysis Results

Table 7.18 presents model results for the analysis conducted under each of the demand conditions listed in Table 7.17.

As seen in Table 7.18, the average unit headloss per 1,000 feet ranged from below 0.4 feet to 1.0 feet, well below the analysis criteria of 10ft/kft. The maximum velocity ranged from 1.0 fps to 1.6 fps, within the range of analysis criteria. Pressure at this site is regulated by the pump station, resulting in the 50 psi pressure maintained under all scenarios. Two of the three pumps were required under each of the scenarios.

Based on the above analyses, it is shown that the existing pipeline is predicted to have sufficient capacity for anticipated demands during each evaluated existing system condition, and no additional recommendations are made.

Table 7.18 bp Nitrification System Analysis
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Total Maximum Headloss(1)	Average Unit Headloss (ft/1,000 ft)	Pressure at Delivery Point	Maximum Velocity	Maximum Travel Time(2) (Water Age)
Average Annual Demand	3.8 ft	0.6 ft/kft	50.0 psi(3)	1.2 fps	2.4 hrs
Maximum Month Demand	6.1 ft	1.0 ft/kft	50.0 psi(3)	1.6 fps	2.0 hrs
Minimum Day Demands	2.5 ft	0.4 ft/kft	50.0 psi(3)	1.0 fps	2.8 hrs

Notes:
(1) Maximum headloss predicted by model over 24-hour simulation period.
(2) Travel time verified for 1-week simulation time.
(3) CRWRF Nitrified Product Water pumps controlled by VSP analysis set to 50.0 psi delivery pressure.

7.1.10 CRWRF Brine Line

7.1.10.1 Criteria

Analysis criteria for the CRWRF brine line includes the following general criteria:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps

Analysis criteria specific to the CRWRF Brine Line includes:

- Positive pressure at the Joint Water Pollution Control Plant (JWPCP) standpipe (as detailed in Chapter 6), corresponding to 8.0 psi at the standpipe sampling point.
- Maximum daily flow of 0.9 mgd (regulated by discharge permit, as detailed in Chapter 4)

These criteria were used to evaluate the existing CRWRF Brine Line system under existing demand conditions.

7.1.10.2 Analysis Conditions

The CRWRF brine line consists of:

- 28,190 lineal feet of 14-inch diameter AWWA C905 PVC pipe that runs from the RO concentrate discharge system at CRWRF to Lomita Street, south of the JWPCP.
- 216 lineal feet of 14-inch outer diameter (OD) standard dimension ratio (SDR) 11 HDPE pipe that runs from north of Lomita Boulevard to the LACSD's Outfall Surge Tower.

Under existing conditions, the CRWRF Brine Line conveys RO concentrate ranging on average daily basis from 0.2 mgd to 0.7 mgd. Based on average daily volumes, the rate of RO concentrate generation was determined in Chapter 4 to average 12.5 percent of the total influent to the CRWRF.

This rate of RO concentrate generation across instantaneous flow data observed during the calibration period was slightly higher, averaging 15.9 percent of CRWRF influent flow. The brine line flows represented on average 25.5 percent of the product water flows. Since the average annual flows were believed to represent more typical behavior of the system, this analysis will utilize the average daily volumes of 12.5 percent of total influent to CRWRF. It should be noted that the separate influent flows to the Nitrification and MF/RO portions of the CRWRF were not evaluated for this analysis, due to lack of annual data for the individual treatment processes (only the MF/RO portion of the CRWRF treatment processes contribute to the CRWRF Brine Line). The 12.5 percent RO concentrate generation assumes the ratio of flows to the Nitrification and MF/RO processes remains the same as 2007 conditions.

Table 7.19 CRWRF Brine Line System Flows
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Average Annual	Average Daily	Average Instantaneous
Average Annual Flow(1)	606 afy	0.54 mgd	376 gpm
Maximum Instantaneous Flow(2)	N/A	0.95 mgd	658 gpm
Minimum Day Flow(3)	N/A	0.11 mgd	162 gpm

Notes:
(1) Average annual flow from 2007 historical daily flows.
(2) Maximum flow observed during Dec.8 – Dec. 10 calibration data gathering (5-min sampling interval).
(3) Minimum daily flow observed from 2007 historical daily flows. For conservative planning purposes, it was assumed this was the average flow during a 24-hour period using the same demand pattern as the other scenarios.

As shown in Table 7.19, this analysis was conducted during the average, maximum, and minimum flow conditions of 376 gpm, 658 gpm, and 162 gpm, respectively.

This analysis was conducted utilizing conditions observed during the calibration period. Since limited data was available for this system from the calibration (48 hours of data), the RO train head pattern and flow patterns from the calibration were used for existing system analysis, and as such may not reflect average conditions in the system.

7.1.10.3 Analysis Results

The results of analyses for each of the flow conditions described in Table 7.19 are reported below in Table 7.20.

Table 7.20 CRWRF Brine Line System Analyses
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Total Headloss(1)	Average Unit Headloss (ft/1,000 ft)	Minimum Pressure at Standpipe(2)	Velocity Range	Maximum Travel Time(2) (Water Age)
Average Annual Flow	10.3 ft	0.4 ft/kft	12.0 psi	0.5 – 1.0 fps	12.0 hrs
Maximum Instantaneous Flow	28.9 ft	1.0 ft/kft	6.9 psi	0.9 – 1.8 fps	7.1 hrs
Minimum Day Flow	2.1 ft	0.1 ft/kft	14.0 psi	0.2 – 0.4 fps	23.7 hrs

Notes:
(1) Headloss across entire pipeline length.
(2) Pressure taken at junction CRB-300, which represents the sampling port of the JWPCP standpipe.

As shown in Table 7.20, the model predicts velocities in the pipeline of between 0.5 and 1.0 fps under average annual demand conditions, slowing to as low as 0.2 fps under minimum flow conditions, well below the analysis criteria of 1 to 3 fps. Such low velocities in this pipeline may lead to build-up of materials and is cause for concern. If possible, routine closed circuit television (CCTV) inspection of the pipeline may aid in determining whether deposits or scaling are occurring. The calibrated friction factor of 120 would suggest that deposits or scaling are not a significant problem at the present. Based on the record drawings for the CRWRF brine line, no access ports are currently installed to allow inspection of the brine line. It is recommended that access ports be installed to allow such inspections and clearing, if necessary. For conservative planning purposes, 8 access ports are included in the CIP.

As shown in Table 7.20, pressures are predicted to drop to 6.9 psi under maximum brine flow conditions, below the 8.0 psi required to maintain discharge into the surge tower. If the discharge pressure of the concentrate at the RO units is able to be increased, it may be possible to address this deficiency through revised operational parameters. However, with increased flow it may be necessary to add a pump station to raise the hydraulic head in order to maintain flow into the surge tower. West Basin staff have indicated significant pressure is available to increase the discharge pressure into the brine line.

The current permitted discharge for the CRWRF Brine Line is 0.9 mgd (CRWQCB 2006), equivalent to an average daily flow of 623 gpm. The peak instantaneous flow observed in the CRWRF Brine Line during calibration was 658 gpm (as shown in Table 7.19), but this was sustained for only one 5-minute sampling period, and the average flow for that day (December 9, 2008) was 495 gpm (0.7 mgd). The current discharge permit does not explicitly state an instantaneous flow limit (CRWQCB 2006). The maximum daily flow during the 2007 calendar year was 0.7 mgd, which is well below the permitted discharge flow rate.

Based on the above analyses, it is shown that the existing pipeline is predicted to have sufficient capacity for anticipated flows during existing system conditions, and no additional recommendations are made.

7.2 EXISTING SYSTEM RECOMMENDATIONS SUMMARY

Table 7.21 summarizes the recommendations made as a part of the existing system analysis. The project IDs used in this table correspond to the IDs used in the Capital Improvement Program as presented in Chapter 9 of this report. Items for which further study is recommended are not necessarily included in the CIP, so may not include an ID. Such studies are also summarized in Chapter 9. Moreover, additional recommendations included in the CIP not addressed in the existing system analysis cause the numbering to be non-consecutive.

Table 7.21 Existing System Recommendations Summary
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Recommendation	System or Facility
-	For Title 22 Customer Chester Washington Golf Course, review the existing golf course irrigation schedule with the customer to reduce their daily peak demands to a more reasonable level in order to extend life of lateral.	Title 22 Distribution System
CRWRF-03, EMWRF-04, ELWRF-11	Detailed Study to determine the most feasible method for reducing the magnitude of the observed pressure surges.	Microfiltration process of ELWRF, CRWRF, and EMWRF; affects surges in Title 22 Distribution System
-	Detailed Study to develop an efficient pumping system that allows operation of the pumps within the preferred operating ranges.	Title 22 Distribution System

Table 7.21 Existing System Recommendations Summary
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Recommendation	System or Facility
-	Study to evaluate whether pipe cleaning test program increases chlorine residual in distribution system, possibly including installation of pig launching and retrieval stations.	Title 22 Distribution System
T22-11	Add chlorine booster stations, depending on effectiveness and results of pipe cleaning test program.	Title 22 Distribution System
-	Detailed analysis to evaluate the pump station to resolve energy loss and establish a more efficient method of operation of the Barrier Product Water Pump Station.	West Coast Barrier System
-	Detailed analysis to optimize system controls, to eliminate the need for manual control of VFD.	Hyperion Secondary Effluent Pumping System
HPS-03	Add backup power to site, most likely consisting of a secondary power connection.	Hyperion Secondary Effluent Pumping System
-	Detailed analysis to maintain firm capacity of the pump station.	Chevron Nitrified Water System
CBRN-01	Design and install access ports for inspection and cleaning (8 access ports).	CRWRF Brine Line
-	Evaluate inspection of brine line and establish routine inspection program.	CRWRF Brine Line
EBRN-02	Design and install access ports for inspection and cleaning (12 access ports).	ELWRF Brine Line
-	Evaluate inspection of brine line and establish routine inspection program.	ELWRF Brine Line
EBRN-01	Detailed analysis to mitigate high velocities, possibly installing pinch valves or pipe restrictions (10 pinch valves/reducers).	ELWRF Brine Line

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FUTURE SYSTEM ANALYSIS

This chapter presents the results of the evaluation of the West Basin Municipal Water District's (West Basin) distribution systems and facilities under the projected future demand conditions. This section is divided into five parts. First the future system analysis approach is discussed in Section 8.1, followed by the analysis of the ten different distribution systems in Section 8.2.

The hydraulic models were used to analyze the future distribution systems under future system demand conditions to determine any deficiencies according to the planning and evaluation criteria and conditions outlined in Chapter 5. Thirdly, the future treatment system expansion and upgrade needs were evaluated under the future demand conditions using a customized treatment model called *OPTIMO*□ . The findings of this analysis are presented in Section 8.3, while Section 8.4 presents the alternative supply analyses conducted, that evaluates options to use future supplies from another source. Any deficiencies found are discussed and recommendations are made to mitigate the deficiencies. A summary of recommendations required to meet future demands are listed in Section 8.5.

8.1 FUTURE SYSTEM ANALYSIS APPROACH

To analyze the future system, seven scenarios were created based on different combinations of potential recycled water customer demands. The average demand conditions associated with each scenario are presented in Table 8.1.

The existing recycled water demand of 31,860 acre-feet per year (afy) and the future non-Title 22 growth demand of 6,854 afy demand were included in all seven scenarios. All future direct Title 22 customer demands (those being served directly from the Title 22 distribution system = 6,468 afy) were also included in every scenario to maintain conservative planning. The sum of these demands, 45,182 afy, makes up the average annual demand for Scenario 1.

In addition, eight (8) potential customers were identified separately due to their large demands, which make them critical components in terms of evaluating the existing capabilities of the Hyperion Secondary Effluent Pump Station (HSEPS) and the Title 22 System, and the needed improvements for serving the future demands. These eight customers were ranked based on the likelihood of being served with recycled water in the future. This likelihood ranges from 90 percent to 10 percent. The customers with the highest likelihood were added first incrementally. Scenario 2 adds bp Carson Refinery (Amoco) industrial RO demand of 5,980 afy to the Scenario 1 demands (total average demand of 51,162 afy), while Scenario 3 adds the LADWP Harbor nitrified water demand of 9,300 afy to the Scenario 1 demands (total average demand of 54,482 afy).

Table 8.1 Future System Analysis Scenarios
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Name	ID[1]	Average Annual Demand (afy[2])	Likelihood	Scenario 1 (afy)	Scenario 2 (afy)	Scenario 3 (afy)	Scenario 4 (afy)	Scenario 5 (afy)	Scenario 6 (afy)	Scenario 7 (afy)
Direct Title 22 Customers[3]	-	6,468	-	6,468	6,468	6,468	6,468	6,468	6,468	6,468
bp Carson Refinery (Amoco[4]) – Industrial RO	P5	5,980	90%		5,980		5,980	5,980	5,980	5,980
LADWP Harbor – Nitrified	P6A	9,300	90%			9,300	9,300	9,300	9,300	9,300
bp Carson Refinery (Watson Cogeneration[4]) – Nitrified	P8	7,111	90%					7,111	7,111	7,111
Dominguez Gap Barrier	P9A	2,000	30%						2,000	2,000
LADWP Harbor (Expansion) – Nitrified	P6B	5,700	10%						5,700	5,700
Dominguez Gap Barrier (Expansion)	P9B	1,500	30%						1,500	1,500
LADWP Westside	P100	4,000	30%							4,000
Kenneth Hahn State Park	P117	1,500	30%							1,500
Total Scenario Growth				6,468	12,448	15,768	21,748	28,859	38,059	43,559
Existing Demand (includes CNF, EMWRF, and CRWRF)				31,860	31,860	31,860	31,860	31,860	31,860	31,860
Non-Title 22 Growth (includes West Coast Barrier, LPBF, HPBF)				6,854	6,854	6,854	6,854	6,854	6,854	6,854
Total Projected Delivery (afy[2])				**45,182**	**51,162**	**54,482**	**60,462**	**67,573**	**76,773**	**82,273**

Notes:
(1) Detailed customer information can be found in Customer Database, listed by ID, in Appendix C.
(2) afy = acre-feet per year
(3) Includes demands for Title 22 customers, CNF as well as Customer P12A, Rhodia, which is planned to be served Nitrified water directly from CRWRF.
(4) Demands for the bp Carson Refinery include expansion of existing service as well as the new demands for Amoco and the Watson Cogeneration. The P5 demand will be treated to Industrial RO Ultra quality on site at bp; the concentrate from this treatment process will be delivered to the bp Nitrified Water System to satisfy a portion of the demand required by P8.

Scenario 4 includes both the bp Carson Refinery (Amoco) and the LADWP Harbor demands (total average demand of 60,462 afy). Scenario 5 adds the bp Carson Refinery (Watson Cogeneration) nitrified water demand of 7,111 afy, resulting in a total average demand of 67,573 afy, which includes all customers with a likelihood of 90 percent. The less likely customers were included in Scenarios 6 and 7.

Water for the bp Carson Refinery and Dominguez Gap would most likely be treated at or somewhere in the vicinity of Carson Regional Water Recycling Facility (CRWRF). The increase in demand for these treatment processes would require additional Title 22 water, which would impact the operation of the existing Title 22 distribution system. A significant supply to these customers would possibly necessitate major pipeline and pump station upgrade projects. The likelihood of service for these customers is based on the following considerations:

- The customer demands that are part of the CRWRF expansion, which is currently in feasibility study, are assumed to have a likelihood of 90 percent. These are the bp Carson Refinery Nitrified Water expansion (P8), the LADWP Harbor Nitrified Water Project (P6A), and the bp Carson Refinery Industrial RO expansion (P5).
- The Dominguez Gap Barrier (P9A) was listed in the customer database as having a relatively low likelihood of 30 percent, because this customer is already being served from LADWP's Terminal Island Plant in combination with blending imported water from Metropolitan Water District of Southern California (MWDSC). In addition, the Dominguez Gap Barrier could potentially be served from a future Los Angeles County Sanitation District (LACSD) plant.
- The expansion of the LADWP Harbor Nitrified Water Project (P6B) was listed in the customer database as having a low likelihood of 10 percent, based on West Basin staff knowledge.
- The expansion of the Dominguez Gap Barrier (P9B) is listed as 30 percent likelihood, similar to the likelihood of the first phase of the Dominguez Gap Barrier. This demand assumes that West Basin would serve the expansion of the LADWP Harbor Nitrified Water Project, which would reduce groundwater pumping in the area.
- The LADWP Westside (P100) demand is not considered likely, since the City of Los Angeles Recycled Water Master Plan (CH:CDM 2006) recommended LADWP prioritize recycled water systems in the San Fernando and Harbor portions before recycled water deliveries to the Central City and Westside. This study estimates higher construction cost in the Westside due to the longer distance to anchor customers, such as the UCLA campus and the Getty Museum (approximately 12 miles from the end of the Inglewood lateral). As such, this demand was only included in Scenario 7.

- The Kenneth Hahn State Park (P117) demand will only occur if the LADWP Westside demand is implemented because it will utilize the same distribution pipes. It is therefore only included in Scenario 7.

Some significant factors in determining the feasibility of serving customers in each of the scenarios mentioned above include:

- The capacity of the existing 60-inch diameter Hyperion Secondary Effluent Force Main is exceeded between Scenarios 5 and 6. Detailed recommendations to accommodate the additional flow in Scenarios 6 and 7 are discussed in the future system analysis for the Hyperion Secondary Effluent Pumping System (Section 8.2.3).
- The pressures along the existing 42-inch diameter Title 22 transmission main in the Carson area and at CRWRF cannot be maintained when demands are increased to the level of Scenario 4. Detailed recommendations to accommodate the additional flow in Scenarios 4 through 7 are discussed in the future system analysis for the Title 22 Distribution System (Section 8.2.1).

Based on discussions with West Basin staff and the on-going financial plan project, it was decided to use Scenario 5 to phase the facilities for year 2020 to reach a demand of nearly 70,000 afy, while Scenario 7 was used to identify the system improvements that would be required to serve the ultimate demand of nearly 82,300 afy.

Alternative sources of supply may reduce the size of some of the required upgrades and improvements, reduce capital costs, and increase overall system reliability. These alternative sources of supply are discussed in detail in Section 8.4.1.

8.2 HYDRAULIC DISTRIBUTION SYSTEM ANALYSES

8.2.1 Title-22 Distribution System

8.2.1.1 Criteria

The general analysis criteria used to evaluate the future Title 22 Distribution System include the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length.
- Velocities of 1 to 3 feet per second (fps) under normal operations, with maximum velocities of 7 fps and minimum velocities of 1 fps.
- Minimum pressure of 65 pounds per square inch (psi) at the connection to the customer meter.
- Surge pressures within 10 percent of the operating pressures.
- Minimum chlorine residual of 2.5 mg/L.

Analysis criteria specific to the Title 22 Distribution System include:

- Ability to deliver the peak hour demand for the selected scenario with the largest pump out of service.

8.2.1.2 Analysis Conditions

The future Title 22 distribution system includes most of the potential customers shown in Table 3.4, including the future demands anticipated at the Chevron Nitrification Facility (CNF), ExxonMobil Water Recycling Facility (EMWRF), and CRWRF. There were eight potential customers with large demands identified as critical components in terms of evaluating the existing capabilities of the Title 22 System and the needed improvements for serving the anticipated future demands. The details of these eight large potential customers are presented in Table 8.2.

The demands for the first six customers listed in Table 8.2 will be served from the CRWRF. Title 22 water will be conveyed from ELWRF to CRWRF for further treatment, and the resulting product water will be pumped to the various customers. The bp Carson Refinery requested additional Industrial RO and Nitrified water. LADWP Harbor will require nitrified water. Dominguez Gap Barrier will require a quality of water proper for injection into the groundwater barrier. The City of Los Angeles' Westside demand will be served through existing recycled water pipes that convey water north from ELWRF.

Seven demand scenarios were evaluated as part of this CIMP project, considering the most likely combination of future demands. A summary of these seven scenarios is shown in Table 8.3. Scenario 5 includes the direct Title 22 customers and the three most likely (90 percent likelihood) future large customers to come on-line by 2012.

For analysis, Scenario 5 and Scenario 7 are further broken down into two separate scenarios. The first scenario (5A and 7A) assumes that all source water is provided from the City of Los Angeles' Hyperion Wastewater Treatment Plant (HWWTP). The second scenario (5B and 7B) assumes that a secondary source of water is available at LACSD's Joint Water Pollution Control Plant (JWPCP) in Carson. Under Scenarios 5B and 7B, future demands for the bp Carson Refinery and Dominguez Gap Barrier will be provided by water produced from secondary effluent retrieved at LACSD's JWPCP.

Table 8.2 Customers with Large Future Demands
Capital Implementation Master Plan
West Basin Municipal Water District

	Customer Name	Customer ID	WBMWD Facility to Serve Water to Customer	Year	% Likely to be Served	Seasonal Peaking Factor	Average Annual Future Demand (afy)	Average Annual Future Demand (mgd)	Maximum Month Future Demand(1) (mgd)
1	bp Carson Refinery (Amoco) – Industrial RO	P5	CRWRF	2012	90%	1.3	5,980	5.3	6.9
2	LADWP Harbor	P6A-1 & P6A-2	CRWRF	2012	90%	1.4	9,300	8.3	11.6
3	bp Carson Refinery (Watson Cogeneration) – Nitrified	P8	CRWRF	2012	90%	1.3	7,111	6.3	8.3
4	Dominguez Gap Barrier	P9A	CRWRF	2025	30%	1.0	2,000	1.8	1.8
5	LADWP Harbor	P6B	CRWRF	2030	10%	1.4	5,700	5.1	7.1
6	Dominguez Gap Barrier	P9B	CRWRF	2030	30%	1.0	1,500	1.3	1.3
7	LA City Westside	P100	ELWRF	2030	30%	2.5	4,000	3.6	8.9
8	Kenneth Hahn State Park	P117	ELWRF	2030	30%	2.5	1,500	1.3	3.3

Notes:
(1) Maximum Month Future Demand is Average Day Future Demand multiplied by Seasonal Peaking Factor (then converted from afy to mgd).

Table 8.3 Title 22 Distribution System Future Demand Scenarios
Capital Implementation Master Plan
West Basin Municipal Water District

Scenario	Description	Total Existing Average Demand (afy)	Total Future Average Demand Added (afy)(1)	Total Future Average Demand (afy)	Total Future Average Supply(2) (afy)
1	Existing Title 22 system demands + Future direct Title 22 demands	16,581	6,469	23,050	23,900
2	Existing Title 22 system demands + Future direct Title 22 demands + bp Carson Refinery (P5)	16,581	12,449	29,030	30,935
3	Existing Title 22 system demands + Future direct Title 22 demands + LADWP Harbor (P6A-1 & P6A-2)	16,581	15,769	32,350	33,200
4	Existing Title 22 system demands + Future direct Title 22 demands + bp Carson Refinery (P5) + LADWP Harbor (P6A-1 & P6A-2)	16,581	21,749	38,330	40,235
5	Existing Title 22 system demands + Future direct Title 22 demands + bp Carson Refinery (P5 & P8) + LADWP Harbor (P6A-1 & P6A-2)	16,581	28,860	45,441	47,346
6	Existing Title 22 system demands + Future direct Title 22 demands + bp Carson Refinery (P5 & P8) + LADWP Harbor (P6A-1 & P6A-2 & P6B) + Dominguez Gap Barrier (P9A & P9B)	16,581	38,060	54,641	56,546
7	Existing Title 22 system demands + Future direct Title 22 demands + bp Carson Refinery (P5 & P8) + LADWP Harbor (P6A-1 & P6A-2 & P6B) + Dominguez Gap Barrier (P9A & P9B) + LA City Westside (P100) + Kenneth Hahn State Park (P117)	16,581	43,560	60,141	62,046

Notes:
The additional water requirement is included in the hydraulic model for analysis.
(1) Total Future Average Demand is equivalent to Total Scenario Growth on Table 8.1. Additional water required for recovery at EMWRF is 356 afy and at CRWRF is 494 afy.
(2) Recovery at EMWRF and CRWRF is estimated at 85%. The supply estimates include the additional water required at EMWRF and CRWRF to produce the Industrial RO and Industrial RO Ultra water. Water loss at the CNF is assumed to be minimal and a 100% recovery ratio is assumed.

8.2.1.3 Analysis Results

8.2.1.3.1 Distribution System

West Basin identified the need for three new booster pump stations in previous studies. These are the Dyehouse Lateral Pump Station, the Palos Verdes Pump Station (Lateral 6B), and the Anza Avenue Lateral Pump Station. A fourth pump station, referred to as the Inglewood/LA Westside Pump Station in this Master Plan, is necessary for Scenario 7A and 7B, when the City of Los Angeles Westside and Kenneth Hahn State Park demands are added to the system. The Inglewood/LA Westside Pump Station will also be needed to boost pressures in the Inglewood area.

The model was used to confirm the previously determined pump station capacities. The pump station details as planned are listed in Table 8.4.

Table 8.4 Title 22 Future Booster Pump Stations
Capital Implementation Master Plan
West Basin Municipal Water District

Pump Station Name	Location	Total Capacity (gpm)	Total Firm Capacity (gpm)	Minimum Pump Recommendations(2)
Dyehouse Lateral Pump Station	Victoria Street west of Central Avenue, City of Carson	750	500	3 pumps at 250 gpm each
Palos Verdes Pump Station	Torrance Municipal Airport, City of Torrance	4,000	3,000	4 pumps at 1,000 gpm each
Anza Avenue Lateral Pump Station	Del Amo Boulevard west of Victor Street, City of Torrance	1,650	1,100	3 pumps at 550 gpm each
Inglewood / LA Westside Pump Station (1)	Doty Avenue at 106th Street, City of Inglewood	34,000	25,500	4 pumps at 8,500 gpm each

Notes:
1) Inglewood / LA Westside Pump Station for Scenario 7A and 7B only. Pump Station is necessary when LA Westside demands (4000 AFY) and Kenneth Hahn State Park demand (1500 AFY) are added to the system.
2) Individual pumps may need to have higher capacities to reach the total firm capacity desired.

If the discharge pressure at the Title 22 Pump Station located at ELWRF is increased to approximately 105 psi, the existing system is able to provide the future peak hour demands to most of the customers with adequate pressures. The model indicates a few areas, generally located at higher elevations where the static head is decreased and/or the distribution system piping is small, and therefore the maximum month demand peak hour pressures are less than the established criteria of 65 psi. Many of these areas still have pressures above 30 psi during the maximum month peak hour and it is therefore not recommended to take any action to increase the pressures further.

R□□□□□□ □□□□□ □□□ W□□□T□□□□□□□ A□□□

When future demands listed in Table 3.4 (Potential Customers) are added to the existing system, system pressures drop significantly in the area of Redondo Beach and West Torrance along Anita Street, Flagler Lane, and Prospect Avenue. There is a highpoint in the system located in the vicinity of the Anita Street and Flagler Lane intersection (Node WB3-180: elevation ~185’). This area is also located just upstream of the proposed Anza Avenue Pump Station (Node WB3-270: elevation ~105’). Per the hydraulic model, this high point and the location of the inlet to the Anza Avenue Pump Station become critical points in terms of pressure.

It is currently planned that Phase II of the Anza Lateral will only serve two of the customers that were originally anticipated. These two customers are Calle Mayor Middle School (ADD = 5 afy) and South Torrance High School (ADD = 25 afy). A total of 86 afy of demand from other customers along Phase II of the Anza Lateral has been eliminated from the demands listed in Table 3.4. Under these conditions, the maximum month peak hour pressure at the highpoint (Node WB3-180) ranges from 8 psi for Scenario 7A to 32 psi for Scenario 1. Therefore, the existing system in the Redondo Beach and west Torrance Area is sufficient.

If all customers listed in Table 3.4 were to be realized along Phase II of the Anza Lateral, additional improvements such as parallel piping in the system would be necessary to accommodate the increased demand of 116 afy versus the currently planned 30 afy.

D□□□□□□□ L□□□□□P□□ □ S□□□□□ I□□□□□□ CRWR□

Other critical points in the system include the location of the inlet to the proposed Dyehouse Lateral Pump Station (Node IIIA-220: elevation ~128’) and CRWRF (Node 42SS-200: elevation ~27’). The maximum month peak hour pressures calculated for each scenario at these critical points are summarized in Table 8.5.

Without further improvement to the distribution system between ELWRF and CRWRF, the hydraulic model indicates sufficient pressures in the system during the maximum month peak hour to accommodate Scenario 1, 2, 3, and 5B. To provide sufficient peak hour pressures for the remaining scenarios, additional system improvements will be necessary.

Table 8.5 Pressures at Dyehouse PS and CRWRF Capital Implementation Master Plan West Basin Municipal Water District		
Scenario	**Pressure at Dyehouse PS(1) (psi)**	**Pressure at CRWRF(2) (psi)**
1	62	105
2	33	73
3	34	74
4	Negative	30
5A	Negative	Negative
5B	34	74
6	Negative	Negative
7A	Negative	Negative
7B	8	46

Notes:
Title 22 Pump Station discharge pressure set at 105 psi for all scenarios.
1) Model node IIIA-220 (elevation 128 ft msl)
2) Model node 42SS-300 (elevation 27 ft msl)

G□□□□□□□C□□□□□□□□□ S□□□□ T□□□□□□□ A□□□□

Maximum month peak hour pressures in the southeast portion of the Title 22 distribution system drop significantly (below 30 psi) in the City of Gardena, the City of Carson and the south portion of the City of Torrance for Scenarios 5A and 7A. The 42-inch diameter pipeline between ELWRF and CRWRF would need to be paralleled to accommodate the demands required for these scenarios. Alternately, a booster pump station can be added to provide the needed pressures during the high demand periods.

C□□□□□□□W□□□□□□□□□ G□□□C□□□□□

The maximum month peak hour pressure at Chester Washington Golf Course drops below 10 psi for Scenario 7A and 7B using a diurnal pattern that has a peaking factor of 3.0 over an 8 hour period. This pattern was used based on the assumption that West Basin would work with the customer to adjust the irrigation schedule at the golf course. It is possible that the pressures in this area will need to be boosted if Scenario 7A or 7B is implemented. The existing lateral pipe size may also need to be increased if the pressures are determined to be too low after adjusting the irrigation schedule. Currently, there is a 6-inch diameter lateral feeding the golf course from the main line in 120th Street.

The location of the low pressure areas can be seen on Figure 8.1.

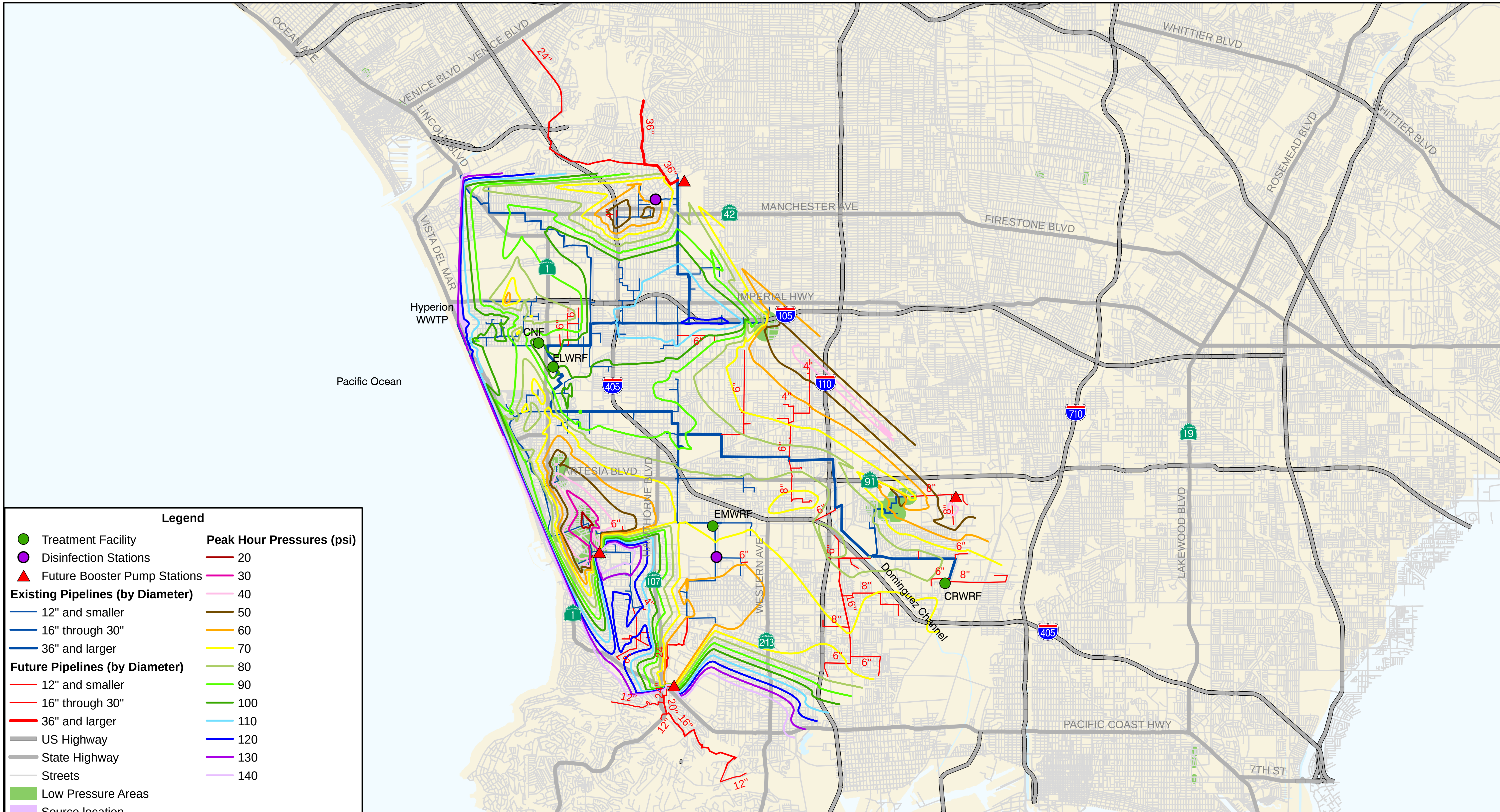

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Figure 8.1
Title 22 Distribution System -
Pressures Under MDD Conditions

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

8.2.1.3.2 Title 22 Pump Station

The firm capacity of the Title 22 pump station is estimated at 47,500 gallons per minute (gpm). The hydraulic model resulted in the following maximum month, peak hour demands for the entire Title 22 System:

- Scenario 1: 42,127 gpm
- Scenario 2: 49,217 gpm
- Scenario 3: 50,199 gpm
- Scenario 4: 57,289 gpm
- Scenario 5A: 65,198 gpm
- Scenario 5B: 50,199 gpm
- Scenario 6: 75,250 gpm
- Scenario 7A: 94,990 gpm
- Scenario 7B: 77,000 gpm

Scenario 5B will require an 8,000 horsepower pump station, including one standby pump. For Scenario 7B, the total connected horsepower will be 12,000.

The improvements to this pump station should be developed through a detailed preliminary design study considering the scenario selected, and the phased development of the demands.

The existing pump station includes pumps on the two tanks, and the discharge pipe of the pumps on Tank 2 connects to the upstream end of the discharge header of the pumps on Tank 1. The entire pumping system would have to be taken out of service in case of an outage of the discharge header of the Tank 1 pumps. Additionally, the entire flow is measured through a 30-inch diameter magnetic flow meter. The discharge piping and flow measurement for the two sets of pumps should be separated so that each set of pumps can be run without the discharge header of the other.

8.2.1.3.3 Conclusions and Recommendations

It is recommended that the pressure at the Title 22 Pump Station be increased to 105 psi to accommodate the future demands. West Basin must work with irrigation customers to ensure that the watering schedules are altered to be more consistent so that high peaks are not experienced in the system. An eight hour watering schedule from 9 pm to 5 am is recommended. This would limit the daily peaking factors to about 3.0 for all irrigation customers.

A detailed study of the final capacity, number of pumps, phased completion, and operation of the Title 22 Pump Station should be conducted to develop the final improvements. For budgeting in this Master Plan, four 800 hp VFD operated pumps are added, replacing the existing smaller pumps for Scenario 5B. For Scenario 7B, five new pumps of 800 hp are added at the proposed 5 mg Title 22 storage tank.

The aforementioned improvements would allow West Basin to implement all the estimated demands for Scenario 3 or Scenario 5B. Scenario 5B requires that a secondary source of water is available at LACSD's JWPCP in Carson, to provide future demands to the bp Carson Refinery and Dominguez Gap Barrier.

To provide sufficient peak hour pressures for the remaining Scenarios 4, 5A, 6, 7A, or 7B, additional improvements will be necessary. These may include parallel piping and/or additional booster pump stations.

It is also recommended that backup water be provided from the Los Angeles County Department of Public Works' potable water pipeline on El Segundo Boulevard to the Title 22 system tanks through an airgap.

8.2.1.3.4 System Hydraulic Transients (Surge)

Implementing one of the alternatives recommended for the existing system is expected to significantly reduce the surge pressures in the Title 22 System. This could be further enhanced by reducing the individual customer peak water usage such as at the Chester Washington Golf Course and Columbia Park.

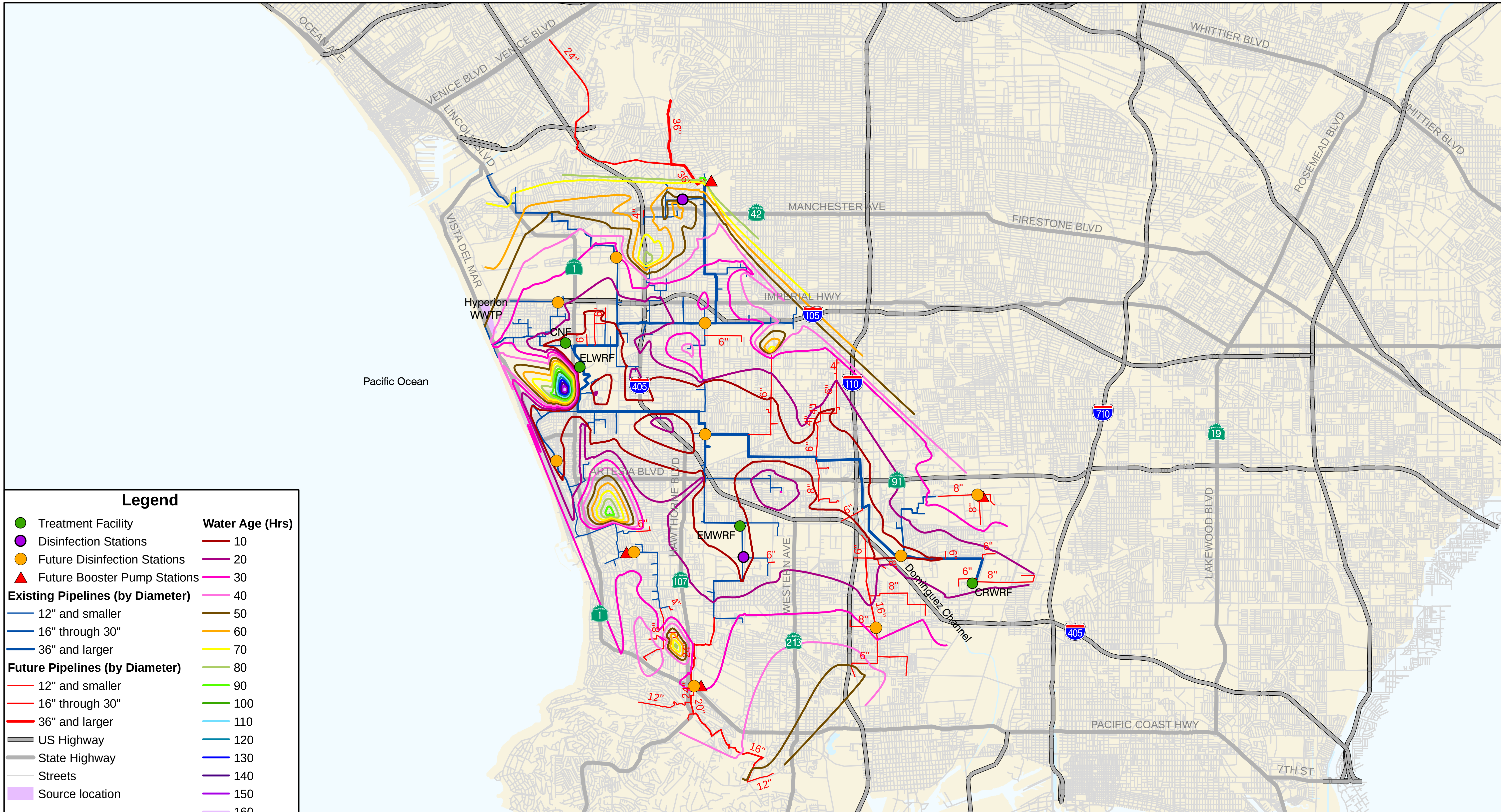
A surge analysis of the proposed system(s) with the upgraded pump station should be conducted following the implementation of the improvements recommended at the CRWRF and EMWRF.

8.2.1.3.5 Operation of the Title 22 Pump Station

The future pump station should utilize variable speed pumps with similar total dynamic heads, so that the operation can be automated. A detailed study of the existing and future water demand patterns should be conducted in selecting the pumps, considering the phased increases in demand.

8.2.1.3.6 Water Quality

Figure 8.2 shows the water age during average demand conditions for Scenario 5B. The results of the recommended improvements for the existing system, such as pipe cleaning and chlorine booster facilities, should be used to formulate the water quality improvement projects for the future system.



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West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Figure 8.2
Title 22 Distribution System -
Water Age Under ADD Conditions

8.2.2 West Coast Barrier Water System

8.2.2.1 Criteria

The general analysis criteria used to evaluate the future West Coast Barrier Water System includes the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length.
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps.

Analysis criteria specific to the West Coast Barrier Water System includes:

- Adequate pressure at the Blend Station, approximately 78 psi.
- Firm pumping capacity to deliver the maximum daily flow of 15.2 million gallons per day (mgd).
- Ability to deliver potable MWD water from the Barrier Blend Station to the RO units when the Phase III Microfiltration units are out of service.

8.2.2.2 Analysis Conditions

The West Coast Barrier System was analyzed with the future maximum day demand of 15.2 mgd, and the largest capacity pump (No. 3) out of service.

8.2.2.3 Analysis Results

An additional 1,750 gpm of pump station capacity is required. Based on discussions with West Basin staff, there is also sufficient space at the pump station for an additional pump. For this CIMP study, one 3,500-gpm pump is planned to replace one of the 1,750 gpm pumps.

The results from the analysis are presented in Table 8.6. The total head loss in the 30-inch diameter barrier water transmission main is 9.4 feet. Average unit headloss is 2.0 feet per 1,000 feet, which is lower than the maximum value of 10 feet per 1,000 feet. The maximum velocity is 4.8 fps also well within the criteria. Water age based on 4,720 feet of pipe is 16.5 minutes. The 20-inch diameter section of the discharge pipe, which also includes the magnetic flowmeter and the flow control valve, would experience velocities of 10.8 fps. This section should be replaced with 27-inch diameter pipe and flowmeter with a resulting maximum velocity of 4.8 fps.

Table 8.6 West Coast Barrier Water System Analyses Capital Implementation Master Plan West Basin Municipal Water District				
Condition	**Total Headloss**	**Average Unit Headloss**	**Velocity**	**Maximum Travel Time(2) (Water Age)**
Future Design Demand(1)	9.4 ft	2.0 ft/kft	4.8 fps	16.5 min

Notes:
(1) 15.2 mgd future maximum flow. Seasonal peaking of the West Coast Barrier system is estimated at 1.0.
(2) Based on length of 4,720 ft.

Analysis conducted with the existing Pumps 1, 2, 4, and 5 and the flow control valve removed indicates that the system can deliver approximately 11,700 gpm (16.9 mgd), which is higher than the future maximum day demand of 15.2 mgd. The existing pump station can deliver 15.2 mgd with pump 1, 2, 4, and 5 operating at approximately 97 percent of full speed and without the flow control valve. Alternately, West Basin can operate the flow control valve to maintain the desired flow. The loss through the flow control valve will be much lower than existing losses with the lower demands.

When the Phase V expansion is implemented, the operation of the pump station should be verified through field-testing to determine the actual firm capacity. The improvement to the pump station should be selected based on the results of the field-testing.

For the Master Plan budgeting, it is assumed that West Basin will install variable frequency drives on the four (4) existing pumps and one (1) replacement pump.

8.2.3 Hyperion Secondary Effluent Pumping System

8.2.3.1 Criteria

Analysis criteria for the Hyperion Secondary Effluent Pumping System (HSEPS) includes the following general criteria:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length
- Maximum velocity of less than 10 fps in the force main
- Surge pressures that will not cause pumps to operate outside of their preferred operating range
- Provide a minimum pressure of 20 psi at ELWRF.

Analysis criteria specific to the HSEPS includes:

- Sufficient firm capacity to deliver the future maximum day demand for the selected scenarios. Availability of secondary effluent at the HWWTP will need to be verified in selecting the scenario.
- Secondary source of power to operate the pump station in case of primary power source outage
- Parallel force main to provide supply to ELWRF in case of an outage of the existing force main

8.2.3.2 Analysis Conditions

The HSEPS was evaluated for the Title 22 System Scenarios 1 through 7, as listed in Table 8.7. It is noted that the secondary effluent (SE) flows at the HWWTP dropped to as low as 138 mgd during January 2007, and may be below the maximum day demands for Scenarios 6 and 7. Therefore, planning of future scenarios will need to consider the diurnal variation of secondary effluent, and availability of storage at HWWTP. All analyses were conducted to provide a minimum pressure of 20 psi at ELWRF.

8.2.3.3 Analysis Results

The results from the analyses performed for each of the maximum month and maximum day demand conditions described in Table 8.7 are presented in Table 8.8.

Table 8.7 Hyperion Secondary Effluent Pumping System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Average Annual Demand (mgd)	Maximum Month Demand (mgd)	Maximum Day Demand (mgd)
T22 Scenario 1	44.3	60.2	85.0
T22 Scenario 2	50.5	68.6	95.2
T22 Scenario 3	52.6	71.8	96.6
T22 Scenario 4	58.9	80.3	106.8
T22 Scenario 5A	65.2	88.8	118.2
T22 Scenario 5B	52.7	71.8	96.6
T22 Scenario 6	73.4	103.3	132.7
T22 Scenario 7A	78.3	112.6	161.1
T22 Scenario 7B	62.7	91.3	135.2

Note: All demands include 85% recovery for RO water

Table 8.8 Hyperion Secondary Effluent Pumping System Analyses
Capital Implementation Master Plan
West Basin Municipal Water District

Demand Condition	Total Headloss	Average Unit Headloss	Pressure at Pump Discharge	Pipe Velocity	Maximum Travel Time(2) (Water Age)
Scenario 1 Max Month	15.7 ft	0.9 ft/kft	63.5 psi	4.8 fps	0.91 hr
Scenario 2 Max Month	20.0 ft	1.1 ft/kft	67.1 psi	5.4 fps	0.79 hr
Scenario 3 Max Month	21.7 ft	1.2 ft/kft	67.5 psi	5.7 fps	0.76 hr
Scenario 4 Max Month	26.7 ft	1.5 ft/kft	70.2 psi	6.3 fps	0.68 hr
Scenario 5A Max Month	32.2 ft	1.8 ft/kft	73.2 psi	7.0 fps	0.61 hr
Scenario 5B Max Month	21.7 ft	1.2 ft/kft	67.5 psi	5.7 fps	0.76 hr
Scenario 6 Max Month (60”)	27.2 ft	1.5 ft/kft	68.7 psi	6.4 fps	0.67 hr
6 - Proposed Parallel 36”	27.3 ft	1.6 ft/kft	68.7 psi	4.9 fps	0.88 hr
Scenario 7A Max Month	21.4 ft	1.2 ft/kft	65.9 psi	5.6 fps	0.76 hr
7A – Proposed Parallel 48”	21.4 ft	1.3 ft/kft	65.9 psi	5.1 fps	0.84 hr
Scenario 7B Max Month	21.7 ft	1.2 ft/kft	66.6 psi	5.7 fps	0.76 hr
7B – Proposed Parallel 36”	21.7 ft	1.3 ft/kft	66.6 psi	4.3 fps	1.00 hr
Scenario 1 Max Day	29.6 ft	1.7 ft/kft	69.89 psi	6.7 fps	0.57 hr
Scenario 2 Max Day	36.6 ft	2.1 ft/kft	73.51 psi	7.5 fps	0.52 hr
Scenario 3 Max Day	37.6 ft	2.1 ft/kft	72.7 psi	7.6 fps	0.52 hr
Scenario 4 Max Day	45.9 ft	2.5 ft/kft	77.2 psi	8.4 fps	0.47 hr
Scenario 5A Max Day	54.7 ft	3.1 ft/kft	79.8 psi	9.3 fps	0.43 hr
Scenario 5B Max Day	37.6 ft	2.1 ft/kft	72.7 psi	7.6 fps	0.52 hr
Scenario 6 Max Day (60”)	43.3 ft	2.4 ft/kft	75.9 psi	8.2 fps	0.52 hr
6 – Proposed Parallel 36”	43.4 ft	2.6 ft/kft	75.9 psi	6.2 fps	0.69 hr
Scenario 7A Max Day (60”)	41.5 ft	2.3 ft/kft	74.4 psi	8.0 fps	0.53 hr
7A – Proposed Parallel 48”	41.6 ft	2.5 ft/kft	74.4 psi	7.3 fps	0.59 hr
Scenario 7B Max Day (60”)	44.8 ft	2.5 ft/kft	76.3 psi	8.4 fps	0.51 hr
7B – Proposed Parallel 36”	44.9 ft	2.7 ft/kft	76.3 psi	6.3 fps	0.68 hr

Notes:
(1) Maximum headloss predicted by model over a 24-hour simulation period.
(2) Based on total length of 15,445 ft.

8.2.3.3.1 Scenario 1 through Scenario 5B.

The force main velocities vary from 4.8 fps for Scenario 1 to 9.3 fps for Scenario 5A. The average unit headloss ranged from 0.9 to 3.1 feet per 1,000 feet, which is well within the criterion. For Scenario 1 through Scenario 5B, the velocities exceed the established criteria maximum velocity of 7 fps with the maximum day demands. However, since these are the maximum day demand velocities, and they are acceptable for the short operating duration.

8.2.3.3.2 Scenario 6 through Scenario 7.

For Scenario 6 through Scenario 7B, a parallel pipe is proposed to keep the velocities below 10 feet per second. For Scenario 6 and Scenario 7B, the parallel pipe is sized at 36 inches in diameter minimum. For Scenario 7A, the parallel pipe is sized at 48 inches in diameter minimum. Under these conditions, the velocities in the existing 60-inch diameter force main vary from 5.6 fps to 8.4 fps. The velocities in the proposed pipe vary from 4.3 fps to 7.3 fps. The average unit headloss ranged from 1.2 to 2.7 feet per 1,000 feet, which is well within the criterion.

The Hyperion Secondary Effluent Pump Station capacity will need to be increased depending on the future scenario selected. For this CIMP, the capital improvement program includes a 7,000 horsepower pump station with a firm capacity of 97 mgd for Scenario 5B, and a 10,000 horsepower pump station with a firm capacity of 135 mgd for Scenario 7B. A detailed design study is beyond the scope of this work. However, it is recommended that the existing pump station be reviewed and modified for incorporation into the future facility. The pump station should have similar or same pumps operated by variable frequency drives to meet the varying demands.

Based on the phasing of demands presented in Chapter 3, the capacity of the HSEPS would need to be upgraded within the next few years. As shown in Figure 4.10, the estimated capacity required in year 2011 is approximately 74 mgd due to the implementation of the ELWRF Phase V expansion project, which is intended to serve large customers such as Chevron Expansion (P10A, P10B, and P10C) and the West Coast Barrier (P10). By calendar year 2012, the pump station would need to have a capacity of approximately 90 mgd when the LADWP Harbor Area (P6A-1 and P6A-2) is expected to be served with recycled water. It should be noted that the required capacities would need to be higher if the bp Refinery demands (P5 and P8) also would need to be supplied from the HWWTP. The capacities presented above and on Figure 4.10 assume that Scenario 5B /7B would be implemented, which would serve the bp Refinery expansion from the JWPCP. Additional details on supply from the JWPCP are included in Section 8.3.

Due to the presence of numerous utilities along some of the existing force main alignment in El Segundo Blvd., it may be difficult to construct a parallel pipeline to reduce the velocities and provide redundancy in case of a failure of the force main. A detailed study of the system, including the pump station should be conducted to formulate the most feasible means of meeting the criteria and providing supply reliability. Supply reliability can be provided for the existing and future Title 22 System customers (28.5 mgd), excluding the refineries and the future City of Los Angeles demands.

A surge study of the existing system, as well as the future system with a total flow of 121 mgd was conducted by Flow Science in 2004. This study did not identify high pressures due to total power failure at the pump station, but recommended a surge tank to eliminate potential release of odors from the air release and vacuum relief valves on the force main. The surge study should be updated for the design conditions selected. The recommended future pump station cost estimate includes a surge tank.

8.2.4 Chevron Low Pressure Boiler Feed System

8.2.4.1 Criteria

Analysis criteria for the Chevron Low Pressure Boiler Feed (LPBF) System includes the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length.
- Velocities of 1 to 3 fps under normal operations, with maximum velocity of 7 fps. A minimum velocity of 1 fps is desired under average annual demands.
- Firm capacity at LPBF Pump Station should meet maximum day demands.

8.2.4.2 Analysis Conditions

Under future demand conditions, the Chevron LPBF System is estimated to supply 1.17 mgd of Industrial RO water to the Chevron El Segundo Refinery and 0.56 mgd to the El Segundo Power Plant on an average annual basis. The total average annual demand will be 1.73 mgd. Maximum month and maximum day demands for the Chevron El Segundo Refinery are calculated using peaking factors of 1.5 and 1.7, respectively. Table 8.9 details the future flow conditions for the Chevron LPBF System.

Figure 8.3 shows the anticipated alignment of the future portions of the Chevron LPBF System.

in association with

Figure 8.3
Chevron Low Pressure Boiler Feed Expansion

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Table 8.9 Chevron Low Pressure Boiler Feed System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Average Annual	Average Daily	Average Instantaneous
Average Demand(1)	1,935 afy	1.73 mgd	1,200 gpm
Maximum Month Demand(2)	N/A	2.31 mgd	1,604 gpm
Maximum Day Demand(3)	N/A	2.94 mgd	2,039 gpm

Notes:
(1). Existing (1,100 afy) + Potential Chevron Expansion, P10C (210 afy) + Potential El Segundo Power Plant, P13A (325 afy) + Potential El Segundo Power Plant, P13B (300 afy). (All demands on this system are present in all Scenarios).
(2) Based on a maximum month peaking factor of 1.5 for the average annual Chevron demand per Table 3.7. The average annual El Segundo Power Plant demand was not peaked.
(3) Based on a maximum month peaking factor of 1.7 for the average annual Chevron demand per Table 3.7. The average annual El Segundo Power Plant demand was not peaked.

8.2.4.3 Analysis Results

Table 8.10 presents model results for the analysis conducted under each of the demand conditions listed in Table 8.9.

As shown in Table 8.10, the average unit headloss per 1,000 feet of pipe ranged from 4.7 feet to 9.8 feet, which is below the analysis criteria of 10 feet per 1,000 feet. However, the maximum velocity in the proposed 10-inch diameter pipeline segment ranged from 4.9 fps (with average day demands) to 7.2 fps (with maximum day demands), which is higher than the 3 fps criterion under normal conditions and the 7 fps maximum velocity criterion. It should be noted that the size of this 10-inch diameter pipeline to the El Segundo power plant was based on the preliminary design report (HDR, 2008) and that it is recommended to increase this pipeline size to 12-inch diameter to meet the criteria under the most recent demand projections. This preliminary design report also uses a C factor of 150, which is considered high for planning purposes. The headloss presented in Table 8.9, is based on a C factor of 120. The existing 12-inch diameter pipeline to the Chevron El Segundo Refinery meets all evaluation criteria.

The discharge pressure at the pump station is dependent on the delivery pressure required by the customers. For the analyses of the future system, a minimum pressure of 20 psi is required at the Chevron LPBF Tank based upon its height and operating levels. The resulting pressures at the El Segundo Power Plant facility range from 42 psi to 47 psi. If higher pressures are required, they can be provided by increasing the pump speed, using larger pumps, or constructing a larger delivery pipe to El Segundo Power Plant. The pressures on the discharge side of the LPBF Pump Station range from 46 psi to 68 psi under the future conditions based upon a delivery pressure of 20 psi at Chevron LPBF Tank.

Table 8.10 Chevron Low Pressure Boiler Feed System Future Analyses
Capital Implementation Master Plan
West Basin Municipal Water District

Demand Condition[1]	Total Headloss[2]	Average Unit Headloss	Pressure at Chevron Delivery Point	Pressure at El Segundo Power Delivery Point	Velocity in 10" Pipe to El Segundo Power Plant[3]	Velocity in 12" Pipe between ELWRF and Chevron[3]	Max Travel Time[4] (Water Age)
Average Day Demand	52.9 ft	4.7 ft/kft	20.7 psi[5]	42.1 psi[5]	4.9 fps	3.4 fps	0.8 hrs
Maximum Month Demand	86.5 ft	8.1 ft/kft	20.1 psi[6]	45.0 psi[6]	6.5 fps	4.5 fps	0.6 hrs
Maximum Day Demand	103.6 ft	9.8 ft/kft	20.4 psi[7]	47.1 psi[7]	7.2 fps	5.0 fps	0.6 hrs

Notes:
(1) Chevron LPBF demands included in all Scenarios.
(2) Maximum headloss predicted by model over 24-hour simulation period.
(3) Pipeline alignments shown on Figure 2.7.
(4) Based on total length of 10,400 ft.
(5) One future 1,250 gpm, 196 ft TDH pump running at 88 percent speed to maintain 46 psi discharge pressure at pump station.
(6) Two future 1,250 gpm, 196 ft TDH pumps running at 82. percent speed maintain 60.1 psi discharge pressure at the pump station.
(7) Two future 1,250 gpm, 196 ft TDH pumps running at 88 percent speed maintain 67.8 psi discharge pressure at pump station.

With one pump on stand-by, the firm capacity of the existing pump station is currently 1,200 gpm or 1.73 mgd. Under future maximum day demand conditions, the pump station will be required to deliver 2,039 gpm. It is recommended to replace the three existing pumps with three new pumps with approximate rated conditions of 1,250 gpm, 196 feet TDH at 1,770 revolutions per minute (RPM). The pumps will be driven by 100 HP variable frequency drives.

The CIP includes a pressure reducing valve at the entrance to the Chevron El Segundo Refinery that may be necessary when LPBF water service is extended to the El Segundo Power Plant in the future and the pressure has to be increased at the LPBF Pump Station.

8.2.5 Chevron High Pressure Boiler Feed System

8.2.5.1 Criteria

Analysis criteria for the Chevron High Pressure Boiler Feed (HPBF) System includes the following general criteria:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps. A minimum velocity of 1 fps is desired under average annual demands.
- Firm capacity at HPBF pump station should meet the maximum day demands

These criteria were used to evaluate the Chevron HPBF System under future demand conditions.

8.2.5.2 Analysis Conditions

Under future demand conditions, the Chevron HPBF System will supply 2.87 mgd of Industrial RO Ultra water to the Chevron El Segundo Refinery on an average annual basis. Table 8.11 details the future flow conditions for the Chevron HPBF System.

8.2.5.3 Analysis Results

Table 8.12 presents the model results for the analysis conducted under each of the demand conditions listed in Table 8.11.

As shown in Table 8.12, the average unit headloss per 1,000 feet of pipe ranged from 5.6 feet to 7.8 feet, which is below the analysis criteria of 10 feet per 1,000 feet. The maximum velocity ranged from 5.7 fps to 6.8 fps. The velocities are higher than 3 fps under average day conditions. To stay within the evaluation criteria the 12-inch diameter pipeline segment would need to be upgraded to a 16-inch diameter pipeline. However, because the velocities are not excessive, no recommendations are made in the CIP presented in Chapter 9.

Table 8.11 Chevron High Pressure Boiler Feed System Future Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Demand Condition(1)	Average Annual	Average Daily	Average Instantaneous
Average Demand(2)	3,219 afy	2.87 mgd	1,996 gpm
Maximum Month Demand(3)	N/A	3.16 mgd	2,195 gpm
Maximum Day Demand(4)	N/A	3.45 mgd	2,395 gpm

Notes:
(1) Chevron HPBF demands included in all Scenarios.
(2) Existing (2,800 afy) + Potential Chevron Expansion, P10B (419 afy).
(3) Based on a seasonal peaking factor of 1.1 applied to the average annual demand per Table 3.7.
(4) Based on a peaking factor of 1.2 applied to the average annual demand per Table 3.7.

The pump station discharge pressure depends on the required delivery point pressure. Based upon the height and operating level of the Chevron HPBF Tank, a delivery pressure of 20 psi was used in the analyses for all conditions. The discharge pressure of the HPBF Pump Station is expected to vary between 39 psi and 45 psi with the future flows.

With one pump on stand-by, the firm capacity of the existing pump station is 1,800 gpm or 2.59 mgd. This is the design capacity of one pump. Under the future maximum day demands, the pump station will be required to pump up to 2,395 gpm. It is recommended to replace the two existing pumps with new pumps that have approximate rated conditions of 2,500 gpm, 119 feet TDH at 1180 RPM. The pumps will be driven by 100 HP variable frequency drives.

8.2.6 Chevron Nitrified Water System

8.2.6.1 Criteria

Analysis criteria for the Chevron Nitrified Water System includes the following:

- Maximum loss of 10 feet for each 1,000 feet of pipe length
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps. A minimum velocity of 1 fps is desired under average annual demands.

Table 8.12 Chevron High Pressure Boiler Feed System Future Analyses
Capital Implementation Master Plan
West Basin Municipal Water District

Demand Condition(1)	Total Headloss(2)	Average Unit Headloss	Pressure at Delivery Point	Velocity in 12" Pipe(3)	Velocity in 16" Pipe(3)	Maximum Travel Time(4) (Water Age)
Average Day Demand	36.0 ft	5.6 ft/kft	21.4 psi(5)	5.7 fps	3.2 fps	0.8 hrs
Maximum Month Demand	42.9 ft	6.7 ft/kft	20.7 psi(6)	6.2 fps	3.5 fps	0.8 hrs
Maximum Day Demand	50.4 ft	7.8 ft/kft	21.4 psi(7)	6.8 fps	3.8 fps	0.7 hrs

Notes:
(1) Chevron HPBF demands included in all Scenarios.
(2) Maximum headloss predicted by model over 24-hour simulation period.
(3) Pipeline alignments shown on Figure 2.7.
(4) Based on total length of 10,020 ft.
(5) One future 2,500 gpm pump running at 81 percent speed to maintain 40 psi discharge pressure at pump station.
(6) One future 2,500 gpm running at 85 percent speed to maintain 43 psi discharge pressure at pump station.
(7) One future 2,500 gpm running at 90 percent speed to maintain 47 psi discharge pressure at pump station.

Analysis criteria specific to the Chevron Nitrified Water System includes:

- Adequate pressure at the Chevron Refinery for the cooling towers, approximately 80 psi
- Ability to deliver potable water from the City of El Segundo's water system when Title 22 water is not available
- Sufficient firm pumping capacity to deliver the future maximum day demands.

8.2.6.2 Analysis Conditions

Table 8.13, shows the future average annual demands, maximum month demands, and maximum day demands for the Chevron Nitrified Water System.

Table 8.13 Chevron Nitrified Water System Future Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Demand Condition(1)	Average Annual	Average Daily	Average Instantaneous
Average Demand(2)	5,206 afy	4.65 mgd	3,228 gpm
Maximum Month Demand(3)	N/A	6.51 mgd	4,519 gpm
Maximum Day Demand(4)	N/A	7.44 mgd	5,164 gpm

Notes:
(1) Chevron Nitrified Water System demands included in all Scenarios.
(2) Existing (3,500 afy) + Potential Chevron Nitrified Water System Expansion, P10B (1,706 afy)
(3) Based on a peaking factor of 1.4 applied to the average annual demand per Table 3.7.
(4) Based on a peaking factor of 1.6 applied to the average annual demand per Table 3.7.

During the model calibration period in October 2008, the existing Nitrified Water Pump Station operated between 77 psi discharge pressure with a total demand of about 3,750 gpm, and 101 psi with a total demand of 2,600 gpm. For the future system analysis, it is assumed that nitrified water will be provided at a pressure of 85 psi at the Chevron El Segundo Refinery delivery point with the largest demand. This is 5 psi higher than the existing minimum delivery pressure and may be necessary for the increased demands.

8.2.6.3 Analysis Results

The results of analyses for each of the demand conditions described in Table 8.13 are presented in Table 8.14.

Table 8.14 Chevron Nitrified Water System Future Analyses Capital Implementation Master Plan West Basin Municipal Water District					
Demand Condition[1]	**Total Head loss**	**Average Unit Headloss**	**Average Pressure at Delivery Point**	**Velocity**	**Maximum Travel Time[2] (Water Age)**
Average Day Demand	4.8 ft	1.7 ft/kft	75.1 psi	4.1 fps	15.0 min
Maximum Month Demand	9.1 ft	3.1 ft/kft	72.5 psi	5.7 fps	10.8 min
Maximum Day Demand	11.6 ft	4.0 ft/kft	71.9 psi	6.6 fps	9.3 min

Note:

(1) Chevron Nitrified Water System demands included in all Scenarios.

With one pump on stand-by, the firm capacity of the pump station is currently 3,600 gpm or 5.18 mgd. Under future maximum day demands, the pump station will be required to pump up to 5,164 gpm.

The existing pump station has a 30-inch diameter suction header, three 16-inch diameter suction pipes, and three 12-inch diameter discharge pipes. Suction and discharge stubs and a pump barrel were constructed for a fourth pump. To make the maximum use out of the existing facilities, the future facility should have three identical duty, and one standby pump, all operated by variable frequency drives. The existing 3-stage Ingersoll Rand 15M pump can be used as part of the future pump station. The upgraded pump station will convey the projected maximum day demand to the Chevron El Segundo Refinery at a pressure of 85 psi.

The existing 20-inch diameter pipe will be able to convey the maximum flow with velocities under 7 fps. Therefore, no pipeline improvement recommendations are made.

The Title 22 System pressure at the entrance to the CNF is approximately 85 psi. This will increase to near 100 psi when the future Title 22 system pump station discharge pressure is increased to 105 psi. The inlet pressure is reduced through either a pressure regulating valve or a hydro generator facility, which can recover some of the cost of pumping. It is reported that the hydro generator facility has not operated in a long time due to problems experienced when it was constructed. Based on the future average annual flow of 3,228 gpm, recovery of 60 psi (140 ft) of head, 70 percent efficiency, and $0.10 per kWH it may be possible to recover approximately $50,000 annually from its operation. The feasibility of placing the hydro generator in service should be investigated. For conservative planning purposes, the cost of a replacement hydro generator has been added to the CIP.

8.2.7 CRWRF Brine Line

8.2.7.1 Criteria

The general analysis criteria used to evaluate the CRWRF brine line includes the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps. A minimum velocity of 1 fps is desired under average annual flows.

Analysis criteria specific to the CRWRF Brine Line includes:

- Positive pressure at the Joint Water Pollution Control Plant (JWPCP) standpipe (as detailed in Chapter 6), corresponding to a pressure of 8.0 psi at the standpipe sampling point.
- Maximum daily flow of 0.9 mgd (regulated by discharge permit, as detailed in Chapter 4)

8.2.7.2 Analysis Conditions

The anticipated flows through the CRWRF Brine Line depend on the Industrial RO flows being treated at CRWRF, and consequently vary significantly between scenarios. The projected flows for each Scenario are shown in Table 8.15. From the existing system analysis for the CRWRF Brine Line system, the RO concentrate flows average about 25 percent of the Industrial RO product water flows (an 80 percent recovery ratio). The flows presented in Table 8.15 assume this same 80 percent recovery ratio.

As seen in Table 8.15, the anticipated flows for the brine line do not change from existing conditions under Scenarios 1, 3, 5B, and 7B. For these scenarios, concentrate for any additional Industrial RO treatment is not conveyed via the CRWRF Brine Line, so the same conditions as the existing system analysis would apply.

Under Scenarios 2, 4, and 5A, the Industrial RO demands associated with expansion of the bp Carson Refinery are supplied by treatment processes at the CRWRF, increasing average annual flows through the CRWRF Brine Line system to 2,195 afy, or 2.0 mgd.

Flows are most significant under Scenarios 6 and 7A, the total Industrial RO treatment capacity at CRWRF would be increased further as a result of service to the Dominguez Gap Barrier. Under Scenarios 6 and 7A, the total flow through the CRWRF Brine Line system would be 3,070 afy, or 2.7 mgd.

Table 8.15	CRWRF Industrial RO Flows Capital Implementation Master Plan West Basin Municipal Water District			
Scenario	**Industrial RO Customers**	**Customer IDs**	**Industrial RO Demands (afy)**	**CRWRF Brine Line Flows[1] (afy)**
1	Existing (bp)	E3	2,800	700
2	Existing, bp Expansion	E3, P5	8,780	2,195
3	Existing	E3	2,800	700
4	Existing, bp Expansion	E3, P5	8,780	2,195
5A	Existing, bp Expansion	E3, P5	8,780	2,195
5B[1]	Existing	E3	2,800	700
6	Existing, bp Expansion, Dominguez Gap	E3, P5, P9A, P9B	12,280	3,070
7A	Existing, bp Expansion, Dominguez Gap	E3, P5, P9A, P9B	12,280	3,070
7B[1]	Existing	E3	2,800	700

Notes:
(1) The anticipated CRWRF Brine Line flows assume an 80% recovery ratio in Industrial RO and Barrier water treatment processes.
(2) For Scenarios 5B and 7B, future demands for the bp Carson Refinery and Dominguez Gap are served by a new treatment plant near the JWPCP rather than CRWRF.

Peaking factors for the future system are assumed to be consistent flow observed during calibration data gathering—a minimum peaking factor of 0.7 and a maximum peaking factor of 1.5.

Table 8.16 presents flow conditions under which analysis was conducted for average, maximum, and minimum flow conditions for both Scenario 5A and Scenario 7A. For Scenarios 5B and 7B, no additional treatment would take place at CRWRF, so future conditions would be the same as existing conditions.

This analysis was conducted assuming the RO train head pattern and flow patterns from the existing system analysis would apply to the future system. Adding additional RO trains may result in different pressure and flow patterns in the future system, which may affect hydraulic behavior of the brine line.

Table 8.16 CRWRF Brine Line System Flows
Capital Implementation Master Plan
West Basin Municipal Water District

Flow Condition	Average Annual	Average Daily	Average Instantaneous
Scenario 5A			
Average Annual Flow(1)	2,195 afy	2.0 mgd	1,389 gpm
Maximum Flow(2)	N/A	2.9 mgd	2,014 gpm
Minimum Flow(3)	N/A	1.4 mgd	972 gpm
Scenario 7A			
Average Annual Flow(1)	3,070 afy	2.7 mgd	1,875 gpm
Maximum Flow(2)	N/A	4.1 mgd	2,847 gpm
Minimum Flow(3)	N/A	1.9 mgd	1,319 gpm

Notes:
(1) Average projected flow assuming an 80% recovery ratio.
(2) Maximum flow based on ratio of maximum flow observed during calibration data gathering (5-min sampling interval) to average flow over same period (1.5).
(3) Minimum flow based on ratio of minimum non-zero flow observed during calibration data gathering (5-min sampling interval) to average flow over same period (0.7).

8.2.7.3 Analysis Results

The results of analyses for each of the loading conditions described in Table 8.16 are presented in Table 8.17.

As shown in Table 8.17, negative pressures are predicted at the sampling port in the standpipe under all future demand conditions. A pump station may be avoided by raising the discharge pressure at the RO trains. According to West Basin staff, the pressure at the RO Trains can be raised by adjusting the concentrate control valve. Initial analysis showed that it was necessary to raise the pressure at the RO trains from 40 psi to 80 psi to reach the 8.0 psi pressure criteria at the sampling port under peak flow conditions for Scenario 5A. As the current pressure range of the concentrate control valve is not evaluated in this analysis, it is recommended that the feasibility of such an operational change be further investigated.

Table 8.17 CRWRF Brine Line System Analyses Capital Implementation Master Plan West Basin Municipal Water District				
Flow Condition	**Pipeline Headloss(1)**	**Minimum Pressure at Standpipe(2)**	**Velocity Range**	**Maximum Travel Time(3) (Water Age)**
<u>Scenario 5A</u>				
Average Annual Flow	4.1 ft/kft	-29.8 psi	2.0 – 3.7 fps	3.5 hrs
Maximum Flow	8.1 ft/kft	-79.2 psi	2.8 – 5.4 fps	2.5 hrs
Minimum Flow	2.1 ft/kft	-5.6 psi	1.4 – 2.6 fps	4.9 hrs
<u>Scenario 7A</u>				
Average Annual Flow	7.1 ft/kft	-66.9 psi	2.7 – 5.0 fps	2.7 hrs
Maximum Flow	15.4 ft/kft	-168.5 psi	4.0 – 7.6 fps	2.0 hrs
Minimum Flow	3.7 ft/kft	-25.2 psi	1.9 – 3.5 fps	3.7 hrs

Notes:
(1) Maximum headloss predicted by model over 24-hour simulation period.
(2) Pressure taken at junction CRB-300, which represents the sampling port of the JWPCP standpipe.
ft/kft = feet per 1,000 feet

The results from the hydraulic model presented in Table 8.17 indicate velocities in the pipeline between 1.4 and 5.4 fps under flow conditions for Scenario 5A. The increased flow in the future system is above the minimum velocity criteria of 1 fps. For Scenario 7A, velocity and headloss criteria are exceeded at peak flow conditions. Additional pipeline capacity would be required, through a parallel pipeline, pipeline replacement, or alternate brine disposal solution.

As the future system loading conditions are greater than 623 gpm (0.9 mgd), the brine line flow is predicted to exceed the current permitted discharge of 0.9 mgd (CRWQCB 2006) for Scenarios 2, 4, 5A, 6, and 7A. A revised brine line permit accommodating the increased flows will need to be applied for. West Basin staff has indicated that the application process for a new permit is predicted to take about two years. Exact discharge levels will need to be determined based on the total anticipated capacity of the RO processes at CRWRF, which will depend on whether the bp Carson Refinery and Dominguez Gap Barrier are served by the CRWRF facility.

Since Scenarios 5B and 7B require no additional treatment capacity at CRWRF, future flows through the CRWRF brine line would be consistent with existing conditions and consequently no recommendations are made to accommodate future system expansions. Depending on the location of the NTP, discharge of the RO concentrate from the NTP would most likely require a separate brine line. Further analysis would need to be conducted during the preliminary design phase of the NTP.

8.2.8 ELWRF Brine Line

8.2.8.1 Criteria

Analysis criteria for the ELWRF Brine Line consists the following:

- Maximum pipeline velocity of 7 fps

8.2.8.2 Analysis Conditions

The future brine flows at the ELWRF were estimated based upon 15 percent of the flow to the West Coast Barrier System, and Chevron LPBF and HPBF Systems. The projected flows are summarized in Table 8.18.

Table 8.18 ELWRF Brine System Future Flows
Capital Implementation Master Plan
West Basin Municipal Water District

Flow Condition(1)	Average Annual	Maximum Month	Maximum Day
West Coast Barrier	15.2 mgd	15.2 mgd	15.2 mgd
Low Pressure Boiler Feed	1.73 mgd	2.31 mgd	2.94 mgd
High Pressure Boiler Feed	2.87 mgd	3.16 mgd	3.45 mgd
Total Product Water	19.8 mgd	20.67 mgd	21.59 mgd
Total Title 22 Water	23.3 mgd	24.32 mgd	25.40 mgd
Brine Flow	3.5 mgd	3.65 mgd	3.81 mgd

Note:
(1) West Coast Barrier and Chevron LPBF and HPBF flows included in all Scenarios.

The brine system was evaluated based on these flows. It should be noted that it is not anticipated that expansion of the Title 22 system would increase the flows to the ELWRF brine line. Because of this, flows to the ELWRF brine line remain the same in all scenarios listed in Table 8.1.

8.1.8.3 Analysis Results

The analysis results with full pipe flow conditions and Hazen Williams C factor of 100 are provided in Table 8.19. As shown in Table 8.19, the unit headloss per 1,000 feet would be less than the analysis criteria of 10 feet per 1,000 feet.

Table 8.19 ELWRF Brine System Future Analysis Capital Implementation Master Plan West Basin Municipal Water District				
Flow Condition(1)	**Total Headloss**	**Average Unit Headloss**	**Velocity(2)**	**Maximum Travel Time(3) (Water Age)**
Average Day Demand	107.6 ft	6.0 ft/kft	4.2 fps	73.0 min
Maximum Month Demand	116.5 ft	6.5 ft/kft	4.4 fps	69.9 min
Maximum Day Demand	126.3 ft	7.1 ft/kft	4.6 fps	66.9 min

Notes:
(1) West Coast Barrier and Chevron LPBF and HPBF flows included in all Scenarios.
(2) Based on full pipe flow with Hazen Williams C=100.
(3) Full pipe flow velocity in 18-inch diameter DR 13.5 HDPE pipe.
(4) Based on total pipeline length of 17,880 feet and full pipe flow velocity.

The velocities within the sections of the pipe under full flow range from 4.1 fps with the average day flows to 4.3 fps with the maximum month flows. These velocities are well below the maximum desired velocity of 7 fps. They are higher than the existing velocities, which are expected to reduce the occurrence of scaling. The travel time varies from 67 minutes to 73 minutes.

The velocities in the sections of the pipe with steep slopes (Station 41+00 to 54+30; 95+00 to 101+70) that follow high points of the alignment may be as high as 21 fps with the maximum day flows and Mannings “n” of 0.009. These velocities would be over 16 fps even with a Manning “n” of 0.013. The free surface flow conditions are expected to occur with the future flows even with full pipe flow Hazen Williams C factors of 100. Full pipe flow conditions should be created by constructing either a series of pinch valves or pipe restrictions at the downstream end. This will also eliminate the high velocities in the steep pipe sections. Since this recommendation is made for the existing system, no recommendation is added to the CIP separately for the future system.

Due to the long-term effect of the relatively low velocity brine flows on the existing system, the periodic pipeline inspection program recommended for the existing system should be continued. Since this recommendation is made for the existing system, no recommendation is added to the CIP separately for the future system.

It is recommended that West Basin include a capital improvement project to design and install inspection ports on the brine line so that its condition can be assessed, and corrective actions can be taken proactively. Additionally, when full pipe flow conditions are established, taps should be provided on the brine line to allow pressure measurements, which would provide the information for determining the roughness of the pipe. The existing pipe is large enough for the future flows, and no new or parallel facility is required for capacity.

8.2.9 bp Reverse Osmosis System

8.2.9.1 Criteria

The general analysis criteria used to evaluate the future bp Carson Refinery (bp) RO system includes the following:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length (ft/kft)
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps. A minimum velocity of 1 fps is desired under average annual flows.
- Capacity should be met with at least one booster pump kept in reserve

No analysis criteria specific to the bp RO system is included. These criteria were used to evaluate the bp RO system under future demand conditions.

8.2.9.2 Analysis Conditions

Under future demand conditions, if supplied by HWWTP (Scenario 5A and 7A), the bp RO system is planned to convey an additional 5,980 afy, or 5.3 mgd, of Industrial RO water beyond the existing 2,800 afy, or 2.5 mgd, demand, bringing the total conveyance of the bp RO system to 8,780 afy, or 7.8 mgd. Of the 8,780 afy of Industrial RO water conveyed by the bp RO system, about 6,765 afy, or 6.0 mgd, is planned to be further treated to Industrial RO Ultra water on the bp site. The concentrate from the second pass RO process, approximately 676 afy, or 0.6 mgd, will supplement expanded Nitrified water demands at bp. Since the concentrate from the second pass RO process is conveyed by the bp RO system, it is included in the demands for the bp RO system although it ultimately satisfies a Nitrified water demand. It is assumed that the additional treatment will not require additional hydraulic head at the delivery point.

Under future conditions, if supplied by JWPCP, the existing system analysis found in Chapter 7, would apply, as the future demands to bp would be supplied by a dedicated pipeline from the JWPCP.

West Basin is currently in the preliminary design phase for expansion of CRWRF to accommodate the additional demand. As a part of the increase in demand and corresponding expansion, an additional pipeline is being designed to convey RO water from the existing delivery point to the south of bp. Since evaluation of hydraulic conditions of the pipeline past the delivery point is outside the scope of this study, it is assumed that the pipeline will not require additional pressure at the point of delivery beyond existing conditions. However, the pipeline alignment to Gate 7 is shown on Figure 8.4.

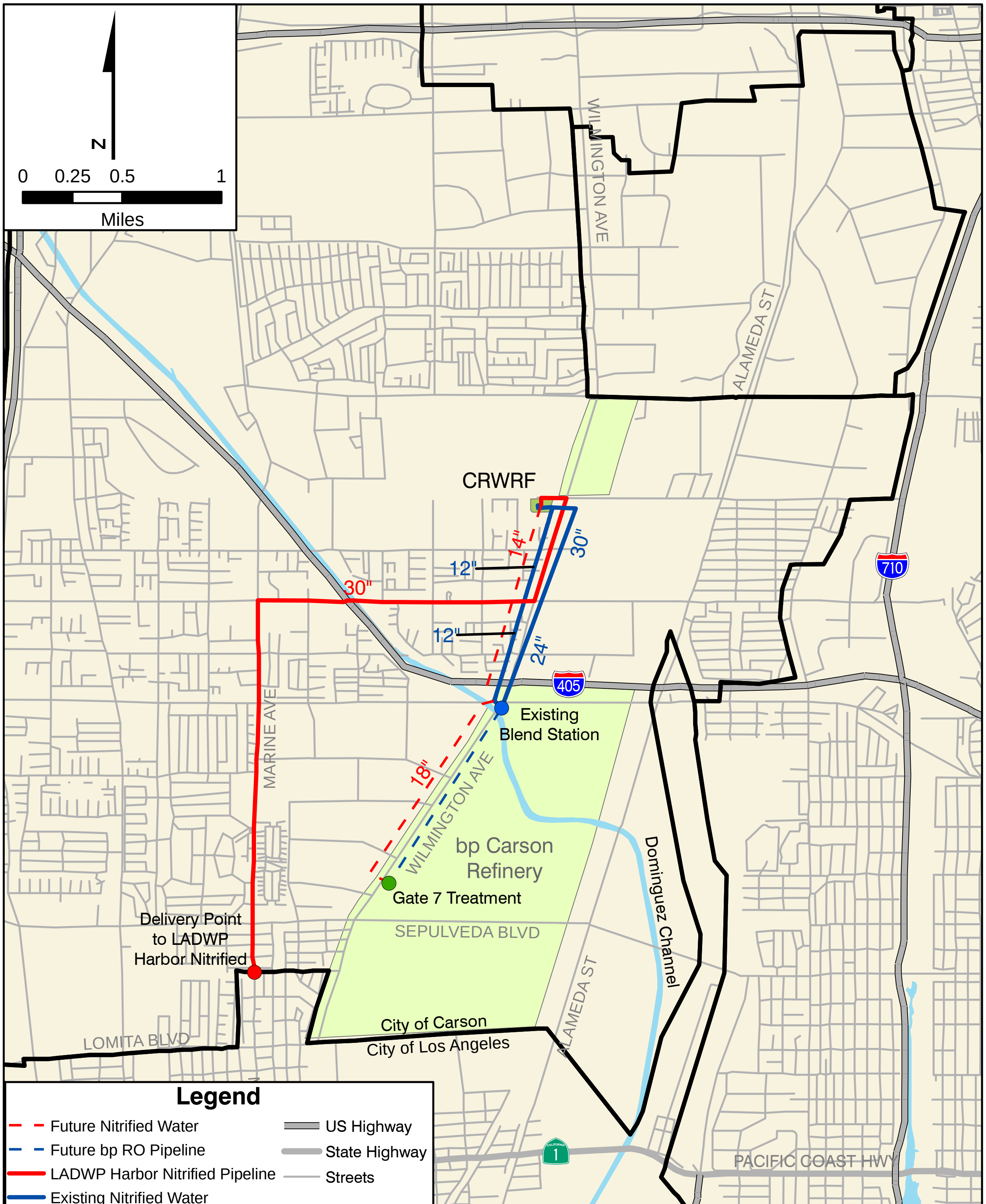

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Figure 8.4
CRWRF Systems

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Based on discussions with West Basin staff, future demands are assumed to have a maximum monthly peaking factor of 1.3. Combined with existing maximum month demand, this equates to a combined maximum month demand of 11.2 mgd, a seasonal peaking factor of 1.4.

Minimum instantaneous demands were assumed to be similar to percentage of average annual demands as that used for the existing system analysis. As detailed in Table 8.20, this analysis was conducted during the average, maximum, and minimum demand conditions of 5,443 gpm, 7,778 gpm, and 3,810 gpm, respectively.

Table 8.20 bp RO System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Demand Condition(1)	Average Annual	Average Daily	Average Instantaneous
Average Annual Demand	8,780 afy	7.8 mgd	5,443 gpm
Maximum Month Demand(1)	N/A	11.2 mgd	7,778 gpm
Minimum Instantaneous Demand(2)	N/A	N/A	3,810 gpm

Notes:
(1) Demands for the bp RO system represent Scenarios .
(2) Based on a seasonal peaking factor of 1.7 to the existing average annual demand and 1.3 to the future average annual demand.
(3) Calculated by applying a minimum peaking factor of 0.7 to future combined demand, taken from the existing system analysis.

8.2.9.3 Analysis Results

Table 8.21 presents model results for the analysis conducted under each of the demand conditions listed in Table 8.20.

As shown in Table 8.21, the pipeline headloss ranged from 1.2 ft/kft to 4.4 ft/kft, below the analysis criteria of 10 ft/kft. The maximum velocity ranged from 3.1 fps to 6.3 fps, below the maximum analysis criteria. Pressure at this site is regulated by the pump station, resulting in the 50-psi pressure maintained under all scenarios. Two of the three pumps were required under each of the scenarios.

With one pump on stand-by, the firm capacity of the existing pump station is 3,500 gpm or 5.0 mgd. This assumes operation of two pumps. Since this firm capacity is less than the future demands, it is recommended to replace the three existing 1,750-gpm pumps with three 4,500-gpm pumps. The modeling results in Table 8.21 reflect this upgrade. The pump motors and electrical systems would need to be upgraded accordingly.

Table 8.21 bp RO System Analysis Capital Implementation Master Plan West Basin Municipal Water District					
Condition	**Total Headloss(1)**	**Average Unit Headloss(1) (ft/1,000 ft)**	**Pressure at Delivery Point**	**Maximum Velocity**	**Maximum Travel Time(2) (Water Age)**
Average Annual Demand	9.4 ft	2.3 ft/kft	50.0 psi(3)	4.4 fps	1.5 hrs
Maximum Month Demand	18.3 ft	4.4 ft/kft	50.0 psi(3)	6.3 fps	1.4 hrs
Minimum Day Demands	4.9 ft	1.2 ft/kft	50.0 psi(3)	3.1 fps	1.8 hrs

Notes:
(1) Maximum headloss predicted by model over 24-hour simulation period.
(2) Travel time verified for 1-week simulation time.
(3) CRWRF RO Product Water pumps controlled by VSP analysis set to 50.0 psi delivery pressure.

Based on the above analyses, it is shown that the existing pipeline is predicted to have sufficient capacity for anticipated future demands during each evaluated future system condition, and no additional recommendations are made for the pipeline. However, since the pipeline reaches the maximum velocity criteria during the MMD demand conditions, if demands exceed 8,540 gpm, the maximum velocity criteria will be exceeded.

8.2.10 bp Nitrified Water System

8.2.10.1 Criteria

The general analysis criteria used to evaluate the bp Carson Refinery (bp) Nitrified Water system includes the following general criteria:

- Maximum headloss of 10 feet for each 1,000 feet of pipe length (ft/kft)
- Velocities of 1 to 3 fps under normal operations, with maximum velocities of 7 fps. A minimum velocity of 1 fps is desired under average annual flows.
- Capacity should be met with at least one booster pump kept in reserve

No analysis criterion specific to the bp Nitrified Water system is included. These criteria were be used to evaluate the bp Nitrified Water system under future demand conditions.

8.2.10.2 Analysis Conditions

Under future demand conditions, if supplied by HWWTP (Scenario 5A and 7A), the bp Nitrified Water system is planned to convey an additional 7,111 afy, or 6.3 mgd, of Nitrified water beyond the existing 600 afy, or 0.5 mgd, demand, bringing the total conveyance of the bp Nitrified Water system to 7,711 afy, or 6.9 mgd. In addition to the 7,711 afy of Nitrified water conveyed by the bp Nitrified Water system, approximately 676 afy, or 0.6 mgd, of concentrate from the second pass RO process will supplement expanded

Nitrified water demands at bp. Since the concentrate from the second pass RO process is conveyed by the bp RO system, it is included in the demands for the bp RO system although it ultimately satisfies a Nitrified water demand.

Under future conditions, if supplied by JWPCP (Scenarios 5B and 7B), the existing system analysis found in Chapter 7, would apply, as the future demands to bp would be supplied by a dedicated pipeline from the JWPCP.

West Basin is currently in the preliminary design phase for expansion of CRWRF to accommodate the additional demand. As a part of the increase in demand and corresponding expansion, a new parallel 14-inch diameter pipeline is being designed to convey Nitrified water from CRWRF to the location of the existing vault and a new 18-inch diameter pipeline is being designed to convey Nitrified water from the the intersection of 223rd Street and Wilmington Avenue to Gate 7 on the south part of the bp property, the approximate location of which is shown on Figure 8.4. Since evaluation of hydraulic conditions of the pipeline past the delivery point is outside the scope of this study, it is assumed that the pipeline will not require additional pressure at the point of delivery beyond existing conditions. However, the pipeline alignment to Gate 7 is shown on Figure 8.4. For redundancy and reliability, a tie-in should be constructed between the proposed 14-inch diameter parallel pipeline and the existing 12-inch diameter pipeline.

An additional expansion of CRWRF to serve nitrified water to customers in the LADWP Harbor is being planned within the preliminary design for expansion of CRWRF. This service would require a new pipeline from the CRWRF to the Los Angeles city boundary. This pipeline is also in preliminary design phase. The alignment of this pipeline is shown on Figure 8.4, as taken from the proposed alignment in the *[illegible] R[illegible] R[illegible] W[illegible] P[illegible] P[illegible]* (LADWP 2008).

Seasonal peaking is assumed to be similar to existing conditions, with a maximum monthly peaking factor of 1.3. Minimum instantaneous demands were obtained from the minimum flows observed during the calibration data gathering period. As detailed in Table 8.22, this analysis was conducted during the average, maximum, and minimum demand conditions of 4,781 gpm, 6,215 gpm, and 3,825 gpm, respectively.

8.2.10.3 <u>Analysis Results</u>

Based on discussions with West Basin staff, preliminary design was considering a 14-inch diameter parallel pipeline. This analysis was conducted with such a pipeline in place.

Initial analysis showed that a 30-inch diameter pipeline would be required to convey flows under the analysis conditions. This analysis is conducted using a 30-inch diameter replacement pipeline. However, paralleling the existing 12-inch diameter pipeline is recommended to maintain service and increase system reliability.

Table 8.22 bp Nitrified Water System Demands
Capital Implementation Master Plan
West Basin Municipal Water District

Demand Type	Average Annual	Average Daily	Average Instantaneous
Average Annual Demand$^{(1)}$	7,711 afy	6.9 mgd	4,781 gpm
Maximum Month Demand$^{(2)}$	N/A	8.9 mgd	6,215 gpm
Minimum Instantaneous Demand$^{(3)}$	N/A	N/A	3,825 gpm

Notes:
(1) Calculated from historical billing records as detailed in Chapter 3.
(2) Based on a seasonal peaking factor of 1.3 to the average annual demand.
(3) By applying a minimum peaking factor of 0.8, based on historical flows.

Table Table 8.22 presents model results for the analysis conducted under each of the demand conditions listed in Table 8.23.

Table 8.23 bp Nitrified Water System Analysis
Capital Implementation Master Plan
West Basin Municipal Water District

Condition	Total Headloss$^{(1)}$	Average Unit Headloss$^{(1)}$ (ft/1,000 ft)	Pressure at Delivery Point	Maximum Velocity	Maximum Travel Time$^{(2)}$ (Water Age)
Average Annual Demand	43 ft	17.1 ft/kft	50.0 psi$^{(3)}$	8.1 fps	0.9 hrs
Maximum Month Demand	69 ft	27.8 ft/kft	50.0 psi$^{(3)}$	10.5 fps	0.8 hrs
Minimum Day Demands	28 ft	11.3 ft/kft	50.0 psi$^{(3)}$	6.5 fps	0.9 hrs

Notes:
(1) Maximum headloss predicted by model over 24-hour simulation period. Headloss in new 14-inch diameter parallel pipeline was slightly higher than in the 12-inch diameter existing pipeline.
(2) Travel time verified for 1-week simulation time.
(3) CRWRF Nitrified Product Water pumps controlled by VSP analysis set to 50.0 psi delivery pressure.

As shown in Table 8.23, the system losses exceeded the analysis criteria of 10 ft/kft under all demand conditions. The maximum velocity ranged from 6.5 fps to 10.5 fps, exceeding the analysis criteria of 7 fps in all but the minimum demand conditions. Based on this analysis, it is recommended that a 20-inch diameter pipeline be used to parallel the existing 12-inch pipeline.

With one pump on stand-by, the firm capacity of the existing pump station is 625 gpm or 0.9 mgd. This assumes operation of one pump. Since this firm capacity is significantly less than the future demands, it is recommended to replace the two existing 625-gpm pumps with four 3,700-gpm pumps. New pump motors and electrical systems would need to be added accordingly.

Based on the above analyses, it is shown that the existing pipeline is predicted to have insufficient capacity for anticipated future demands during the future system conditions. Initial analysis shows that it is recommended to parallel this pipeline with a 20-inch diameter pipeline.

8.3 FUTURE TREATMENT SYSTEMS ANALYSIS

8.3.1 Near-Term Treatment Facility Expansions

As discussed in Chapter 4, West Basin is planning on treatment expansions at several of its facilities within the next five years. Near-term expansion status and plans are discussed in detail for each facility.

8.3.1.1 Edward C. Little Water Recycling Facility

West Basin has completed the feasibility study for the Phase V expansion of ELWRF (HDR, 2008). This expansion is intended to increase the MF and RO capacity of ELWRF to meet additional demands at the Chevron El Segundo Refinery, the West Coast Barrier, and new customers such as the El Segundo Power Plant. The feasibility study planned to add capacity to meet between 2.9 mgd and 8.4 mgd of Barrier and Industrial RO water quality demands, respectively.

As a part of this expansion, the following key projects will be implemented:

- Expansion of Barrier Treatment Processes
- Expansion of Industrial RO Treatment Processes
- Expansion of Industrial RO Ultra Treatment Processes
- Expansion of Barrier Product Water Pump Station
- Expansion of Chevron LPBF Product Water Pump Station
- Expansion of Chevron HPBF Product Water Pump Station
- Pipeline from Chevron LPBF System to El Segundo Power Plant

8.3.1.2 ExxonMobil Water Recycling Facility

Expansion of the EMWRF is not planned within the planning horizon. West Basin did not include additional demands at EMWRF within the customer database. Consequently, only existing system recommendations are made for EMWRF.

8.3.1.3 Carson Regional Water Recycling Facility

As part of the CRWRF Phase II Expansion Project, additional MF, RO, UV, and AOP process upgrades are anticipated to increase the plant capacity from 5 mgd to 12 mgd to meet future maximum day demands under Scenario 5A. The additional MF and RO units are anticipated to produce additional Single-Pass RO product water for the bp Carson Refinery. Under Scenario 5B, the NTP would take the place of these process upgrades.

Under Scenario 7A, future expansions could provide additional barrier water to the Dominguez Gap Barrier, increasing plant capacity to 15 mgd. Currently, the Dominguez Gap Barrier receives highly treated barrier water from the County of Los Angeles' Terminal Island Treatment Facility. As part of this study it is assumed that the supply to the Dominguez Gap Barrier from LADWP would either be replaced or supplemented with water from West Basin treated at the CRWRF only under Scenario 7A and from the NTP under Scenario 6B and 7B.

The Phase II Expansion Project is anticipated to involve expansion of the nitrification treatment process by implementing additional Biofor units to produce more nitrified water for the bp Carson Refinery and City of Los Angeles' recycled water system in the LA Harbor region. Plant capacity is anticipated to increase from 1 mgd to 12 mgd under Scenario 5B and 21 mgd under Scenario 5A.

8.3.1.4 Chevron Nitrification Facility

As part of the CNF Phase II Expansion Project, an additional Biofor unit was recommended to be implemented and facility improvements such as pump station and electrical upgrades are planned for accommodating an additional 0.58 mgd of nitrified water demand. In addition to the facility improvements, it is also planned that the Phase II Expansion Project will include implementation of an emergency backup potable water supply to the nitrification storage tank for reliability.

Since the *P□□□□ □ □□□□□□□□□ S□□□□* (HDR, 2008), Chevron has requested additional nitrified water from West Basin. This additional demand is included in the customer database entry for the nitrified component of Chevron's demands (Customer P10A Table 3.4). It is anticipated that an additional average annual demand of 1,706 afy, or 1.52 mgd, will be required by Chevron in the year 2011, bringing the total demand of nitrified water by Chevron to 5,206 afy, or 4.65 mgd. West Basin staff have indicated that it would be intended that two additional Biofor units be constructed at the CNF and that space is available at the existing site.

8.3.2 Future Treatment System Analysis

A customized system-wide model representing source water, treatment, and simplified recycled water demands was developed for the WBMWD system and applied to support the Capital Implementation Master Plan (CIMP) development. The model, OPTIMO™, is a flow and mass balance model and includes source water quantity and quality, treatment capacities and efficiencies, and recycled demands and water quality criteria. The model was developed for the WBMWD to help identify system capacity constraints, water quality issues, and could be used in the future to identify operational and/or estimate operation and maintenance costs.

Three different models were developed in sequential order to support the CIMP development. Model No. 1 represented the existing WBMWD system with existing demands. This model was calibrated to match current system performance in terms of matching recycled water customer demands and water quality. Model No. 2 represented the existing WBMWD system with future demands. This model was used to determine the treatment flow capacity constraints, and if treatment processes effectively met customer water quality needs. Model No. 3 was developed from Model No. 2 and represented the future WBMWD system required to meet recycled water flow and water quality needs.

Details of model development can be found in the OPTIMO™ Model Development Technical Memorandum, which is included in Appendix G. This section summarizes the model creation methodology, evaluation criteria, and the future system recommendations developed for the WBMWD ultimate system in 2030 (Model No. 3).

8.3.2.1 Model Creation

The influent source water flows and projected water quality from HWWTP and JWPCP were included in the model. Major pump stations (e.g. HSEPS) and pipelines (e.g. the Hyperion Secondary Effluent Force Main) were also included in the model to help identify capacity constraints in the distribution system based on simplified hydraulic calculations.

The four treatment facilities (ELWRF, CNF, CRWRF, and EMWRF) were modeled. Each of the major treatment unit processes at each facility was included in the model for each facility. Four treatment plants are connected together to create an overall system optimization model of the entire West Basin recycled water system.

The major recycled water demands were grouped by water source and quality type, and included in the model as demand nodes. User inputs for these demand nodes include demand flows and water quality requirements. Major discharges of waste to sewers and brine lines were also modeled, incorporating discharge limits and water quality discharge prohibitions, where applicable.

8.3.2.2 Evaluation Criteria

The key evaluation criteria in the model were flow balancing to meet capacity limitations and recycled water demands, and meeting the water quality objectives of recycled water customers. These criteria are described in detail below in Table 8.24.

Table 8.24 Water Quality Restrictions for Recycled Water Customers
West Basin Municipal Water District
Capital Implementation Master Plan

			Demineralized Product Water					Nitrified Product Water			
Constituent	**Units**	**T22**	**WCB**	**CLP**	**CHP**	**BPRO**	**EMRO**	**EMN**	**BPN**	**CNF**	**LAHN**
TSS	mg/L	NA (1)	NA (1)	NA (1)	NA (1)	NA (1)	NA (1)	5	NA (1)	NA (1)	NA (1)
BOD	mg/L	NA (1)	NA (1)	NA (1)	NA (1)	NA (1)	NA (1)	90 (4)	NA (1)	NA (1)	NA (1)
NH_3	mg/L	NA (1)	5 (3)	NA (1)	NA (1)	4	1.9	1.6	0.1	NA (1)	0.1
TDS	mg/L	1000 (2)	500	60	5	35	NA (1)	NA (1)	NA (1)	NA (1)	NA (1)
Alkalinity	mg/L as $CaCO_3$	NA (1)	NA (1)	NA (1)	NA (1)	NA (1)	NA (1)	350	NA (1)	NA (1)	NA (1)
Hardness	mg/L as $CaCO_3$	NA (1)	NA (1)	0.3	0.03	NA (1)	NA (1)	360	NA (1)	NA (1)	NA (1)
Cl	mg/L	NA (1)	250	NA (1)	NA (1)	NA (1)	NA (1)	450	NA (1)	NA (1)	NA (1)
Ca	mg/L	NA (1)	NA (1)	NA (1)	NA (1)	1	NA (1)	80	60	NA (1)	60
Mg	mg/L	NA (1)	NA (1)	NA (1)	NA (1)	1	NA (1)	40	24	NA (1)	24
Conductivity	μmho/cm	NA (1)	NA (1)	NA (1)	NA (1)	NA (1)	50	3000	1000	NA (1)	1000
SiO2	mg/L	NA (1)	NA (1)	1.5	0.1	1	1	35	22	NA (1)	22
TOC	mg/L	NA (1)	0.5	NA (1)	NA (1)	NA (1)	0.7	NA (1)	NA (1)	NA (1)	NA (1)

Notes:
(1) No applicable water quality restriction.
(2) Assumed customer acceptance limit of 1000 mg/L.
(3) Measured as total nitrogen.
(4) As COD, mg/L.
(5) Customer Abbreviations: T22 - Title 22; WCB – West Coast Barrier; CLP – Chevron Low Pressure Boiler Feed, CHP: Chevron High Pressure Boiler Feed, BPRO – bp Reverse Osmosis System, BPN – bp Nitrifed Water System, EMRO – ExxonMobil Reverse Osmosis System, EMN – ExxonMobil Nitrified System, CNF – Chevron Nitrified Water System, LAHN – LADWP Harbor Nitrified System

8.3.2.2.1 Flow Balancing

An optimization routine utilized by the model helps to determine the best flow routing scheme in the WBMWD system with the goal of treating water within capacity constraints while meeting the flow requirements of recycled water customers. The model identified which processes were system capacity constraints. These processes were considered capacity constraints because the available treatment capacity did not allow for sufficient recycled water supplies to meet projected demands. The model also identified the additional required treatment capacity, and whether recycled water flow demands were met. Since storage hydraulic effects were not modeled, supply and demand flows were compared on an average daily basis for this modeling effort.

8.3.2.2.2 Water Quality Objectives

Another criteria of the model are the recycled water customer water quality objectives. Treated product water quality was determined according to the assumed removal rates of treatment processes included in the model based upon simplified mass balance equations. The model compared product water quality to the water quality objectives (See Table 8.24) for each major customer and reported if the water quality was acceptable or not. Influent water quality was modeled on a maximum day basis and customer water quality objectives were modeled on an average day basis to provide a conservative comparison.

8.3.2.3 Future System Recommendations

8.3.2.3.1 System Description

The overall model representation of the future WBMWD system is depicted on Figure 8.5. Each green square represents the treatment facilities, and the purple triangles represent the major recycled water demand nodes served from the respective treatment facilities. The major laterals included in the model are shown as horizontal, purple pipes, and the disposal of wastes to sewer or brine lines are shown as vertical, blue pipes. The tabular data displayed summarizes key model results.

Within each treatment facility (green square), the facility is modeled to the major unit process level. Figure 8.6 shows the model representation of ELWRF. Each of West Basin's other three treatment facilities were modeled to a similar level of detail. The capacities and removal efficiencies of existing unit processes were input to the major unit processes in the facility.

Figure 8.5 OPTIMO™ Model Representation of the WBMWD System in 2030.

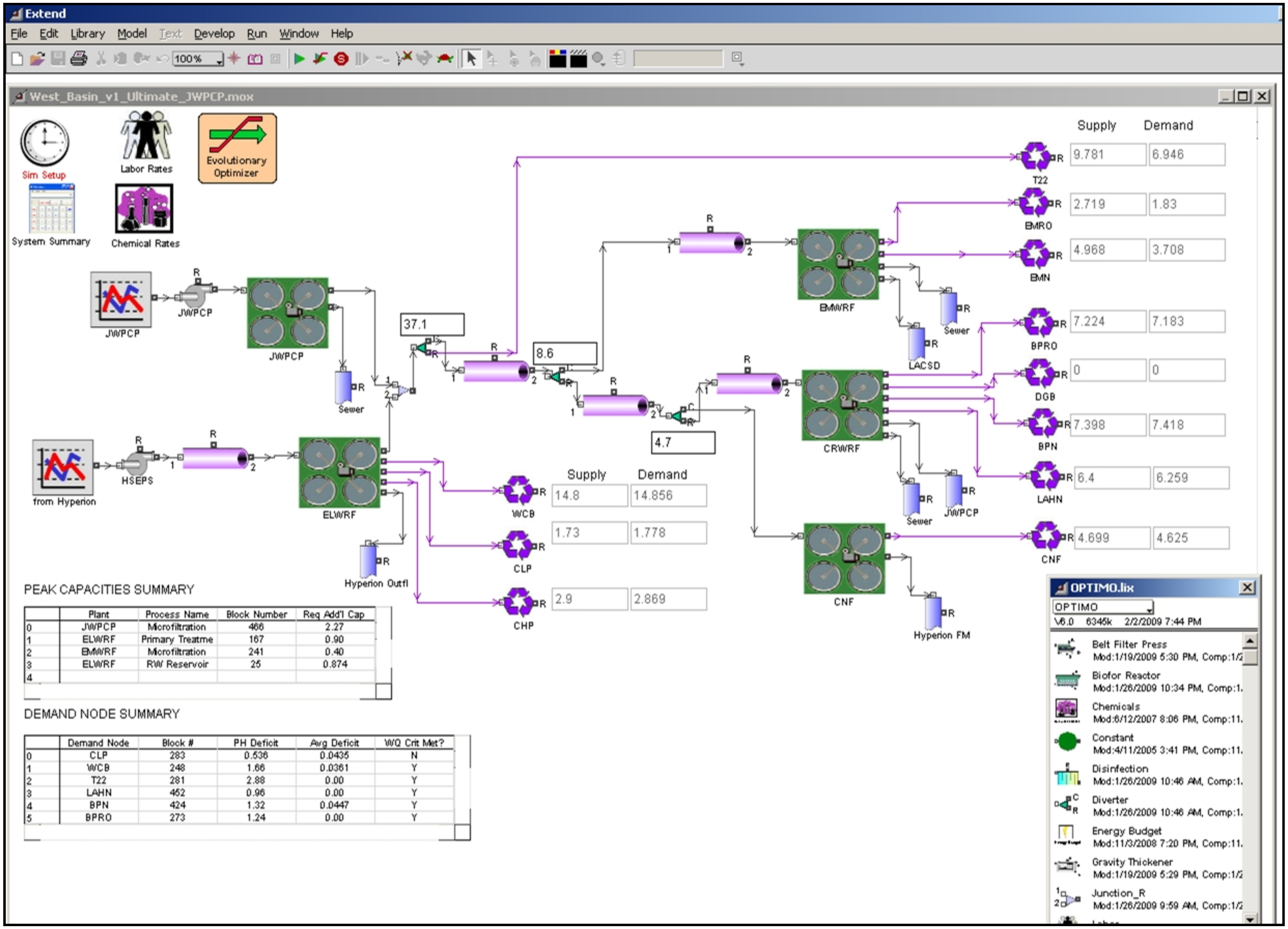
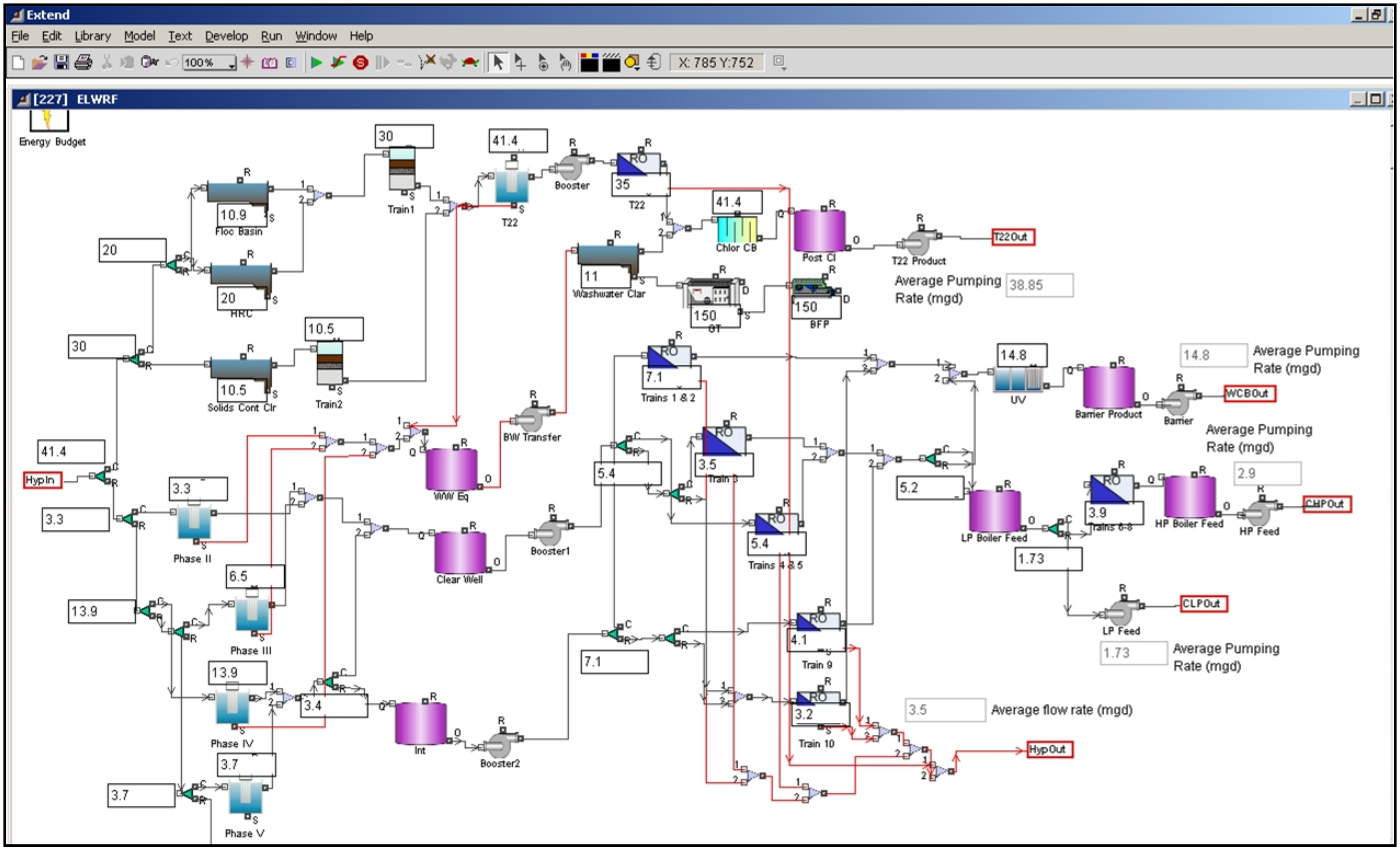


Figure 8.6 OPTIMO™ Model Representation of the ELWRF in 2030.



8.3.2.3.2 *Hydraulic Results*

The projected flows available from the HWWTP and JWPCP were input to the model for the years 2020 (Scenario 5) and 2030 (Scenario 7) with the existing system capacities to identify system capacity constraints. Once the capacity-limited processes were identified, the model was re-run with expanded capacities to relieve the capacity constraints with the goal of meeting all recycled water demand flows in Scenario 5 and Scenario 7, as discussed in Section 8.1. These scenarios were selected since the water demands represent project phasing opportunities. In combination with the water quality modeling results, the hydraulic modeling results were used to develop a list of capital improvement projects required for each facility described in detail below.

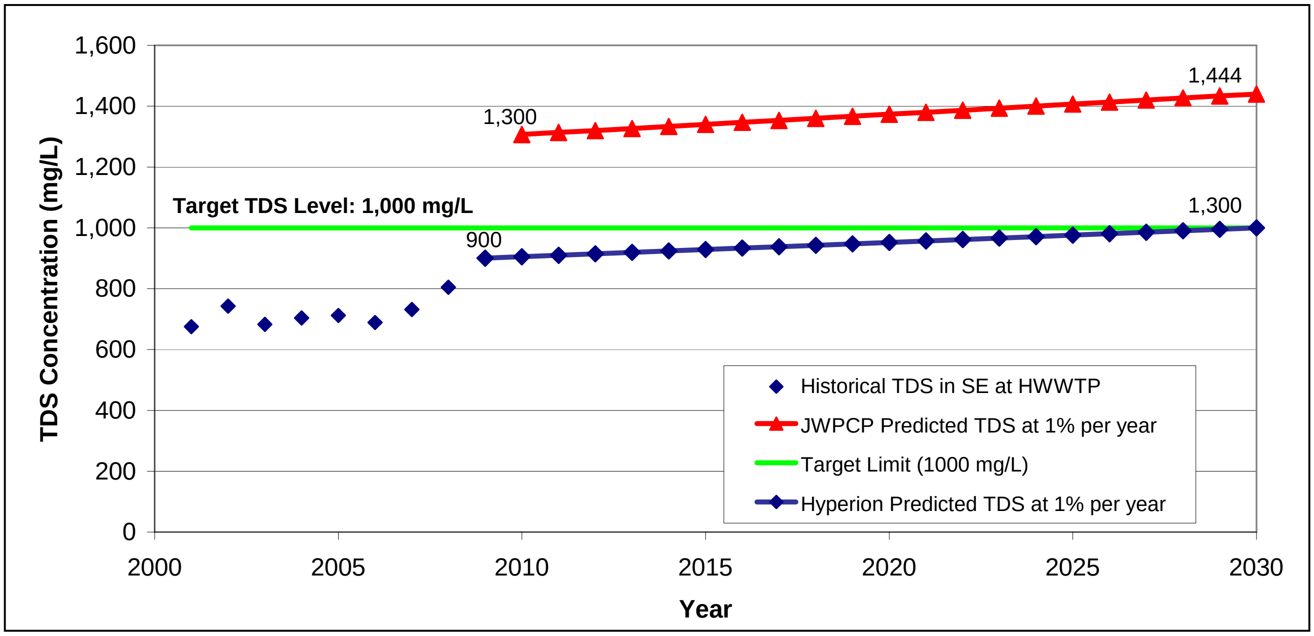
8.3.2.3.3 *Water Quality Results*

One of the 15 water quality parameters evaluated was total dissolved solids (TDS). The current average TDS levels in the secondary effluent of the HWWTP and the JWPCP are approximately 900 mg/L and 1300 mg/L, respectively. However, TDS concentrations in the secondary effluent (SE) of the HWWTP are expected to increase due to:

- Greater reliance on Colorado River water over State Project water
- Increases in water conservation measures which can lead to higher concentrations of contaminants in treated wastewater
- Larger volumes of industrial effluent which may have higher TDS loadings
- Increases in residential use of water softeners

JWPCP TDS concentrations are also expected to increase with time. The projected TDS concentrations for HWWTP and JWPCP are shown in Figure 8.7. The historical data show an average increase of 2.2 percent per year during the last 8 years. If this trend is extrapolated through 2030, TDS concentrations could reach 1200 mg/L (overall increase of 33 percent, or 2.2 percent per year). However, the exact contribution of each potential factor that may have caused this upward trend in TDS concentration is unknown at this time. For example, it is possible that the use of water softeners in the market is nearly saturated such that TDS concentrations may not continue to increase as much due to water softeners. To avoid oversizing of treatment facilities based on this recent trend, it is assumed that the increase in TDS levels is 1 percent per year. The overall increase in TDS concentrations through 2030 is therefore expected to be 11 percent by 2030. The existing TDS levels in SE from the HWWTP are thus assumed to increase to 1,000 mg/L in HWWTP water.

Figure 8.7
Measured and Projected TDS Concentrations for HWWTP Effluent



The current average TDS concentration in secondary effluent from JWPCP is 1,300 mg/L. Assuming an 11 percent increase in TDS concentration through 2030 results in an estimated concentration of 1,444 mg/L.

The projected source water quality for HWWTP and JWPCP water were input to the model for year 2030 with the existing system removal efficiencies. The model was used to compare the treated effluent water quality supplied to each major recycled water customer to the customer's water quality criteria. The target TDS concentration for water distributed to T22 customers is 1,000 mg/L. With this limit, TDS is the water quality parameter that governs treatment needs in comparison to the water quality requirements of the other 14 constituents.

Considering the projected increases in TDS in HWWTP and JWPCP water, a higher level of treatment is required when using SE from JWPCP for West Basin's recycled water system. It should be noted that the final process selection for TDS treatment should be evaluated during preliminary design, when different technologies may be more appropriate. The most efficient technology currently available to treat SE directly to Title 22 standards is microfiltration (MF) followed by Reverse Osmosis (RO). It is therefore assumed that a MF/RO treatment plant be built when using SE from JWPCP for West Basin's recycled water system. This treatment process will also remove TOC to acceptable limits. The entire treatment plant capacity would be sized for MF/RO, without any bypass of flow.

8.3.2.3.4 ELWRF

Expansions of the UV system, Barrier PS, HP Feed Pump, LP Feed Pump, and RO Ultra treatment for HPBF are required to meet the projected demands since existing capacities are insufficient. To meet the projected demands these projects need to be operable in 2011.

Assuming TDS concentrations in HWWTP water remain at or below the estimated 1,000 mg/L acceptance level (See Figure 8.7), more advanced treatment for TDS is not anticipated at ELWRF.

8.3.2.3.5 CRWRF

The Carson Expansion Project is needed to provide additional nitrification treatment capacity at CRWRF to meet the projected demands at bp Nitrified Water System and LADWP Harbor Nitrified System since existing capacities are insufficient. These projects include increasing the Biofor Reactor treatment capacity from 0.9 mgd to 17 mgd, and increasing the nitrification feed and product pumps accordingly. To meet these demands, these projects need to be operable in 2012.

Expansion of the MF/RO treatment processes at CRWRF is needed to meet the higher bp RO demand in 2012. The existing MF capacity will need to be increased from 6.9 mgd to 10.0 mgd (assuming 85 percent recovery). The existing RO capacity will need to be increased from 5.0 mgd to 8.5 mgd (assuming 85 percent recovery).

With the addition of MF/RO treatment at the proposed new treatment plant (described in Section 8.4), the influent water to CRWRF will be of higher quality. It is likely that less treatment will be required at CRWRF. Monitoring of influent TDS concentrations to ELWRF or CRWRF is recommended to determine appropriate flow bypass amounts and potential cost savings.

8.3.2.3.6 New Water Treatment Plant

As described previously, it is recommended that MF/RO treatment be implemented at the new treatment plant to treat SE from the JWPCP to Title 22 targets for TDS (1000 mg/L), and to serve the industrial and recycled water customers near the CRWRF. To meet projected recycled water demands without additional treatment at ELWRF, the new treatment plant (NTP) needs to be sized for 25 mgd. The entire flow would require MF and RO treatment.

Siting of this treatment plant could be at JWPCP or CRWRF, or somewhere in the vicinity of the pipeline connecting the two facilities. Section 8.4.1 describes the pipeline projects required for the New Treatment Plant. The siting of the treatment plant itself is not determined.

Besides reducing TDS levels and meeting all Title 22 water quality criteria, the use of MF/RO treatment at the new treatment plant will provide a much higher quality effluent not only to T22 customers, but also customers downstream of EMWRF, CRWRF, and CNF. It is possible that less treatment will be required at these facilities, providing O&M, and possibly capital savings to WBMWD. Cost estimates for these savings were not included in this analysis, but it is recommended that these considerations should be explored further.

8.4 ALTERNATIVE SUPPLY ANALYSIS

8.4.1 Supply Scenarios

The existing recycled water system is supplied from only one source, the HWWTP. To serve the projected demands, the contract capacity needs to be expanded beyond the current limit of 51 mgd and/or an additional source of supply needs to be developed. Due to the location of many of the large customers in the southeast portion of the West Basin service area and the capacity limitations of the existing backbone infrastructure, it is practical to consider a second source of supply near the opposite site of the system. The Joint Water Pollution Control Plant (JWPCP) from the LACSD is located in close vicinity to the CRWRF as shown on Figure 4.6. This plant treats on average approximately 300 mgd to secondary effluent standards. This facility could therefore become a large and reliable source of recycled water supply.

Based on discussions with West Basin staff, it was decided to evaluate the JWPCP as second source of supply and its impact on the overall capital implementation plan cost and system reliability.

The addition of this second supply source would require:

- Capacity to treat SE from JWPCP to Title 22 water quality standards;
- Land acquisition to place the new treatment plant (NTP)
- Associated pipelines and pumping stations to convey water from the NTP to the various customers

The implementation of these NTP associated projects could potentially avoid or reduce the size of the following projects that would be required if all of West Basin's recycled water was supplied from the HWWTP only:

- Treatment capacity to treat SE from HWWTP to Title 22 water quality standards;
- Upgrade of the HSEPS and force main to convey water from HWWTP to the ELWRF; and
- Upgrade of the existing 42-inch diameter and other backbone pipelines, as well as the Title 22 pumping station, to convey water from the ELWRF to future customers.

To evaluate the supply alternatives, the cost of adding treatment capabilities to the southeast side of West Basin's distribution system needs to be weighed against the cost of additional projects that are required to convey water from the HWWTP to many large customers that are located in the southeast portion of the West Basin service area, such as the bp Carson Refinery, Dominquez Gap Barrier, and the LADWP customers in the Harbor area. Three alternatives are presented, with varying levels of supply from HWWTP and JWPCP.

Table 8.25, Table 8.26, and Table 8.27 list the projects which would be affected by the supply balance, and the estimated cost of the improvement projects that would be required to serve the demands identified for Scenario 7 (see Table 8.1). The cost estimating assumptions used for this analysis are presented in Chapter 5 of this report, and further detailed in Chapter 9.

The IDs presented in each of the tables correlate to the associated project in the CIP. However, the project ID may not correspond to the location of the project in each alternative, as they are each affected by the difference in supply alternative.

8.4.1.1 <u>Supply from Hyperion Only</u>

Table 8.25 presents the recommended improvements under the first alternative, assuming the HWWTP serves as the sole source of supply for the future distribution systems.

8.4.1.2 <u>bp and Dominguez Gap Supplies from JWPCP</u>

Table 8.25 presents the recommended improvements under the first alternative, assuming the HWWTP serves as the sole source of supply for the future distribution systems.

Table 8.28 summarizes the recommendations presented in Table 8.25, Table 8.26, and Table 8.27. As shown in Table 8.28, the overall cost is reduced with increased use of the JWPCP supply source.

The majority of this cost savings is accomplished through elimination of large conveyance facilities from the west portion of West Basin's service area to the east portion. The significant pipeline replacement and upgrades crossing the distribution system are not required in the third alternative, Option 3, with flows through the 42-inch diameter transmission main crossing the distribution system and the 60-inch diameter HSEFM being reduced by the alternative supplies from the JWPCP.

Table 8.25 Option 1: Hyperion as Sole Supply Source
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Project Description[1]	Capital Cost[1,2] ($M)
HPS-01	Add 90 mgd of additional firm pumping capacity, to bring total capacity to 141 mgd of firm capacity (Assumes 5 pumps, 6,400 hp increase)	$70.3
HPS-05	Parallel HSEFM w/ 54"	$36.0
HPS-06	Add 63 mgd of additional firm pumping capacity, to bring total firm capacity to 204 mgd. (For LADWP Westside, Kenneth Hahn, LADWP Harbor Expansion, Dominguez Gap) (Assumes 5 pumps, 3,000 hp increase)	$33.0
T22-04	42" Parallel Transmission Main from ELWRF to Avalon	$117.9
ELWRF-09	Add 41.0 mgd of Title 22 Treatment, to bring total Title 22 Treatment Capacity of ELWRF to 91.0 mgd	$173.2
ELWRF-10	Increase capacity of Title 22 Pump Station at ELWRF by 5,200 hp (from 4,800 hp to 10,000 hp) to serve Future Title 22 Customers	$57.1
ELWRF-17	Increase capacity of Title 22 Pump Station at ELWRF by 4,250 hp to serve Future Title 22 Customers (Westside, LADWP Harbor, Dominguez Gap, Kenneth Hahn)	$46.7
BPN-01	Treat SE from JWPCP w/ MF/RO to serve growth in bp Nitrified System (Included in Title 22 Treatment)	Not Needed
BPN-02	Nitrified Treatment - treat Title 22 water from HWWTP at CRWRF to serve growth in bp Nitrified System	$14.7
BPN-03	New 18" pipeline from vault to Gate 7 for conveyance of Nitrified Water.	$4.7
BPN-03	Parallel 12" bp Nitrified w/ 20" pipeline from CRWRF to vault at bp for conveyance of Nitrified Water.	$6.0
BPN-04	Replace 2 existing pumps in pump station at CRWRF to serve bp Nitrified (assumes total of 4-3,700 gpm pumps)	$1.5
BPN-04	Add 2 new pumps to pump station at CRWRF to serve bp Nitrified (assumes total of 4-3,700 gpm pumps)	$4.4
BPRO-01	Treat Title 22 Water at CRWRF to meet bp RO demands	$23.6
BPRO-02	New Pipeline from NTP to bp for conveyance of Industrial RO Water.	Not Needed
BPRO-03	Replace 3 existing pumps in pump station at CRWRF to serve bp Industrial RO (assumes 3-4,500 gpm pumps)	$2.5
CRWRF-01	Pipe for LADWP Harbor demands from CRWRF to Carson City bndy	$20.8
CRWRF-02	Nitrified Treatment (Nitrified Water for LADWP Harbor Demand and Rhodia) 12.3 mgd	$21.9
NTP-03	Add new 3.1 mgd pump station at NTP to serve Dominguez Gap (Phase I + II)	Not Needed
NTP-01	Land Acquisition (7.4 ac for Conventional Treatment at ELWRF)	$24.9
NTP-05	New Pipeline from CRWRF to Dominguez Gap Barrier Blending Station for conveyance of Barrier Water.	$7.3
Total Cost		**$666.5**

Notes:
(1) All numbers in this table are based on total demands and cost assumptions presented in the report dated April 3, 2009. This analysis was not updated with the revised peaking factors and unit cost assumptions, and should therefore be used for relative comparison purposed only.
(2) See Chapter 5 for unit cost assumptions and markups and Chapter 9 for detailed CIP information.

Table 8.26	Option 2: Partial Supplies from JWPCP Capital Implementation Master Plan West Basin Municipal Water District	
ID	**Project Description[1]**	**Capital Cost[1,2] ($M)**
HPS-01	Add 66 mgd of additional firm pumping capacity, to bring total capacity to 117 mgd of firm capacity. (Assumes 5 pumps, 2,800 hp increase)	$30.8
HPS-05	Parallel HSEFM w/ 36"	$24.6
HPS-06	Add 61 mgd of additional firm pumping capacity, to bring total firm capacity to 178 mgd. (For LADWP Westside, Kenneth Hahn, LADWP Harbor Expansion) (Assumes 5 pumps, 2,800 hp increase)	$30.8
T22-04	Parallel Pipeline to 42" Transmission Main from ELWRF to Avalon	$87.6
ELWRF-09	Add 17.3 mgd of Title 22 Treatment, to increase Title 22 treatment capacity from 50.0 mgd to 67.3 mgd	$73.1
ELWRF-10	Increase capacity of Title 22 Pump Station at ELWRF by 3,200 hp (from 4,800 hp to 8,000 hp) to serve Future Title 22 Customers	$35.2
ELWRF-17	Increase capacity of Title 22 Pump Station at ELWRF by 4,000 hp to serve Future Title 22 Customers (Westside, Kenneth Hahn, LADWP Harbor)	$43.9
BPN-01	Treat SE from JWPCP w/ MF/RO to serve growth in bp Nitrified System	$104.4
BPN-02	Nitrified Treatment - treat Industrial RO water from JWPCP to serve growth in bp Nitrified System	$14.7
BPN-03	New 20" pipeline from NTP to bp for conveyance of Nitrified Water.	$10.3
BPN-04	New pump station at NTP to serve bp Nitrified (assumes 4-1,500 gpm pumps, in PS w/ BPRO-03)	$3.8
BPRO-01	Treat SE from JWPCP w/ MF/RO to serve growth in bp RO System	$88.2
BPRO-02	New Pipeline from NTP to bp for conveyance of Industrial RO Water.	$9.4
BPRO-03	New pump station at NTP to serve bp Industrial RO (assumes 4-2,100 gpm pumps, in PS w/ BPN-04)	$5.1
CRWRF-01	Pipeline for LADWP Harbor demands at Carson City bndy	$20.8
CRWRF-02	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand and Rhodia)	$21.9
CRWRF-08	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand Phase II)	$12.7
NTP-03	Add new 3.1 mgd pump station at NTP to serve Dominguez Gap (Phase I + II)	$2.5
NTP-01	Land Acquisition of 4.5 ac near JWPCP for NTP	$9.0
NTP-04	New Pipeline from NTP to Dominguez Gap Barrier Blending Station for conveyance of Barrier Water.	$10.4
Total Cost		**$639.0**

Notes:
(1) All numbers in this table are based on total demands and cost assumptions presented in the report dated April 3, 2009. This analysis was not updated with the revised peaking factors and unit cost assumptions, and should therefore be used for relative comparison purposed only.
(2) See Chapter 5 for unit cost assumptions and markups and Chapter 9 for detailed CIP information.

Table 8.27 Option 3: Maximize Supplies from JWPCP Capital Implementation Master Plan West Basin Municipal Water District

ID	Project Description(1)	Capital Cost(1,2) ($M)
HPS-01	Add 54 mgd of additional firm pumping capacity, to bring total capacity to 105 mgd of firm capacity. (Assumes 5 pumps, 2,200 hp increase)	$26.0
HPS-05	Parallel HSEFM w/ 36"	Not Needed
HPS-06	Add 53 mgd of additional firm pumping capacity, to bring total firm capacity to 158 mgd. (For LADWP Westside, Kenneth Hahn) (Assumes 5 pumps, 2,500 hp increase)	$30.8
T22-04	Parallel Pipeline to 42" Transmission Main from ELWRF to Avalon	Not Needed
ELWRF-09	Add 2.4 mgd of Title 22 Treatment, to bring total Title 22 Treatment Capacity of ELWRF to 52.4 mgd	$10.1
ELWRF-10	Increase capacity of Title 22 Pump Station at ELWRF by 100 hp to serve Future Title 22 Customers	$1.7
ELWRF-17	Increase capacity of Title 22 Pump Station at ELWRF by 3,500 hp to serve Future Title 22 Customers (Westside, Kenneth Hahn)	$38.5
BPN-01	Treat 25.7 mgd of SE from JWPCP w/ MF/RO to serve growth in bp Nitrified System, LADWP Harbor, Rhodia	$260.8
BPN-02	Nitrified Treatment - treat Industrial RO water from JWPCP to serve growth in bp Nitrified System	$14.7
BPN-03	New 20" pipeline from NTP to bp for conveyance of Nitrified Water.	$10.1
BPN-04	New pump station at NTP to serve bp Nitrified and LADWP Harbor Nitrified demand (assumes 30 mgd pump station)	$14.2
BPRO-01	Industrial RO Treatment - treat 8.7 mgd of SE from JWPCP to serve growth in bp RO System	$88.0
BPRO-02	New Pipeline from NTP to bp for conveyance of Industrial RO Water.	$9.4
BPRO-03	New pump station at NTP to serve bp Industrial RO (assumes 4-2,100 gpm pumps, in PS w/ BPN-04)	$5.1
CRWRF-01	Pipeline for bp Nitrified Water and LADWP Harbor demands from NTP to Carson City bndy	$10.2
CRWRF-02	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand and Rhodia)	$21.9
NTP-03	Add new 3.1 mgd pump station at NTP to serve Dominguez Gap (Phase I + II)	$2.5
NTP-01	Land Acquisition of 4.5 ac near JWPCP for NTP	$4.3
NTP-04	New Pipeline from NTP to Dominguez Gap Barrier Blending Station for conveyance of Barrier Water.	$10.4
Total Cost		**$558.6**

Notes:
(1) All numbers in this table are based on total demands and cost assumptions presented in the report dated April 3, 2009. This analysis was not updated with the revised peaking factors and unit cost assumptions, and should therefore be used for relative comparison purposed only.
(2) See Chapter 5 for unit cost assumptions and markups and Chapter 9 for detailed CIP information..

Table 8.28	**Summary of Supply Alternatives Capital Implementation Master Plan West Basin Municipal Water District**			
Option	**Description**	**Supply from HWWTP(1,2)**	**Supply from JWPCP(1,2)**	**Capital Cost(2) ($M)**
Option 1	Supply from Hyperion Only	82,275 afy	0 afy	$666.5
Option 2	Partial Supplies from JWPCP	64,684 afy	16,591 afy	$639.0
Option 3	Maximize Supply from JWPCP	50,684 afy	31,591 afy	$558.6

Note:
(1) On an average annual basis. Treatment in comparisons are sized for pre-treatment MMD supply levels. Pump stations in comparisons are sized for peak hour MDD levels.
(2) All numbers in this table are based on total demands and cost assumptions presented in the report dated April 3, 2009. This analysis was not updated with the revised peaking factors and unit cost assumptions, and should therefore be used for relative comparison purposed only.

Comparing the three supply options, this simplified analysis suggests that significant cost savings may be possible by maximizing the JWPCP as a secondary source. Some additional benefits include increased reliability and redundancy, as well as reduced long-distance, large-diameter pipe construction through the urban areas in El Segundo and the South Bay. For conservative planning purposes, and due to the lower likelihood of service of the customers in Option 3, the CIP will be based on Option 2, partial supply from the JWPCP.

8.4.2 Microfiltration and RO Train Replacement

Based on the recommended alternative from the existing system analysis, membrane replacement is anticipated to be required every 5 years through the planning horizon. For planning purposes, it is assumed that replacement of 20 percent of the units will occur annually. Membrane replacement is included in the CIP for each treatment plant and costs are estimated based on the number of MF and RO units in each treatment plant.

Replacement of MF and RO units for future treatment plants and expansions are assumed to not require replacement for five years following construction, after which it is assumed that replacement of 20 percent of the units will occur annually.

8.4.3 Backup Power

For analysis of backup power to West Basin’s facilities, three tiers of possible backup power are evaluated.

Three levels of backup power were identified:

- **Critical Customers**: Provide sufficient backup power capacity to maintain service to critical industrial customers. This would most likely maintain backup power capacity of only a portion of each pump station, and possibly some treatment processes. This option would require individual evaluation of customers to determine their reliability and redundancy requirements.
- **Pump Stations and Potable Backup**: Provide backup power to the pump stations and potable water feeds to the product water storage tanks upstream of the product water pump stations. For large connections, the potable water distribution systems and potable water connections would need to be evaluated for hydraulic capacity during backup power conditions. Required capacity for the Title 22 Product Water pump stations could be reduced, due to demands at EMWRF, CNF, and CRWRF being met by potable water connections instead of Title 22 water.
- **Entire Facilities**: Provide backup power capacity for the entire connected load at each facility. This option would be the most expensive, but allow West Basin to maintain full capacity of all facilities in event of power loss. Possible methods for accomplishing this would be a dedicated power generation system for each facility, a connection to a separate electrical grid, or a dedicated connection to offsite generation facilities. If this option is selected, availability of supplies during power loss conditions should be evaluated.

As detailed analysis of costs for these alternatives is beyond the scope of this study, it is recommended that these alternatives for each facility be evaluated through a separate study. West Basin staff indicated that such a study is currently underway for CRWRF, and a similar study is planned for ELWRF. Based on preliminary investigation by West Basin and discussions with West Basin staff, it is assumed in the CIP that backup power will be provided only to the product water pump stations with potable water backup.

8.4.4 Storage

Storage is currently provided at most of West Basin’s facilities. One reason for storage at each facility is to provide product water in event of treatment or supply loss for a long enough period of time to switch individual customer or treatment sites to potable water. Based on discussions with United Water staff, it is estimated that approximately 6 hours are required for United Water staff to perform the reconfiguration necessary to switch swivel-ell connections from recycled water sources to potable water sources.

Based on this length of time, Table 8.29 presents recommended storage for each facility.

Table 8.29 Storage Requirements by Facility
Capital Implementation Master Plan
West Basin Municipal Water District

Facility or System	Maximum Month Demand$^{(1)}$ (mgd)	Hours of Backup (hrs)	Storage Required (MG)	Existing Storage (MG)	Recommended Additional Storage (MG)
Chevron LPBF$^{(1)}$	2.31	6	0.6	0.8	0.0
Chevron HPBF$^{(2)}$	3.16	6	0.8	1.2	0.0
Chevron Nitrification$^{(3)}$ Facility	6.51	6	1.6	0.4	0.0
West Coast Barrier$^{(4)}$	17.5	-	-	0.4	-
Title 22 Distribution System	73.2	6	18.3	10.0	5.0$^{(5)}$

Notes:
(1) MMD at ultimate demand.
(2) No additional storage recommended. It is assumed that this system can be backfed from the Barrier connection in event of a source water loss.
(3) No storage recommended. It is assumed that this system can be served by a potable water connection in event of supply loss.
(4) No storage recommended. It is assumed that this system can be served by the MWD connection at the blending station in event of a source water loss.
(5) It is assumed that the potable water backup at CRWRF can eliminate some of the Title 22 demand during periods of emergency, so only 5.0 MG of storage is recommended.

8.5 FUTURE SYSTEM RECOMMENDATIONS SUMMARY

The recommendations detailed in the Hydraulic Distribution Systems Analyses are summarized in Table 8.30. Detailed cost estimates for each of these recommendations are presented in Chapter 9.

Recommendations within Table 8.30 are based on Scenario 7B, with Scenario 5B assumed to take place by 2020 and Scenario 7B by 2030. As such, the recommendations which are required for Scenario 7B but not for Scenario 5B are called out in the CIP separately. Treatment recommendations are not included in Table 8.30, but are included in the CIP.

Table 8.30 Future System Recommendations Summary
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Recommendation	System or Facility
T22-20	Dyehouse Lateral Pump Station (3-250 gpm pumps)	Title-22 Distribution System
T22-16	Palos Verdes Pump Station (4-1,000 gpm pumps)	Title-22 Distribution System
T22-10	Anza Avenue Lateral Pump Station (3-500 gpm pumps)	Title-22 Distribution System
T22-26	Inglewood /LA Westside Pump Station (4-8,500 gpm pumps)	Title-22 Distribution System
T22-24	Anza Lateral Break Tank (resolving pressure problems in Redondo Beach area when they become significant; only anticipated if additional customers connected to Anza Lateral Phase II)	Title-22 Distribution System
-	Detailed study to increase discharge pressure of Title 22 pump station at ELWRF to 105 psi.	Title-22 Distribution System
ELWRF-10, ELWRF-33	Increase capacity of Title 22 pump station at ELWRF (to 8,000 hp for Scenario 5B, 12,000 hp for Scenario 7B).	Title-22 Distribution System
T22-23	Modify pump station discharge configuration to isolate Title 22 pump stations from each other.	Title-22 Distribution System
ELWRF-15	Add backup potable connection to the Title 22 product water storage tanks.	Title-22 Distribution System
-	Surge analysis of the Title 22 distribution system following modifications made to EMWRF and CRWRF to reduce surge effects.	Title-22 Distribution System
-	A detailed study of the demands on the Title 22 pump station, including phased development, should be conducted in selecting the pumps and increase the discharge pressure to 105 psi.	Title-22 Distribution System
-	Following incorporation of existing system water quality recommendations, water quality of the distribution system should be reevaluated.	Title-22 Distribution System

Table 8.30 Future System Recommendations Summary
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Recommendation	System or Facility
BW-02	Field testing to determine the firm capacity of the pump station. Result should be used to determine improvements to the pump station. (Install variable frequency drives on the five existing pumps)	West Coast Barrier Water System
-	Add an additional 1,750 gpm of pumping capacity to the West Coast Barrier pump station. (Replace one of the 1,750 gpm pumps with one 3,500 gpm pump). [Assumed to be included in lump sum treatment cost of BW-01.]	West Coast Barrier Water System
BW-04	Replace the 20-inch diameter discharge piping and magnetic flowmeter with 27-inch diameter pipe and meter	West Coast Barrier Water System
HPS-05	Add a 15,500 foot parallel 36-inch diameter pipeline to the 60-inch diameter pipeline, to meet Scenario 7B demands.	Hyperion Secondary Effluent Pumping System
HPS-01, HPS-06	Detailed design study to review the existing pump station modification for incorporation into the future facility. Increase the capacity of the pump station to meet future supply requirements (total of 7,000 hp for Scenario 5B, and 10,000 hp for Scenario 7B).	Hyperion Secondary Effluent Pumping System
-	Update surge study for future system design conditions.	Hyperion Secondary Effluent Pumping System
HPS-03	Detailed design study of the system to formulate the most feasible means of meeting the criteria and providing supply reliability	Hyperion Secondary Effluent Pumping System
CL-02	Replace the three existing pumps with three new pumps with approximate rated conditions of 1,250 gpm, 196 feet TDH at 1,770 RPM. Driven by 100 HP VFDs	Chevron Low Pressure Boiler Feed System
ESPP-02	Serve El Segundo Power Plant with a 12-inch diameter pipeline rather than a 10-inch diameter pipeline.	El Segundo Power Plant System

Table 8.30	Future System Recommendations Summary Capital Implementation Master Plan West Basin Municipal Water District	
ID	**Recommendation**	**System or Facility**
ESPP-03	Add a PRV to the Chevron LPBF to accommodate higher pressures from the pumps	El Segundo Power Plant System
CH-02	Add 595 gpm of pumping capacity (Replace the two existing pumps with two new pumps with approximate rated conditions of 2,500 gpm, 119 feet TDH at 1,180 RPM. Driven by 100 HP VFDs)	Chevron High Pressure Boiler Feed System
CN-01	Preliminary design to add 1,564 gpm of pump station capacity. To make the maximum use out of the existing facility the future facility should have three identical duty and one standby pump, all operated by VFDs. (Replace pumps with 4-2,100 gpm pumps)	Chevron Nitrified Water System
CNF-03	Investigate feasibility of placing the hydro generator / turbine in service. (Replace hydro generator / turbine)	Chevron Nitrified Water System
-	Evaluate how to effectively increase discharge pressure of RO Trains at CRWRF. [Under Scenario 5A / 7A]	CRWRF Brine Line
-	Apply for revised brine line permit accommodating increased flows [Under Scenario 5A / 7A]	CRWRF Brine Line

Note:
(1) Alternatives to this recommendation are discussed in the text of the report. For conservative planning purposes, the alternative judged to be the most costly is listed here in parenthesis and included in the CIP.

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CAPITAL IMPROVEMENT PROGRAM

This chapter presents the recommended capital improvement program (CIP) for the West Basin Municipal Water District's (West Basin) distribution systems. The CIP summarizes the recommended improvements, cost estimates, and the allocation of project cost for the recommended improvements to the distribution systems, and establishes phasing of projects through the planning horizon. The purpose of this CIP is to provide West Basin with a guideline for the planning and budgeting of future improvements to its distribution systems and facilities. The CIP is based on the evaluation of the West Basin's distribution systems, and on the recommended projects described in previous chapters.

This chapter is divided into three subsections. First, the recommended projects are summarized for each of the ten distribution systems and the five treatment plants (four existing and one proposed). Secondly, the phasing of recommendation is presented by planning period from fiscal year (FY) 2008/2009 through FY 2029/2030 (FY29/30). This chapter is concluded with a summary of the entire CIP by presenting summaries of the estimated project improvement cost by planning year and facility type. It should be noted that all cost presented in this chapter are based on 2009 dollars, with the exception of the escalated CIP at the end of this chapter.

The reasons for replacements, upgrades, and/or new facilities and other details for each of the projects recommended in this CIP can be found in Chapters 7 and 8.

Where applicable, it is assumed that West Basin projects will be designed for certification in accordance with the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. However, specific decisions on incorporation of green building technology will need to be made and refined at the preliminary design level.

9.1 PROJECT SUMMARY BY SYSTEM/FACILITY

This section summarizes the recommended projects discussed in Chapter 7 (Existing System Analysis) and Chapter 8 (Future System Analysis) for each of the ten distribution systems and the five treatment plants. The ten distribution systems, in the order presented, are:

- Hyperion Secondary Effluent Pumping Station (HSEPS) System
- Title 22 Distribution System
- West Coast Barrier System
- Chevron High Pressure Boiler Feed (CHPBF) System
- Chevron Low Pressure Boiler Feed (CLPBF) System

- Chevron Nitrified Water System
- ELWRF Brine Line
- bp Reverse Osmosis System (bp-RO)
- bp Nitrified Water System (bp-N)
- CRWRF Brine Line

The five treatment plants, including four existing and one proposed plant, are:

- Edward L. Little Water Reclamation Facility (ELWRF)
- Carson Regional Water Reclamation Facility (CRWRF)
- ExxonMobil Water Reclamation Facility (EMWRF)
- Chevron Nitrified Facility (CNF)
- New Treatment Plant (NTP)

As discussed in Chapter 8, this NTP would treat secondary effluent from the Los Angeles County Sanitation District's Joint Water Pollution Control Plant (JWPCP).

In addition, there are three types of recurring projects that are related to ongoing improvements at the treatment plants, such as membrane replacements, electrical upgrades, mechanical equipment, etc. These three types of recurring projects are:

- Replacement and rehabilitation projects identified in the Condition Assessment TM (Carollo 2009)
- Membrane replacements, assumed to take place every five years, as detailed in Section 8.4.2.
- Recapitalization projects identified by United Water (United Water 2009).

In this section, these recurring projects have been organized by treatment plant (Sections 9.1.13 through 9.1.17) and are phased as "mult", meaning multiple planning phases. In Section 9.2, the costs of these projects are organized by planning phase. The cost breakdown by treatment plant and planning phases can be found in the master CIP list presented at the end of this chapter (Table 9.37).

9.1.1 Hyperion Secondary Effluent Pumping System

Table 9.1 presents the list of recommended improvements to the HSEPS facility and distribution system.

As presented in Table 9.1, the total anticipated cost for improvements at the HSEPS is approximately $83.3 million (M). The most costly improvements are additional pumping capacity to support future demands and the pipeline to parallel the Hyperion Secondary Effluent Force Main (HSEFM) for Scenario 7 demands.

Table 9.1 Project Summary for HSEPS
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
HPS-01	FY10/11	Add 23 mgd of additional pumping capacity, to bring firm capacity to 74 mgd of firm capacity. (Phase I of II; total project assumes 7 pumps, 7,000 hp total)	$14,700,000
HPS-03	FY10/11	Secondary Power Connection for Backup Power	$2,520,000
HPS-04	FY10/11	PS Building	$560,000
HPS-05	FY11/12	Add 23 mgd of additional pumping capacity, to bring firm capacity to 97 mgd of firm capacity. (Phase II of II; total project assumes 7 pumps, 7,000 hp total)	$14,700,000
HPS-06	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$725,000
HPS-07	FY20-25	Add 38 mgd of additional firm pumping capacity, to bring total firm capacity to 135 mgd. (For LADWP Westside, Kenneth Hahn, LADWP Harbor Expansion) (Assumes 3 pumps, 3,000 hp increase)	$27,300,000
HPS-08	FY20-25	Parallel HSEFM w/ 36"	$22,815,000
Total			**$83,320,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

The additional pumping capacity is split into two initial phases to supply Scenario 5B demands through 2020 and a single post-2020 phase, to accommodate supplies to meet the additional demands for customers of Scenario 7B. Further details on HSEPS capacity requirements can be found in Chapter 4 and Chapter 8.

Consistent with the *HSEPS Expansion Study* (CDM 2004), a secondary power connection is recommended due to limited space and nearby connection availability.

The rehabilitation and replacement project is an aggregation of expected remaining life of existing equipment at the HSEPS as determined by the condition assessment. More information about the condition assessment can be found in the Condition Assessment Technical Memorandum (Carollo 2009), which can be found in Appendix F.

9.1.2 Title 22 Distribution System

Table 9.2 presents the list of recommended improvements to the Title 22 distribution system.

Table 9.2	Project Summary for Title 22 Distribution System Capital Implementation Master Plan West Basin Municipal Water District		
ID	**Phase**	**Project Description**	**Capital Cost(1)**
T22-01	FY12/13	Caltrans Inglewood Lateral	$260,000
T22-02	FY11/12	El Segundo Lateral (Boeing, Kilroy Airport)	$1,500,000
T22-02A	FY09/10	Mariposa Lateral (Mattel, Hilton, Marriot)	$750,000
T22-04	FY10/11	Virco-Torrance Lateral	$340,000
T22-06	FY09/10	Carson Mall Lateral(2)	$2,500,000
T22-07	FY11/12	Redondo Beach Lateral (Pete's Nursery)	$660,000
T22-08	FY11/12	Mills Park Lateral	$245,000
T22-09	FY09/10	Anza Lateral Phase II(2)	$3,500,000
T22-10	FY09/10	Anza PS (4-500 gpm pumps)(2)	$2,000,000
T22-11	FY12/13	Chlorination Stations (Phase I)	$1,960,000
T22-12	FY13/14	Main Street Carson Lateral	$17,075,000
T22-13	FY10/11	Dominguez Street Lateral(2)	$4,500,000
T22-14	FY14/15	Caltrans Gardena Lateral	$985,000
T22-15	FY15-20	Palos Verdes - Lateral 6B	$27,290,000
T22-16	FY15-20	Palos Verdes PS (4-1,250 gpm pumps)	$4,900,000
T22-17	FY15-20	Increase Title 22 product water storage by 5.0 MG	$10,500,000
T22-18A	FY15-20	Gardena Lateral - Normandie Ave	$3,635,000
T22-18B	FY15-20	Gardena Lateral - Normandie and Vermont	$6,170,000
T22-18C	FY15-20	Gardena Lateral - Van Ness	$4,480,000
T22-19	FY09/10	Dyehouse Lateral(2)	$3,000,000
T22-20	FY09/10	Dyehouse PS (3-250 gpm pumps)(2)	$1,500,000
T22-21	FY15-20	Chlorination Stations (Phase II)	$1,960,000
T22-22	FY15-20	Hawthorne Lateral (Solec)	$1,595,000
T22-23	FY15-20	Title-22 PS Discharge Pipeline Modification	$465,000
T22-24	FY20-25	Anza Lateral Break Tank	$4,200,000
T22-25	FY25-30	LA Westside Lateral	$40,005,000
T22-26	FY25-30	Inglewood/LA Westside PS (assumes 4-8,500 gpm pumps)	$28,025,000
Total			**$174,000,000**

Notes:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.
(2) Cost estimates provided by West Basin staff from preliminary design estimates.

Improvements related to treatment of Title 22 product water are included in the summaries of recommendations for ELWRF and NTP. Figure 9.1 shows each of the recommended distribution system improvements, with IDs corresponding to the IDs shown in Table 9.2. As presented in Table 9.2, the recommended improvements for the Title 22 distribution system are approximately $174.0M.

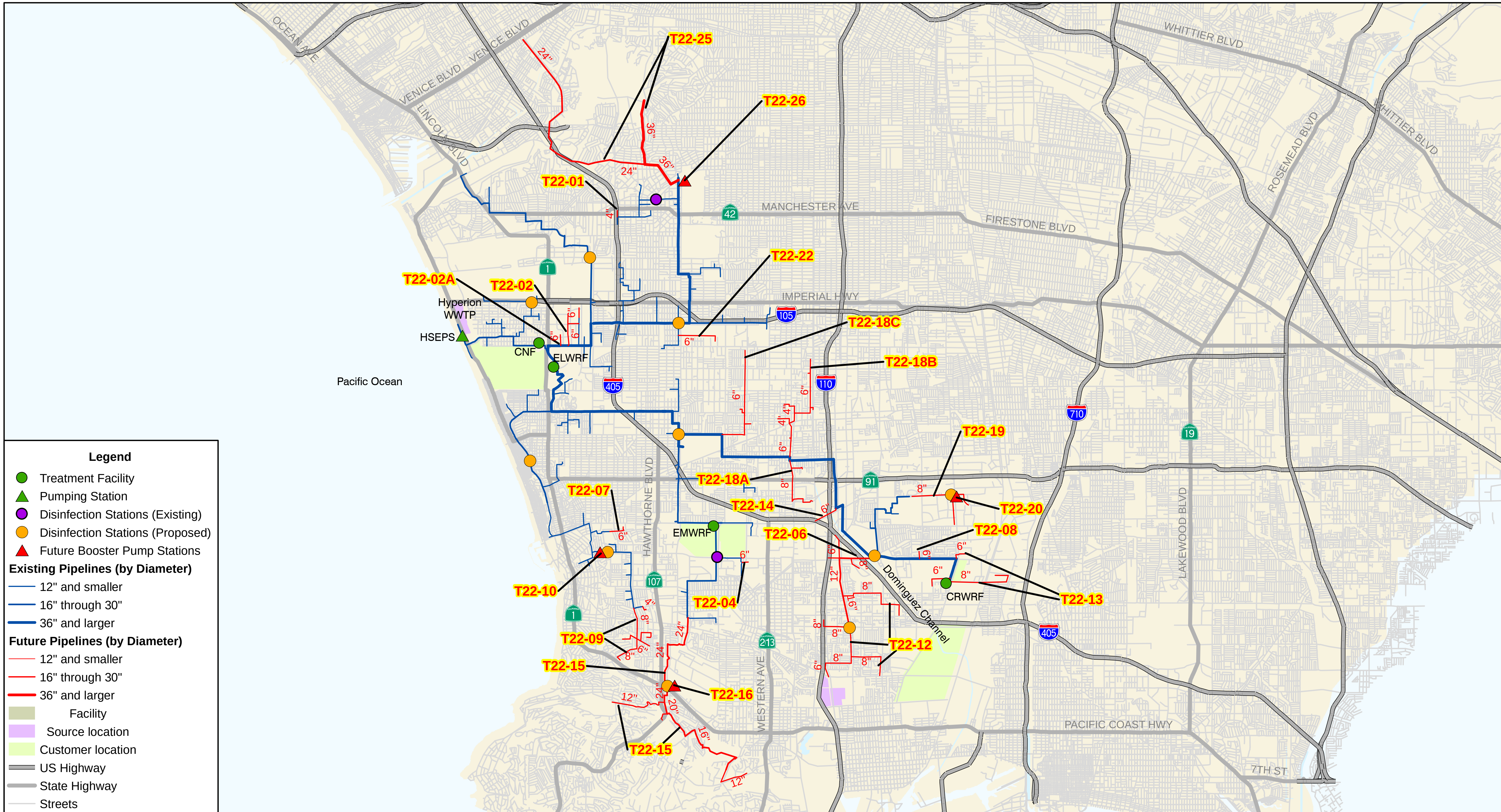

Figure 9.1
Title 22 CIP Projects

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

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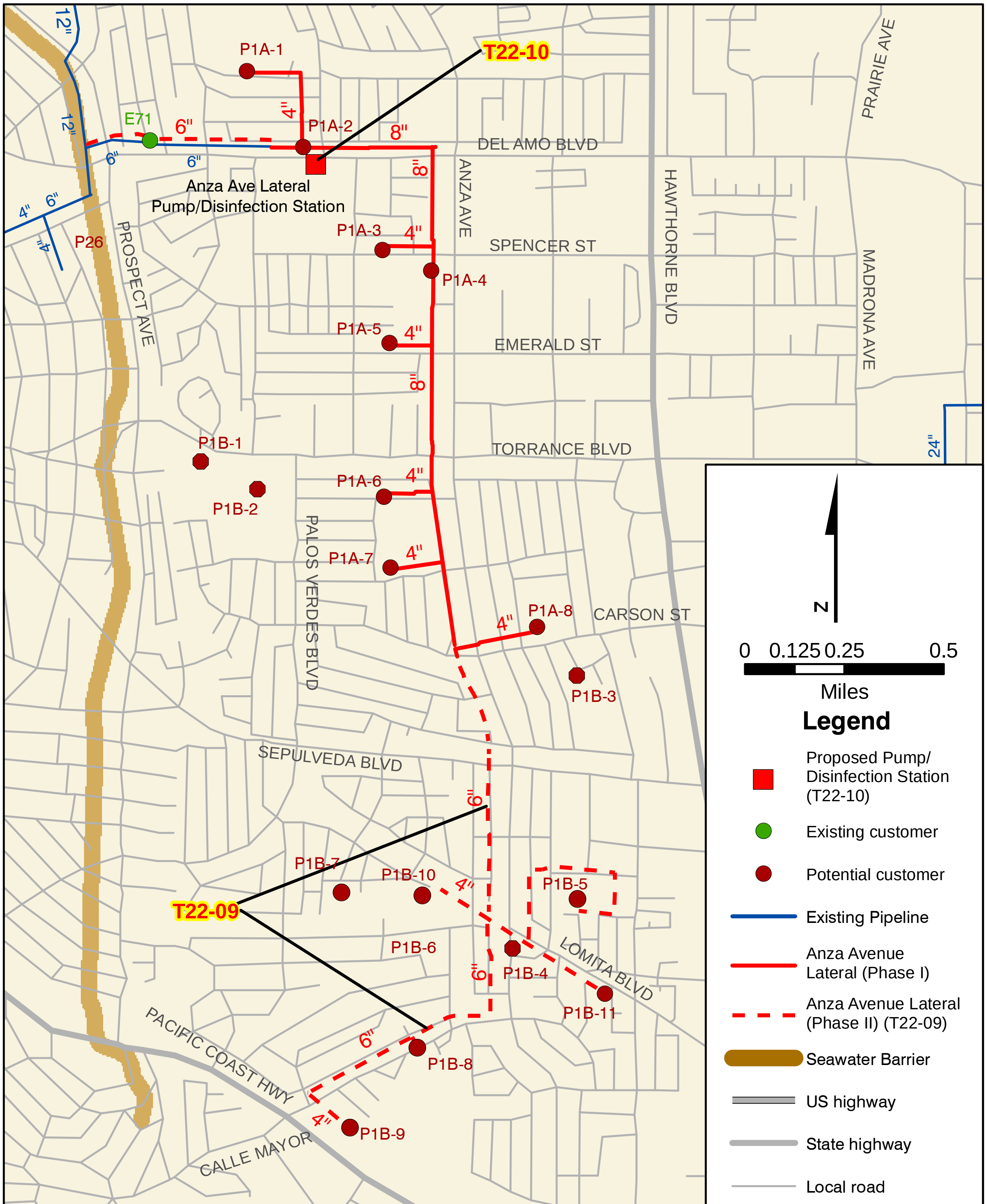
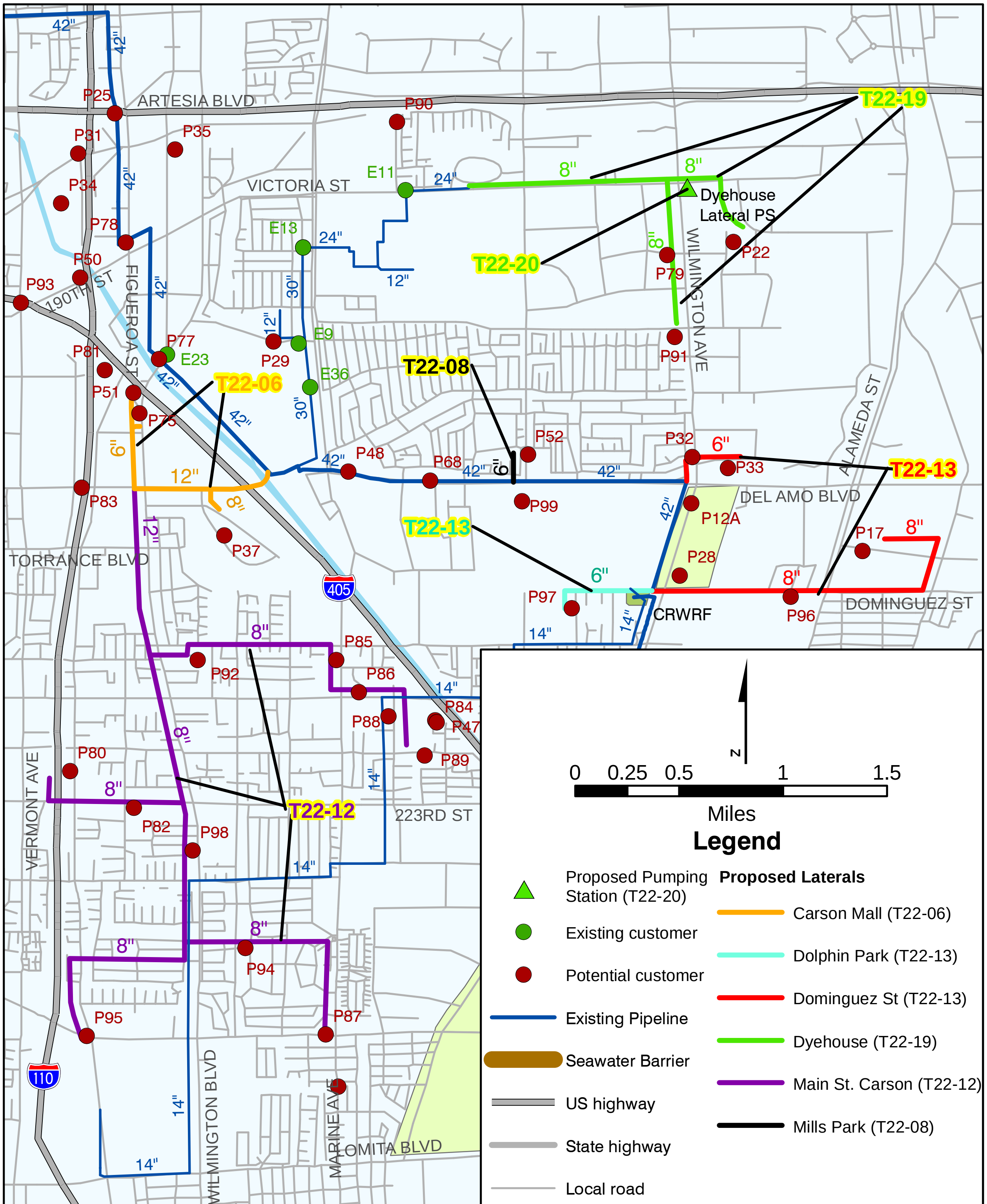


Figure 9.1A
Anza Avenue Lateral

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems



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AKM SPi

Figure 9.1B
City of Carson -
Potential Recycled
Water Customer Sites

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

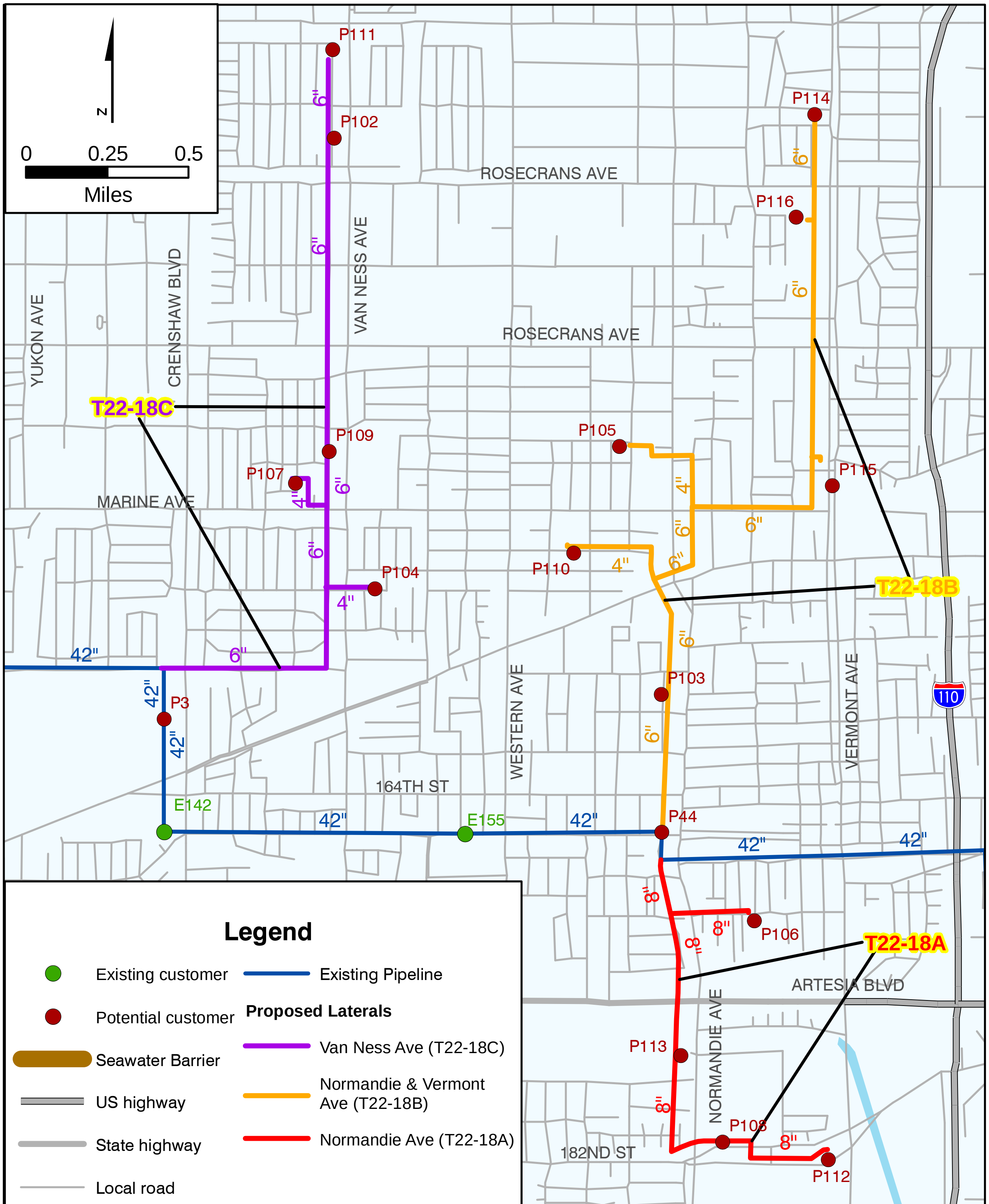

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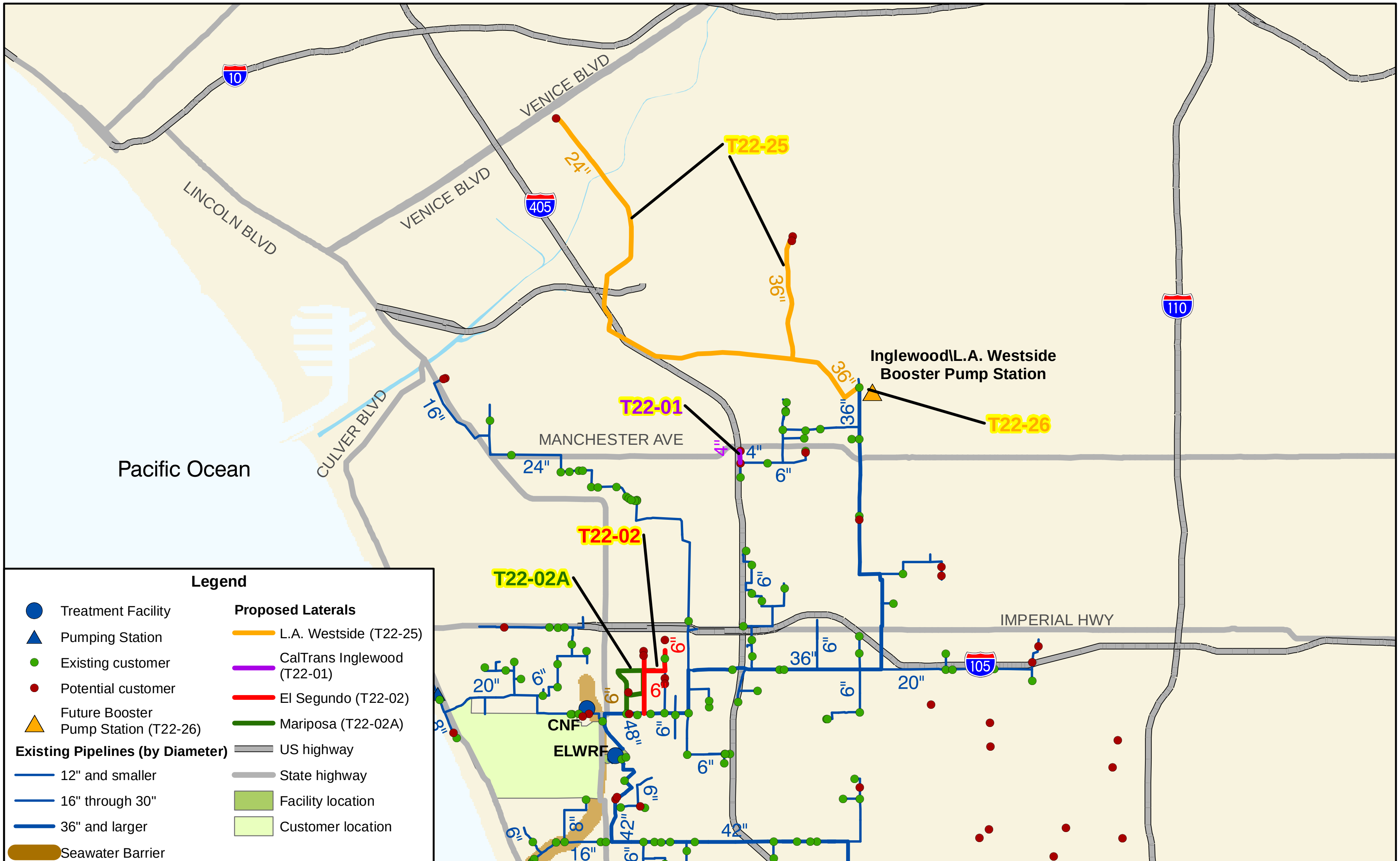
Figure 9.1C
City of Gardena - Potential Recycled Water Customer Sites

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems



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West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Figure 9.1D
LA Westside and
El Segundo Laterals

For all pipeline alignments, it is recommended that West Basin evaluate alternative alignments during preliminary design. As indicated in Table 9.2, cost estimates for several projects were provided by West Basin based on preliminary design and funding of specific laterals and were not estimated as a part of this study.

Special construction markups were applied to several of the Title 22 distribution system pipelines, as detailed in Table 9.4. The special construction markups were applied utilizing GIS layers for railroad, freeway, and arterial streets to determine which pipeline segments were anticipated to carry a larger cost of construction than anticipated by the developed unit costs. For railroad and freeway crossings, the markups account for assumed jack and bore construction techniques, while for arterial streets, higher markups account for increased cost of temporary traffic control. Where pipeline segments were not easily delineated into segments applicable for application of special construction markups, 500 feet was assumed for the construction markup (i.e., if the pipeline segment is 5,000 feet long, but crosses a freeway, the construction markup is applied to 500 feet of the segment length rather than the entire pipeline length).

It should be noted that the locations of the ten proposed disinfection stations shown on Figure 9.1 need to be verified and further evaluated based on water quality data obtained from field measurements. For budgetary purposes the ten recommended stations were divided into two groups, Phase I (T22-11) and Phase II (T22-21). The prioritization of these stations would need to be evaluated by comparing field measurements of existing and historical chlorine residual levels. It is also recommended that a study be conducted to evaluate if the installation of pig-launching and retrieval ports at strategic locations in the distribution system could replace and/or increase the effectiveness of these proposed disinfection stations. This study is included in the list of recommended studies found in Table 9.35.

For each of the laterals recommended for the Title 22 distribution system, demands served by the lateral are presented in Table 9.3. The projected average annual demands reflect Scenarios 7A and 7B.

A detailed breakdown of pipeline sizes for each lateral is presented in Table 9.4. The lengths in Table 9.4 are grouped into individual projects listed in Table 9.2 and Table 9.37. Special construction considerations indicate portions of the project to which are apply additional markups to account for advanced construction techniques or additional traffic control.

Table 9.3 Demands Associated with Title 22 Laterals
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Project Description	Average Annual Demand (afy)
T22-01	Caltrans Inglewood Lateral	10.0
T22-02	El Segundo Lateral (Boeing, Kilroy Airport)	200.0
T22-02A	Mariposa Lateral (Mattel, Hilton, Marriot)	15.0
T22-04	Virco-Torrance Lateral	10.0
T22-06	Carson Mall Lateral	110.0
T22-07	Redondo Beach Lateral (Pete's Nursery)	25.0
T22-08	Mills Park Lateral	10.0
T22-09	Anza Lateral Phase II	80.0
T22-10	Anza PS (4-500 gpm pumps)	
T22-12	Main Street Carson Lateral	275.0
T22-13	Dominguez Street Lateral	260.0
T22-14	Caltrans Gardena Lateral	25.0
T22-15	Palos Verdes - Lateral 6B	670.0
T22-16	Palos Verdes PS (4-1,250 gpm pumps)	
T22-18A	Gardena Lateral - Normandie Ave	165.0
T22-18B	Gardena Lateral - Normandie and Vermont	70.0
T22-18C	Gardena Lateral - Van Ness	55.0
T22-19	Dyehouse Lateral	220.0
T22-20	Dyehouse PS (3-250 gpm pumps)	
T22-22	Hawthorne Lateral (Solec)	175.0
T22-25	LA Westside Lateral	5,500.0

Table 9.4 Details of Title 22 Laterals
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Project Description	Diameter	Special Const(1)	Length(2) (ft)
T22-14	Caltrans Gardena Lateral	8	-	215
		6		3,025
T22-01	Caltrans Inglewood Lateral	4	ART	771
T22-06	Carson Mall Lateral	6	-	1,259
		6	ART	1,623
		6	FWY	1,344
		16	-	1,555
		16	FWY	2,597
		8	-	1,508

Table 9.4 Details of Title 22 Laterals
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Project Description	Diameter	Special Const(1)	Length(2) (ft)
T22-19	Dyehouse Lateral	8	-	11,638
T22-02	El Segundo Lateral (Boeing, Kilroy Airport)	6	-	546
T22-02A	Mariposa Lateral (Mattel, Hilton, Marriot)	6	-	1,400
T22-02	El Segundo Lateral (Boeing, Kilroy Airport)	6	-	5,802
T22-22	Hawthorne Lateral (Solec)	6	-	5,055
T22-15	Palos Verdes - Lateral 6B	24	-	13,048
		20	-	1,417
		16	-	14,232
		12	-	13,642
T22-07	Redondo Beach Lateral (Pete's Nursery)	6	-	2,092
T22-04	Virco-Torrance Lateral	6	-	1,072
T22-08	Mills Park Lateral	6	-	864
T22-12	Main Street Carson Lateral	16	ART	8,452
		8	-	13,538
		8	ART	3,500
		6	-	9,156
		6	ART	2,195
T22-13	Dominguez Street Lateral	6	-	5,073
		8	-	5,887
		8	RR	3,322
T22-18B	Gardena Lateral - Normandie and Vermont	6	-	11,908
		6	ART	2,243
		4	-	5,072
T22-18A	Gardena Lateral - Normandie Ave	8	-	8,235
		8	ART	915
T22-18C	Gardena Lateral - Van Ness	6	-	12,784
		4	-	1,742
T22-25	LA Westside Lateral	24	-	25,802
		36	-	12,721
		36	FWY	1,000
		36	RR	500
T22-09	Anza Lateral Phase II	8	-	8,002
		6	-	7,167
		4	-	698
Total				**234,618**

Notes:
1. Special Construction Markup Abbreviations: ART – Arterial Street requiring extensive temporary traffic control or alternate construction hours (125% of unit cost for distance of crossing or distance along street); RR – Railroad Crossing requiring jack and bore or alternate trenchless construction techniques (200% of unit cost for distance of crossing).FWY – Freeway Crossing requiring jack and bore or alternate trenchless construction techniques (200% of unit cost for distance of crossing).
2. Totals may not line up with Table 9.37 due to rounding.

As shown in Table 9.4, the total length of new Title 22 laterals is estimated at 235,000 lineal feet or 44 miles.

9.1.3 West Coast Barrier System

Table 9.5 presents the list of recommended improvements to the West Coast Barrier distribution system and treatment processes.

Table 9.5 Project Summary for West Coast Barrier System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost
BW-01	FY10/11	ELWRF Phase V Expansion - Increase treatment capacity of Barrier treatment by 5.0 mgd, from 12.5 mgd to 17.5 mgd.	$31,800,000
BW-02	FY10/11	Add VFDs to product water pumps	$700,000(1)
BW-04	FY10/11	Modify site piping at ELWRF, replacing 20-inch discharge piping and meter with 27-inch discharge piping and meter.	$175,000(1)
Total			**$32,675,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.5, the total anticipated cost for the recommended improvements for the West Coast Barrier System are approximately $32.7 M. The most costly project of the projects proposed for the West Coast Barrier Water System is the Phase V Treatment Expansion Project (BW-01).

For BW-01, the cost estimate shown is from the ELWRF Phase V Expansion Feasibility Study (HDR 2008) and was not estimated as a part of this study. Costs for expansion of the Barrier product water pump station are assumed to be included in the capital cost shown. This project is anticipated to be completed as a part of the ELWRF Phase V Expansion.

9.1.4 Chevron High Pressure Boiler Feed System

Table 9.6 presents the list of recommended improvements to the Chevron HPBF distribution system and treatment processes.

Table 9.6 Project Summary for CHPBF System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost
CH-01	FY10/11	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO Ultra treatment for HPBF by 0.5 mgd, from 2.6 mgd to 3.1 mgd (to meet MMD of 2,153 gpm).	$2,650,000
CH-02	FY10/11	Replace existing pumps with 2-2,400 gpm pumps (to meet MDD of 2,395 gpm).	$700,000(1)
Total			**$3,350,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.6, the total anticipated cost for improvements for the CHPBF is approximately $3.4M. The most costly component is the additional treatment capacity. Phasing of these improvements is coordinated with the ELWRF Phase V Expansion.

The cost estimate for CH-01 was provided by West Basin staff and is based on cost estimates prepared during ELWRF Phase V Expansion Feasibility Study phase.

9.1.5 Chevron Low Pressure Boiler Feed System

Table 9.7 presents the list of recommended improvements to the Chevron LPBF distribution system and treatment processes, excluding improvements to the system for the addition of the El Segundo Power Plant, which are addressed in Section 9.1.6.

Table 9.7 Project Summary for CLPBF System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost
CL-01	FY10/11	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO treatment for LPBF by 0.4 mgd, from 1.7 mgd to 2.1 mgd (to meet MMD of 1,218 gpm).	$1,050,000
CL-02	FY10/11	Replace existing pumps with 3-1,250 gpm pumps (to meet MDD of 2,039 gpm).	$1,050,000(1)
Total			**$2,100,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.7, the total anticipated cost for improvements at the CLPBF is approximately $2.1 M. The most costly component is the additional treatment capacity. Phasing of these improvements is coordinated with the ELWRF Phase V Expansion.

The cost estimate for CL-01 was provided by West Basin staff and is based on cost estimates prepared during ELWRF Phase V Expansion Feasibility Study phase.

Figure 9.2 shows locations of each of the recommended improvements from Table 9.7.

9.1.6 El Segundo Power Plant Boiler Feed System

Table 9.8 presents the list of recommended improvements to the El Segundo Power Plant Boiler Feed System distribution system. Pump station costs are included with upgrades to the Chevron Low Pressure Boiler Feed System, found in Table 9.7.

Table 9.8 Project Summary for ESPP System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost[1]
ESPP-01	FY15-20	Add to treatment capacity of Industrial RO treatment for ESPP of 0.5 mgd (to meet MMD of 325 gpm).	$1,900,000
ESPP-02	FY15-20	El Segundo Power Plant Pipeline from Chevron to El Segundo Power Plant	$3,895,000
ESPP-03	FY15-20	PRV at Chevron	$80,000
Total			**$5,875,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.8, the total anticipated cost for improvements to serve El Segundo Power Plant is approximately $5.9 M. The most costly component is the pipeline from the CLPBF system to the El Segundo Power Plant.

For ESPP-01, the cost estimate shown is from the ELWRF Phase V Expansion Study and was not estimated as a part of this study. Figure 9.2 shows locations of each of the recommended improvements from Table 9.8.

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Figure 9.2
Chevron LPBF & ESPP
CIP Projects

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

9.1.7 Chevron Nitrified Water System

Table 9.9 presents the list of recommended improvements to the Chevron Nitrified Water distribution system. Recommended improvements for treatment, backup power, and replacement equipment for the Chevron Nitrification Facility are included in Table 9.18.

**Table 9.9 Project Summary for Chevron Nitrified Water System
Capital Implementation Master Plan
West Basin Municipal Water District**

ID	Phase	Project Description	Capital Cost(1)
CN-01	FY10/11	Replace existing pumps with 4-1,800 gpm pumps (to meet peak demand of 5,164 gpm).	$1,575,000
Total			**$1,575,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.9, the total anticipated cost for improvements at the CNS is approximately $1.6M. The only recommendation for this distribution system is upgrade of the pump station. Phasing of this improvement is coordinated with the ELWRF Phase V Expansion. It should be noted that the improvements associated with the Chevron Nitrification Facility are listed in Section 9.1.16.

9.1.8 ELWRF Brine Line

Table 9.10 presents the list of recommended improvements to the ELWRF Brine Line system. Recommended improvements for treatment, backup power, and replacement equipment for this system are included in the ELWRF improvement list in Table 9.15.

**Table 9.10 Project Summary for ELWRF Brine Line
Capital Implementation Master Plan
West Basin Municipal Water District**

ID	Phase	Project Description	Capital Cost(1)
EBRN-01	FY10/11	Install pinch valves/reducers	$630,000
EBRN-02	FY11/12	Install access ports for cleaning	$1,885,000
Total			**$2,515,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.10, the total anticipated cost for improvements in the ELWRF Brine Line system is approximately $2.5 M.

9.1.9 bp Reverse Osmosis System

Table 9.11 presents the list of recommended improvements to the bp RO system.

Table 9.11 Project Summary for bp Reverse Osmosis System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
BPRO-01	FY11/12	Treat SE from JWPCP w/ MF/RO to serve growth in bp RO System	$73,080,000
BPRO-02	FY11/12	New Pipeline from NTP to bp for conveyance of Industrial RO Water.	$8,705,000
BPRO-03	FY11/12	New pump station at NTP to serve bp Industrial RO (assumes 4-2,100 gpm pumps, in PS w/ BPN-04)	$4,200,000
Total			**$85,985,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.11, the total anticipated cost for improvements in the bp RO system is approximately $86.0 M. The most costly component is the treatment associated with supplying Industrial RO water at the JWPCP. It is important to note that under supply alternative Option 1, discussed in Section 8.4, this cost would be partially encountered through expansion of the conventional Title 22 treatment processes at ELWRF, but the MF/RO treatment at JWPCP incorporates both SE treatment and Industrial RO treatment into one process. Phasing of these improvements are coordinated with the CRWRF Phase II Expansion.

9.1.10 bp Nitrified Water System

Table 9.12 presents the list of recommended improvements to the bp Nitrified water system.

As presented in Table 9.12, the total anticipated cost for improvements in the bp Nitrified system is approximately $48.0 M. The most costly component is the treatment associated with supplying MF water at the JWPCP to the Nitrification process. It is important to note that under supply alternative Option 1, discussed in Section 8.4, this cost would be partially encountered through expansion of the conventional Title 22 treatment processes at ELWRF. Phasing of these improvements are coordinated with the CRWRF Phase II Expansion.

Table 9.12 Project Summary for bp Nitrified Water System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
BPN-01	FY11/12	Treat SE from JWPCP w/ MF to serve growth in bp Nitrified System	$16,800,000
BPN-02	FY11/12	Nitrified Treatment - treat MF treated SE (BPN-01) from JWPCP to serve growth in bp Nitrified System	$12,205,000
BPN-03	FY11/12	New 20" pipeline from NTP to bp for conveyance of Nitrified Water.	$9,535,000
BPN-03A	FY11/12	Parallel 14" pipeline from CRWRF to bp for conveyance of Nitrified Water.	$4,245,000
BPN-04	FY11/12	New pump station at NTP to serve bp Nitrified (assumes 4-1,500 gpm pumps, in PS w/ BPRO-03)	$3,150,000
BPN-05	FY11/12	Add a 1.0 MG storage reservoir to NTP to maintain current number of hours of backup for bp Nitrified system.	$2,100,000
Total			**$48,035,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

The 14-inch diameter parallel pipeline from CRWRF to Gate 7 at the bp Carson Refinery would provide redundancy to the current 12-inch diameter pipeline used for conveyance of Nitrified Water. The configuration of the projects listed in Table 9.12 will need to be established during preliminary design.

9.1.11 CRWRF Brine Line

Table 9.13 presents the list of recommended improvements to the CRWRF Brine Line system. Recommended improvements for treatment, backup power, and replacement equipment for this system are included in the CRWRF improvement list in Table 9.16.

As presented in Table 9.13, the total anticipated cost for improvements in the CRWRF Brine Line system is approximately $1.3M. Phasing of these improvements is coordinated with the CRWRF Phase II Expansion.

Table 9.13	Project Summary for CRWRF Brine Line Capital Implementation Master Plan West Basin Municipal Water District		
ID	**Phase**	**Project Description**	**Capital Cost(1)**
CBRN-01	FY11/12	Install access ports for cleaning	$1,260,000
Total			**$1,260,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As discussed in Chapter 8, sufficient pressure is available at the CRWRF RO process train to convey the additional flow anticipated for this system. Costs for reconfiguring the RO process train to provide additional head for this system are assumed minimal and thus not included in the CIP.

9.1.12 System-Wide Improvements

Table 9.14 presents a list of recommended improvements which apply to more than one West Basin facility.

Table 9.14	Project Summary for System-Wide Improvements Capital Implementation Master Plan West Basin Municipal Water District		
ID	**Phase**	**Project Description**	**Capital Cost**
SW-01	Mult	United Water Recapitalization Improvements (recurring)	$4,230,000
SW-02	FY09/10	UW Recap - Major Painting Projects	$150,000
SW-03	FY09/10	UW Recap - Purchase trailer for spill response	$5,000
SW-04	FY09/10	UW Recap - Asset Management Software, Implementation and Training	$300,000
SW-05	FY09/10	UW Recap - Replace all Biofor valves at CNF and EMWRF	$200,000
SW-06	Mult	United Water Recapitalization Improvements (recurring)	$4,230,000
Total			**$9,115,000**

As shown in Table 9.14, the costs for improvements associated with more than one facility total $9.1M. The system-wide improvements consist solely of recapitalization improvements, identified by United Water (UW), West Basin's system operator. These are improvements requested by United Water and are listed individually for FY0910. For conservative planning purposes, it is assumed a similar cost will occur approximately every five years through the planning horizon, in FY1415, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in SW-01 and SW-06 (listed as two separate projects to separate the costs for FY1415 through FY1920 and FY2021 through FY2930). United Water projects are listed similarly for all treatment facilities. For a summary of these project costs by treatment facility and other recurring costs, see Section 9.3.4.

9.1.13 ELWRF

The recommended projects for ELWRF are listed in Table 9.15.

As presented in Table 9.15, the total anticipated cost for improvements for ELWRF is anticipated to be approximately $276.2 M. Phasing of improvements related to Phase V are coordinated with the ELWRF Phase V Expansion, and are included in the relevant subsystems (i.e., Sections 9.1.3, 9.1.4, 9.1.5, and 9.1.6). A summary of items included in the Phase V expansion are included in Section 9.3.3).

Table 9.15 does not include treatment expansions at ELWRF associated with subsystems, as detailed in Sections 9.1.3, 9.1.4, 9.1.5, and 9.1.6. The total cost of all projects physically located at ELWRF, including projects listed in detailed in Sections 9.1.3, 9.1.4, 9.1.5, and 9.1.6, is estimated to be $316.2 M (excluding the Title 22 pump station and storage).

Table 9.15 Project Summary for ELWRF
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost[1]
ELWRF-01	FY09/10	UW Recap - T-22 backwash pump total rebuilds (increase capacity of T22 backwash blower)	$100,000
ELWRF-03	FY10/11	ELWRF Phase V Expansion - Add redundant gravity thickener.	$1,960,000
ELWRF-04	FY10/11	ELWRF Phase V Expansion - Resolve underperformance of baskwash equalization basin.	$170,000
ELWRF-05	FY10/11	ELWRF Phase V Expansion - Redundant Sludge Conditioning Tank	$140,000
ELWRF-06	FY10/11	Increase Capacity of Title 22 Air Vacuum Release Valve for Product Water Storage Tanks	$100,000
ELWRF-07	FY12/13	Add Title 22 High Rate Clarifier and Title 22 Filters (to bring clarifier from 30.0 mgd to 50.0 mgd and filter capacity from 40.0 mgd to 50.0 mgd)	$12,600,000
ELWRF-09	FY15-20	Add 17.3 mgd of Title 22 Treatment, to increase Title 22 treatment capacity from 50.0 mgd to 67.3 mgd	$48,440,000

Table 9.15 Project Summary for ELWRF
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
ELWRF-10	FY15-20	Increase capacity of Title 22 Pump Station at ELWRF by 3,200 hp (from 4,800 hp to 8,000 hp) to serve Future Title 22 Customers	$14,340,000
ELWRF-11	FY15-20	Microfiltration - Replace existing Phase II and III MF System w/ Pressurized System	$16,800,000
ELWRF-12	FY15-20	Backup Power	$11,200,000
ELWRF-13	FY15-20	Dewatered Sludge Handling Transfer System	$2,800,000
ELWRF-15	FY15-20	Potable Water Connection to ELWRF	$280,000
ELWRF-16	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$21,860,000
ELWRF-17	Mult	Membrane Replacement (recurring)	$11,053,800
ELWRF-18	Mult	United Water Recapitalization Improvements (recurring)	$5,070,000
ELWRF-19	FY09/10	UW Recap - Pave area between T 22 filters and the holding basins	$8,800
ELWRF-20	FY09/10	UW Recap - Shelter/Overhead cover when CO2 tank is removed. To provide covered storage area for chemical totes. Include access for forklifts around dike area.	$100,000
ELWRF-21	FY09/10	UW Recap - Phase III Memcor and SCADA and PC	$5,000
ELWRF-22	FY09/10	UW Recap - No. 3 Sulfuric acid day tank replace	$30,000
ELWRF-23	FY09/10	UW Recap - Replace grating replacement in chemical area with chemical resistant grating	$40,000
ELWRF-24	FY09/10	UW Recap - Trench Drains at Decant Sump area	$30,000
ELWRF-25	FY09/10	UW Recap - Power receptacles for emergency generator hook up for Title 22	$20,000
ELWRF-26	FY09/10	UW Recap - Replace DCS back up power (48vac) generator	$45,000
ELWRF-27	FY09/10	UW Recap - Flow control valve and actuator for barrier product pump	$100,000
ELWRF-28	FY09/10	UW Recap - Replace or expand plant instrument air compressor system	$75,000
ELWRF-29	FY09/10	UW Recap - Replace phase II RO Membranes	$375,000
ELWRF-30	FY09/10	UW Recap - Data Parser to allow for direct entry of data from instrumentation into LIMS.	$25,000
ELWRF-31	FY09/10	UW Recap - Replace or repair lab wall to prevent water intrusion and mold	$25,000
ELWRF-32	FY20-25	Land Acquisition of 4.0 ac near ELWRF for Expansion of Title 22 Beyond 70.0 mgd	$9,600,000

Table 9.15	Project Summary for ELWRF Capital Implementation Master Plan West Basin Municipal Water District		
ID	**Phase**	**Project Description**	**Capital Cost**(1)
ELWRF-33	FY25-30	Increase capacity of Title 22 Pump Station at ELWRF by 4,000 hp (from 8,000 hp to 12,000 hp) to serve LADWP Harbor Expansion, Westside, and Kenneth Hahn	$16,800,000
ELWRF-34	FY25-30	Add 8.9 mgd of Additional Title 22 Treatment to Serve LADWP Harbor Expansion, increasing Title 22 Treatment Capacity from 67.3 mgd to 76.2 mgd	$24,945,000
ELWRF-35	FY25-30	Add 15.3 mgd of Additional Title 22 Treatment to Serve LADWP Westside and Kenneth Hahn Park, increasing Title 22 Treatment Capacity from 76.2 mgd to 91.5 mgd	$42,970,000
ELWRF-36	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$17,965,000
ELWRF-37	Mult	Membrane Replacement (recurring)	$11,055,000
ELWRF-38	Mult	United Water Recapitalization Improvements (recurring)	$5,070,000
Total			**$276,197,600**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

Recapitalization improvements requested by United Water are listed individually for FY09/10 (ELWRF-19 through ELWRF-31). For conservative planning purposes, it is assumed a similar cost will occur approximately every five years through the planning horizon, in FY14/15, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in ELWRF-18 and ELWRF-38 (listed as two separate projects to separate the costs for FY14/15 through FY19/20 and FY20/21 through FY29/30). For detailed information on the development of recurring costs, see Section 9.3.4.

9.1.14 CRWRF

The recommended projects for CRWRF are listed in Table 9.16. As seen in Table 9.16, the total anticipated cost for improvements for CRWRF is anticipated to be approximately $126.1 M. The most costly recommendation for this distribution system is the Nitrified treatment for future Nitrified water demands served by CRWRF.

Table 9.15 does not include treatment expansions at the NTP, which are detailed in Sections 9.1.9 and 9.1.10. If the JWPCP secondary source is not utilized for service to bp and Dominguez Gap Barrier, most of the NTP projects would need to be redefined and included at CRWRF.

Figure 9.3 shows the proposed alignment of the pipeline required to convey recycled water to the boundary between the cities of Carson and Los Angeles to deliver the LADWP Harbor demand. This figure also shows the alignment of the pipeline to serve the bp Nitrification demands (listed in Table 9.12, with the bp Nitrified water distribution system) associated with the NTP. It should be noted that the actual locations of the NTP and the pipeline would need to be determined during preliminary design of these projects.

Table 9.16 Project Summary for CRWRF
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Year / Phase	Project Description	Capital Cost(1)
CRWRF-01	FY11/12	Pipeline for LADWP Harbor demands at Carson City bndy	$29,100,000
CRWRF-02	FY11/12	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand and Rhodia)	$43,141,278
CRWRF-03	FY11/12	Add new 11.6 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	$5,250,000
CRWRF-04	FY11/12	Surge Protection – Modify MF Units with Break Tank and Pumps	$6,300,000
CRWRF-05	FY11/12	Raw Water Storage (1 hour)	$5,250,000
CRWRF-06	FY11/12	Repair Nitrified Product Water Storage Tank	$560,000
CRWRF-07	FY15-20	Backup Power	$2,520,000
CRWRF-08	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$6,375,000
CRWRF-09	Mult	Membrane Replacement (recurring)	$2,799,000
CRWRF-10	Mult	United Water Recapitalization Improvements (recurring)	$1,690,000
CRWRF-11	FY09/10	UW Recap - Construct paved access way from road to rear side of RO CIP tank.	$10,000
CRWRF-12A	FY20-25	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand Phase II)	$10,480,000
CRWRF-12B	FY20-25	Add new 7.1 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	$4,200,000
CRWRF-13	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$3,895,000
CRWRF-14	Mult	Membrane Replacement (recurring)	$2,800,000
CRWRF-15	Mult	United Water Recapitalization Improvements (recurring)	$1,690,000
Total			**$126,060,278**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

Recapitalization improvements requested by United Water are listed individually for FY09/10 (CRWRF-11). For conservative planning purposes, it is assumed a similar cost will occur approximately every five years through the planning horizon, in FY14/15, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in CRWRF-10 and CRWRF-15 (listed as two separate projects to separate the costs for FY14/15 through FY19/20 and FY20/21 through FY29/30). For detailed information on the development of recurring costs, see Section 9.3.4.

9.1.15 EMWRF

Table 9.17 presents the list of recommended improvements to EMWRF.

Table 9.17 Project Summary for EMWRF
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost[1]
EMWRF-01	FY11/12	Repair or Replace Bulk Chemical Storage Tank and Associated Equipment	$700,000
EMWRF-02	FY11/12	Inspect Nitrified Product Water Storage Tank Internal Condition	$85,000
EMWRF-03	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$6,980,000
EMWRF-04	FY15-20	Add 0.6 mgd of Industrial RO Treatment of Title 22 Water (half of 1,000 afy total w/ RO).(6)	$1,890,000
EMWRF-05	FY15-20	Add 0.5 mgd of Nitrified Treatment of Title 22 Water (half of 1,000 afy total w/ Nitrified).(6)	$735,000
EMWRF-06	FY15-20	Surge Protection - Modify MF Units with Break Tank and Pumps	$3,500,000
EMWRF-07	FY15-20	Backup Power for Product Water Pumps	$700,000
EMWRF-08	Mult	Membrane Replacement (recurring)	$1,650,000
EMWRF-09	Mult	United Water Recapitalization Improvements (recurring)	$850,000
EMWRF-10	FY09/10	UW Recap - Pavement of area between gated entrance and plant.	$20,000
EMWRF-11	FY09/10	UW Recap - Add an additional air compressor for the MF system	$30,000
EMWRF-12	FY09/10	UW Recap - RO Train 4 membrane change out	$160,000
EMWRF-13	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$3,265,000
EMWRF-14	Mult	Membrane Replacement (recurring)	$1,650,000
EMWRF-15	Mult	United Water Recapitalization Improvements (recurring)	$850,000
Total			**$23,065,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.17, the total anticipated cost for improvements for EMWRF is anticipated to be approximately $23.1 M. Projects EMWRF-04 and EMWRF-05 are included to accommodate potential expansion of the capacity of EMWRF. It should be noted that, as the projects due to growth or expansion anticipated at EMWRF are not associated with demands listed in the customer database, no analysis or hydraulic evaluation associated with the effects of these demands was conducted (these demands are not mentioned in Chapters 3, 4, or 8). All remaining projects are either replacement or rehabilitation of existing equipment, as planned by the condition assessment, reliability projects, or surge reduction projects to reduce surges to the Title 22 distribution system (i.e., EMWRF-06).

Recapitalization improvements requested by United Water are listed individually for FY09/10 (EMWRF-10 through EMWRF-12). For conservative planning purposes, it is assumed a similar cost will occur approximately every five years through the planning horizon, in FY14/15, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in EMWRF-09 and EMWRF-15 (listed as two separate projects to separate the costs for FY14/15 through FY19/20 and FY20/21 through FY29/30). For detailed information on the development of recurring costs, see Section 9.3.4.

9.1.16 CNF

Table 9.18 presents the list of recommended improvements to CNF.

As presented in Table 9.17, the total anticipated cost for improvements for CNF is anticipated to be approximately $11.5 M. The vast majority of this cost is in replacement of existing equipment, as planned by the condition assessment. However, the costs for expansion of Nitrified treatment capacity are also significant. These improvements are described as the ELWRF Phase Va Expansion.

It should be noted that costs associated with the Chevron Nitrified Water system (consisting solely of expansion of the Nitrified water product water pump station) are included in Section 9.1.7, even though they are geographically located at the CNF. Since the Chevron Nitrified Water system costs total $1.7 M, the total cost of all improvements anticipated at the CNF is estimated to be $13.1 M.

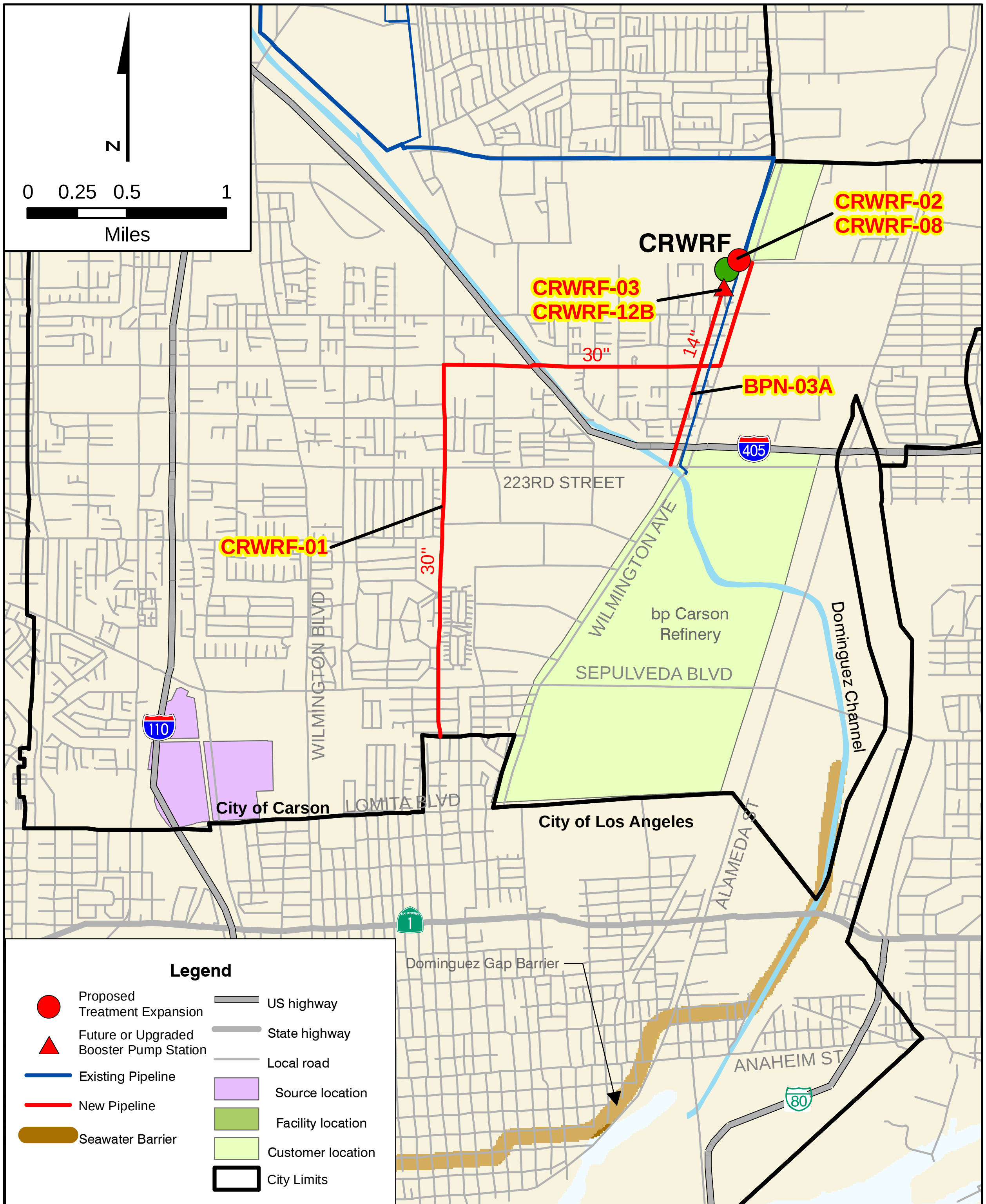

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Figure 9.3
Carson Regional Water Recycling Facility (CRWRF) Area CIP

Table 9.18 Project Summary for CNF
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost[1]
CNF-01	FY15-20	ELWRF Phase Va Expansion - Increase treatment capacity of Nitrified by 2.1, from 4.9 mgd to 7.0 mgd. (Two Biofor Units)	$3,090,000
CNF-02	FY15-20	ELWRF Phase Va Expansion - Backup Power to Product Water Pumps	$700,000
CNF-03	FY10/11	ELWRF Phase Va Expansion - Replace Turbine	$700,000
CNF-04	FY15-20	ELWRF Phase Va Expansion - Potable Water Backup Supply	$350,000
CNF-05	FY11/12	ELWRF Phase Va Expansion - Inspect Nitrified Product Water Storage Tank Internal Condition	$85,000
CNF-06	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$4,520,000
CNF-07	Mult	United Water Recapitalization Improvements (recurring)	$850,000
CNF-08	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$350,000
CNF-09	Mult	United Water Recapitalization Improvements (recurring)	$850,000
Total			**$11,495,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

No recapitalization improvements requested by United Water are included for CNF. For conservative planning purposes, it is assumed United Water costs will be required in future years, similar to West Basin's other treatment facilities approximately every five years through the planning horizon, in FY14/15, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in CNF-07 and CNF-09 (listed as two separate projects to separate the costs for FY14/15 through FY19/20 and FY20/21 through FY29/30). For detailed information on the development of recurring costs, see Section 9.3.4.

9.1.17 New Treatment Plant System

A new treatment plant (NTP) is needed to cost-effectively meet expanded advanced treatment demands in the south-east portion of West Basin's service area. As discussed in Chapter 8, it was determined that it would be most beneficial to add additional treatment on the south-east side to the West Basin recycled water system by treating secondary effluent from the Los Angeles County Sanitation District's JWPCP. This would provide cost savings and increase the overall system reliability. Sizing of the NTP is discussed in Section 8.4.1. The major recommended components for this treatment plant and associated distribution system are listed in Table 9.19. Treatment, pump station, and pipeline improvements associated with specific distribution systems are included separately with those distribution systems (i.e., Sections 9.1.9 and 9.1.10).

Table 9.19 Project Summary for the New Treatment Plant
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
NTP-01	FY11/12	Land Acquisition of 4.5 ac near JWPCP for NTP	$4,800,000
NTP-02	Mult	Membrane Replacement (recurring)	$8,525,000
NTP-03	FY20-25	Barrier Water Treatment - treat SE from JWPCP to serve Dominguez Gap (Phase I and II)	$34,125,000
NTP-04	FY20-25	Add new 3.1 mgd pump station at NTP to serve Dominguez Gap (Phase I + II)	$2,100,000
NTP-05	FY20-25	New Pipeline from NTP to Dominguez Gap Barrier Blending Station for conveyance of Barrier Water.	$9,640,000
NTP-06	Mult	Membrane Replacement (recurring)	$17,050,000
Total			**$76,240,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.19, the total anticipated cost for improvements for the NTP is approximately $76.2 M. The most costly recommendation listed in Table 9.19 is the treatment costs associated with the Dominguez Gap Barrier. However, treatment capacities for the bp Nitrified water system and bp RO system are listed separately in Sections 9.1.9 and 9.1.10 although they would be geographically located at the NTP.

The total cost of all improvements located at the NTP is estimated to be $187.8 M. It is important to note that under supply alternative Option 1, as discussed in Section 8.4, this cost would be partially encountered through expansion of the conventional Title 22 treatment processes at ELWRF. Phasing of these improvements is coordinated with the CRWRF Phase II Expansion.

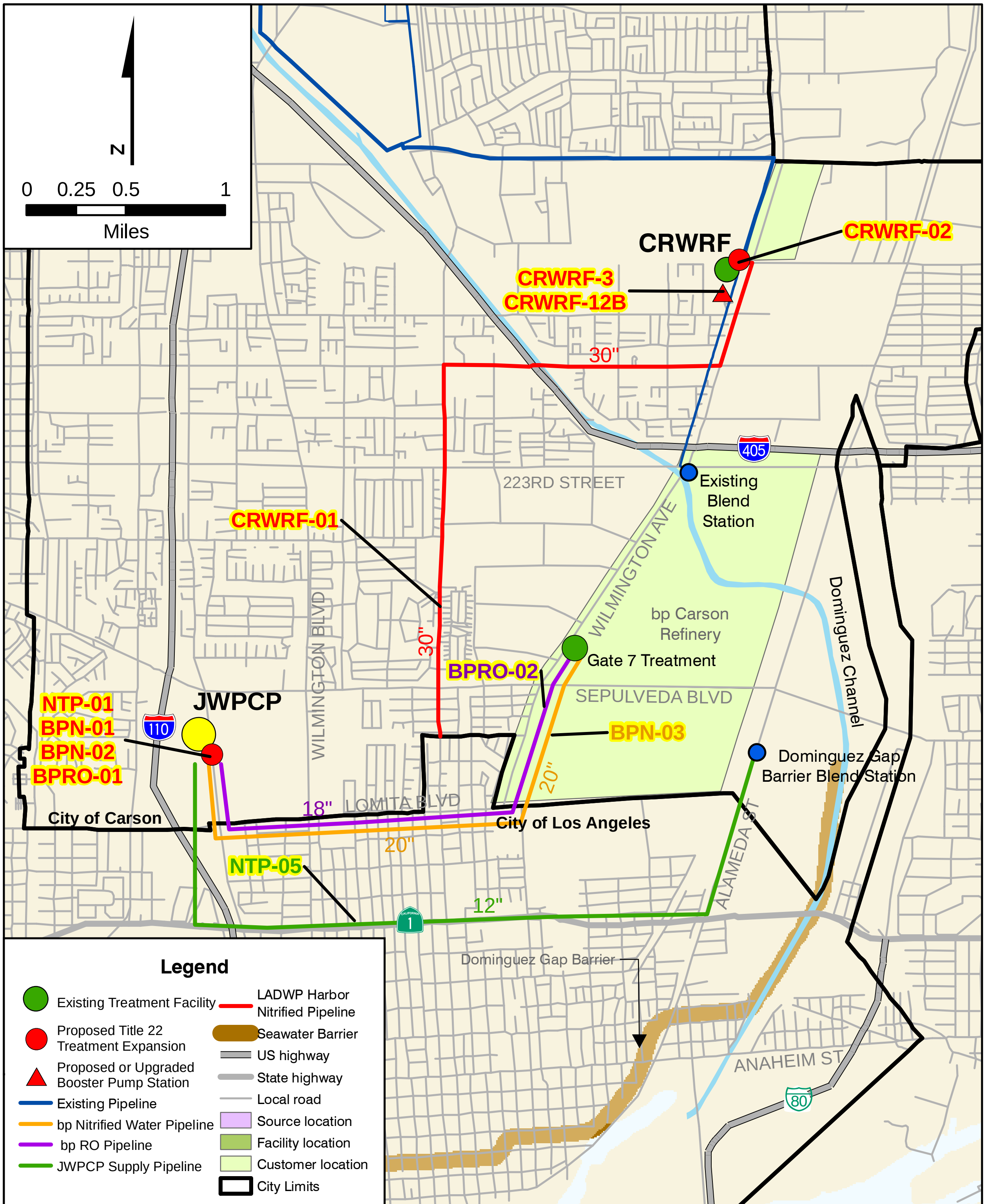

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Figure 9.4
New Treatment Plant (NTP) Area CIP

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Based on the modeling conducted with *OPTIMO*™, the major treatment process components that would need to be included in this NTP are:

- Microfiltration (MF)
- Reverse Osmosis (RO)
- MF Backwash Disposal
- RO Brine Disposal
- Disinfection

This NTP could be located at or in the vicinity of JWPCP, CRWRF, or along the transmission main alignment between the two plants. The preliminary locations of the facilities are shown on Figure 9.4. It should be noted that the actual locations of the NTP and the associated pipelines would need to be determined during preliminary design of these projects.

9.1.18 CIP Summary by System

The total estimated capital cost for the proposed projects of each of the systems described in Sections 9.1.1through 9.1.16 are summarized in Table 9.20.

Table 9.20 Project Summary by System
Capital Implementation Master Plan
West Basin Municipal Water District

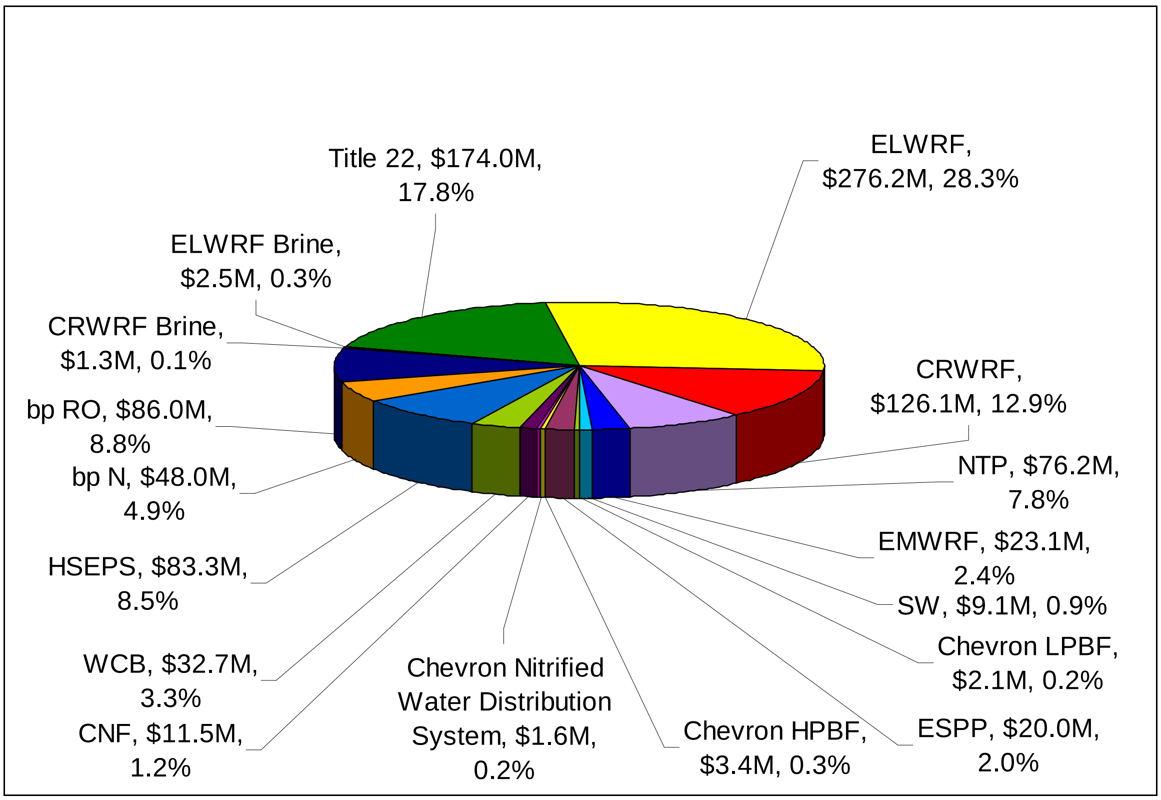
Facility ID	System/Treatment Plant Name	No. of Projects	Capital Cost(1)	Percentage of Total
HPS	Hyperion Secondary Effluent Pumping System	7	$83,320,000	8.6%
T22	Title 22 Distribution System	27	$174,000,000	18.1%
BW	West Coast Barrier Water System	3	$32,675,000	3.4%
CH	Chevron High Pressure Boiler Feed System	2	$3,350,000	0.3%
CL	Chevron Low Pressure Boiler Feed System	2	$2,100,000	0.2%
ESPP	El Segundo Power Plant System	3	$5,875,000	0.6%
CN	Chevron Nitrified Water System	1	$1,575,000	0.2%
EBRN	ELWRF Brine Line	2	$2,515,000	0.3%
BPRO	bp RO System	3	$85,985,000	8.9%
BPN	bp Nitrified Water System	6	$48,035,000	5.0%
CBRN	CRWRF Brine Line	1	$1,260,000	0.1%
SW	System Wide Improvements	6	$9,115,000	0.9%
ELWRF	Edward C. Little Water Recycling Facility	35	$276,197,600	28.7%
CRWRF	Carson Regional Water Recycling	16	$126,060,278	13.1%

Table 9.20	Project Summary by System Capital Implementation Master Plan West Basin Municipal Water District			
Facility ID	**System/Treatment Plant Name**	**No. of Projects**	**Capital Cost(1)**	**Percentage of Total**
	Facility			
EMWRF	ExxonMobil Water Recycling Facility	15	$23,065,000	2.4%
CNF	Chevron Nitrification Facility	9	$11,495,000	1.2%
NTP	New Treatment Plant	6	$76,240,000	7.9%
Total		**144**	**$962,862,878**	**100.0%**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.20, the total capital cost for all facilities is estimated at approximately $963.0 M. Figure 9.5 shows the distribution of these capital costs by system.

Figure 9.5
Distribution of Capital Costs by System



As shown in Figure 9.5, more than half of the total CIP costs are contributed by four of the fifteen systems, the Title 22 system, ELWRF, CRWRF, and the NTP.

9.2 PHASING OF RECOMMENDATIONS

This CIP is divided into six 1-year planning periods from Fiscal Year (FY) 2009/2010 through FY 2014/2015, and three 5-year planning periods from FY2015/2016 through FY 2025/2030. The phasing for a large number of projects is related to the phasing of the CRWRF Phase II Expansion project, for which the Carson Regional WRF Expansion Feasibility Study should be completed in April 2009. Project phasing is also based on the anticipated year that customers could be connected as determined in discussions with West Basin staff and as listed in Chapter 3.

This section presents a summary of the CIP projects by planning phase.

9.2.1 CIP Projects for FY09/10

Table 9.21 presents the CIP projects phased in FY2009/2010 (FY09/10).

Table 9.21 CIP Projects for FY09/10
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost[1]
T22-02A	T22	Mariposa Lateral (Mattel, Hilton, Marriot)	$750,000
T22-06	T22	Carson Mall Lateral	$2,500,000
T22-09	T22	Anza Lateral Phase II	$3,500,000
T22-10	T22	Anza PS (4-500 gpm pumps)	$2,000,000
T22-19	T22	Dyehouse Lateral	$3,000,000
T22-20	T22	Dyehouse PS (3-250 gpm pumps)	$1,500,000
Subtotal – Title 22 Distribution System			***$13,250,000***
ELWRF-01	ELWRF	UW Recap - T-22 backwash pump total rebuilds (increase capacity of T22 backwash blower)	$100,000
ELWRF-19	ELWRF	UW Recap - Pave area between T 22 filters and the holding basins	$8,800
ELWRF-20	ELWRF	UW Recap - Shelter/Overhead cover when CO2 tank is removed. To provide covered storage area for chemical totes. Include access for forklifts around dike area.	$100,000
ELWRF-21	ELWRF	UW Recap - Phase III Memcor and SCADA and PC	$5,000
ELWRF-22	ELWRF	UW Recap - No. 3 Sulfuric acid day tank replace	$30,000
ELWRF-23	ELWRF	UW Recap - Replace grating replacement in chemical area with chemical resistant grating	$40,000
ELWRF-24	ELWRF	UW Recap - Trench Drains at Decant	$30,000

Table 9.21 CIP Projects for FY09/10 Capital Implementation Master Plan West Basin Municipal Water District			
ID	**System**	**Project Description**	**Capital Cost(1)**
		Sump area	
ELWRF-25	ELWRF	UW Recap - Power receptacles for emergency generator hook up for Title 22	$20,000
ELWRF-26	ELWRF	UW Recap - Replace DCS back up power (48vac) generator	$45,000
ELWRF-27	ELWRF	UW Recap - Flow control valve and actuator for barrier product pump	$100,000
ELWRF-28	ELWRF	UW Recap - Replace or expand plant instrument air compressor system	$75,000
ELWRF-29	ELWRF	UW Recap - Replace phase II RO Membranes	$375,000
ELWRF-30	ELWRF	UW Recap - Data Parser to allow for direct entry of data from instrumentation into LIMS.	$25,000
ELWRF-31	ELWRF	UW Recap - Replace or repair lab wall to prevent water intrusion and mold	$25,000
CRWRF-11	CRWRF	UW Recap - Construct paved access way from road to rear side of RO CIP tank.	$10,000
EMWRF-10	EMWRF	UW Recap - Pavement of area between gated entrance and plant.	$20,000
EMWRF-11	EMWRF	UW Recap - Add an additional air compressor for the MF system	$30,000
EMWRF-12	EMWRF	UW Recap - RO Train 4 membrane change out	$160,000
SW-02	SW	UW Recap - Major Painting Projects	$150,000
SW-03	SW	UW Recap - Purchase trailer for spill response	$5,000
SW-04	SW	UW Recap - Asset Management Software, Implementation and Training	$300,000
SW-05	SW	UW Recap - Replace all Biofor valves at CNF and EMWRF	$200,000
Subtotal – United Water Recapitalization Improvements			***$1,853,800***
Total			**$15,103,800**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As shown in Table 9.21, projects currently anticipated in FY09/10 include only rehabilitation and recapitalization projects. These projects total $15.1M. The projects listed for FY09/10 are either Title 22 distribution system improvements or United Water recapitalization improvements.

9.2.2 CIP Projects for FY10/11

Table 9.22 presents the CIP projects phased in FY2010/2011 (FY10/11).

Table 9.22 CIP Projects for FY10/11
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost(1)
CL-01	CL	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO treatment for LPBF by 0.4 mgd, from 1.7 mgd to 2.1 mgd (to meet MMD of 1,218 gpm).	$1,050,000
CL-02	CL	Replace existing pumps with 3-1,250 gpm pumps (to meet MDD of 2,039 gpm).	$1,050,000
CH-01	CH	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO Ultra treatment for HPBF by 0.5 mgd, from 2.6 mgd to 3.1 mgd (to meet MMD of 2,153 gpm).	$2,650,000
CH-02	CH	Replace existing pumps with 2-2,400 gpm pumps (to meet MDD of 2,395 gpm).	$700,000
CN-01	CN	ELWRF Phase Va Expansion - Replace existing pumps with 4-1,800 gpm pumps (to meet peak demand of 5,164 gpm).	$1,575,000
CNF-03	CNF	ELWRF Phase Va Expansion - Replace Turbine	$700,000
BW-01	BW	ELWRF Phase V Expansion - Increase treatment capacity of Barrier treatment by 5.0 mgd, from 12.5 mgd to 17.5 mgd.	$31,800,000
BW-02	BW	Add VFDs to product water pumps	$700,000
BW-04	BW	Modify site piping at ELWRF, replacing 20-inch discharge piping and meter with 27-inch discharge piping and meter.	$175,000
HPS-01	HPS	Add 23 mgd of additional pumping capacity, to bring firm capacity to 74 mgd of firm capacity. (Phase I of II; total project assumes 7 pumps, 7,000 hp total)	$14,700,000
HPS-03	HPS	Secondary Power Connection for Backup Power	$2,520,000
HPS-04	HPS	PS Building	$560,000
EBRN-01	EBRN	Install pinch valves/reducers	$630,000
T22-04	T22	Virco-Torrance Lateral	$340,000
T22-13	T22	Dominguez Street Lateral	$4,500,000
ELWRF-03	ELWRF	ELWRF Phase V Expansion - Add redundant gravity thickener.	$1,960,000
ELWRF-04	ELWRF	ELWRF Phase V Expansion - Resolve underperformance of backwash equalization basin.	$170,000

Table 9.22	CIP Projects for FY10/11 Capital Implementation Master Plan West Basin Municipal Water District		
ID	**System**	**Project Description**	**Capital Cost(1)**
ELWRF-05	ELWRF	ELWRF Phase V Expansion - Redundant Sludge Conditioning Tank	$140,000
ELWRF-06	ELWRF	Increase Capacity of Title 22 Air Vacuum Release Valve for Product Water Storage Tanks	$100,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$1,340,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$68,910,280**

Notes:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.
(2) Recurrence for United Water improvements is assumed to be every five years.

As presented in Table 9.22, the total anticipated cost for the project recommended for phase FY10/11 are approximately $68.9 M. The most costly projects proposed for this phase are associated with the ELWRF Phase V Expansion.

9.2.3 CIP Projects for FY11/12

Table 9.23 presents the CIP projects phased in FY2011/2012 (FY11/12).

As presented in Table 9.23, the total anticipated cost for the project recommended for phase FY11/12 are approximately $251.9 M. The most costly projects proposed for this phase are associated with the bp / CRWRF expansion.

9.2.4 CIP Projects for FY12/13

Table 9.24 presents the rehabilitation and recapitalization projects anticipated in FY2012/2013 (FY12/13).

Table 9.23 CIP Projects for FY11/12
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost[1]
CNF-05	CNF	ELWRF Phase Va Expansion - Inspect Nitrified Product Water Storage Tank Internal Condition	$85,000
HPS-05	HPS	Add 23 mgd of additional pumping capacity, to bring firm capacity to 97 mgd of firm capacity. (Phase II of II; total project assumes 7 pumps, 7,000 hp total)	$14,700,000
BPN-01	BPN	Treat SE from JWPCP w/ MF to serve growth in bp Nitrified System	$16,800,000
BPN-02	BPN	Nitrified Treatment - treat MF treated SE (BPN-01) from JWPCP to serve growth in bp Nitrified System	$12,205,000
BPN-03	BPN	New 20" pipeline from NTP to bp for conveyance of Nitrified Water.	$9,535,000
BPN-03A	BPN	Parallel 14" pipeline from CRWRF to bp for conveyance of Nitrified Water.	$4,245,000
BPN-04	BPN	New pump station at NTP to serve bp Nitrified (assumes 4-1,500 gpm pumps, in PS w/ BPRO-03)	$3,150,000
BPN-05	BPN	Add a 1.0 MG storage reservoir to NTP to maintain current number of hours of backup for bp Nitrified system.	$2,100,000
BPRO-01	BPRO	Treat SE from JWPCP w/ MF/RO to serve growth in bp RO System	$73,080,000
BPRO-02	BPRO	New Pipeline from NTP to bp for conveyance of Industrial RO Water.	$8,705,000
BPRO-03	BPRO	New pump station at NTP to serve bp Industrial RO (assumes 4-2,100 gpm pumps, in PS w/ BPN-04)	$4,200,000
CBRN-01	CBRN	Install access ports for cleaning	$1,260,000
EBRN-02	EBRN	Install access ports for cleaning	$1,885,000
T22-02	T22	El Segundo Lateral (Boeing, Kilroy Airport)	$1,500,000
T22-07	T22	Redondo Beach Lateral (Pete's Nursery)	$660,000
T22-08	T22	Mills Park Lateral	$245,000
CRWRF-01	CRWRF	Pipeline for LADWP Harbor demands at Carson City bndy	$29,100,000
CRWRF-02	CRWRF	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand and Rhodia)	$43,141,278
CRWRF-03	CRWRF	Add new 11.6 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	$5,250,000

Table 9.23	**CIP Projects for FY11/12 Capital Implementation Master Plan West Basin Municipal Water District**		
ID	**System**	**Project Description**	**Capital Cost(1)**
CRWRF-04	CRWRF	Surge Protection - Modify MF Units with Break Tank and Pumps	$6,300,000
CRWRF-05	CRWRF	Raw Water Storage (1 hour)	$5,250,000
CRWRF-06	CRWRF	Repair Nitrified Product Water Storage Tank	$560,000
NTP-01	NTP	Land Acquisition of 4.5 ac near JWPCP for NTP	$4,800,000
EMWRF-01	EMWRF	Repair or Replace Bulk Chemical Storage Tank and Associated Equipment	$700,000
EMWRF-02	EMWRF	Inspect Nitrified Product Water Storage Tank Internal Condition	$85,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$775,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$251,866,558**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

Table 9.24	**CIP Projects for FY12/13 Capital Implementation Master Plan West Basin Municipal Water District**		
ID	**System**	**Project Description**	**Capital Cost(1)**
T22-01	T22	Caltrans Inglewood Lateral	$260,000
T22-11	T22	Chlorination Stations (Phase I)	$1,960,000
ELWRF-07	ELWRF	Add Title 22 High Rate Clarifier and Title 22 Filters (to bring clarifier from 30.0 mgd to 50.0 mgd and filter capacity from 40.0 mgd to 50.0 mgd)	$12,600,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$345,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$16,715,280**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As shown in Table 9.24, the total anticipated cost for the projects recommended for phase FY12/13 is approximately $16.7 M. Recommendations in this planning year consist primarily of improvements to the Title 22 distribution system and treatment processes. Project ELWRF-07, the Title 22 High Rate Clarifier is triggered by growth in Title 22 demand, with the total Title 22 demand exceeding 30.0 mgd in this planning year.

9.2.5 CIP Projects for FY13/14

Table 9.25 presents the rehabilitation and recapitalization projects anticipated in FY2013/2014 (FY13/14).

Table 9.25 CIP Projects for FY13/14
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost[(1)]
T22-12	T22	Main Street Carson Lateral	$17,075,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$6,895,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$25,520,280**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As shown in Table 9.25, the total anticipated cost for the projects recommended for phase FY13/14 is approximately $25.5M. Recommendations for this planning period consist of the Main Street Carson Lateral, and equipment rehabilitation and replacement estimates and ongoing membrane replacement.

9.2.6 CIP Projects for FY14/15

Table 9.25 presents the rehabilitation and recapitalization projects anticipated in FY2014/2015 (FY14/15).

Table 9.26 CIP Projects for FY14/15
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost[(1)]
T22-14	T22	Caltrans Gardena Lateral	$985,000
Mult	Mult	United Water Recapitalization Improvements (recurring)	$6,345,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$1,110,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$9,990,280**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As shown in Table 9.25, the total anticipated cost for the projects recommended for phase FY14/15 is approximately $10.0 M. Recommendations for this planning period consist of a Title 22 lateral, triggered by individual customers estimated date of connection (as detailed in the customer database), and equipment rehabilitation and replacement estimates. United Water recapitalization recurrences also occur in this year, as they are assumed to recur every five years.

9.2.7 CIP Projects for FY15/20

Table 9.27 presents the CIP projects phased in FY2015/2020 (FY15/20).

Table 9.27 CIP Projects for FY15/20
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost(1)
ESPP-01	ESPP	Add to treatment capacity of Industrial RO treatment for ESPP of 0.5 mgd (to meet MMD of 325 gpm).	$1,900,000
ESPP-02	ESPP	El Segundo Power Plant Pipeline from Chevron to El Segundo Power Plant	$3,895,000
ESPP-03	ESPP	PRV at Chevron	$80,000
CNF-01	CNF	ELWRF Phase Va Expansion - Increase treatment capacity of Nitrified by 2.1, from 4.9 mgd to 7.0 mgd. (Two Biofor Units)	$3,090,000
CNF-02	CNF	ELWRF Phase Va Expansion - Backup Power to Product Water Pumps	$700,000
CNF-04	CNF	ELWRF Phase Va Expansion - Potable Water Backup Supply	$350,000
T22-15	T22	Palos Verdes - Lateral 6B	$27,290,000
T22-16	T22	Palos Verdes PS (4-1,250 gpm pumps)	$4,900,000
T22-17	T22	Increase Title 22 product water storage by 5.0 MG	$10,500,000
T22-18A	T22	Gardena Lateral - Normandie Ave	$3,635,000
T22-18B	T22	Gardena Lateral - Normandie and Vermont	$6,170,000
T22-18C	T22	Gardena Lateral - Van Ness	$4,480,000
T22-21	T22	Chlorination Stations (Phase II)	$1,960,000
T22-22	T22	Hawthorne Lateral (Solec)	$1,595,000
T22-23	T22	Title-22 PS Discharge Pipeline Modification	$465,000
ELWRF-09	ELWRF	Add 17.3 mgd of Title 22 Treatment, to increase Title 22 treatment capacity from 50.0 mgd to 67.3 mgd	$48,440,000

Table 9.27 CIP Projects for FY15/20
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost(1)
ELWRF-10	ELWRF	Increase capacity of Title 22 Pump Station at ELWRF by 3,200 hp (from 4,800 hp to 8,000 hp) to serve Future Title 22 Customers	$14,340,000
ELWRF-11	ELWRF	Microfiltration - Replace existing Phase II and III MF System w/ Pressurized System	$16,800,000
ELWRF-12	ELWRF	Backup Power	$11,200,000
ELWRF-13	ELWRF	Dewatered Sludge Handling Transfer System	$2,800,000
ELWRF-15	ELWRF	Potable Water Connection to ELWRF	$280,000
CRWRF-07	CRWRF	Backup Power	$2,520,000
EMWRF-04	EMWRF	Add 0.6 mgd of Industrial RO Treatment of Title 22 Water (half of 1,000 afy total w/ RO).(6)	$1,890,000
EMWRF-05	EMWRF	Add 0.5 mgd of Nitrified Treatment of Title 22 Water (half of 1,000 afy total w/ Nitrified).(6)	$735,000
EMWRF-06	EMWRF	Surge Protection - Modify MF Units with Break Tank and Pumps	$3,500,000
EMWRF-07	EMWRF	Backup Power for Product Water Pumps	$700,000
Mult	Mult	United Water Recapitalization Improvements (recurring)	$6,345,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$29,995,000
Mult	Mult	Membrane Replacement (recurring)	$16,276,400
Total			**$226,831,400**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.27, the total anticipated cost for the project recommended for phase FY15/20 are approximately $226.8 M. The most costly projects proposed for this phase are related to increasing Title 22 treatment capacity at ELWRF.

It should be noted that improvements required to serve all customers included in Scenario 5, as discussed in Section 8.1 are incorporated by the end of this planning phase. Remaining planning phases include improvements required to serve customers in Scenario 6 and 7 and recurring rehabilitation or replacement projects associated with equipment useful life.

9.2.8 CIP Projects for FY20/25

Table 9.28 presents the CIP projects phased in FY2020/25 (FY20/25).

Table 9.28 CIP Projects for FY20/25
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost[1]
HPS-07	HPS	Add 38 mgd of additional firm pumping capacity, to bring total firm capacity to 135 mgd. (For LADWP Westside, Kenneth Hahn, LADWP Harbor Expansion) (Assumes 3 pumps, 3,000 hp increase)	$27,300,000
HPS-08	HPS	Parallel HSEFM w/ 36"	$22,815,000
T22-24	T22	Anza Lateral Break Tank	$4,200,000
ELWRF-32	ELWRF	Land Acquisition of 4.0 ac near ELWRF for Expansion of Title 22 Beyond 70.0 mgd	$9,600,000
CRWRF-11	CRWRF	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand Phase II)	$10,480,000
CRWRF-12	CRWRF	Add new 7.1 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	$4,200,000
NTP-03	NTP	Barrier Water Treatment - treat SE from JWPCP to serve Dominguez Gap (Phase I and II)	$34,125,000
NTP-04	NTP	Add new 3.1 mgd pump station at NTP to serve Dominguez Gap (Phase I + II)	$2,100,000
NTP-05	NTP	New Pipeline from NTP to Dominguez Gap Barrier Blending Station for conveyance of Barrier Water.	$9,640,000
Mult	Mult	United Water Recapitalization Improvements (recurring)	$6,345,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$16,245,000
Mult	Mult	Membrane Replacement (recurring)	$16,277,500
Total			**$163,327,500**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.28, the total anticipated cost for the project recommended for phase FY20/25 are approximately $163.3 M. The most costly projects proposed for this phase are treatment costs at the NTP related to service of the Dominguez Gap and HSEPS and HSEFM expansions associated with serving future demands from Hyperion.

9.2.9 CIP Projects for FY25/30

Table 9.29 presents the CIP projects phased in FY2025/30 (FY25/30).

Table 9.29 CIP Projects for FY25/30
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost(1)
T22-25	T22	LA Westside Lateral	$40,005,000
T22-26	T22	Inglewood/LA Westside PS (assumes 4-8,500 gpm pumps)	$28,025,000
ELWRF-33	ELWRF	Increase capacity of Title 22 Pump Station at ELWRF by 4,000 hp (from 8,000 hp to 12,000 hp) to serve LADWP Harbor Expansion, Westside, and Kenneth Hahn	$16,800,000
ELWRF-34	ELWRF	Add 8.9 mgd of Additional Title 22 Treatment to Serve LADWP Harbor Expansion, increasing Title 22 Treatment Capacity from 67.3 mgd to 76.2 mgd	$24,945,000
ELWRF-35	ELWRF	Add 15.3 mgd of Additional Title 22 Treatment to Serve LADWP Westside and Kenneth Hahn Park, increasing Title 22 Treatment Capacity from 76.2 mgd to 91.5 mgd	$42,970,000
Mult	Mult	United Water Recapitalization Improvements (recurring)	$6,345,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$9,230,000
Mult	Mult	Membrane Replacement (recurring)	$16,277,500
Total			**$184,597,500**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.29, the total anticipated cost for the project recommended for phase FY25/30 are approximately $184.6 M. The most costly projects proposed for this phase are related to service of the LADWP Westside Title 22 demands.

9.3 CIP SUMMARIES

This section presents the following summaries of the CIP:

- CIP by Phase
- CIP by Facility Type
- Recurring Projects by Treatment Plant Facility

- Summary of ELWRF Phase V Projects
- Summary of Recommended Studies
- Escalated CIP Cost by Phase

In addition, a detailed list of all CIP projects is presented at the end of this chapter in Table 9.37.

9.3.1 CIP Summary by Phase

The project phasing presented in Section 9.2 is summarized in Table 9.30.

Table 9.30 Summary of Project Phasing
Capital Implementation Master Plan
West Basin Municipal Water District

Planning Phase	Planning Year	Capital Cost(1)	Percentage of Total Capital Cost
FY09/15	FY09/10	$15,103,800	1.6%
	FY10/11	$68,910,280	7.2%
	FY11/12	$251,866,558	26.2%
	FY12/13	$16,715,280	1.7%
	FY13/14	$25,520,280	2.7%
	FY14/15	$9,990,280	1.0%
	FY09/15	***$388,106,478***	***40.3%***
FY15/20		$226,831,400	23.6%
Subtotal	***FY09-20***	***$614,937,878***	
FY20/25		$163,327,500	17.0%
FY25/30		$184,597,500	19.2%
Total		**$962,862,878**	**100.0%**

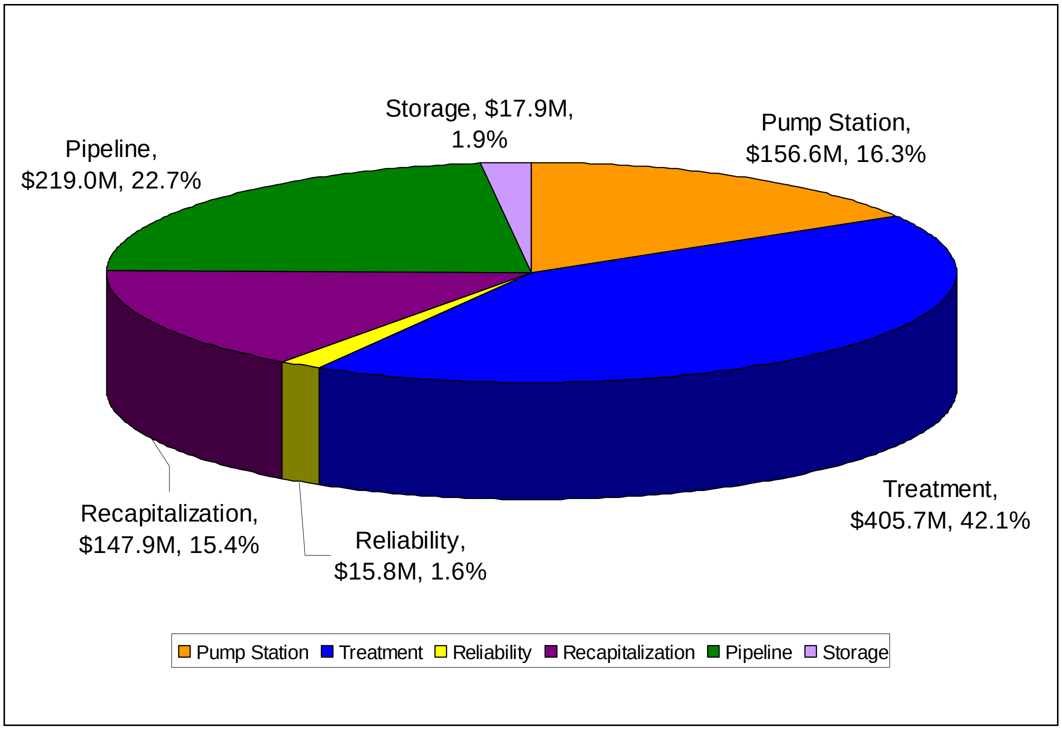
Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.30, the total estimated capital cost of all projects recommended in Chapters 7 and 8, combined with rehabilitation and recapitalization projects, is about $962.9M. As shown, the phase with the largest contribution to the overall CIP cost is FY11/12 with $251.9 M. The total estimated cost through FY19/20 is $615 M.

9.3.2 CIP Summary by Facility Type

The CIP cost distribution of by project type is depicted on Figure 9.6. As shown in this figure, the majority of costs are related to water treatment, contributing to $406M or 42 percent of the total CIP. The second largest category is pipelines with a combined estimated capital cost of $219M or 23 percent of the total CIP.

Figure 9.6
Distribution of Capital Costs by Facility Type



9.3.3 Summary of ELWRF Phase V Expansion Costs

The above projects, which are a part of the ELWRF Phase V Expansion Costs are summarized in Table 9.31.

As shown in Table 9.31, the total cost estimated for the ELWRF Phase V expansion is $58.8 M. The most costly portion of this expansion is the Barrier water treatment capacity expansion for the West Coast Barrier. Note that the cost estimates presented here are based on the ELWRF Phase V Expansion Study.

Table 9.31	Projects Included in ELWRF Phase IV Expansion Capital Implementation Master Plan West Basin Municipal Water District		
ID	**Phase**	**Project Description**	**Capital Cost[(1)]**
BW-01	FY1011	ELWRF Phase V Expansion - Increase treatment capacity of Barrier treatment by 5.0 mgd, from 12.5 mgd to 17.5 mgd.	$31,800,000
BW-02	FY1011	Add VFDs to product water pumps	$700,000
BW-04	FY1011	Modify site piping at ELWRF, replacing 20-inch discharge piping and meter with 27-inch discharge piping and meter.	$175,000
ELWRF-04	FY1011	ELWRF Phase V Expansion - Resolve underperformance of backwash equalization basin.	$170,000
ELWRF-05	FY1011	ELWRF Phase V Expansion - Redundant Sludge Conditioning Tank	$140,000
ELWRF-07	FY1213	Add Title 22 High Rate Clarifier and Title 22 Filters (to bring clarifier from 30.0 mgd to 50.0 mgd and filter capacity from 40.0 mgd to 50.0 mgd)	$12,600,000
ELWRF-03	FY1011	ELWRF Phase V Expansion - Add redundant gravity thickener.	$1,960,000
Subtotal - ELWRF Phase V Barrier System			***$47,545,000***
CH-01	FY1011	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO Ultra treatment for HPBF by 0.5 mgd, from 2.6 mgd to 3.1 mgd (to meet MMD of 2,153 gpm).	$2,650,000
CH-02	FY1011	Replace existing pumps with 2-2,400 gpm pumps (to meet MDD of 2,395 gpm).	$700,000
CL-01	FY1011	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO treatment for LPBF by 0.4 mgd, from 1.7 mgd to 2.1 mgd (to meet MMD of 1,218 gpm).	$1,050,000
CL-02	FY1011	Replace existing pumps with 3-1,250 gpm pumps (to meet MDD of 2,039 gpm).	$1,050,000
Subtotal - ELWRF Phase V Chevron Systems			***$5,450,000***
ESPP-01	FY15-20	Add to treatment capacity of Industrial RO treatment for ESPP of 0.5 mgd (to meet MMD of 325 gpm).	$1,900,000
ESPP-02	FY15-20	El Segundo Power Plant Pipeline from Chevron to El Segundo Power Plant	$3,895,000
ESPP-03	FY15-20	PRV at Chevron	$80,000
Subtotal - ELWRF Phase V ESPP Systems			***$5,875,000***
Total			**$58,870,000**

Note:

(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

9.3.4 Recurring Improvements by Treatment Facility

Table 9.32 summarizes United Water improvements for each of West Basin's treatment facilities for each planning period.

Table 9.32 United Water Improvement Summary
Capital Implementation Master Plan
West Basin Municipal Water District

	Planning Year / Phase					Total
Facility	**FY0910**	**FY1415**	**FY15-20**	**FY20-25**	**FY25-30**	**Capital Cost(1)**
ELWRF	$978,800	$2,535,000	$2,535,000	$2,535,000	$2,535,000	$11.1 M
CRWRF	$10,000	$845,000	$845,000	$845,000	$845,000	$3.4 M
EMWRF	$210,000	$425,000	$425,000	$425,000	$425,000	$1.9 M
CNF	$0	$425,000	$425,000	$425,000	$425,000	$1.7 M
SW	$655,000	$2,115,000	$2,115,000	$2,115,000	$2,115,000	$9.1 M
Total	**$1,853,800**	**$6,345,000**	**$6,345,000**	**$6,345,000**	**$6,345,000**	**$27.2 M**

Note:
(1) Costs based on United Water estimates. Additional markups are applied to costs for FY1415 through FY25-30.

In addition to the United Water recommendations, the Rehabilitation and Replacement from the Condition Assessment and Membrane Replacement projects are listed as recurring and consist of summarized values of more detailed items for each treatment facility.

The Rehabilitation and Replacement from Condition Assessment items are estimates of the expected replacement costs based on the anticipated remaining life of various assets evaluated during the Condition Assessment portion of this project. The assumptions used for this cost estimate are described in Appendix F, the Condition Assessment TM.

The membrane replacement costs are costs to replace all of the existing membranes at West Basin's facilities on a continuous basis, assuming individual membrane life of 5 years. The estimated annual costs for the membrane replacement are detailed in Table 9.33.

Table 9.33 Membrane Replacement Costs
Capital Implementation Master Plan
West Basin Municipal Water District

Facility	Number of Membranes RO	MF (Type I)	MF (Type II)	Replacement Cost ($M / 5 yrs)	Annual Cost ($M / yr)
Unit Replacement Cost	$500	$750	$900		
ELWRF	4,536	1,350	2,496	$5.5	$1.1
CRWRF	1,584	810	0	$1.4	$0.3
EMWRF	840	540	0	$0.8	$0.2
Total for Existing	**6,960**	**2,700**	**2,496**	$7.8	$1.6
NTP(2)				$8.5	$1.7
Total				$16.3	$3.3

Note:
(1) Membrane replacement cost based on typical costs for type of membrane.
(2) Membrane replacement costs for future facilities were based on total flow and similar facilities rather than number of membranes.

As discussed in Chapter 8, several alternatives were evaluated for reducing surges in the Title 22 distribution system through modifications to the membrane systems at EMWRF and CRWRF. Alternatives were also evaluated for replacing the Phase II and III microfiltration units at ELWRF (to improve performance). A summary of the costs for each alternative discussed in Chapter 7 and 8 is presented in Table 9.34. The costing details for these alternatives are provided at the end of Appendix F. Within Chapter 7, it was recommended that further study be conducted before selecting an alternative. Within the CIP, it was assumed that the second option be implemented in each facility—a break tank and pumps at EMWRF and CRWRF, and pressurized MF units at ELWRF.

9.3.5 Summary of Recommended Studies

Within this report, several studies were considered beyond the scope of this report but recommended for further investigation. Table 9.35 lists each of the recommended studies mentioned within this report. If applicable, the CIP IDs of the related projects are indicated in brackets. Several of the studies listed in Table 9.35 could be incorporated into larger projects, such as the ELWRF Phase V Expansion.

Table 9.34 Alternatives for Resolving Microfiltration Surges Capital Implementation Master Plan West Basin Municipal Water District			
	Alternatives		
Facility	**Dedicated Flush System**	**Break Tank and Pumps**	**Alternate MF Units (Submerged)**
EMWRF	$659,000	$2,058,000	$10,129,000
CRWRF	$887,000	$6,907,000	$15,409,000
	Retrofit Existing MF Units	**Replace with Pressurized MF Units**	**Replace with Submerged MF Units**
ELWRF	$12,254,190	$14,893,970	$19,737,510

Notes:
(1) Cost estimate details are included in Appendix F (following the Condition Assessment TM).
(2) Cost estimates shown in this table vary from the estimates used in the CIP (Table 9.37) due to adjustments made to the contingency and markups (as discussed in Chapter 5).

Table 9.35 Recommended Studies Capital Implementation Master Plan West Basin Municipal Water District		
Study	**Description**	**Report Section**
Demand Pattern Revision for Chester Washington Golf Course	For Title 22 Customer Chester Washington Golf Course, review the existing golf course irrigation schedule with the customer to reduce their daily peak demands to a more reasonable level in order to extend life of lateral.	7.1.1.3
CMF Unit Surge Study	Detailed Study to determine the most feasible method for reducing the magnitude of the observed pressure surges. [CRWRF-02, EMWRF-01, ELWRF-03]	7.1.1.3.1
Title 22 Pump Station Control Study	Detailed Study to develop an efficient pumping system that allows operation of the pumps within the preferred operating ranges	7.1.1.3.2
Title 22 Pipe Cleaning Test Program	Study to evaluate whether pipe cleaning test program increases chlorine residual in distribution system, possibly including installation of pig launching and retrieval stations. [T22-11]	7.1.1.3.3
Barrier Product Water Pump Station Operational Efficiency Study	Detailed analysis to evaluate the pump station to resolve energy loss and establish a more efficient method of operation of the Barrier Product Water Pump Station.	7.1.2.3
Hyperion Secondary Effluent Pump	Detailed analysis to optimize system controls, to eliminate the need for manual control of VFD.	7.1.3.3

Table 9.35 Recommended Studies Capital Implementation Master Plan West Basin Municipal Water District		
Study	**Description**	**Report Section**
Station Control Automation and Optimization		
Chevron Nitrified Water Product Pump Station Firm Capacity Study	Detailed analysis to maintain firm capacity of the pump station.	7.1.6.3
CRWRF Brine Line Inspection Program	Evaluate inspection of brine line and establish routine inspection program. [CBRN-01]	7.1.7.3
ELWRF Brine Line Inspection Program	Evaluate inspection of brine line and establish routine inspection program. [EBRN-01]	7.1.8.3
ELWRF Brine Line Velocity Reduction Study	Detailed analysis to mitigate high velocities, possibly installing pinch valves or pipe restrictions.[EBRN-02]	7.1.8.3
ELWRF Brine Line	Inspection program and taps for pipeline calibration	8.2.8.3
Title 22 Pump Station Pressure Increase Evaluation	A detailed study of the existing and future water demand patterns, including phased development, should be conducted in selecting the pumps and increase the discharge pressure to 105 psi.	8.2.1.3.3
Title 22 Surge Analysis	Surge analysis of the Title 22 distribution system following modifications made to EMWRF and CRWRF to reduce surge effects.	8.2.1.3.4
Title 22 Pump Station Operation Evaluation	A detailed study of the demands on the Title 22 pump station, including phased development, should be conducted in selecting the pumps and increase the discharge pressure to 105 psi.	8.2.1.3.5
Title 22 Distribution System Water Quality Analysis	Following incorporation of existing system water quality recommendations, water quality of the distribution system should be reevaluated.	8.2.1.3.6
West Coast Barrier Pump Station Operational Evaluation	Field testing to determine the firm capacity of the pump station. Result should be used to determine improvements to the pump station. [BW-02]	8.2.2.3
Hyperion Secondary Effluent Pump Station Design Study	Detailed design study to review the existing pump station modification for incorporation into the future facility. Increase the capacity of the pump station to meet future supply requirements (add a 9,000 hp PS for Scenario 5A, and a 12,000 hp PS for Scenario 7A).	8.2.3.3

Table 9.35 Recommended Studies Capital Implementation Master Plan West Basin Municipal Water District		
Study	**Description**	**Report Section**
Hyperion Secondary Effluent Pump Station Reliability Study	Detailed design study of the system to formulate the most feasible means of meeting the demand criteria and providing supply reliability	8.2.3.3
Hyperion Secondary Effluent Pumping System Surge Evaluation	Update surge study for future system design conditions.	8.2.3.3
Chevron Nitrified Water System Pump Station Design	Preliminary design to add 1,564 gpm of pump station capacity. To make the maximum use out of the existing facility the future facility should have three identical duty and one standby pump, all operated by VFDs..	8.2.6.3
Chevron Nitrified Water System Hydrogenerator Feasibility Study	Investigate feasibility of placing the hydro generator in service.	8.2.6.3
CRWRF RO Discharge Pressure Adjustment	Evaluate how to effectively increase discharge pressure of RO Trains at CRWRF.	8.2.7.3
CRWRF Brine Line Permit	Apply for revised brine line permit accommodating increased flows[1]	8.2.7.3
CRWRF Power	Investigate power problems at this site.	Condition Assessment

Note:
1. This is not necessary under Scenario 5B and 7B, but will be required wherever the potential bp demands are treated.

The studies listed in Table 9.35 are not included within the CIP, but may affect costs for several of the projects included in the CIP.

9.3.6 Escalated CIP Cost

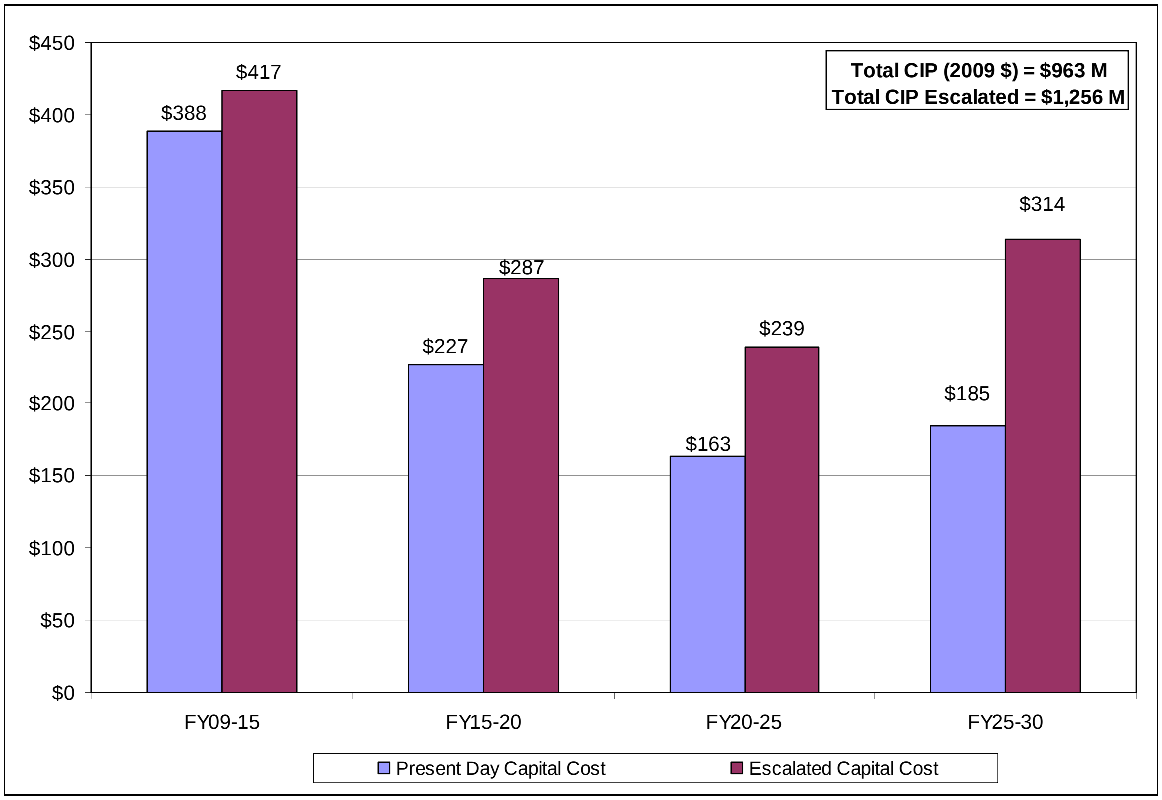
The CIP cost presented in the Master Plan are all based on 2009 dollars and an ENR index for the greater Los Angeles area of 9811 published in January 2009. However, as most projects will be implemented in the future, the actual CIP cost in dollars will be higher based on the phasing of each project. The CIP presented in Table 9.36 shows the escalated CIP cost for each project phase based on an annual inflation rate of 3 percent.

Table 9.36	Escalated CIP Cost Summary by Phase Capital Implementation Master Plan West Basin Municipal Water District		
Planning Phase	**Planning Year**	**Capital Cost In 2009 Dollars(1)**	**Escalated Capital Cost(2)**
FY09-15	FY09/10	$15,103,800	$15,300,000
	FY10/11	$68,910,280	$71,860,000
	FY11/12	$251,866,558	$270,520,000
	FY12/13	$16,715,280	$18,500,000
	FY13/14	$25,520,280	$29,080,000
	FY14/15	$9,990,280	$11,730,000
	FY09-15	**$388,106,478**	**$416,990,000**
FY15-20	FY15-20	$226,831,400	$286,640,000
Subtotal	***FY09/10 – FY19/20***		***$703,630,000***
FY20-25	FY20-25	$163,327,500	$239,270,000
FY25-30	FY25-30	$184,597,500	$313,500,000
Total		**$962,862,878**	**$1,256,400,000**

Notes:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.
(2) Escalated from January 2009 to the mid-point of each planning period using an annual inflation rate of 3.0% (rounded to $10,000).

As presented in Table 9.36, the escalated cost of the $963M CIP (2009 Dollars) is estimated at $1,256M. The phasing of cost by phase, with and without escalation, is also depicted on Figure 9.7.

Figure 9.7
Breakdown of Capital Costs by Phase including Escalation



WB Project ID	Project ID	System Name	Project Type	Project Description	Year	Size	Unit	Capacity	Unit	Unit Cost	Unit	Construction Cost (w/o Spcl Cond)	Special Construction	Spcl Cnst	Construction Cost	Project Location (for TTC)	Contingency	Capital Cost	Other Payer	Cost to Other Party	Cost to West Basin	FY0910	FY10-15	FY15-20	FY20-25	FY25-30
1	BW-01	BW	Treatment	ELWRF Phase V Expansion - Increase treatment capacity of Barrier treatment by 5.0 mgd, from 12.5 mgd to 17.5 mgd.	FY1011	5.0	mgd			$ -	lumpsum(3)	$ -	1.00	-	$ 14,672,833	-	217%	$ 31,800,000	WRD	$ 31,800,000	$ -	-	$ 31,800,000	-	$ -	$ -
1	BW-02	BW	PS	Add VFDs to product water pumps	FY1011					$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	None	$ -	$ 700,000	-	$ 700,000	-	$ -	$ -
1	BW-04	BW	Pipeline	Modify site piping at ELWRF, replacing 20-inch discharge piping and meter with 27-inch discharge piping and meter.	FY1011	1	site			$ 125,000	lumpsum(1)	$ 125,000	1.00	-	$ 125,000	IF	140%	$ 175,000	None	$ -	$ 175,000	-	$ 175,000	-	$ -	$ -
1	ELWRF-04	ELWRF	Recapitalization	ELWRF Phase V Expansion - Resolve underperformance of backwash equalization basin.	FY1011	1	system			$ 120,000	lumpsum(5)	$ 120,000	1.00	-	$ 120,000	IF	140%	$ 170,000	None	$ -	$ 170,000	-	$ 170,000	-	$ -	$ -
1	ELWRF-05	ELWRF	Recapitalization	ELWRF Phase V Expansion - Redundant Sludge Conditioning Tank	FY1011	2	tanks	25,000	gallon	$ 2.00	per gallon	$ 100,000	1.00	-	$ 100,000	IF	140%	$ 140,000	None	$ -	$ 140,000	-	$ 140,000	-	$ -	$ -
1	ELWRF-07	ELWRF	Treatment	Add Title 22 High Rate Clarifier and Title 22 Filters (to bring clarifier from 30.0 mgd to 50.0 mgd and filter capacity from 40.0 mgd to 50.0 mgd)	FY1213	1	system			$ 9,000,000	lumpsum(1)	$ 9,000,000	1.00	-	$ 9,000,000	IF	140%	$ 12,600,000	None	$ -	$ 12,600,000	-	$ 12,600,000	-	$ -	$ -
1	ELWRF-03	ELWRF	Recapitalization	ELWRF Phase V Expansion - Add redundant gravity thickener.	FY1011	1	system			$ 1,400,000	system(5)	$ 1,400,000	1.00	0	$ 1,400,000	IF	140%	$ 1,960,000	None	$ -	$ 1,960,000	-	$ 1,960,000	-	$ -	$ -
Subtotal	ECLWRF Phase V Expansion - Barrier System											$ 11,245,000			$ 25,917,833			$ 47,545,000		$ 31,800,000	$ 15,745,000	$ -	$ 47,545,000	$ -	$ -	$ -
2	CH-01	CH	Treatment	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO Ultra treatment for HPBF by 0.5 mgd, from 2.6 mgd to 3.1 mgd (to meet MMD of 2,153 gpm).	FY1011	0.5	mgd			$ -	lumpsum(5)	$ -	0.00	0.00	$ -		0%	$ 2,650,000	Chev	$ 2,650,000	$ -	-	$ 2,650,000	-	$ -	$ -
2	CH-02	CH	PS	Replace existing pumps with 2-2,400 gpm pumps (to meet MDD of 2,395 gpm).	FY1011	4,600	gpm	200	hp	$ 2,500	per hp	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	Chev	$ 700,000	$ -	-	$ 700,000	-	$ -	$ -
2	CL-01	CL	Treatment	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO treatment for LPBF by 0.4 mgd, from 1.7 mgd to 2.1 mgd (to meet MMD of 1,218 gpm).	FY1011	0.4	mgd			$ -	lumpsum(5)	$ -	0.00	0.00	$ -		0%	$ 1,050,000	Chev	$ 1,050,000	$ -	-	$ 1,050,000	-	$ -	$ -
2	CL-02	CL	PS	Replace existing pumps with 3-1,250 gpm pumps (to meet MDD of 2,039 gpm).	FY1011	3,750	gpm	300	hp	$ 2,500	per hp	$ 750,000	1.00	-	$ 750,000	IF	140%	$ 1,050,000	Chev	$ 1,050,000	$ -	-	$ 1,050,000	-	$ -	$ -
Subtotal	ECLWRF Phase V Expansion - Chevron Boilerfeed											$ 1,250,000			$ 1,250,000			$ 5,450,000		$ 5,450,000	$ -	$ -	$ 5,450,000	$ -	$ -	$ -
3	ESPP-01	ESPP	Treatment	Add to treatment capacity of Industrial RO treatment for ESPP of 0.5 mgd (to meet MMD of 325 gpm).	FY15-20	0.7	mgd			$ -	lumpsum(7)	$ 1,355,000	1.00	-	$ 1,355,000	IF	140%	$ 1,900,000	ESPP	$ 1,900,000	$ -	-	$ -	$ 1,900,000	$ -	$ -
3	ESPP-02	ESPP	Pipeline	El Segundo Power Plant Pipeline from Chevron to El Segundo Power Plant	FY15-20	8,000	lineal ft	12	inches	$ 310	per ft	$ 2,480,000	1.00	-	$ 2,480,000	OF	157%	$ 3,895,000	ESPP	$ 3,895,000	$ -	-	$ -	$ 3,895,000	$ -	$ -
3	ESPP-03	ESPP	Pipeline	PRV at Chevron	FY15-20	1	PRV	8	inches	$ 50,000	per PRV	$ 50,000	1.00	-	$ 50,000	OF	157%	$ 80,000	ESPP	$ 80,000	$ -	-	$ -	$ 80,000	$ -	$ -
Subtotal	ECLWRF Phase V Expansion - El Segundo Power Plant											$ 3,885,000			$ 3,885,000			$ 5,875,000		$ 5,875,000	$ -	$ -	$ -	$ 5,875,000	$ -	$ -
4	CN-01	CN	PS	ELWRF Phase Va Expansion - Replace existing pumps with 4-1,800 gpm pumps (to meet peak demand of 5,164 gpm).	FY1011	7,200	gpm	500	hp	$ 2,250	per hp	$ 1,125,000	1.00	-	$ 1,125,000	IF	140%	$ 1,575,000	Chev	$ 1,575,000	$ -	-	$ 1,575,000	-	$ -	$ -
4	CNF-01	CNF	Treatment	ELWRF Phase Va Expansion - Increase treatment capacity of Nitrified by 2.1, from 4.9 mgd to 7.0 mgd. (Two Biofor Units)	FY15-20	2.1	mgd			$ 1.05	per gal	$ 2,205,000	1.00	-	$ 2,205,000	IF	140%	$ 3,090,000	Chev	$ 3,090,000	$ -	-	$ -	$ 3,090,000	$ -	$ -
4	CNF-03	CNF	Recapitalization	ELWRF Phase Va Expansion - Replace Turbine	FY1011	1	site			$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	Chev	$ 700,000	$ -	-	$ 700,000	-	$ -	$ -
4	CNF-02	CNF	Reliability	ELWRF Phase Va Expansion - Backup Power to Product Water Pumps	FY15-20	1	system			$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	Chev	$ 700,000	$ -	-	$ -	$ 700,000	$ -	$ -
4	CNF-04	CNF	Reliability	ELWRF Phase Va Expansion - Potable Water Backup Supply	FY15-20	1	site			$ 250,000	per site	$ 250,000	1.00	-	$ 250,000	IF	140%	$ 350,000	Chev	$ 350,000	$ -	-	$ -	$ 350,000	$ -	$ -
Subtotal	Chevron Nitrification Facility - Nitrified System Expansion											$ 4,580,000			$ 4,580,000			$ 6,415,000		$ 6,415,000	$ -	$ -	$ 2,275,000	$ 4,140,000	$ -	$ -
5	BPN-01	BPN	Treatment	Treat SE from JWPCP w/ MF to serve growth in bp Nitrified System	FY1112	8.7	mgd			$ 12,000,000	lumpsum(1)	$ 12,000,000	1.00	-	$ 12,000,000	IF	140%	$ 16,800,000	bp	$ 16,800,000	$ -	-	$ 16,800,000	-	$ -	$ -
5	BPN-02	BPN	Treatment	Nitrified Treatment - treat MF treated SE (BPN-01) from JWPCP to serve growth in bp Nitrified System	FY1112	8.3	mgd			$ 1.05	per gpd	$ 8,715,000	1.00	-	$ 8,715,000	IF	140%	$ 12,205,000	bp	$ 12,205,000	$ -	-	$ 12,205,000	-	$ -	$ -
5	BPN-03	BPN	Pipeline	New 20" pipeline from NTP to bp for conveyance of Nitrified Water.	FY1112	10,560	lineal ft	20	inches	$ 460	per lineal ft	$ 4,857,600	1.25	A	$ 6,072,000	OF	157%	$ 9,535,000	bp	$ 9,535,000	$ -	-	$ 9,535,000	-	$ -	$ -
5	BPN-03A	BPN	Pipeline	Parallel 14" pipeline from CRWRF to bp for conveyance of Nitrified Water.	FY1112	6,178	lineal ft	14	inches	$ 350	per lineal ft	$ 2,162,160	1.25	A	$ 2,702,700	OF	157%	$ 4,245,000	bp	$ 4,245,000	$ -	-	$ 4,245,000	-	$ -	$ -
5	BPN-04	BPN	PS	New pump station at NTP to serve bp Nitrified (assumes 4-1,500 gpm pumps, in PS w/ BPRO-03)	FY1112	6,000	gpm	300	hp	$ 7,500	per hp	$ 2,250,000	1.00	-	$ 2,250,000	IF	140%	$ 3,150,000	bp	$ 3,150,000	$ -	-	$ 3,150,000	-	$ -	$ -
5	BPN-05	BPN	Storage	Add a 1.0 MG storage reservoir to NTP to maintain current number of hours of backup for bp Nitrified system.	FY1112	1.0	MG			$ 1.50	per gallon	$ 1,500,000	1.00	-	$ 1,500,000	IF	140%	$ 2,100,000	bp	$ 2,100,000	$ -	-	$ 2,100,000	-	$ -	$ -
5	BPRO-01	BPRO	Treatment	Treat SE from JWPCP w/ MF/RO to serve growth in bp RO System	FY1112	8.7	mgd			$ 6.00	per gal	$ 52,200,000	1.00	-	$ 52,200,000	IF	140%	$ 73,080,000	bp	$ 73,080,000	$ -	-	$ 73,080,000	-	$ -	$ -
5	BPRO-02	BPRO	Pipeline	New Pipeline from NTP to bp for conveyance of Industrial RO Water.	FY1112	10,560	lineal ft	18	inches	$ 420	per lineal ft	$ 4,435,200	1.25	A	$ 5,544,000	OF	157%	$ 8,705,000	bp	$ 8,705,000	$ -	-	$ 8,705,000	-	$ -	$ -
5	BPRO-03	BPRO	PS	New pump station at NTP to serve bp Industrial RO (assumes 4-2,100 gpm pumps, in PS w/ BPN-04)	FY1112	8,400	gpm	400	hp	$ 7,500	per hp	$ 3,000,000	1.00	-	$ 3,000,000	IF	140%	$ 4,200,000	bp	$ 4,200,000	$ -	-	$ 4,200,000	-	$ -	$ -
5	CRWRF-04	CRWRF	Treatment	Surge Protection - Modify MF Units with Break Tank and Pumps	FY1112			lump sum		$ 4,500,000	lumpsum(2)	$ 4,500,000	1.00	-	$ 4,500,000	IF	140%	$ 6,300,000	None	$ -	$ 6,300,000	-	$ 6,300,000	-	$ -	$ -
5	CRWRF-05	CRWRF	Storage	Raw Water Storage (1 hour)	FY1112	2.5	MG			$ 1.50	per gallon	$ 3,750,000	1.00	-	$ 3,750,000	IF	140%	$ 5,250,000	None	$ -	$ 5,250,000	-	$ 5,250,000	-	$ -	$ -
5	NTP-01	NTP	Treatment	Land Acquisition of 4.5 ac near JWPCP for NTP	FY1112	21.3	mgd	4.0	ac	$ 1,000,000	per acre(1)	$ 4,000,000	1.00	-	$ 4,000,000	LA	120%	$ 4,800,000	None	$ -	$ 4,800,000	-	$ 4,800,000	-	$ -	$ -
Subtotal	bp Refinery Capacity Expansion Project											$ 103,369,960			$ 106,233,700			$ 150,370,000		$ 134,020,000	$ 16,350,000	$ -	$ 150,370,000	$ -	$ -	$ -
6	CRWRF-01	CRWRF	Pipeline	Pipeline for LADWP Harbor demands at Carson City bndy	FY1112	20,200	lineal ft	30	inches	$ -	lumpsum(7)	$ 18,535,000	1.00	-	$ 18,535,000	OF	157%	$ 29,100,000	Other	$ 29,100,000	$ -	-	$ 29,100,000	-	$ -	$ -
6	CRWRF-02	CRWRF	Treatment	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand and Rhodia)	FY1112	12.3	mgd			$ -	lumpsum(7)	$ 30,815,000	1.00	-	$ 30,815,000	IF	140%	$ 43,141,278	None	$ -	$ 43,141,278	-	$ 43,141,278	-	$ -	$ -
6	CRWRF-03	CRWRF	PS	Add new 11.6 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	FY1112	9,667	gpm	500	hp	$ 7,500	per hp	$ 3,750,000	1.00	-	$ 3,750,000	IF	140%	$ 5,250,000	None	$ -	$ 5,250,000	-	$ 5,250,000	-	$ -	$ -
Subtotal	Los Angeles Harbor Area Expansion Project											$ 53,100,000			$ 53,100,000			$ 77,491,278		$ 29,100,000	$ 48,391,278	$ -	$ 77,491,278	$ -	$ -	$ -

West Basin Municipal Water District
Capital Implementation Master Plan for Recycled Water Systems
Detailed CIP List w/ Project Breakdown

WB Project ID	Project ID	System Name	Project Type	Project Description	Year	Size	Unit	Capacity	Unit	Unit Cost	Unit	Construction Cost (w/o Spcl Cond)	Special Construction	Spcl Cnst	Construction Cost	Project Location (for TTC)	Contingency	Capital Cost	Other Payer	Cost to Other Party	Cost to West Basin	FY0910	FY10-15	FY15-20	FY20-25	FY25-30
7	ELWRF-09	ELWRF	Treatment	Add 17.3 mgd of Title 22 Treatment, to increase Title 22 treatment capacity from 50.0 mgd to 67.3 mgd	FY15-20	17.3	mgd			$ 2.00	per gpd	$ 34,600,000	1.00	-	$ 34,600,000	IF	140%	$ 48,440,000	None	$ -	$ 48,440,000	-	$ -	$ 48,440,000	$ -	$ -
7	ELWRF-10	ELWRF	PS	Increase capacity of Title 22 Pump Station at ELWRF by 3,200 hp (from 4,800 hp to 8,000 hp) to serve Future Title 22 Customers	FY15-20			3,200	hp	$ 3,200	per hp	$ 10,240,000	1.00	-	$ 10,240,000	IF	140%	$ 14,340,000	None	$ -	$ 14,340,000	-	$ -	$ 14,340,000	$ -	$ -
7	ELWRF-11	ELWRF	Treatment	Microfiltration - Replace existing Phase II MF System w/ Pressurized System	FY15-20	8.4	mgd			$ 12,000,000	lumpsum(1)	$ 12,000,000	1.00	-	$ 12,000,000	IF	140%	$ 16,800,000	None	$ -	$ 16,800,000	-	$ -	$ 16,800,000	$ -	$ -
7	ELWRF-12	ELWRF	Reliability	Backup Power	FY15-20	1	system			$ 8,000,000	lumpsum(1)	$ 8,000,000	1.00	-	$ 8,000,000	IF	140%	$ 11,200,000	None	$ -	$ 11,200,000	-	$ -	$ 11,200,000	$ -	$ -
7	ELWRF-13	ELWRF	Treatment	Dewatered Sludge Handling Transfer System	FY15-20	1	system			$ 2,000,000	lumpsum(1)	$ 2,000,000	1.00	-	$ 2,000,000	IF	140%	$ 2,800,000	None	$ -	$ 2,800,000	-	$ -	$ 2,800,000	$ -	$ -
7	ELWRF-15	ELWRF	Reliability	Potable Water Connection to ELWRF	FY15-20					$ 200,000	per site(1)	$ 200,000	1.00	-	$ 200,000	IF	140%	$ 280,000	None	$ -	$ 280,000	-	$ -	$ 280,000	$ -	$ -
7	EMWRF-07	EMWRF	Reliability	Backup Power for Product Water Pumps	FY15-20	1	system			$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	None	$ -	$ 700,000	-	$ -	$ 700,000	$ -	$ -
7	T22-17	T22	Storage	Increase Title 22 product water storage by 5.0 MG	FY15-20	5	MG			$ 1.50	per gallon	$ 7,500,000	1.00	-	$ 7,500,000	IF	140%	$ 10,500,000	None	$ -	$ 10,500,000	-	$ -	$ 10,500,000	$ -	$ -
7	T22-23	T22	Pipeline	Title-22 PS Discharge Pipeline Modification	FY15-20	300	lineal ft	54	inches	$ 1,100	per lineal ft	$ 330,000	1.00	-	$ 330,000	IF	140%	$ 465,000	None	$ -	$ 465,000	-	$ -	$ 465,000	$ -	$ -
Subtotal	ELWRF Phase VI - Future Plant Expansions											$ 75,370,000			$ 75,370,000			$ 105,525,000		$ -	$ 105,525,000	$ -	$ -	$ 105,525,000	$ -	$ -
13	HPS-01	HPS	PS	Add 23 mgd of additional pumping capacity, to bring firm capacity to 74 mgd of firm capacity. (Phase I of II; total project assumes 7 pumps, 7,000 hp total)	FY1011			7,000	hp	$ 3,000	per hp	$ 10,500,000	1.00	-	$ 10,500,000	IF	140%	$ 14,700,000	None	$ -	$ 14,700,000	-	$ 14,700,000	-	$ -	$ -
13	HPS-04	HPS	PS	PS Building	FY1011	1	building					$ 400,000	1.00	-	$ 400,000	IF	140%	$ 560,000	None	$ -	$ 560,000	-	$ 560,000	-	$ -	$ -
13	HPS-05	HPS	PS	Add 23 mgd of additional pumping capacity, to bring firm capacity to 97 mgd of firm capacity. (Phase II of II; total project assumes 7 pumps, 7,000 hp total)	FY1112			7,000	hp	$ 3,000	per hp	$ 10,500,000	1.00	-	$ 10,500,000	IF	140%	$ 14,700,000	None	$ -	$ 14,700,000	-	$ 14,700,000	-	$ -	$ -
Subtotal	Hyperion Secondary Effluent Pump Station Expansion											$ 21,400,000			$ 21,400,000			$ 29,960,000		$ -	$ 29,960,000	$ -	$ 29,960,000	$ -	$ -	$ -
14	HPS-03	HPS	PS	Secondary Power Connection for Backup Power	FY1011	1	system			$ 1,800,000	lumpsum(1)	$ 1,800,000	1.00	-	$ 1,800,000	IF	140%	$ 2,520,000	None	$ -	$ 2,520,000	-	$ 2,520,000	-	$ -	$ -
Subtotal	Hyperion Secondary Effluent Pump Station Secondary Feed											$ 1,800,000			$ 1,800,000			$ 2,520,000		$ -	$ 2,520,000	$ -	$ 2,520,000	$ -	$ -	$ -
15	T22-11	T22	Pipeline	Chlorination Stations (Phase I)	FY1213	5	stations			$ 280,000	per station	$ 1,400,000	1.00	-	$ 1,400,000	IF	140%	$ 1,960,000	None	$ -	$ 1,960,000	-	$ 1,960,000	-	$ -	$ -
15	T22-21	T22	Pipeline	Chlorination Stations (Phase II)	FY15-20	5	stations			$ 280,000	per station	$ 1,400,000	1.00	-	$ 1,400,000	IF	140%	$ 1,960,000	None	$ -	$ 1,960,000	-	$ -	$ 1,960,000	$ -	$ -
Subtotal	Water Quality Facility Improvements											$ 2,800,000			$ 2,800,000			$ 3,920,000		$ -	$ 3,920,000	$ -	$ 1,960,000	$ 1,960,000	$ -	$ -
16	T22-02	T22	Pipeline	El Segundo Lateral (Boeing, Kilroy Airport)	FY1112	6,300	lineal ft	6	inches		see detail	$ 955,000	1.00	-	$ 955,000	OF	157%	$ 1,500,000	Fed	$ 1,031,250	$ 468,750	-	$ 1,500,000	-	$ -	$ -
16	T22-02A	T22	Pipeline	Mariposa Lateral (Mattel, Hilton, Marriot)	FY0910	1,700	lineal ft	6	inches		see detail	$ 475,000	1.00	-	$ 475,000	OF	157%	$ 750,000	Fed	$ 515,625	$ 234,375	$ 750,000	$ -	-	$ -	$ -
16	T22-06	T22	Pipeline	Carson Mall Lateral	FY0910	10,000	lineal ft	6 - 16	inches		lumpsum(7)	$ 1,070,000	1.48	A,F	$ 1,590,000	OF	157%	$ 2,500,000	Fed	$ 1,718,750	$ 781,250	$ 2,500,000	$ -	-	$ -	$ -
16	T22-08	T22	Pipeline	Mills Park Lateral	FY1112	1,000	lineal ft	6	inches		see detail	$ 175,000	1.00	-	$ 175,000	IF	140%	$ 245,000	Fed	$ 168,438	$ 76,563	-	$ 245,000	-	$ -	$ -
16	T22-09	T22	Pipeline	Anza Lateral Phase II	FY0910	12,000	lineal ft	4 - 8	inches		lumpsum(8)	$ -	0.00	0.00	$ -	-	0%	$ 3,500,000	Fed	$ 2,406,250	$ 1,093,750	$ 3,500,000	$ -	-	$ -	$ -
16	T22-10	T22	PS	Anza PS (4-500 gpm pumps)	FY0910	2,000	gpm	200	hp		lumpsum(4)	$ -	0.00	0.00	$ -	-	0%	$ 2,000,000	Fed	$ 1,375,000	$ 625,000	$ 2,000,000	$ -	-	$ -	$ -
16	T22-13	T22	Pipeline	Dominguez Street Lateral	FY1011	14,500	lineal ft	6 - 8	inches		lumpsum(4)	$ -	0.00	0.00	$ -	-	0%	$ 4,500,000	Fed	$ 3,093,750	$ 1,406,250	-	$ 4,500,000	-	$ -	$ -
16	T22-19	T22	Pipeline	Dyehouse Lateral	FY0910	12,000	lineal ft	8	inches		lumpsum(4)	$ -	0.00	0.00	$ -	-	0%	$ 3,000,000	Fed	$ 2,062,500	$ 937,500	$ 3,000,000	$ -	-	$ -	$ -
16	T22-20	T22	PS	Dyehouse PS (3-250 gpm pumps)	FY0910	600	gpm	40	hp		lumpsum(4)	$ -	0.00	0.00	$ -	-	0%	$ 1,500,000	Fed	$ 1,031,250	$ 468,750	$ 1,500,000	$ -	-	$ -	$ -
Subtotal	Harbor / South Bay Project Laterals - US ARMY CORPS											$ 2,675,000			$ 3,195,000			$ 19,495,000		$ 13,402,813	$ 6,092,188	$ 13,250,000	$ 6,245,000	$ -	$ -	$ -
17	T22-01	T22	Pipeline	Caltrans Inglewood Lateral	FY1213	1,000	lineal ft	4	inches		see detail	$ 130,000	1.25	A	$ 165,000	OF	157%	$ 260,000	Fed	$ 178,750	$ 81,250	-	$ 260,000	-	$ -	$ -
17	T22-04	T22	Pipeline	Virco-Torrance Lateral	FY1011	1,500	lineal ft	6	inches		see detail	$ 215,000	1.00	-	$ 215,000	OF	157%	$ 340,000	None	$ -	$ 340,000	-	$ 340,000	-	$ -	$ -
17	T22-07	T22	Pipeline	Redondo Beach Lateral (Pete's Nursery)	FY1112	2,500	lineal ft	6	inches		see detail	$ 420,000	1.00	-	$ 420,000	OF	157%	$ 660,000	None	$ -	$ 660,000	-	$ 660,000	-	$ -	$ -
17	T22-12	T22	Pipeline	Main Street Carson Lateral	FY1314	37,000	lineal ft	6 - 16	inches		see detail	$ 9,715,000	1.12	A	$ 10,875,000	OF	157%	$ 17,075,000	None	$ -	$ 17,075,000	-	$ 17,075,000	-	$ -	$ -
17	T22-14	T22	Pipeline	Caltrans Gardena Lateral	FY1415	3,500	lineal ft	6 - 8	inches		see detail	$ 625,000	1.00	-	$ 625,000	OF	157%	$ 985,000	None	$ -	$ 985,000	-	$ 985,000	-	$ -	$ -
17	T22-15	T22	Pipeline	Palos Verdes - Lateral 6B	FY15-20	42,500	lineal ft	12 - 24	inches		see detail	$ 17,380,000	1.00	-	$ 17,380,000	OF	157%	$ 27,290,000	Fed	$ 18,761,875	$ 8,528,125	-	$ -	$ 27,290,000	$ -	$ -
17	T22-16	T22	PS	Palos Verdes PS (4-1,250 gpm pumps)	FY15-20	5,000	gpm	375	hp		lumpsum(1)	$ 3,500,000	1.00	-	$ 3,500,000	IF	140%	$ 4,900,000	None	$ -	$ 4,900,000	-	$ -	$ 4,900,000	$ -	$ -
17	T22-18A	T22	Pipeline	Gardena Lateral - Normandie Ave	FY15-20	9,500	lineal ft	8	inches		see detail	$ 2,260,000	1.02	A	$ 2,315,000	OF	157%	$ 3,635,000	None	$ -	$ 3,635,000	-	$ -	$ 3,635,000	$ -	$ -
17	T22-18B	T22	Pipeline	Gardena Lateral - Normandie and Vermont	FY15-20	19,500	lineal ft	4 - 6	inches		see detail	$ 3,815,000	1.03	A	$ 3,930,000	OF	157%	$ 6,170,000	None	$ -	$ 6,170,000	-	$ -	$ 6,170,000	$ -	$ -
17	T22-18C	T22	Pipeline	Gardena Lateral - Van Ness	FY15-20	15,000	lineal ft	4 - 6	inches		see detail	$ 2,855,000	1.00	A	$ 2,855,000	OF	157%	$ 4,480,000	None	$ -	$ 4,480,000	-	$ -	$ 4,480,000	$ -	$ -
17	T22-22	T22	Pipeline	Hawthorne Lateral (Solec)	FY15-20	5,500	lineal ft	6	inches		see detail	$ 1,015,000	1.00	-	$ 1,015,000	OF	157%	$ 1,595,000	Fed	$ 1,096,563	$ 498,438	-	$ -	$ 1,595,000	$ -	$ -
Subtotal	Harbor / South Bay Project Laterals - DISTRICT											$ 41,930,000			$ 43,295,000			$ 67,390,000		$ 20,037,188	$ 47,352,813	$ -	$ 19,320,000	$ 48,070,000	$ -	$ -
18	CRWRF-07	CRWRF	Reliability	Backup Power	FY15-20	1	system			$ 1,800,000	lumpsum	$ 1,800,000	1.00	-	$ 1,800,000	IF	140%	$ 2,520,000	None	$ -	$ 2,520,000	-	$ -	$ 2,520,000	$ -	$ -
Subtotal	Backup Power and Water Supply											$ 1,800,000			$ 1,800,000			$ 2,520,000		$ -	$ 2,520,000	$ -	$ -	$ 2,520,000	$ -	$ -
30	CNF-05	CNF	Recapitalization	ELWRF Phase Va Expansion - Inspect Nitrified Product Water Storage Tank Internal Condition	FY1112	1	site			$ 60,000	lumpsum(1)	$ 60,000	1.00	-	$ 60,000	IF	140%	$ 85,000	Chev	$ 85,000	$ -	-	$ 85,000	-	$ -	$ -
30	CNF-06	CNF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 3,765,000	1.00	-	$ 3,765,000	CA	120%	$ 4,520,000	Chev	$ 4,520,000	$ -	$ -	$ 2,740,000	$ 1,780,000	$ -	$ -
30	CNF-07	CNF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 500,000	1.00	-	$ 500,000	IF	140%	$ 850,000	Chev	$ 850,000	$ -	$ -	$ 425,000	$ 425,000	$ -	$ -
30	HPS-06	HPS	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 600,000	1.00	-	$ 600,000	CA	120%	$ 725,000	None	$ -	$ 725,000	$ -	$ 350,000	$ 375,000	$ -	$ -
Subtotal	Treatment Facility Repair, Replacement, and Improvements											$ 4,925,000			$ 4,925,000			$ 6,180,000		$ 5,455,000	$ 725,000	$ -	$ 3,600,000	$ 2,580,000	$ -	$ -
	EMWRF-04	EMWRF	Treatment	Add 0.6 mgd of Industrial RO Treatment of Title 22 Water (half of 1,000 afy total w/ RO).(6)	FY15-20						per gpd	$ 1,350,000	1.00	-	$ 1,350,000	IF	140%	$ 1,890,000	EMWRF	$ 1,890,000	$ -	-	$ -	$ 1,890,000	$ -	$ -
	EMWRF-05	EMWRF	Treatment	Add 0.5 mgd of Nitrified Treatment of Title 22 Water (half of 1,000 afy total w/ Nitrified).(6)	FY15-20	0.5	mgd			$ 1	per gpd	$ 525,000	1.00	-	$ 525,000	IF	140%	$ 735,000	EMWRF	$ 735,000	$ -	-	$ -	$ 735,000	$ -	$ -
Subtotal	EMWRF Expansion											$ 1,875,000			$ 1,875,000			$ 2,625,000		$ 2,625,000	$ -	$ -	$ -	$ 2,625,000	$ -	$ -
31	CBRN-01	CBRN	Pipeline	Install access ports for cleaning	FY1112	8	ports			$ 100,000	per port	$ 800,000	1.00	-	$ 800,000	OF	157%	$ 1,260,000	None	$ -	$ 1,260,000	-	$ 1,260,000	-	$ -	$ -
31	CRWRF-06	CRWRF	Recapitalization	Repair Nitrified Product Water Storage Tank	FY1112	0.2	MG			$ 2.00	per gallon	$ 400,000	1.00	-	$ 400,000	IF	140%	$ 560,000	None	$ -	$ 560,000	-	$ 560,000	-	$ -	$ -
31	CRWRF-08	CRWRF	PS	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 5,310,000	1.00	-	$ 5,310,000	CA	120%	$ 6,375,000	None	$ -	$ 6,375,000	$ -	$ 1,125,000	$ 5,250,000	$ -	$ -
31	CRWRF-09	CRWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 279,900	per year	$ 2,795,000	1.00	-	$ 2,795,000	MR	100%	$ 2,799,000	None	$ -	$ 2,799,000	-	$ 1,399,500	$ 1,399,500	$ -	$ -
31	CRWRF-10	CRWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 1,205,000	1.00	-	$ 1,205,000	IF	140%	$ 1,690,000	None	$ -	$ 1,690,000	$ -	$ 845,000	$ 845,000	$ -	$ -
31	CRWRF-11	CRWRF	Recapitalization	UW Recap - Construct paved access way from road to rear side of RO CIP tank.	FY0910							$ 10,000	1.00	-	$ 10,000	UW	100%	$ 10,000	None	$ -	$ 10,000	$ 10,000	$ -	-	$ -	$ -
31	EBRN-01	EBRN	Pipeline	Install pinch valves/reducers	FY1011	10	reducers			$ 40,000	per valve(1)	$ 400,000	1.00	-	$ 400,000	OF	157%	$ 630,000	None	$ -	$ 630,000	-	$ 630,000	-	$ -	$ -
31	EBRN-02	EBRN	Pipeline	Install access ports for cleaning	FY1112	12	ports			$ 100,000	per port	$ 1,200,000	1.00	-	$ 1,200,000	OF	157%	$ 1,885,000	None	$ -	$ 1,885,000	-	$ 1,885,000	-	$ -	$ -
31	ELWRF-01	ELWRF	Recapitalization	UW Recap - T-22 backwash pump total rebuilds (increase capacity of T22 backwash blower)	FY0910					$ 100,000	lumpsum(9)	$ 100,000	1.00	-	$ 100,000	UW	100%	$ 100,000	None	$ -	$ 100,000	$ 100,000	$ -	-	$ -	$ -
31	ELWRF-06	ELWRF	Recapitalization	Increase Capacity of Title 22 Air Vacuum Release Valve for Product Water Storage Tanks	FY1011	1	valve			$ 70,000	lumpsum(1)	$ 70,000	1.00	-	$ 70,000	IF	140%	$ 100,000	None	$ -	$ 100,000	-	$ 100,000	-	$ -	$ -

Tabe 9.37

WB Project ID	Project ID	System Name	Project Type	Project Description	Year	Size	Unit	Capacity	Unit	Unit Cost	Unit	Construction Cost (w/o Spcl Cond)	Special Construction	Spcl Cnst	Construction Cost	Project Location (for TTC)	Contingency	Capital Cost	Other Payer	Cost to Other Party	Cost to West Basin	FY0910	FY10-15	FY15-20	FY20-25	FY25-30
31	ELWRF-16	ELWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 18,215,000	1.00	-	$ 18,215,000	CA	120%	$ 21,860,000	None	$ -	$ 21,860,000	$ -	$ 4,660,000	$ 17,200,000	$ -	$ -
31	ELWRF-17	ELWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 1,105,380	per year	$ 11,050,000	1.00	-	$ 11,050,000	MR	100%	$ 11,053,800	None	$ -	$ 11,053,800	-	$ 5,526,900	$ 5,526,900	$ -	$ -
31	ELWRF-18	ELWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 3,620,000	1.00	-	$ 3,620,000	IF	140%	$ 5,070,000	None	$ -	$ 5,070,000	$ -	$ 2,535,000	$ 2,535,000	$ -	$ -
31	ELWRF-19	ELWRF	Recapitalization	UW Recap - Pave area between T 22 filters and the holding basins	FY0910							$ 8,800	1.00	-	$ 8,800	UW	100%	$ 8,800	None	$ -	$ 8,800	$ 8,800	$ -	-	$ -	$ -
31	ELWRF-20	ELWRF	Recapitalization	UW Recap - Shelter/Overhead cover when CO2 tank is removed. To provide covered storage area for chemical totes. Include access for forklifts around dike area.	FY0910							$ 100,000	1.00	-	$ 100,000	UW	100%	$ 100,000	None	$ -	$ 100,000	$ 100,000	$ -	-	$ -	$ -
31	ELWRF-21	ELWRF	Recapitalization	UW Recap - Phase III Memcor and SCADA and PC	FY0910							$ 5,000	1.00	-	$ 5,000	UW	100%	$ 5,000	None	$ -	$ 5,000	$ 5,000	$ -	-	$ -	$ -
31	ELWRF-22	ELWRF	Recapitalization	UW Recap - No. 3 Sulfuric acid day tank replace	FY0910							$ 30,000	1.00	-	$ 30,000	UW	100%	$ 30,000	None	$ -	$ 30,000	$ 30,000	$ -	-	$ -	$ -
31	ELWRF-23	ELWRF	Recapitalization	UW Recap - Replace grating replacement in chemical area with chemical resistant grating	FY0910							$ 40,000	1.00	-	$ 40,000	UW	100%	$ 40,000	None	$ -	$ 40,000	$ 40,000	$ -	-	$ -	$ -
31	ELWRF-24	ELWRF	Recapitalization	UW Recap - Trench Drains at Decant Sump area	FY0910							$ 30,000	1.00	-	$ 30,000	UW	100%	$ 30,000	None	$ -	$ 30,000	$ 30,000	$ -	-	$ -	$ -
31	ELWRF-25	ELWRF	Recapitalization	UW Recap - Power receptacles for emergency generator hook up for Title 22	FY0910							$ 20,000	1.00	-	$ 20,000	UW	100%	$ 20,000	None	$ -	$ 20,000	$ 20,000	$ -	-	$ -	$ -
31	ELWRF-26	ELWRF	Recapitalization	UW Recap - Replace DCS back up power (48vac) generator	FY0910							$ 45,000	1.00	-	$ 45,000	UW	100%	$ 45,000	None	$ -	$ 45,000	$ 45,000	$ -	-	$ -	$ -
31	ELWRF-27	ELWRF	Recapitalization	UW Recap - Flow control valve and actuator for barrier product pump	FY0910							$ 100,000	1.00	-	$ 100,000	UW	100%	$ 100,000	None	$ -	$ 100,000	$ 100,000	$ -	-	$ -	$ -
31	ELWRF-28	ELWRF	Recapitalization	UW Recap - Replace or expand plant instrument air compressor system	FY0910							$ 75,000	1.00	-	$ 75,000	UW	100%	$ 75,000	None	$ -	$ 75,000	$ 75,000	$ -	-	$ -	$ -
31	ELWRF-29	ELWRF	Recapitalization	UW Recap - Replace phase II RO Membranes	FY0910							$ 375,000	1.00	-	$ 375,000	UW	100%	$ 375,000	None	$ -	$ 375,000	$ 375,000	$ -	-	$ -	$ -
31	ELWRF-30	ELWRF	Recapitalization	UW Recap - Data Parser to allow for direct entry of data from instrumentation into LIMS.	FY0910							$ 25,000	1.00	-	$ 25,000	UW	100%	$ 25,000	None	$ -	$ 25,000	$ 25,000	$ -	-	$ -	$ -
31	ELWRF-31	ELWRF	Recapitalization	UW Recap - Replace or repair lab wall to prevent water intrusion and mold	FY0910							$ 25,000	1.00	-	$ 25,000	UW	100%	$ 25,000	None	$ -	$ 25,000	$ 25,000	$ -	-	$ -	$ -
31	EMWRF-01	EMWRF	Recapitalization	Repair or Replace Bulk Chemical Storage Tank and Associated Equipment	FY1112		1 system			$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	None	$ -	$ 700,000	-	$ 700,000	-	$ -	$ -
31	EMWRF-02	EMWRF	Recapitalization	Inspect Nitrified Product Water Storage Tank Internal Condition	FY1112		1 site			$ 60,000	lumpsum(1)	$ 60,000	1.00	-	$ 60,000	IF	140%	$ 85,000	None	$ -	$ 85,000	-	$ 85,000	-	$ -	$ -
31	EMWRF-03	EMWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult						lumpsum(1)	$ 5,815,000	1.00	-	$ 5,815,000	CA	120%	$ 6,980,000	None	$ -	$ 6,980,000	$ -	$ 1,590,000	$ 5,390,000	$ -	$ -
31	EMWRF-06	EMWRF	Treatment	Surge Protection - Modify MF Units with Break Tank and Pumps	FY15-20		1 system	lump sum for alternatives		$ 2,500,000	lumpsum(2)	$ 2,500,000	1.00	-	$ 2,500,000	IF	140%	$ 3,500,000	None	$ -	$ 3,500,000	-	$ -	$ 3,500,000	$ -	$ -
31	EMWRF-08	EMWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 165,000	per year	$ 1,650,000	1.00	-	$ 1,650,000	MR	100%	$ 1,650,000	None	$ -	$ 1,650,000	-	$ 825,000	$ 825,000	$ -	$ -
31	EMWRF-09	EMWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 605,000	1.00	-	$ 605,000	IF	140%	$ 850,000	None	$ -	$ 850,000	$ -	$ 425,000	$ 425,000	$ -	$ -
31	EMWRF-10	EMWRF	Recapitalization	UW Recap - Pavement of area between gated entrance and plant.	FY0910							$ 20,000	1.00	-	$ 20,000	UW	100%	$ 20,000	None	$ -	$ 20,000	$ 20,000	$ -	-	$ -	$ -
31	EMWRF-11	EMWRF	Recapitalization	UW Recap - Add an additional air compressor for the MF system	FY0910							$ 30,000	1.00	-	$ 30,000	UW	100%	$ 30,000	None	$ -	$ 30,000	$ 30,000	$ -	-	$ -	$ -
31	EMWRF-12	EMWRF	Recapitalization	UW Recap - RO Train 4 membrane change out	FY0910							$ 160,000	1.00	-	$ 160,000	UW	100%	$ 160,000	None	$ -	$ 160,000	$ 160,000	$ -	-	$ -	$ -
31	NTP-02	NTP	Recapitalization	Membrane Replacement (recurring)	Mult					$ 1,705,000	per year	$ 5,040,000	1.00	-	$ 5,040,000	MR	100%	$ 8,525,000	None	$ -	$ 8,525,000	-	$ -	$ 8,525,000	$ -	$ -
31	SW-01	SW	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 3,020,000	1.00	-	$ 3,020,000	IF	140%	$ 4,230,000	None	$ -	$ 4,230,000	$ -	$ 2,115,000	$ 2,115,000	$ -	$ -
31	SW-02	SW	Recapitalization	UW Recap - Major Painting Projects	FY0910							$ 150,000	1.00	-	$ 150,000	UW	100%	$ 150,000	None	$ -	$ 150,000	$ 150,000	$ -	-	$ -	$ -
31	SW-03	SW	Recapitalization	UW Recap - Purchase trailer for spill response	FY0910							$ 5,000	1.00	-	$ 5,000	UW	100%	$ 5,000	None	$ -	$ 5,000	$ 5,000	$ -	$ -	$ -	$ -
31	SW-04	SW	Recapitalization	UW Recap - Asset Management Software, Implementation and Training	FY0910							$ 300,000	1.00	-	$ 300,000	UW	100%	$ 300,000	None	$ -	$ 300,000	$ 300,000	$ -	-	$ -	$ -
31	SW-05	SW	Recapitalization	UW Recap - Replace all Biofor valves at CNF and EMWRF	FY0910							$ 200,000	1.00	-	$ 200,000	UW	100%	$ 200,000	None	$ -	$ 200,000	$ 200,000	$ -	-	$ -	$ -
Subtotal	Conveyance Facility Repair, Replacement, and Improvements											$ 66,108,800			$ 66,108,800			$ 81,656,600		$ -	$ 81,656,600	$ 1,853,800	$ 26,266,400	$ 53,536,400	$ -	$ -
											Total	**$ 398,113,760**	**$ -**	**$ -**	**$ 417,535,333**	**-**	**$ -**	**$ 614,937,878**	**$ -**	**$ 254,180,000**	**$ 360,757,878**	**$ 15,103,800**	**$ 373,002,678**	**$ 226,831,400**	**$ -**	**$ -**

Notes:
1) Cost estimated based on considerations specific to the site, application, or project, rather than through utilization of unit costs.
2) Withfor this report, multiple alternatives were proposed. For conservative planning purposes, the more expensive option is included here. Decisions regarding alternatives will need to be made during preliminary design. See Chapters 7 and 8 for more details.
3) Cost estimate obtained from ELWRF Phase V Expansion Feasibility Study (HDR April 2008). Cost estimate does not reflect unit costs or markups developed for this report.
4) Budget for project prepared by West Basin as a part of preliminary design. Cost estimate does not reflect unit costs or markups developed for this report.
5) Cost based on recent discussions with West Basin staff. Cost estimate does not reflect unit costs or markups developed for this report.
6) Expansion of the EMWRF Facility and assosciated increase in Title 22 water are not included in the Customer Database or System Analysis portions of this report.
7) Cost provided by West Basin staff. Based on recent customer revisions.
8) Length reduced from 16,000 lf to 12,000 lf based on discussions with West Basin staff.
9) Cost provided by United Water cost estimate.

West Basin Municipal Water District
Capital Implementation Master Plan for Recycled Water Systems
Detailed CIP List w/ Project Breakdown

Post 2020 Projects

Project ID	System Name (Lookup)	Project Type	Project Description	Year	Size	Unit	Capacity	Unit	Unit Cost	Unit	Construction Cost (w/o Spcl Cond)	Special Construction	Spcl Cnst	Construction Cost	Project Location (for TTC)	Contingency	Capital Cost	Other Payer	Cost to Other Party	Cost to West Basin	FY0910	FY10-15	FY15-20	FY20-25	FY25-30
CNF-08	CNF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 290,000	1.00	-	$ 290,000	CA	120%	$ 350,000	None	$ -	$ 350,000	$ -	$ -	$ -	$ 170,000	$ 180,000
CNF-09	CNF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 500,000	1.00	-	$ 500,000	IF	140%	$ 850,000	None	$ -	$ 850,000	$ -	$ -	$ -	$ 425,000	$ 425,000
HPS-07	HPS	PS	Add 38 mgd of additional firm pumping capacity, to bring total firm capacity to 135 mgd. (For LADWP Westside, Kenneth Hahn, LADWP Harbor Expansion) (Assumes 3 pumps, 3,000 hp increase)	FY20-25	46	mgd	3,000	hp	$ 6,500	per hp	$ 19,500,000	1.00	-	$ 19,500,000	IF	140%	$ 27,300,000	None	$ -	$ 27,300,000	-	$ -	$ -	$ 27,300,000	-
HPS-08	HPS	Pipeline	Parallel HSEFM w/ 36"	FY20-25	15,500	lineal ft	36	inches	$ 750	per lineal ft	$ 11,625,000	1.25	A	$ 14,531,250	OF	157%	$ 22,815,000	None	$ -	$ 22,815,000	-	$ -	$ -	$ 22,815,000	-
T22-24	T22	Pipeline	Anza Lateral Break Tank	FY20-25					0	lumpsum	$ 3,000,000	1.00	-	$ 3,000,000	IF	140%	$ 4,200,000	None	$ -	$ 4,200,000	-	$ -	$ -	$ 4,200,000	-
T22-25	T22	Pipeline	LA Westside Lateral	FY25-30	40,500	lineal ft	24 - 36	inches	0	see detail	$ 24,355,000	1.05	F,R	$ 25,480,000	OF	157%	$ 40,005,000	None	$ -	$ 40,005,000	-	$ -	$ -	-	$ 40,005,000
T22-26	T22	PS	Inglewood/LA Westside PS (assumes 4-8,500 gpm pumps)	FY25-30	34,000	gpm	5,950	hp	$ 3,000	per hp	$ 17,850,000	1.00	-	$ 17,850,000	OF	157%	$ 28,025,000	None	$ -	$ 28,025,000	-	$ -	$ -	-	$ 28,025,000
ELWRF-32	ELWRF	Treatment	Land Acquisition of 4.0 ac near ELWRF for Expansion of Title 22 Beyond 70.0 mgd	FY20-25	21.5	mgd	4.0	ac	$ 2,000,000	per acre	$ 8,000,000	1.00	-	$ 8,000,000	LA	120%	$ 9,600,000	None	$ -	$ 9,600,000	-	$ -	$ -	$ 9,600,000	-
ELWRF-33	ELWRF	PS	Increase capacity of Title 22 Pump Station at ELWRF by 4,000 hp (from 8,000 hp to 12,000 hp) to serve LADWP Harbor Expansion, Westside, and Kenneth Hahn	FY25-30			4,000	hp	$ 3,000	per hp	$ 12,000,000	1.00	-	$ 12,000,000	IF	140%	$ 16,800,000	None	$ -	$ 16,800,000	-	$ -	$ -	-	$ 16,800,000
ELWRF-34	ELWRF	Treatment	Add 8.9 mgd of Additional Title 22 Treatment to Serve LADWP Harbor Expansion, increasing Title 22 Treatment Capacity from 67.3 mgd to 76.2 mgd	FY25-30	8.9	mgd			$ 2.00	per gal	$ 17,815,000	1.00	-	$ 17,815,000	IF	140%	$ 24,945,000	None	$ -	$ 24,945,000	-	$ -	$ -	-	$ 24,945,000
ELWRF-35	ELWRF	Treatment	Add 15.3 mgd of Additional Title 22 Treatment to Serve LADWP Westside and Kenneth Hahn Park, increasing Title 22 Treatment Capacity from 76.2 mgd to 91.5 mgd	FY25-30	15.3	mgd			$ 2.00	per gal	$ 30,690,000	1.00	-	$ 30,690,000	IF	140%	$ 42,970,000	None	$ -	$ 42,970,000	-	$ -	$ -	-	$ 42,970,000
ELWRF-36	ELWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 14,970,000	1.00	-	$ 14,970,000	CA	120%	$ 17,965,000	None	$ -	$ 17,965,000	$ -	$ -	$ -	$ 11,040,000	$ 6,925,000
ELWRF-37	ELWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 1,105,380	per year	$ 11,055,000	1.00	-	$ 11,055,000	MR	100%	$ 11,055,000	None	$ -	$ 11,055,000	$ -	$ -	$ -	$ 5,527,500	$ 5,527,500
ELWRF-38	ELWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 3,620,000	1.00	-	$ 3,620,000	IF	140%	$ 5,070,000	None	$ -	$ 5,070,000	$ -	$ -	$ -	$ 2,535,000	$ 2,535,000
CRWRF-12A	CRWRF	Treatment	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand Phase II)	FY20-25	7.1	mgd			$ 1.05	per gpd	$ 7,485,000	1.00	-	$ 7,485,000	IF	140%	$ 10,480,000	None	$ -	$ 10,480,000	-	$ -	$ -	$ 10,480,000	-
CRWRF-12B	CRWRF	PS	Add new 7.1 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	FY20-25	5,917	gpm	300	hp	$ 10,000	per hp	$ 3,000,000	1.00	-	$ 3,000,000	IF	140%	$ 4,200,000	None	$ -	$ 4,200,000	-	$ -	$ -	$ 4,200,000	-
CRWRF-13	CRWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 3,245,000	1.00	-	$ 3,245,000	CA	120%	$ 3,895,000	None	$ -	$ 3,895,000	$ -	$ -	$ -	$ 2,595,000	$ 1,300,000
CRWRF-14	CRWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 279,900	per year	$ 2,800,000	1.00	-	$ 2,800,000	MR	100%	$ 2,800,000	None	$ -	$ 2,800,000	$ -	$ -	$ -	$ 1,400,000	$ 1,400,000
CRWRF-15	CRWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 1,205,000	1.00	-	$ 1,205,000	IF	140%	$ 1,690,000	None	$ -	$ 1,690,000	$ -	$ -	$ -	$ 845,000	$ 845,000
NTP-03	NTP	Treatment	Barrier Water Treatment - treat SE from JWPCP to serve Dominguez Gap (Phase I and II)	FY20-25	3.9	mgd			$ 6.25	per gal	$ 24,375,000	1.00	-	$ 24,375,000	IF	140%	$ 34,125,000	None	$ -	$ 34,125,000	-	$ -	$ -	$ 34,125,000	-
NTP-04	NTP	PS	Add new 3.1 mgd pump station at NTP to serve Dominguez Gap (Phase I + II)	FY20-25	2,583	gpm	150	hp	$ 10,000	per hp	$ 1,500,000	1.00	-	$ 1,500,000	IF	140%	$ 2,100,000	None	$ -	$ 2,100,000	-	$ -	$ -	$ 2,100,000	-
NTP-05	NTP	Pipeline	New Pipeline from NTP to Dominguez Gap Barrier Blending Station for conveyance of Barrier Water.	FY20-25	15,840	lineal ft	12	inches	$ 310	per ft	$ 4,910,400	1.25	A	$ 6,138,000	OF	157%	$ 9,640,000	None	$ -	$ 9,640,000	-	$ -	$ -	$ 9,640,000	-
NTP-06	NTP	Recapitalization	Membrane Replacement (recurring)	Mult					$ 1,705,000	per year	$ 10,085,000	1.00	-	$ 10,085,000	MR	100%	$ 17,050,000	None	$ -	$ 17,050,000	$ -	$ -	$ -	$ 8,525,000	$ 8,525,000
EMWRF-13	EMWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 2,720,000	1.00	-	$ 2,720,000	CA	120%	$ 3,265,000	None	$ -	$ 3,265,000	$ -	$ -	$ -	$ 2,440,000	$ 825,000
EMWRF-14	EMWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 165,000	per year	$ 1,650,000	1.00	-	$ 1,650,000	MR	100%	$ 1,650,000	None	$ -	$ 1,650,000	$ -	$ -	$ -	$ 825,000	$ 825,000
EMWRF-15	EMWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 605,000	1.00	-	$ 605,000	IF	140%	$ 850,000	None	$ -	$ 850,000	$ -	$ -	$ -	$ 425,000	$ 425,000
SW-06	SW	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 3,020,000	1.00	-	$ 3,020,000	IF	140%	$ 4,230,000	None	$ -	$ 4,230,000	$ -	$ -	$ -	$ 2,115,000	$ 2,115,000
										Total	**$ 241,870,400**	**$ -**	**$ -**	**$ 247,129,250**	**-**	**$ -**	**$ 347,925,000**	**$ -**	**$ -**	**$ 347,925,000**	**$ -**	**$ -**	**$ -**	**$ 163,327,500**	**$ 184,597,500**
										Grand Total	**$ 639,984,160**	**$ -**	**$ -**	**$ 664,664,583**	**-**	**$ -**	**$ 962,862,878**	**$ -**	**$ 254,180,000**	**$ 708,682,878**	**$ 15,103,800**	**$ 373,002,678**	**$ 226,831,400**	**$ 163,327,500**	**$ 184,597,500**

Water Usage Data for:

Manhattan Village HOA

Manhattan Village HOA

Date	HCF*	AFY	@ 2014 Potable Rates	@ 2014 Recycled Rates	Potential Savings
2009	14,025	32.2	$ 82,186.50	$ 47,404.50	$ 34,782.00
2008	24,172	55.5	$ 141,647.92	$ 81,701.36	$ 59,946.56
2007	27,424	63.0	$ 160,704.64	$ 92,693.12	$ 68,011.52
2006	20,996	48.2	$ 123,036.56	$ 70,966.48	$ 52,070.08
2005	20,132	46.2	$ 117,973.52	$ 68,046.16	$ 49,927.36
2004	24,288	55.8	$ 142,327.68	$ 82,093.44	$ 60,234.24
2003	25,785	59.2	$ 151,100.10	$ 87,153.30	$ 63,946.80

GS BROTHERS INC.

MANHATTAN VILLAGE SPRINKLER
2009 WATER CONSUMPTION REPORT

11/2008- PRESENT

ACCT. NO.	SERVICE LOCATION	BILLING PERIOD (11/2008 - PRESENT)											
		24-Nov-08		27-Jan-09		24-Mar-09		15-May-09		25-Jul-09		23-Sep-09	
		HCF	$	HCF	$	HCF	$	HCF	$	HCF	$	HCF	$
10-1000001-07	GUARD SHACK		CLOSED	0	CLOSED	0	CLOSED	0	CLOSED	0	CLOSED	0	CLOSED
10-1319002-02	N/S VILLAGE CTR DR.	336	$ 608.88	114	$ 255.90	141		283	$ 524.61				
10-3114501-04	PARK/ SANTA CRUZ CT	513	$ 1,243.11	168	$ 433.62	194	$ 531.74	377	$ 939.83				
10-3400001-08	44 FAIRWAY DRIVE	4	$ 33.70	2	$ 29.24	3	$ 31.47	3	$ 31.47				
10-3501600-00	FAIRWAY/ EVERGREEN LN	7	$ 40.39	3	$ 31.47	4	$ 33.70	6	$ 38.16				
10-3880001-07	30 FAIRWAY DR	517	$ 1,252.03	131	$ 391.25	167	$ 471.53	348	$ 875.16				
10-3995000-00	GRANADA CT/ EVERGREEI	191	$ 378.33	67	$ 181.17	70	$ 185.94	183	$ 365.61				
11-0100002-06	E. SIDE GATEWAY DR	466	$ 815.58	202	$ 395.82	170	$ 344.94	484	$ 844.20				
11-0100010-00	1 GATEWAY DR	1	$ 27.01	2	$ 29.24	1	$ 27.01	2	$ 29.24				
11-0105002-01	VILLAGE CENTER DR N	623	$ 1,065.21	203	$ 397.41	413	$ 731.31	391	$ 696.33				
11-1528001-08	VILLAGE CENTER DR	242	$ 638.78	63	$ 239.61	83	$ 284.21	198	$ 540.66				
11-0107001-09	7 VILLAGE CENTER DR	25	$ 105.31	24	$ 103.08	57	$ 176.67	32	$ 120.92				
11-0201035-00	45 SAUSALITO CIR	202	$ 549.58	77	$ 270.83	71	$ 257.45	203	$ 551.00				
11-0300090-00	62 SAUSALITO/ LNDSCP	396	$ 704.28	178	$ 357.66	99	$ 232.05	346	$ 624.78				
11-0400016-00	36 MONTEREY CT SPA	8	$ 67.40	7	$ 65.17	7	$ 65.17	12	$ 76.32				
11-0601700-00	19 SAUSALITO CIR E.	397	$ 984.43	141	$ 413.55	158	$ 451.46	447	$ 1,095.93				
11-0700000-00	31 CORDOBA/ SAUSALITO	448	$ 786.96	158	$ 325.86	174	$ 351.30	508	$ 882.36				
11-0802700-00	1 BERMUDA CT	272	$ 705.68	77	$ 270.83	84	$ 208.20	206	$ 402.18				
11-1029000-00	SAUSALITO CIR.	203	$ 551.81	81	$ 279.75	70	$ 255.22	223	$ 596.41				
11-1330001-06	MALAGA PL. W.	235	$ 623.17	54	$ 219.54	77	$ 270.83	202	$ 549.58				
11-1400002-01	MALAGA PL. E	258	$ 484.86	62	$ 173.22	73	$ 190.71	236	$ 449.88				
11-1425000-00	49 MALAGA WAY	9	$ 44.85	5	$ 35.93	3	$ 31.47	44	$ 49.31				
	TOTAL :	5353	$ 11,711.35	1819	$ 4,900.15	2119	$ 5,132.38	4734	$ 10,283.94	0	$ -	0	$ -
	2009 Total HCF		14025	Total Billing		$	32,027.82						

GS BROTHERS INC.

MANHATTAN VILLAGE SPRINKLER
2008 WATER CONSUMPTION REPORT

11/2007- 9/2008

ACCT. NO.	SERVICE LOCATION	BILLING PERIOD (11/2007 - 9/2008)											
		28-Nov-07		25-Jan-08		28-Mar-08		22-May-08		25-Jul-08		23-Sep-08	
		HCF	$	HCF	$	HCF	$	HCF	$	HCF	$	HCF	$
10-1000001-07	GUARD SHACK		CLOSED	0	CLOSED	0	CLOSED	0	CLOSED	0	CLOSED	0	CLOSED
10-1319002-02	N/S VILLAGE CTR DR.	258	$ 484.86	117	$ 260.67	150	$ 313.14	299	$ 550.95	385	$ 686.79	302	$ 554.82
10-3114501-04	PARK/ SANTA CRUZ CT	361	$ 786.52	137	$ 351.96	188	$ 450.90	419	$ 899.04	498	$ 1,052.30	423	$ 1,042.41
10-3400001-08	44 FAIRWAY DRIVE	5	$ 31.25	4	$ 29.31	5	$ 31.25	0	$ 21.55	2	$ 25.43	3	$ 31.47
10-3501600-00	FAIRWAY/ EVERGREEN LN	14	$ 48.71	7	$ 35.13	11	$ 42.89	9	$ 39.01	7	$ 35.13	9	$ 44.85
10-3880001-07	30 FAIRWAY DR	284	$ 637.14	120	$ 318.98	147	$ 371.36	382	$ 827.26	730	$ 1,502.38	616	$ 1,472.80
10-3995000-00	GRANADA CT/ EVERGREE	130	$ 281.34	39	$ 136.65	57	$ 165.27	193	$ 381.51	218	$ 421.26	201	$ 394.23
11-0100002-06	E. SIDE GATEWAY DR	478	$ 834.66	613	$ 1,049.31	274	$ 510.30	630	$ 1,076.34	709	$ 1,201.95	605	$ 1,036.59
11-0100010-00	1 GATEWAY DR	2	$ 25.43	1	$ 23.49	1	$ 23.49	2	$ 25.43	4	$ 29.31	2	$ 29.24
11-0105002-01	VILLAGE CENTER DR N	371	$ 664.53	124	$ 271.80	207	$ 403.77	526	$ 910.98	609	$ 1,042.95	576	$ 990.48
11-1528001-08	VILLAGE CENTER DR	181	$ 437.32	76	$ 233.62	105	$ 289.88	231	$ 534.32	342	$ 749.66	315	$ 801.57
11-0107001-09	7 VILLAGE CENTER DR	34	$ 109.05	40	$ 120.69	26	$ 93.53	33	$ 107.11	42	$ 124.57	41	$ 140.99
11-0201035-00	45 SAUSALITO CIR	148	$ 373.30	37	$ 157.96	54	$ 190.94	230	$ 532.38	282	$ 633.26	251	$ 658.85
11-0300090-00	62 SAUSALITO/ LNDSCP	229	$ 438.75	79	$ 200.25	130	$ 281.34	414	$ 732.90	489	$ 852.15	414	$ 732.90
11-0400016-00	36 MONTEREY CT SPA	24	$ 89.65	13	$ 68.31	7	$ 56.67	7	$ 56.67	10	$ 62.49	7	$ 56.98
11-0601700-00	19 SAUSALITO CIR E.	324	$ 714.74	103	$ 286.00	211	$ 495.52	496	$ 1,048.42	576	$ 1,203.62	460	$ 1,124.92
11-0700000-00	31 CORDOBA/ SAUSALITO	311	$ 569.13	87	$ 212.97	204	$ 399.00	450	$ 790.14	576	$ 990.48	473	$ 826.71
11-0802700-00	1 BERMUDA CT	145	$ 367.48	48	$ 179.30	63	$ 208.40	237	$ 545.96	290	$ 648.78	246	$ 647.70
11-1029000-00	SAUSALITO CIR.	99	$ 278.24	30	$ 144.38	57	$ 196.76	168	$ 412.10	204	$ 481.94	217	$ 583.03
11-1330001-06	MALAGA PL. W.	137	$ 351.96	52	$ 187.06	88	$ 256.90	234	$ 540.14	275	$ 619.68	199	$ 542.89
11-1400002-01	MALAGA PL. E	111	$ 251.13	42	$ 141.42	77	$ 197.07	233	$ 445.11	291	$ 537.33	235	$ 448.29
11-1425000-00	49 MALAGA WAY	25	$ 70.05	11	$ 42.89	10	$ 40.95	16	$ 52.59	16	$ 52.59	18	$ 64.92
	TOTAL :	3671	$ 7,845.24	1780	$ 4,452.15	2072	$ 5,019.33	5209	$ 10,529.91	6555	$ 12,954.05	4885	$ 10,597.94

2008 Total HCF	24172	Total Billing	51,399

As of 8/6/2009

GS BROTHERS INC.

MANHATTAN VILLAGE SPRINKLER
2007 WATER CONSUMPTION REPORT

11/2006-9/2007

ACCT. NO.	SERVICE LOCATION	BILLING PERIOD (11/2006 - 11/2007)											
		30-Nov-06		25-Jan-07		24-Mar-07		24-May-07		25-Jul-07		23-Sep-07	
		HCF	$	HCF	$	HCF	$	HCF	$	HCF	$	HCF	$
10-1000001-07	GUARD SHACK		CLOSED	0	CLOSED	0	CLOSED						
10-1319002-02	N/S VILLAGE CTR DR.	277	$ 515.07	161	$ 330.63	140	$ 297.24	292	$ 538.92	399	$ 709.05	506	$ 879.18
10-3114501-04	PARK/ SANTA CRUZ CT	517	$ 1,089.16	280	$ 629.38	165	$ 406.28	418	$ 897.10	517	$ 1,089.16	641	$ 1,329.72
10-3400001-08	44 FAIRWAY DRIVE	2	$ 25.43	4	$ 29.31	2	$ 25.43	6	$ 33.19	4	$ 29.31	3	$ 27.37
10-3501600-00	FAIRWAY/ EVERGREEN LN	13	$ 46.77	10	$ 40.95	11	$ 42.89	14	$ 48.71	12	$ 44.83	13	$ 46.77
10-3880001-07	30 FAIRWAY DR	475	$ 1,007.68	146	$ 369.42	161	$ 398.52	396	$ 854.42	499	$ 1,054.24	505	$ 1,065.88
10-3995000-00	GRANADA CT/ EVERGREE	306	$ 561.18	81	$ 203.43	83	$ 206.61	216	$ 418.08	273	$ 508.71	268	$ 468.96
11-0100002-06	E. SIDE GATEWAY DR	475	$ 829.89	193	$ 381.51	311	$ 569.13	268	$ 500.76	650	$ 1,108.14	513	$ 890.31
11-0100010-00	1 GATEWAY DR	2	$ 25.43	1	$ 23.49	3	$ 27.37	2	$ 25.43	1	$ 23.49	2	$ 25.43
11-0105002-01	VILLAGE CENTER DR N	661	$ 1,125.63	217	$ 419.67	226	$ 433.98	386	$ 688.38	1149	$ 1,901.55	840	$ 1,410.24
11-1528001-08	VILLAGE CENTER DR	282	$ 633.26	97	$ 274.36	88	$ 256.90	296	$ 660.42	369	$ 802.04	397	$ 856.36
11-0107001-09	7 VILLAGE CENTER DR	70	$ 178.89	36	$ 112.93	32	$ 105.17	38	$ 116.81	41	$ 122.63	69	$ 176.95
11-0201035-00	45 SAUSALITO CIR	169	$ 414.04	74	$ 229.74	85	$ 251.08	244	$ 559.54	267	$ 604.16	259	$ 588.64
11-0300090-00	62 SAUSALITO/ LNDSCP	33	$ 127.11	172	$ 348.12	149	$ 311.55	370	$ 662.94	494	$ 860.10	485	$ 845.79
11-0400016-00	36 MONTEREY CT SPA	7	$ 56.67	14	$ 70.25	12	$ 66.37	9	$ 60.55	15	$ 72.19	14	$ 70.25
11-0601700-00	19 SAUSALITO CIR E.	469	$ 996.04	204	$ 481.94	233	$ 538.20	558	$ 1,168.70	685	$ 1,415.08	647	$ 1,341.36
11-0700000-00	31 CORDOBA/ SAUSALITO	411	$ 728.13	194	$ 383.10	210	$ 408.54	485	$ 845.79	602	$ 1,031.82	558	$ 961.86
11-0802700-00	1 BERMUDA CT	275	$ 619.68	77	$ 235.66	86	$ 253.02	253	$ 577.00	338	$ 741.90	277	$ 623.56
11-1029000-00	SAUSALITO CIR.	152	$ 381.06	72	$ 225.86	75	$ 231.68	227	$ 526.56	248	$ 567.30	219	$ 511.04
11-1330001-06	MALAGA PL. W.	321	$ 708.92	104	$ 287.94	94	$ 268.54	269	$ 608.04	279	$ 627.44	284	$ 637.14
11-1400002-01	MALAGA PL. E	238	$ 453.06	91	$ 219.33	85	$ 209.79	249	$ 470.55	259	$ 486.45	274	$ 510.30
11-1425000-00	49 MALAGA WAY	10	$ 40.95	8	$ 37.07	11	$ 42.89	15	$ 50.65	12	$ 44.83	13	$ 46.77
	TOTAL :	5165	$ 10,564.05	2236	$ 5,334.09	2262	$ 5,351.18	5011	$ 10,312.54	7113	$ 13,844.42	5637	$ 11,077.61

2007 Total HCF	27424	Total Billing	$ 56,483.89

Prepared by 8/6/2009

GS BROTHERS INC.

MANHATTAN VILLAGE SPRINKLER

11/2005-9/2006

2006 WATER CONSUMPTION REPORT

ACCT. NO.	SERVICE LOCATION	BILLING PERIOD (11/2005 - 9/2006) 23-Nov-05 HCF	23-Nov-05 $	25-Jan-06 HCF	25-Jan-06 $	24-Mar-06 HCF	24-Mar-06 $	24-May-06 HCF	24-May-06 $	25-Jul-06 HCF	25-Jul-06 $	23-Sep-06 HCF	23-Sep-06 $
10-1000001-07	GUARD SHACK	0	CLOSED	0	CLOSED	0	CLOSED						
10-1319002-02	N/S VILLAGE CTR DR.	154	$ 319.50	115	$ 257.49	127	$ 276.57	166	$ 338.58	404	$ 717.00	368	$ 659.76
10-3114501-04	PARK/ SANTA CRUZ CT	310	$ 687.58	216	$ 505.22	255	$ 580.88	380	$ 823.38	615	$ 1,279.28	576	$ 1,203.62
10-3400001-08	44 FAIRWAY DRIVE	3	$ 27.37	4	$ 29.31	4	$ 29.31	4	$ 29.31	7	$ 35.13	5	$ 31.25
10-3501600-00	FAIRWAY/ EVERGREEN LN	11	$ 42.89	13	$ 46.77	12	$ 44.83	13	$ 46.77	12	$ 44.83	13	$ 46.77
10-3880001-07	30 FAIRWAY DR	285	$ 639.08	105	$ 289.88	103	$ 286.00	183	$ 441.20	352	$ 769.06	564	$ 1,180.34
10-3995000-00	GRANADA CT/ EVERGREEI	85	$ 209.79	72	$ 189.12	73	$ 190.71	110	$ 249.54	215	$ 416.49	202	$ 395.82
11-0100002-06	E. SIDE GATEWAY DR	254	$ 478.50	187	$ 371.97	180	$ 360.84	268	$ 500.76	825	$ 1,386.39	819	$ 1,376.39
11-0100010-00	1 GATEWAY DR	2	$ 25.43	2	$ 25.43	2	$ 25.43	2	$ 25.43	3	$ 27.37	3	$ 27.37
11-0105002-01	VILLAGE CENTER DR N	220	$ 424.44	207	$ 403.77	239	$ 454.65	353	$ 635.91	549	$ 947.55	599	$ 1,027.05
11-1528001-08	VILLAGE CENTER DR	145	$ 367.48	86	$ 253.02	98	$ 276.30	127	$ 332.56	396	$ 854.42	397	$ 856.36
11-0107001-09	7 VILLAGE CENTER DR	32	$ 105.17	68	$ 175.01	119	$ 273.95	61	$ 161.43	39	$ 118.75	10	$ 62.49
11-0201035-00	45 SAUSALITO CIR	111	$ 301.52	64	$ 210.34	61	$ 204.52	88	$ 256.90	320	$ 706.98	308	$ 683.70
11-0300090-00	62 SAUSALITO/ LNDSCP	2	$ 77.82	13	$ 95.31	11	$ 92.13	17	$ 101.67	50	$ 154.14	49	$ 152.55
11-0400016-00	36 MONTEREY CT SPA	20	$ 81.89	51	$ 142.03	12	$ 66.37	23	$ 87.71	22	$ 85.77	29	$ 99.35
11-0601700-00	19 SAUSALITO CIR E.	333	$ 732.20	248	$ 567.30	230	$ 532.38	319	$ 705.04	642	$ 1,331.66	618	$ 1,285.10
11-0700000-00	31 CORDOBA/ SAUSALITO	161	$ 330.63	139	$ 295.65	125	$ 273.39	186	$ 370.38	444	$ 780.60	489	$ 852.15
11-0802700-00	1 BERMUDA CT	130	$ 338.38	105	$ 289.88	87	$ 254.96	144	$ 365.54	416	$ 893.22	446	$ 951.42
11-1029000-00	SAUSALITO CIR.	70	$ 221.98	73	$ 227.80	62	$ 206.46	96	$ 272.42	274	$ 617.74	253	$ 577.00
11-1330001-06	MALAGA PL. W.	126	$ 330.62	82	$ 245.26	78	$ 237.50	108	$ 295.70	346	$ 757.42	339	$ 743.84
11-1400002-01	MALAGA PL. E	120	$ 265.44	83	$ 206.61	71	$ 187.53	132	$ 284.52	351	$ 632.73	275	$ 511.89
11-1425000-00	49 MALAGA WAY	11	$ 42.89	14	$ 48.71	14	$ 48.71	9	$ 39.01	9	$ 39.01	8	$ 37.07
	TOTAL :	2585	$6,050.60	1947	$4,875.88	1963	$4,903.42	2789	$ 6,363.76	6291	$ 12,595.54	5421	$ 10,866.66

2006 Total HCF	20996	Total Billing	$ 45,655.86

8/6/2009

GS BROTHERS, INC.

MANHATTAN VILLAGE
2005 SPRINKLER WATER CONSUMPTION REPORT

11/2004 - 9/2005

ACCT. NO.	SERVICE LOCATION	BILLING PERIOD (11/2004 - 11/2005)											
		23-Nov-04		25-Jan-05		24-Mar-05		24-May-05		25-Jul-05		29-Sep-05	
		HCF	$	HCF	$	HCF	$	HCF	$	HCF	$	HCF	$
10-1000001-07	GUARD SHACK	0	$ 18.66	0	$ 18.66	0	CLOSED	0	CLOSED	0	CLOSED	0	CLOSED
10-1319002-02	N/S VILLAGE CTR DR.	183	$ 365.61	73	$ 190.71	44	$ 144.60	201	$ 394.23	278	$ 516.66	272	$ 507.12
10-3114501-04	PARK/ SANTA CRUZ CT	293	$ 654.60	108	$ 295.70	156	$ 388.82	363	$ 790.40	440	$ 939.78	466	$ 990.22
10-3400001-08	44 FAIRWAY DRIVE	3	$ 27.37	2	$ 25.43	1	$ 23.49	3	$ 27.37	4	$ 29.31	3	$ 27.37
10-3501600-00	FAIRWAY/ EVERGREEN LN	0	$ 21.55	9	$ 39.01	5	$ 31.25	8	$ 37.07	9	$ 39.01	11	$ 42.89
10-3880001-07	30 FAIRWAY DR	450	$ 959.18	420	$ 900.98	300	$ 668.18	354	$ 772.94	233	$ 538.20	393	$ 848.60
10-3995000-00	GRANADA CT/ EVERGREEI	135	$ 289.29	30	$ 122.34	20	$ 106.44	138	$ 294.06	209	$ 406.95	180	$ 360.84
11-0100002-06	E. SIDE GATEWAY DR	357	$ 642.27	119	$ 263.85	104	$ 240.00	421	$ 774.03	614	$ 1,050.90	538	$ 930.06
11-0100010-00	1 GATEWAY DR	0	$ 21.55	2	$ 25.43	2	$ 25.43	1	$ 23.49	1	$ 23.49	4	$ 29.31
11-0105002-01	VILLAGE CENTER DR N	553	$ 953.91	168	$ 341.76	128	$ 278.16	391	$ 696.33	639	$ 1,090.65	481	$ 839.43
11-1528001-08	VILLAGE CENTER DR	115	$ 309.28	28	$ 140.50	19	$ 123.04	140	$ 357.78	268	$ 606.10	354	$ 772.94
11-0107001-09	7 VILLAGE CENTER DR	49	$ 138.15	15	$ 72.19	47	$ 134.27	62	$ 163.37	42	$ 124.57	43	$ 126.51
11-0201035-00	45 SAUSALITO CIR	144	$ 365.54	22	$ 128.86	42	$ 167.66	154	$ 384.94	216	$ 505.22	247	$ 565.36
11-0300009-00	62 SAUSALITO/ LNDSCP	40	$ 138.24	40	$ 138.24	36	$ 131.88	57	$ 165.27	0	$ 74.64	0	$ 74.64
11-0400013-00	36 MONTEREY CT SPA	8	$ 58.61	9	$ 60.55	13	$ 68.31	42	$ 124.57	32	$ 105.17	18	$ 78.01
11-0601700-00	19 SAUSALITO CIR E.	388	$ 838.90	56	$ 194.82	103	$ 286.00	400	$ 862.18	610	$ 1,269.58	646	$ 1,339.42
11-0700000-00	31 CORDOBA/ SAUSALITO	302	$ 554.82	41	$ 139.38	106	$ 243.18	318	$ 580.26	429	$ 756.75	369	$ 661.35
11-0802700-00	1 BERMUDA CT	178	$ 431.50	28	$ 140.50	48	$ 179.30	196	$ 466.42	286	$ 641.02	299	$ 666.24
11-1029000-00	SAUSALITO CIR.	140	$ 357.78	30	$ 144.38	31	$ 146.32	162	$ 400.46	230	$ 532.38	205	$ 483.88
11-1330001-06	MALAGA PL. W.	169	$ 414.04	14	$ 113.34	27	$ 138.56	191	$ 456.72	294	$ 656.54	292	$ 652.66
11-1400002-01	MALAGA PL. E	176	$ 354.48	30	$ 122.34	26	$ 115.98	161	$ 330.63	238	$ 453.06	215	$ 416.49
11-1425000-00	49 MALAGA WAY	9	$ 39.01	15	$ 50.65	13	$ 46.77	12	$ 44.83	13	$ 46.77	14	$ 48.71
TOTAL		3692	$7,954.34	1259	$3,650.96	1271	$3,687.64	3775	$ 8,147.35	5085	$10,406.75	5050	$ 10,462.05

2005 Total HCF : 20132	**Total Billing : $ 44,309.09**

GS BROTHERS, INC.

MANHATTAN VILLAGE
2004 SPRINKLER WATER CONSUMPTION REPORT

11/2003 - 11/2004

ACCT. NO.	SERVICE LOCATION	BILLING PERIOD (11/2003 - 11/2004)											
		24-Nov-03		25-Jan-04		23-Mar-04		24-May-03		23-Jul-04		24-Sep-05	
		HCF	$	HCF	$	HCF	$	HCF	$	HCF	$	HCF	$
10-1000001-07	GUARD SHACK	0	$ 18.66	0	$ 18.66	0	$ 18.66	0	$ 18.66	0	$ 18.66	0	$ 19.59
10-1319002-02	N/S VILLAGE CTR DR.	207	$ 403.77	105	$ 241.59	225	$ 432.39	308	$ 564.36	370	$ 661.94	565	$ 972.99
10-3114501-04	PARK/ SANTA CRUZ CT	335	$ 695.65	319	$ 666.37	206	$ 459.58	469	$ 940.87	401	$ 864.12	451	$ 961.12
10-3400001-08	44 FAIRWAY DRIVE	5	$ 29.80	2	$ 24.31	5	$ 29.80	4	$ 27.97	2	$ 25.43	3	$ 28.46
10-3501600-00	FAIRWAY/ EVERGREEN LN	5	$ 29.80	0	$ 20.65	0	$ 20.65	0	$ 20.65	1	$ 23.49	0	$ 22.46
10-3880001-07	30 FAIRWAY DR	425	$ 860.35	420	$ 851.20	258	$ 554.74	570	$ 1,070.80	444	$ 947.54	552	$ 1,157.06
10-3995000-00	GRANADA CT/ EVERGREEI	173	$ 349.71	64	$ 176.40	56	$ 163.68	216	$ 418.08	232	$ 443.52	267	$ 499.17
11-0100002-06	E. SIDE GATEWAY DR	320	$ 583.44	193	$ 381.51	344	$ 621.60	509	$ 883.95	623	$ 1,065.21	769	$ 1,297.35
11-0100010-00	1 GATEWAY DR	7	$ 33.46	2	$ 24.31	2	$ 24.31	1	$ 22.48	1	$ 23.49	1	$ 24.50
11-0105002-01	VILLAGE CENTER DR N	325	$ 591.39	303	$ 556.41	125	$ 273.39	611	$ 1,046.13	519	$ 899.85	549	$ 547.55
11-1528001-08	VILLAGE CENTER DR	182	$ 415.66	151	$ 358.93	123	$ 307.69	270	$ 576.70	288	$ 644.90	307	$ 681.76
11-0107001-09	7 VILLAGE CENTER DR	31	$ 98.03	35	$ 105.35	48	$ 129.14	20	$ 77.90	39	$ 118.75	64	$ 173.19
11-0201035-00	45 SAUSALITO CIR	267	$ 571.21	59	$ 190.57	41	$ 157.63	182	$ 415.66	218	$ 509.10	260	$ 590.58
11-0300009-00	62 SAUSALITO/ LNDSCP	16	$ 100.08	9	$ 88.95	8	$ 87.36	27	$ 117.57	36	$ 131.88	46	$ 154.37
11-0400013-00	36 MONTEREY CT SPA	44	$ 121.82	21	$ 79.73	24	$ 85.22	14	$ 66.92	27	$ 95.47	10	$ 67.26
11-0601700-00	19 SAUSALITO CIR E.	565	$ 1,116.55	170	$ 393.70	194	$ 437.62	452	$ 909.76	431	$ 922.32	530	$ 1,114.38
11-0700000-00	31 CORDOBA/ SAUSALITO	252	$ 475.32	133	$ 286.11	107	$ 244.77	404	$ 717.00	561	$ 966.63	535	$ 925.29
11-0802700-00	1 BERMUDA CT	185	$ 421.15	91	$ 249.13	102	$ 269.26	211	$ 468.73	265	$ 600.28	321	$ 708.92
11-1029000-00	SAUSALITO CIR.	91	$ 249.13	74	$ 218.02	64	$ 199.72	188	$ 426.64	186	$ 447.02	209	$ 491.64
11-1330001-06	MALAGA PL. W.	130	$ 320.50	70	$ 210.70	70	$ 210.70	211	$ 468.73	294	$ 656.54	254	$ 578.94
11-1400002-01	MALAGA PL. E	185	$ 368.79	94	$ 224.10	56	$ 163.68	203	$ 397.41	321	$ 585.03	280	$ 519.84
11-1425000-00	49 MALAGA WAY	11	$ 40.78	10	$ 38.95	9	$ 37.12	11	$ 40.78	10	$ 40.95	12	$ 46.88
TOTAL		3761	$ 7,895.05	2325	$ 5,405.65	2067	$ 4,928.71	4881	$ 9,697.75	5269	$ 10,692.12	5985	$ 11,583.30

2004 Total HCF: 24288	Total Billing: $ 50,202.58

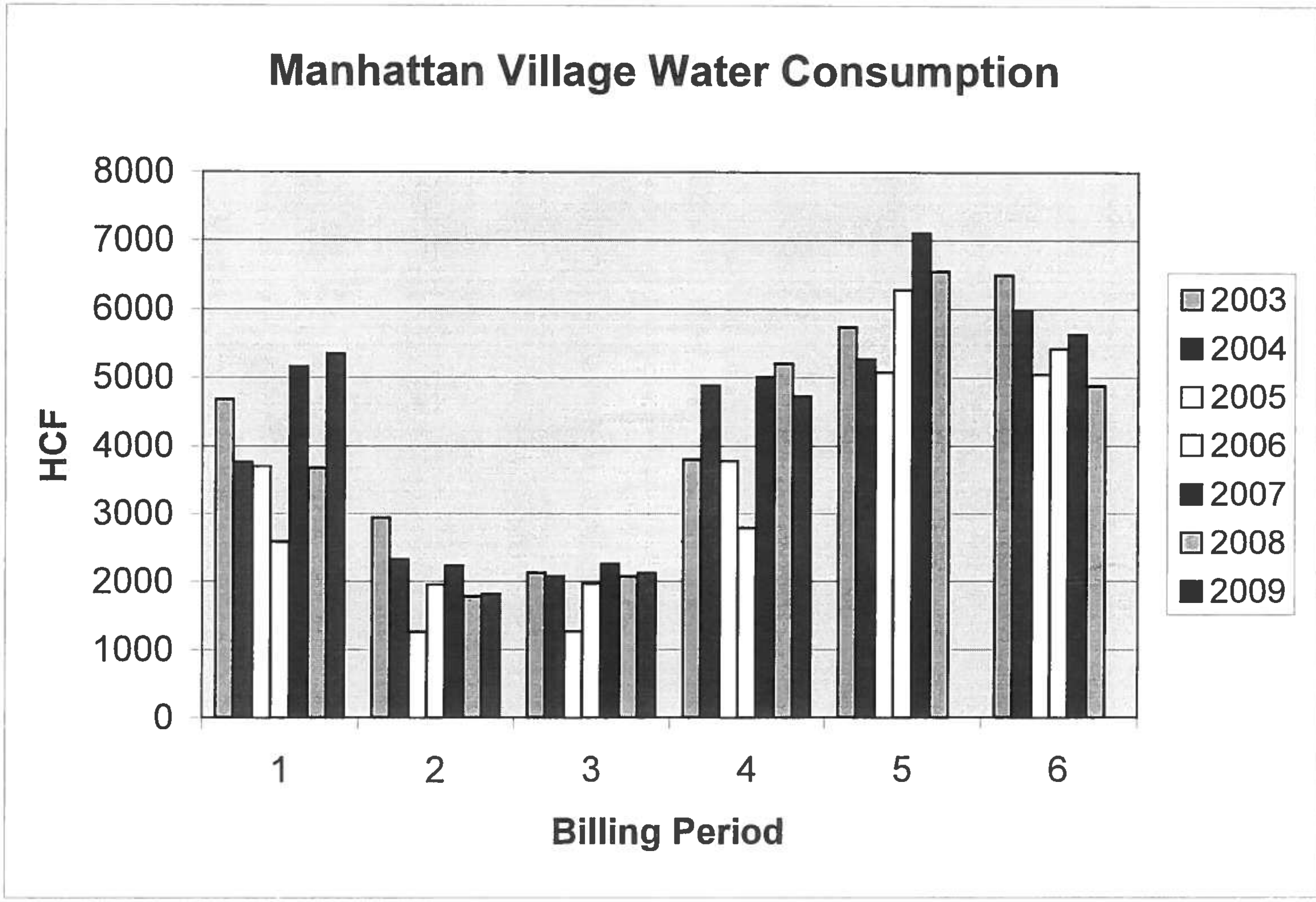
GS BROTHERS, INC.

11/2002 - 11/2003

MANHATTAN VILLAGE
2003 SPRINKLER WATER CONSUMPTION REPORT

ACCT. NO.	SERVICE LOCATION	BILLING PERIOD (11/2002 - 11/2003)											
		22-Nov-02		23-Jan-03		26-Mar-03		24-May-03		25-Jul-03		25-Sep-03	
		HCF	$	HCF	$	HCF	$	HCF	$	HCF	$	HCF	$
10-1000001-07	GUARD SHACK	0	$ 18.66	0	$ 18.66	0	$ 18.66			0	$ 18.66	0	$ 18.66
10-1319002-02	N/S VILLAGE CTR DR.	428	$ 755.16	141	$ 298.83	90	$ 217.74	120	$ 265.44	719	$ 1,217.85	314	$ 573.90
10-3114501-04	PARK/ SANTA CRUZ CT	601	$ 1,182.43	293	$ 618.79	228	$ 499.84	568	$ 1,122.04	426	$ 862.18	536	$ 1,063.48
10-3400001-08	44 FAIRWAY DRIVE	5	$ 29.80	3	$ 26.14	6	$ 31.63	6	$ 31.63	5	$ 29.80	5	$ 29.80
10-3501600-00	FAIRWAY/ EVERGREEN LN	1	$ 22.48	0	$ 20.65	1	$ 22.48	0	$ 20.65	0	$ 20.65	0	$ 20.65
10-3880001-07	30 FAIRWAY DR	0	$ 82.60	0	$ 82.60	0	$ 82.60	548	$ 1,085.44	374	$ 767.02	497	$ 992.11
10-3995000-00	GRANADA CT/ EVERGREEN	263	$ 492.81	74	$ 192.30	79	$ 200.25	115	$ 257.49	169	$ 343.35	248	$ 468.96
11-0100002-06	E. SIDE GATEWAY DR	456	$ 799.68	367	$ 658.17	240	$ 456.24	320	$ 583.44	816	$ 1,372.08	869	$ 1,456.35
11-0100010-00	1 GATEWAY DR	7	$ 33.46	8	$ 35.29	13	$ 44.44	21	$ 59.08	19	$ 55.42	27	$ 70.06
11-0105002-01	VILLAGE CENTER DR N	396	$ 704.28	374	$ 669.30	282	$ 523.02	399	$ 709.05	631	$ 1,077.93	699	$ 1,186.05
11-1528001-08	VILLAGE CENTER DR	278	$ 591.34	157	$ 369.91	101	$ 267.43	128	$ 316.84	283	$ 600.49	250	$ 540.10
11-0107001-09	7 VILLAGE CENTER DR	30	$ 96.20	35	$ 105.35	37	$ 109.01	41	$ 116.33	76	$ 180.38	44	$ 121.82
11-0201035-00	45 SAUSALITO CIR	152	$ 360.76	120	$ 302.20					266	$ 569.38	342	$ 708.46
11-0300009-00	62 SAUSALITO/ LNDSCP	30	$ 122.34	26	$ 115.98	21	$ 108.03	19	$ 104.85	26	$ 115.98	40	$ 138.24
11-0400013-00	36 MONTEREY CT SPA	42	$ 118.16	15	$ 68.75	14	$ 66.92	11	$ 61.43	31	$ 98.03	24	$ 85.22
11-0601700-00	19 SAUSALITO CIR E.	542	$ 1,074.46	370	$ 759.70	257	$ 552.91	541	$ 1,072.63	424	$ 858.52	636	$ 1,246.48
11-0700000-00	31 CORDOBA/ SAUSALITO	538	$ 930.06	326	$ 592.98	198	$ 389.46	382	$ 682.02	569	$ 979.35	580	$ 996.84
11-0802700-00	1 BERMUDA CT	261	$ 560.23	197	$ 443.11	89	$ 245.47	218	$ 481.54	287	$ 607.81	380	$ 778.00
11-1029000-00	SAUSALITO CIR.	106	$ 276.58	60	$ 192.40	136	$ 331.48	111	$ 285.73	139	$ 336.97	211	$ 468.73
11-1330001-06	MALAGA PL. W.	224	$ 492.52	142	$ 342.46	104	$ 272.92	114	$ 291.22	292	$ 616.96	446	$ 898.78
11-1400002-01	MALAGA PL. E	313	$ 572.31	224	$ 430.80	214	$ 414.90	124	$ 271.80	181	$ 362.43	336	$ 608.88
11-1425000-00	49 MALAGA WAY	9	$ 37.12	8	$ 35.29	13	$ 44.44	11	$ 40.78	12	$ 42.61	14	$ 46.27
TOTAL		**4682**	**$9,353.44**	**2940**	**$6,379.66**	**2123**	**$4,899.87**	**3797**	**$ 7,859.43**	**5745**	**$ 11,133.85**	**6498**	**$12,517.84**

2003 Total HCF : 25785	**Total Billing : $ 52,144.09**


Manhattan Village Water Consumption
HCF
8000
7000
6000
5000
4000
3000
2000
1000
0
1
2
3
4
5
6
Billing Period
2003
2004
2005
2006
2007
2008
2009

WATER RECYCLING PROGRAM

Master Plan

— Final Submittal —

Submitted to:

WEST BASIN MUNICIPAL WATER DISTRICT / LOS ANGELES DEPARTMENT OF WATER & POWER

Submitted by:

Kennedy/Jenks Consultants

In Association With:

ASL Consulting Engineers

Delta Geographics

July 21, 2000

Customer Name	Potential Recycled Water Use (AFY)
J. PACIFIC INC.	7
J. PACIFIC INC. - Delta Dyeing & Fi	137
SWISSTEX CALIFORNIA INC	282
TOTAL	**1019**

Lateral 10: LA Southwest College Lateral

This lateral extends from the 20-inch main line that terminates at Chester Washington Golf Course and Western Avenue. This lateral extends north on Western Avenue and terminates at Imperial Highway. This lateral is to serve LA Southwest College, Caltrans I-105, and Clay Jr. High School. Table 4-20 lists the customers on Lateral No. 10.

Table 4-20
Customers on Proposed Lateral No. 10

Customer Name	Potential Recycled Water Use (AFY)
Caltrans I-105 & Western (DO7)	9
Los Angeles Southwest College	98
LAUSD - CLAY JR HIGH	17
TOTAL	**124**

Lateral 11: E&J Dye House Lateral

This lateral extends from the 20-inch main line in 120th Street and Crenshaw Blvd. This lateral extends south on Crenshaw Blvd. and west with the Union Pacific Railroad right-of-way and terminates at E&J Dye House. Northrop and United Detector Tech are also served by this lateral. Table 4-21 lists the customers on Lateral No.11.

WEST BASIN MUNICIPAL WATER DISTRICT/LOS ANGELES DEPARTMENT OF WATER AND POWER
POTENTIAL CUSTOMER DEMAND
EXHIBIT I-A

Customer	Potential Recycled Water Use (AFY) Annual Average (AFY)	Annual Average (gpm)	Peak Demand (gpm)	Purveyor
ING UNIFIED SCH - KELSO SCHOOL	9	6	32	Inglewood
ING UNIFIED SCH #24 INGLEWOOD	14	9	50	Inglewood
ING UNIFIED SCH #65 CLYDE WOOD	10	6	36	Inglewood
INGLEWOOD CAR WASH	14	9	23	Inglewood
Inglewood City Service Center	8	5	29	Inglewood
International Rectifi	40	25	67	El Segundo
Kelso School	3	2	11	Inglewood
KEN/KOAR LAX PARTNRS LP/DJONT LEA	30	19	107	LADWP
L.A. Air Force Base (Area A)	50	31	179	El Segundo
LA COUNTY INTERNAL SERVS DEPT	9	6	32	SCWC
LA COUNTY MECH DEPT	8	5	29	Inglewood
LAUSD - CLAY JR HIGH	17	11	61	SCWC
LAWNDALE SCHOOL DISTRICT	7	4	25	SCWC
LAWNDALE SCHOOL DISTRICT	14	9	50	SCWC
LENNOX SCHOOL DISTRICT	10	6	36	SCWC
LENNOX SCHOOL DISTRICT	22	14	79	SCWC
Lockhaven Mini	1	1	4	SCWC
LOS ANGELES AIR FORCE BASE	54	33	193	SCWC
Los Angeles Southwest College	98	61	350	SCWC
LOYOLA MARYMOUNT UNIV	29	18	104	LADWP
Magruder School	8	5	29	Torrance
Manhattan Heights Park	2	1	7	Manhattan Beach
Manhattan Village Mall	64	40	229	Manhattan Beach
Mark Twain School	15	9	54	SCWC
Marriot Golf Course	100	62	357	Manhattan Beach
MOBIL OIL CORP	19	12	32	LADWP
Monroe Jr. High School	11	7	39	Inglewood
NATIONAL GUARD PPTY	1	1	4	Inglewood
OSAGE COMM ASSOC	6	4	21	SCWC
Parras Middle School	17	11	61	CWSC-Herm/Redon
Playa Pacifica Inc.	28	17	100	CWSC - Herm/Redon
Prairie & Yukon Median	1	1	4	Torrance
Prospect Park	2	1	7	CWSC-Herm/Redon
Public Services Facility	4	2	14	Manhattan Beach
Radiant Services Corp.	37	23	62	El Segundo
RAMADA INTERNATIONAL - Renaissance	67	42	239	LADWP
Rockwell International Corporation	1	1	4	El Segundo
Scattergood (Irrigation)	71	44	254	LADWP
Seaview Parkette	1	1	4	CWSC-Herm/Redon
SITINVEST U.S.A. INC/IRP LAX HOTEL	38	24	136	LADWP
SKW BIOSYSTEMS	58	36	207	SCWC
SLC LOS ANGELES LLC - Westin Los An	156	97	557	LADWP
SO CALIF EDISON CO	9	6	15	SCWC
STUMPUS/GAWRYN PARTNERS	32	20	114	SCWC
THE GEON COMPANY	22	14	37	DWC
The Strand	11	7	39	Manhattan Beach
TORRANCE USD Lincoln Avenue Scho	6	4	21	Torrance
TORRANCE USD-Towers School	13	8	46	Torrance
TORRANCE USD-West Torrance High	25	16	89	DWC

Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District

March, 2007

Robert C. Wilkinson, Ph.D.

Energy Intensity of Water Supplies for West Basin Municipal Water District

	af/yr	Percentage of Total Source Type	kWh/af Conveyance Pumping	kWh/af MWD Treatment	kWh/af Recycled Treatment	kWh/af Groundwater Pumping	kWh/af Groundwater Treatment	kWh/af Desalination	kWh/af WBMWD Distribution	Total kWh/af	Total kWh/year
Imported Deliveries											
State Water Project (SWP) [1]	57,559	43%	3,000	44	NA	NA	NA	NA	0	3,044	175,209,596
Colorado River Aqueduct (CRA) [1] (other that replenishment water)	76,300	57%	2,000	44	NA	NA	NA	NA	0	2,044	155,957,200
Groundwater[2]											
natural recharge	19,720	40%	NA	NA	NA	350	0	NA	0	350	6,902,030
replenished with (injected) SWP water [1]	9,367	19%	3,000	44	NA	350	0	NA	0	3,394	31,791,598
replenished with (injected) CRA water [1]	11,831	24%	2,000	44	NA	350	0	NA	0	2,394	28,323,432
replenished with (injected) recycled water	8,381	17%	205	0	790	350	0	NA	220	1,565	13,116,278
Recycled Water											
West Basin Treatment, Title 22	21,506	60%	205	NA	0	NA	NA	NA	285	490	10,537,940
West Basin Treatment, RO	14,337 35,843	40%	205	NA	790	NA	NA	NA	285	1,280	18,351,360
Ocean Desalination	20,000	100%	200	NA	NA	NA	NA	3,027	460	3,687	82,588,800

Notes:

NA Not applicable

1 Imported water based on percentage of CRA and SWP water MWD received, averaged over an 11-year period. Note that the figures for imports do not include an accounting for system losses due to evaporation and other factors. These losses clearly exist, and an estimate of 5% or more may be reasonable. The figures for imports above should therefore be understood to be conservative (that is, the actual energy intensity is in fact higher for imported supplies than indicated by the figures).

2 Groundwater values include entire basin, West Basin service area covers approximately 86% of the basin. Groundwater values are specific to aquifer characteristics, including depth, within the basin.

California Climate Action Registry General Reporting Protocol

Reporting Entity-Wide Greenhouse Gas Emissions

Version 3.1 | January 2009

Thus, regional/power pool emission factors for electricity consumption can be used to determine emissions based on electricity consumed. If you can obtain verified emission factors specific to the supplier of your electricity, you are encouraged to use those factors in calculating your indirect emissions from electricity generation. If your electricity provider reports an electricity delivery metric under the California Registry's Power/Utility Protocol, you may use this factor to determine your emissions, as it is more accurate than the default regional factor. Utility-specific emission factors are available in the Members-Only section of the California Registry website and through your utility's Power/Utility Protocol report in CARROT.

This Protocol provides power pool-based carbon dioxide, methane, and nitrous oxide emission factors from the U.S. EPA's eGRID database (see Figure III.6.1), which are provided in Appendix C, Table C.2. These are updated in the Protocol and the California Registry's reporting tool, CARROT, as often as they are updated by eGRID.

To look up your eGRID subregion using your zip code, please visit U.S. EPA's "Power Profiler" tool at www.epa.gov/cleanenergy/energy-and-you/how-clean.html.

Fuel used to generate electricity varies from year to year, so emission factors also fluctuate. When possible, you should use emission factors that correspond to the calendar year of data you are reporting. CO_2, CH_4, and N_2O emission factors for historical years are available in Appendix E. If emission factors are not available for the year you are reporting, use the most recently published figures.

U.S. EPA Emissions and Generation Resource Integrated Database (eGRID)

The Emissions & Generation Resource Integrated Database (eGRID) provides information on the air quality attributes of almost all the electric power generated in the United States. eGRID provides search options, including information for individual power plants, generating companies, states, and regions of the power grid. eGRID integrates 24 different federal data sources on power plants and power companies, from three different federal agencies: EPA, the Energy Information Administration (EIA), and the Federal Energy Regulatory Commission (FERC). Emissions data from EPA are combined with generation data from EIA to produce values like pounds per megawatt-hour (lbs/MWh) of emissions, which allows direct comparison of the environmental attributes of electricity generation. eGRID also provides aggregated data to facilitate comparison by company, state or power grid region. eGRID's data encompasses more than 4,700 power plants and nearly 2,000 generating companies. eGRID also documents power flows and industry structural changes. www.epa.gov/cleanenergy/egrid/index.htm.

Figure III.6.1 eGRID Subregions

Source: eGRID2007 Version 1.1, December 2008 (Year 2005 data).

Project 9

Upper San Gabriel Valley Municipal Water District Recycled Water Program Expansion

Supporting Documents

La Puente Valley County Water District Recycled Water Project

Technical Memorandum

May 2014

MEMORANDUM

TO: Reymundo Trejo DATE: May 22, 2014

FROM: Stetson Engineers Inc. JOB NO: 1046-062

RE: La Puente Valley County Water District Recycled Water Project

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PROJECT BACKGROUND AND DESCRIPTION

California is experiencing a drought that will cause groundwater levels in the Main San Gabriel Groundwater Basin (Basin) to reach historic lows within a few weeks. The groundwater levels will continue to decline if the drought continues. Declining water levels will, at some point, impact the ability to produce groundwater in the basin. An extension of the Upper San Gabriel Valley Municipal Water District's (Upper District) Phase IIB recycled water distribution system into La Puente Valley County Water District's (LPVCWD) service area has previously been proposed to improve water supply reliability in the Basin. In 2012, LPVCWD prepared a draft Feasibility Study to further examine potential recycled water use in LPVCWD's service area. The Feasibility Study evaluated several project alternatives to ultimately supply a large number of irrigation and industrial users with recycled water. The project is consistent with Upper District's overall strategy to reduce demands and increase supplies in the Main San Gabriel Basin as described in the 2012 Integrated Resources Plan.

The ultimate project consists of the construction of a recycled water distribution system including pipelines, and customer retrofits, to supply recycled water provided by the San Jose Creek Water Reclamation Plant (SJCWRP) to customers in the cities of Industry and La Puente from a connection to the existing Phase IIB Industry Recycled Water Pipeline. . In response to the current drought, Upper District and LPVCWD have developed an initial phase of the preferred alternative for the LVCWD Recycled Water Project. The initial phase will supply approximately 52 acre feet per year of recycled water to be used for non-potable purposes such as landscape irrigation and industrial purposes. The map below provides the location for the initial phase of the Project. In response to your request, this memorandum provides a summary of the water demands, schedule, and costs for the initial phase proposed by Upper District and LPVCWD.

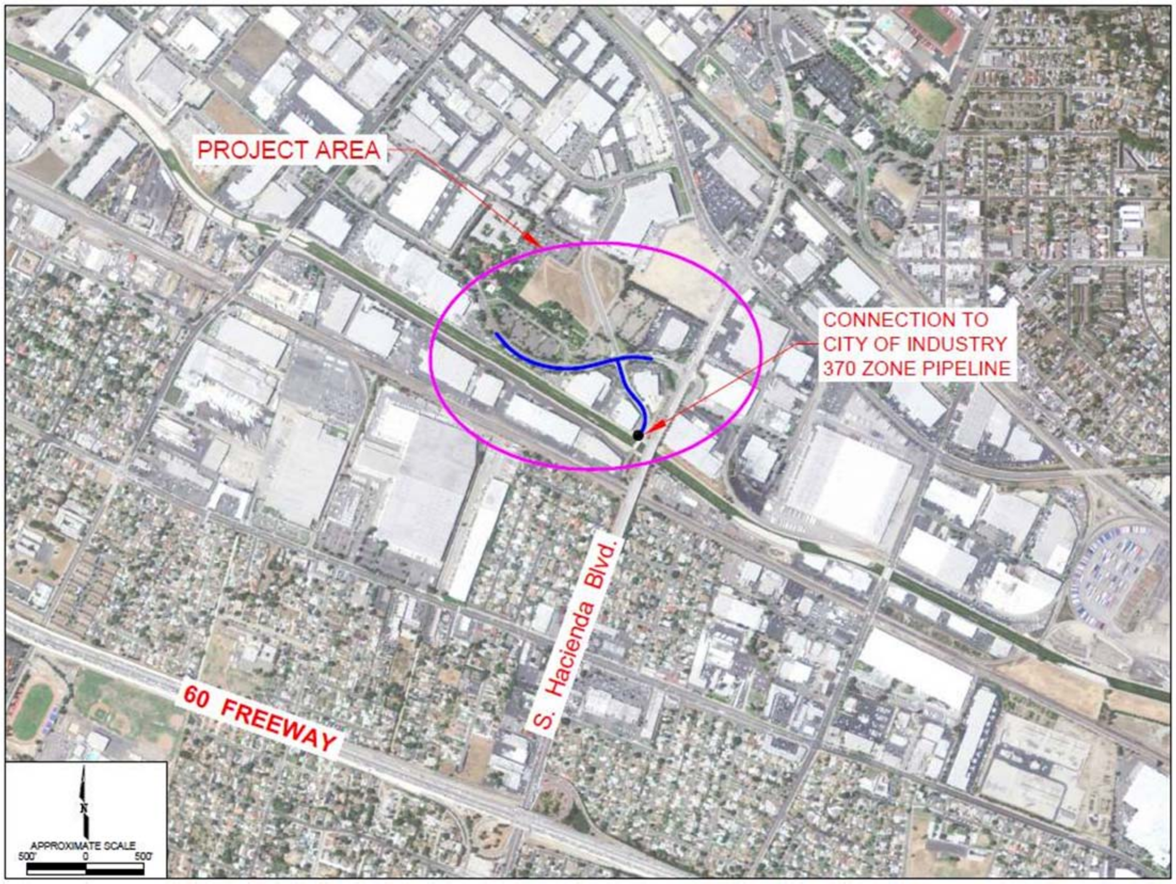


Figure 1. LPVCWD Recycled Water Project Initial Phase Location.

RECYCLED WATER CUSTOMERS

The table below provides a summary of the recycled water customers to be serviced by the initial phase of the Project.

Table 1. Initial Phase Recycled Water Customers

Customer	Service Class	Approximate Recycled Water Use (AFY)
City of Industry[1]	Irrigation	43
Delta Products Corporation	Irrigation	2.3
Thermaltake, Inc.	Irrigation	2
Fibre Container	Packaging	4.8
Total		**52**

Source: LPVCWD Recycled Water Feasibility Study Report.

[1] The City of Industry will have multiple pipeline connections.

PROJECT SCHEDULE

The table below provides the Project schedule for critical milestones of the initial phase.

Table 2. Initial Phase Project Schedule.

Task	Start Date	Finish Date
Planning	4/4/11	3/31/12
Feasibility Study	10/3/11	3/31/12
Pre-Project Monitoring	4/4/11	3/31/12
Environmental Assessment	9/2/13	8/29/14
Design	6/2/14	11/28/14
Environmental Permits	3/3/14	8/29/14
Building/Other Permits	9/1/14	2/27/15
Construction/Implementation	3/4/15	3/1/16
Post Project Monitoring	3/3/16	3/1/17

Source: Upper District Recycled Water Program Expansion Project Schedule.

PROJECT COSTS

The table below provides the initial phase Project costs.

Table 3. Initial Phase Project Costs.

Diameter (inches)	Length (feet)	Unit Cost ($/foot)	Pipeline Cost	45% Mark Up (Eng. & Admin)	15% Mark Up (Contingency)
4	500	$140	$70,000	$101,500	$116,725
6	1,000	$160	$160,000	$232,000	$266,800
8	800	$180	$144,000	$208,800	$240,120
Total	2,300		$374,000	$542,300	**$624,000**
				Traffic Control, Paving, and Misc.	**$150,000**
				Subtotal	**$774,000**
				Customer Conversion (assumes 10 customers)	**$450,000**
				Total	**$1,224,000**

Source: Unit costs for pipe diameters provided in the LPVCWD Recycled Water Feasibility Study Report.

SUMMARY

The initial phase of the LPVCWD Recycled Water Project consists of the construction of a recycled water distribution system with an approximate length of 2,300 linear feet to deliver approximately 52 AFY of recycled water to customers in the City of Industry for non-potable uses for irrigation and industrial purposes. The total cost for the initial phase is estimated to be $1,224,000 and the current schedule indicates that construction can begin by March 4, 2015.

DRAFT

Feasibility Study

For The

Proposed South El Monte Recycled Water System

October 7, 2013

UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT

In cooperation with

SAN GABRIEL VALLEY WATER COMPANY

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

Executive Summary

Introduction

The proposed South El Monte Recycled Water Project (Project) will provide up to 559 acre-feet per year (AFY) of recycled water service to 44 customers within the Cities of South El Monte, El Monte, Industry, and Pico Rivera. A map of the proposed Project area is provided in Figure 1-1. A map of the proposed Project facilities is provided in Figure 1-2.

Conceptual Packages (phases) have been developed in order to break up the cost and construction of the Project over time. Also each proposed use site has been briefly reviewed for any apparent issues that could make the recycled water retrofit process more challenging or costly per site. A thorough understanding of the customer reuse sites are of critical importance, as any major decrease in estimated demand can make a potentially beneficial project uneconomic.

The Upper San Gabriel Valley Municipal Water District (USGVMWD) is interested in the possibility of interconnecting the existing USGVMWD's Phase IIA Rosemead System, with the proposed South El Monte Recycled Water Project to add reliability in the event of a water reclamation plant (WRP) outage or pump station failure at the Whittier Narrows WRP. The feasibility of interconnecting the two systems in order to provide more reliable delivery of recycled water to the Phase IIA customers is discussed in Section 3.7.

Conceptual Project Phasing

The conceptual project phasing for the Proposed South El Monte Recycled Water System is shown in Figure 1-2. There are five (5) packages to build out the system as detailed below:

Package 1 Pipeline

The Package 1 Pipeline will connect the first group of South El Monte recycled water customers to the existing Upper District Phase IIA recycled water system extension served by the Los Angeles County Sanitation Districts (LACSD) Whittier Narrows Water Reclamation Plant (WRP). This Packages anchor user is El Monte High School.

Package 2 Pipeline, Pump Station, and Reservoir

Package 2 will construct a pipeline (Package 2A) that will connect the Package 1 Pipeline to the proposed Fairview Pump Station and Reservoir (Package 2B). The Fairview Pump Station and Reservoir will pump recycled water from the San Jose Creek WRP on the west side of the 605 freeway. The main objective of Package 2 Pipeline is to provide a backup source of recycled water to the Phase IIA system in the event that the Whittier Narrows WRP or pump station experiences an outage. A small low head transfer pump may also be necessary to transport the recycled water from the SJCWRP to the proposed Fairview RW Reservoir.

Package 3 Pipeline

The Package 3 Pipeline will connect the Package 2 Pipeline to the existing Phase IIA system near South El Monte High School near the intersection of Durfee Ave. and Santa Anita Ave. Once built, the existing Phase IIA System and proposed South El Monte System will be connected at two points. This second point of connection will form a loop between both systems, and provide better hydraulic pressure during peak hour flow, or in the event of a plant outage. System pressures will be critical at the highest elevation sites that are also furthest from the pump stations.

Package 4 Pipeline

The Package 4 Pipeline will connect several potential customer sites adjacent to the first three pipeline packages. Upon verification of the demands for each of these customer sites, the individual pipeline segments may be constructed, or deleted from this Package. This Package also consists of crossing the 60 freeway and San Gabriel River in order to pick up the anchor user Pico Rivera Bicentennial Park and Equestrian Center. These crossings will be costly, and the demands south of the freeway and river should be confirmed prior to construction of this portion of pipeline.

Package 5 Pipeline

The Package 5 Pipeline will be constructed from the northern most Package 4 Pipeline to serve demands north of Interstate 10. Half of the proposed recycled water sites are for car dealerships, and the other half for irrigation sites. If the car dealerships use the majority of their demand for washing vehicles, it is unlikely that conventional recycled water conversion will be a viable option. The Package 5 sites are also at the highest elevation relative to the South El

Monte Recycled Water System, and may not have adequate pressure during peak hour system demand.

Potential Recycled Water Customer Review

Several proposed customer sites stand out as potentially impactful to the overall Project. These sites estimated demands should be further evaluated before the project is constructed. The findings could significantly impact the estimated recycled water demands. These are discussed in more detail in Section 2.3. Highlighted below are the largest potential recycled water users for the Project.

Site 13 – El Monte High School (Package 1 – 49 AFY)
The schools estimated demand (49 AFY) is much higher than what is estimated based on the actual scaled irrigation areas (21 AFY). A site inspection is recommended in order to determine if other site demands could be driving the high estimated meter demand (i.e. cooling towers, swimming pool, etc.).

Site 40 – Bicentennial Park & Sports Arena (Package 4 – 129 AFY)
Bicentennial Park is one of the largest demands in the Project consisting of campground spots for public camping, and an arena used for rodeo shows several times per month. The City of Pico Rivera is currently considering a remodel of the park campground. The renovation plans could impact the estimated amount of water used by the site. Depending on the City's future plans the water demand may be diminished.

Site 42 – Watershed Conservation Authority – Duck Farm (Package 4 – 60 AFY)
The Watershed Conservation Authority is currently renovating the old Duck Farm adjacent to the 605 FWY. It is recommended to contact the Watershed Conservation Authority and get a more detailed plan for their renovation of the site in order to verify the estimated amount of irrigation that will be required.

Site 36 – Longo Toyota (Package 5 – 33 AFY)
Longo Toyota / Lexus is the anchor user of the Package 5 Pipeline. The two dealerships make up the largest car dealership in the world according to their website. The property is nearly 30 acres in size but there is very little irrigated area (less than an acre).

The majority of the water used on site is likely used for washing cars. Recycled water is not suitable for washing cars without some form of water treatment added.

If Longo Toyota cannot use recycled water for washing cars then the Package 5 Pipeline west of Site 21 should be deleted. The other dealerships in the area will have similar conversion problems, and have relatively small estimated demands.

Furthermore, if Longo Toyota is deleted, the Package 5 Pipeline may no longer be cost effective due to the diminished demand and the high construction costs to cross the I-10 freeway.

Phase IIA Recycled Water System Backup

In order to provide the Phase IIA customers with a more reliable recycled water supply, the Upper District is considering interconnecting the existing Phase IIA RW System with the proposed South El Monte RW System.

In order for a backup to be possible, the two system pressures will need to match. However, if the Proposed South El Monte RW System requires a higher HGL than the existing Phase IIA system, the ability to interconnect these systems for two way redundancy may not be possible.

The available information about the existing Whittier Narrows Recycled Water Pump Station and various system backup scenarios has been reviewed to better understand the recycled water system pressure impacts in Section 3.8.

Next Steps

For the purposes of this feasibility study, it is assumed the existing Phase IIA system has adequate hydraulic capacity to supply at least the proposed Package 1 Pipeline customers with recycled water. However, it is not clear if all the proposed customers will receive adequate pressure. In order to determine if adequate pressure will be provided, the San Gabriel Valley Water Company (SGVWC) will need to provide the existing domestic water pressure (or pressures) currently serving the proposed customers. We will then know what pressure they are currently served, and the required recycled water pressure will be determined.

It is also recommended that the existing Phase IIA system be modeled for key operating scenarios to determine the impacts if the two systems are interconnected. The first operating scenario could model the Whittier Narrows Pump Station supplying demands for the proposed South El Monte Systems initial Package 1 customers. The second operating scenario could model the proposed recycled water pump station providing full backup for the Phase IIA System if the Whittier Narrows Plant goes down. Other scenarios could then be run depending on the outcome of the above model runs.

LIST OF ATTACHMENTS

Attachment 1	Reclaimed Water Supply Agreement between County Sanitation District No. 2 of Los Angeles County and Upper San Gabriel Valley Municipal Water District, August 12, 1998
Attachment 2	San Gabriel Valley Water Company's 2010 Urban Water Management Plan (Chapter 6)
Attachment 3	Upper San Gabriel Valley Municipal Water District's 2010 Urban Water Management Plan (Chapter 5)
Attachment 4	Operations and Maintenance Agreement by and between Upper San Gabriel Valley Municipal Water District and San Gabriel Valley Water Company, June 2, 2008
Attachment 5	Agreement for Purchase and Sale of Reclaimed Water, January 12, 2005
Attachment 6	Upper San Gabriel Valley Municipal Water District's Integrated Resources Plan, November 2012 (Excerpts)
Attachment 7	Ordinance of the Upper San Gabriel Valley Municipal Water District Mandating the Use of Recycled Water, November 7, 2006
Attachment 8	Draft San Gabriel Valley Water Company Mandatory Use of Recycled Water Ordinance
Attachment 9	Agreement between the Upper San Gabriel Valley Municipal Water District, the San Gabriel Valley Water Company, and the County of Los Angeles, through its Department of Parks and Recreation for Construction, Operation and Maintenance of Facilities and Purchase and Sale of Recycled Water, June 13, 2006
Attachment 10	Agreement for the Construction, Operation and Maintenance of a Recycled Water Distribution System by the Upper San Gabriel Valley Municipal Water District and Suburban Water Systems, November 3, 2010

SECTION 1 – PROPOSED RECYCLED WATER PROJECT BACKGROUND

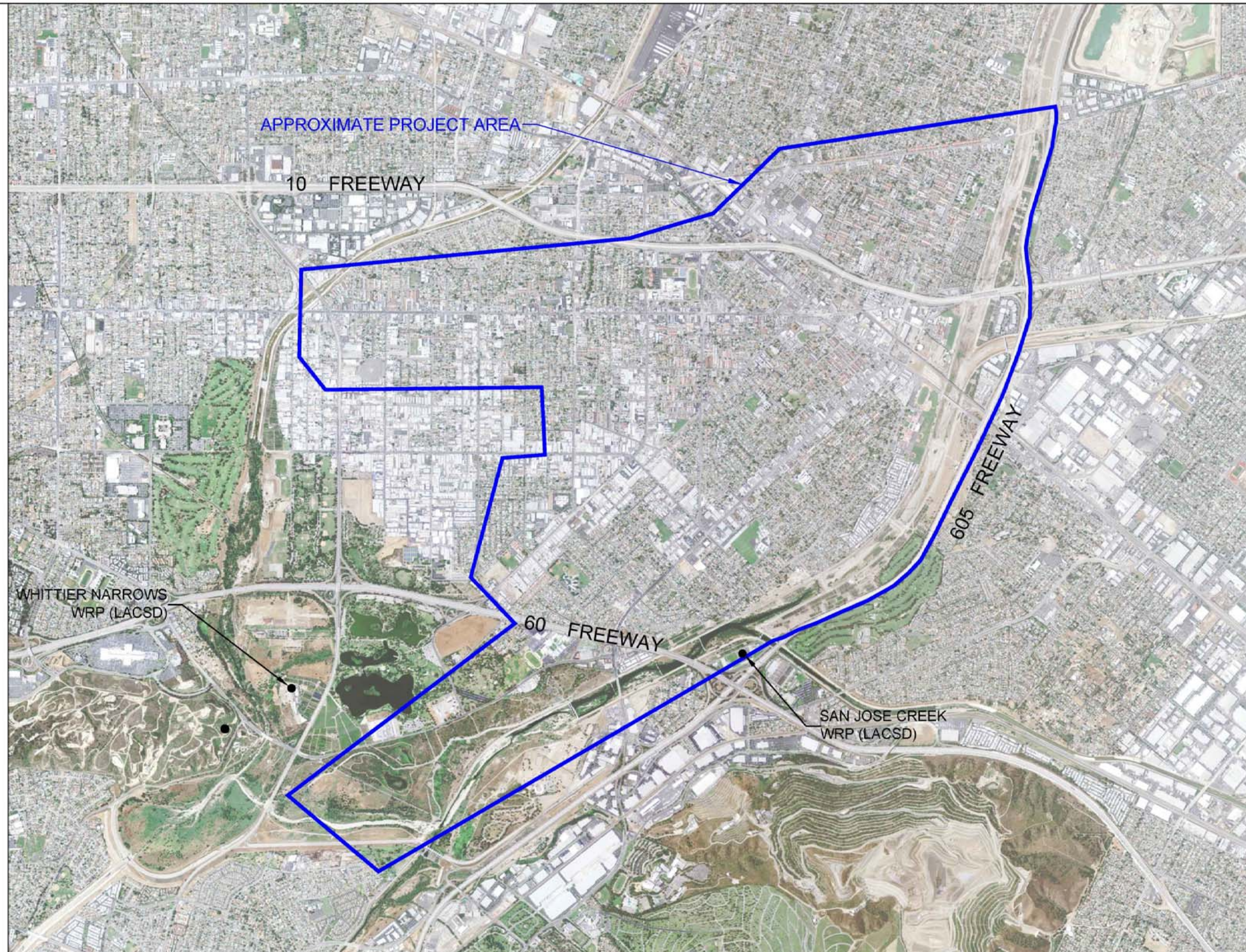
1.1 Project Description

The proposed South El Monte Recycled Water Project (Project) will provide up to 559 acre-feet per year (AFY) of recycled water service to 44 customers within the Cities of South El Monte, El Monte, Industry, and Pico Rivera. The Project includes the Construction of 4-inch, 6-inch, 8-inch, 12-inch, and 16-inch diameter pipelines to distribute recycled water; retrofits of customer sites to receive recycled water; a pump station; and a 1.0 million gallon (MG) recycled water reservoir. The Project will connect to an existing recycled water system and supply recycled water to new customers including multiple schools, parks, car washes, a nursery, and other landscape irrigation customers. A map of the proposed Project area is provided in Figure 1-1. A map of the proposed Project facilities is provided in Figure 1-2.

The Project evaluated various alignments to achieve the least cost alternative that maximized delivery of recycled water within the Project area. The Project was divided into 5 packages (phases) to ensure orderly expansion of the recycled water system. The initial Package 1 was developed to be a simple extension of the existing USGVMWD's Phase IIA (Rosemead) recycled water system, with a lower initial capital cost. The ultimate system expansion will require construction of a new recycled water pump station, reservoir, and a looped recycled water pipeline between the USGVMWD's Phase IIA Rosemead Recycled Water System and the proposed system. The proposed ultimate system may be constructed to provide a backup recycled water supply for the existing Rosemead system or vice-versa. This added system redundancy could be very beneficial in the event of a water reclamation plant shutdown or to enable maintenance flexibility for either system.

The Upper San Gabriel Valley Municipal Water District (USGVMWD), in cooperation with San Gabriel Valley Water Company (SGVWC), authorized preparation of this Feasibility Study (Study) to evaluate the feasibility of the proposed Project and the reasonableness of the associated costs of the Project. The service areas for SGVWC and USGVMWD are provided in Figure 1-3.

FIGURE 1-1



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APPROX. SCALE :
0 1,500' 3,000'

UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT
PROPOSED SOUTH EL MONTE RECYCLED WATER PROJECT

PROJECT VICINITY MAP

D:\JOBS\1046\1046-52\14-El Monte RW Extension FS\FIGURE 1-1.DWG
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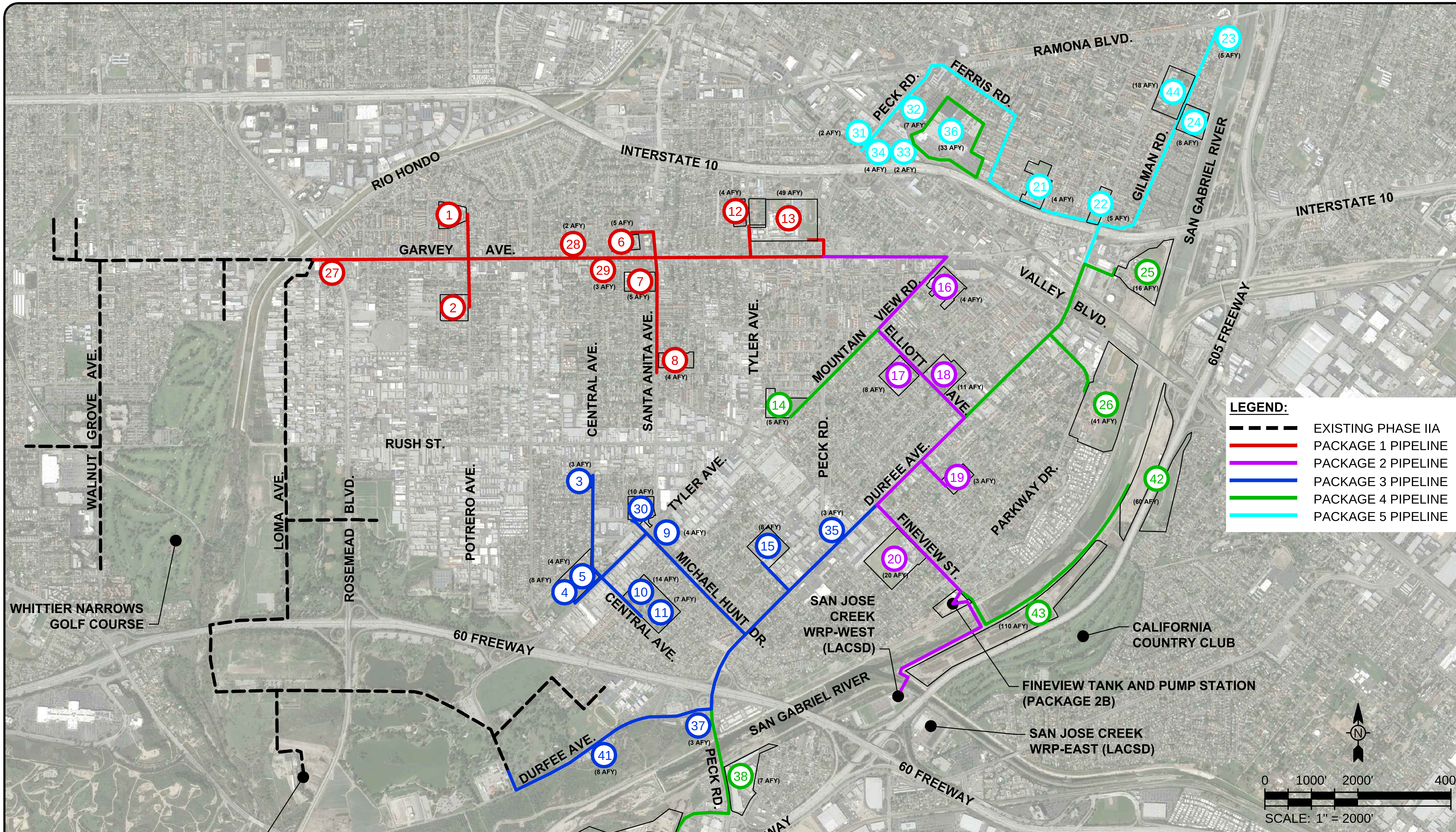

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UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT

SOUTH EL MONTE RECYCLED WATER PROJECT
PROPOSED PROJECT FACILITIES
CONCEPTUAL PHASING

Project No.:
Date: SEPTEMBER 2013
Designed By: CH
FIGURE
1-2

Bar Measures 1 inch

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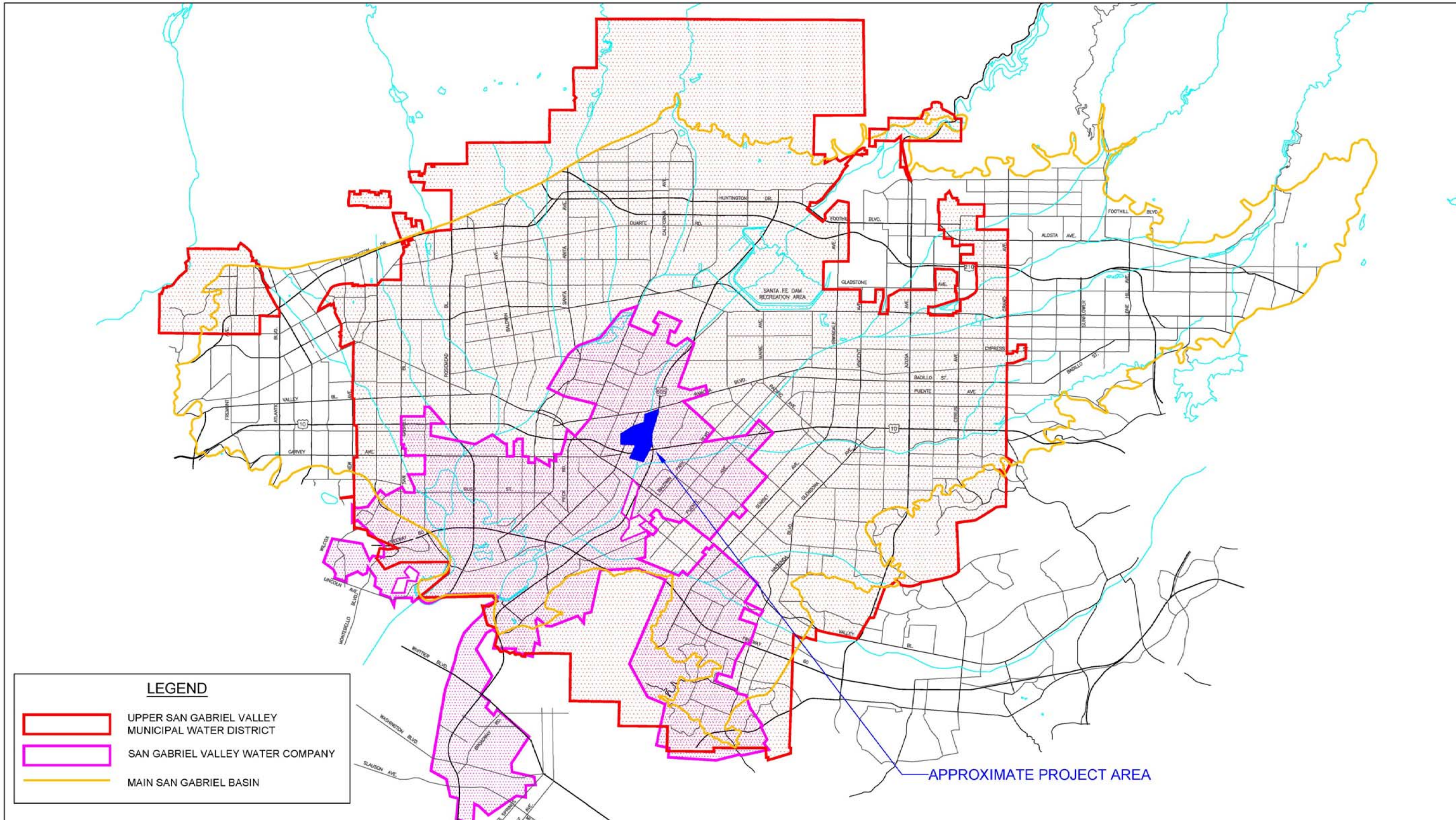
Copyright: Tetra Tech

FIGURE 1-3



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APPROXIMATE SCALE
5,000' 0 5,000'

UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT
PROPOSED SOUTH EL MONTE RECYCLED WATER PROJECT

SERVICE AREA BOUNDARIES

E:\JOBS\1046\1046-52\14- El Monte RW Extension FS\FIGURE 1-3.DWG
F:\JOBS\1046-52.14.CTB

Use of recycled water allows SGVWC to reduce the amount of groundwater production required from the Main San Gabriel Basin (Main Basin). In addition, use of recycled water allows USGVMWD's member agencies, including SGVWC, to reduce reliance on groundwater production from the Main Basin that requires purchases of imported water supplies from the Metropolitan Water District of Southern California (MWD) for Main Basin replenishment. The imported water supplies are conveyed from Northern California through the State Water Project.

Recycled water for the Project will be supplied by the Sanitation Districts of Los Angeles County (LACSD) through their San Jose Creek Water Reclamation Plant (SJCWRP) with an interconnection to their Whittier Narrows WRP (WNWRP). The SJCWRP consists of primary sedimentation, secondary treatment via an activated sludge process and clarification, tertiary treatment consisting of coagulation and filtration (either inert dual media or inert deep bed monomedia filters), followed by chlorination and dechlorination. The WNWRP consists of primary sedimentation, secondary treatment via a conventional activated sludge process and clarification, tertiary treatment consisting of coagulation and inert dual media filtration, followed by chlorination and dechlorination. Recycled water produced from the SJCWRP and WNWRP is disinfected, Title 22 tertiary treated water suitable for urban landscape irrigation, agricultural irrigation, industrial process water, recreational impoundments, wildlife habitat maintenance, and (in some cases) groundwater replenishment purposes. The locations of the SJCWRP and WNWRP are provided in Figure 1-1 and Figure 1-2.

A small portion of the Project will serve recycled water to existing City of El Monte water customers. Based on previous discussions between SGVWC and the City of El Monte, and for the purposes of this Study, it is assumed the City of El Monte will allow SGVWC to provide and sell recycled water to the City's customers, without duplication of service issues.

Additional description of Project Participants (Project Partners and Associated Partners) is provided in Section 1.6

1.2 Project Development and Timeline

SGVWC and USGVWMD currently serve and provide recycled water for nonpotable reuse (i.e. purple pipe systems) and actively seek to expand recycled water service within their respective service areas. SGVWC has supplied recycled water to customers for irrigation uses since the mid 1990's. USGVWMD began wholesaling recycled water to purveyors for nonpotable reuse within its service area in 2003. USGVMWD has a phased recycled water program (see Section 1.3) which is planned to ultimately supply approximately 5,400 AFY of recycled water for direct reuse to purveyors who will then retail the recycled water to customers within their service area for nonpotable use. The service areas for SGVWC and USGVMWD are provided in Figure 1-3. Additional information for SGVWC and USGVMWD is provided in Section 1.6.

SGVWC and USGVMWD started the initial planning of the Project in August 2012. SGVWC has continued to identify customers and refine potential pipeline alignments, with input from USGVMWD at subsequent meetings. Some minor modifications to the pipeline alignments were made during the progress meetings. It is anticipated that additional planning and then preliminary engineering may be conducted over the next nine months (through the end of 2013). Project final design is anticipated to require about one year (through the end of 2014), with permit, environmental compliance and regulatory work conducted concurrently. Project construction (pipeline, reservoir, pump station, and customer retrofits) is anticipated to be conducted over two years with a Project completion date of approximately the end of 2016.

1.3 Status of Related Projects

The proposed Project is similar to existing recycled water projects completed by USGVMWD, many of them in cooperation and direct coordination with SGVWC, within the past seven (7) years. The status of these related recycled water projects is as follows:

- Phase I of USGVWMD's recycled water project was completed in 2006 and currently wholesales recycled water to SGVWC for its customers for irrigation purposes in the City of Whittier, and unincorporated areas of Los Angeles County near the City of Whittier. The source of the Title 22 recycled water is from LACSD's SJCWRP.

- Phase IIA of USGVWMD's recycled water project was completed in 2006 and currently wholesales recycled water to SGVWC for its customers for irrigation purposes in the South El Monte and Whittier Narrows area. The source of the Title 22 recycled water is from LACSD's WNWRP. This proposed Project will connect to the existing Phase IIA project at the southwest corner of South El Monte High School and Durfee Avenue.

- A first extension to the Phase IIA system was completed in 2010 and wholesales recycled water to SGVWC for its customers for irrigation purposes in the City of Rosemead and Whittier Narrows area. The source of the Title 22 recycled water is from LACSD's WNWRP.

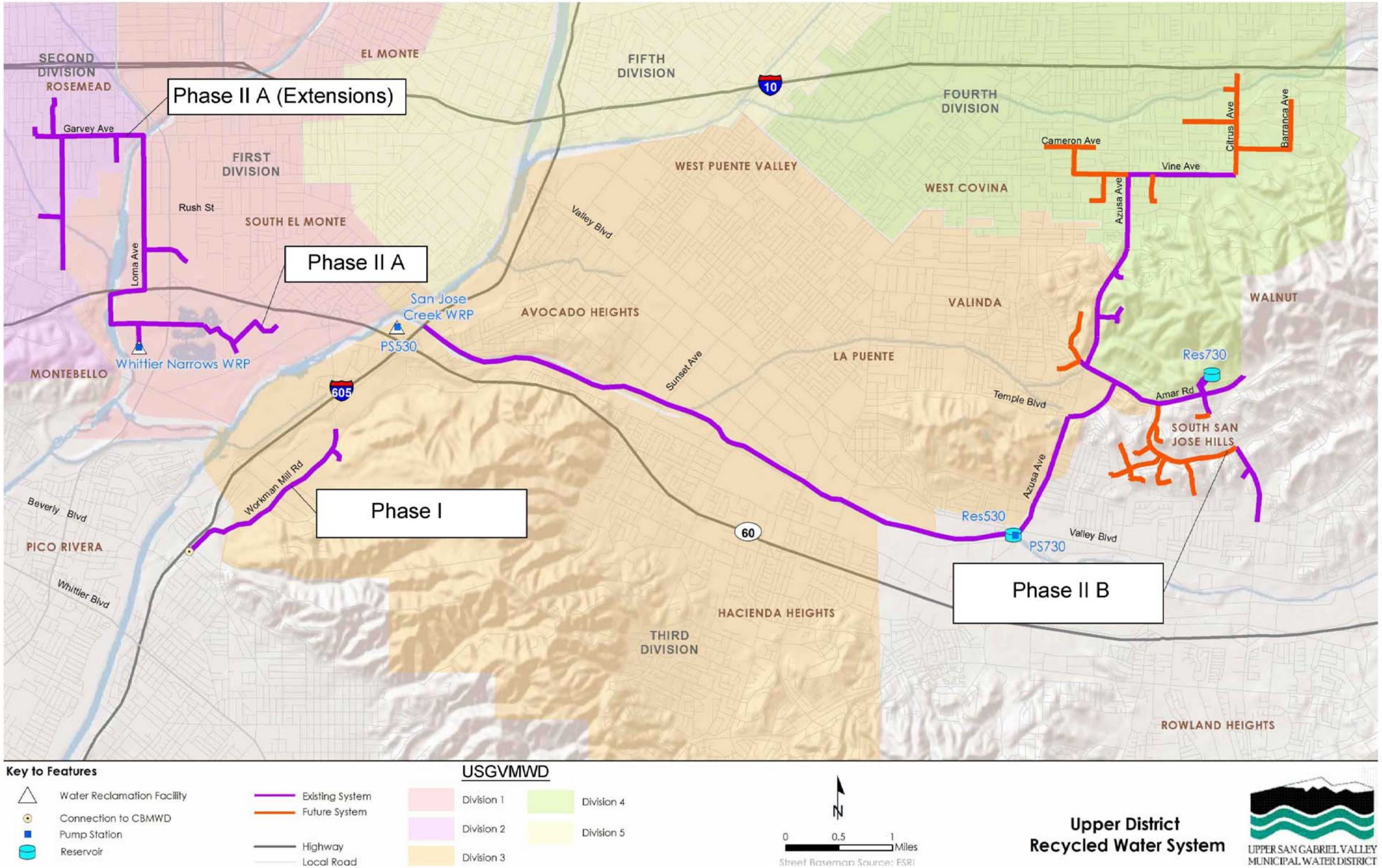
- A second extension to the existing Phase IIA system was completed in 2012 and wholesales recycled water to SGVWC and Golden State Water Company for their customers in the City of Rosemead.

- USGVMWD is completing constructing its Phase IIB system (delivery pipelines, booster pumping stations, storage reservoirs and customer retrofits), which began wholesaling recycled water to Suburban Water Systems for its customers in the City of West Covina in July of 2012. The Phase IIB system is separated into four packages with the first two packages completed in November 2012. These completed packages include pipelines, a reservoir, booster pump stations and customer retrofits. USGVMWD completed pipeline construction of the remaining

Phase IIB pipeline packages in November 2012. USGVMWD is currently completing the final retrofits and anticipates completion by December 2013. USGVMWD will wholesale recycled water to Suburban Water Systems and Valencia Heights Water Company for their respective customers in the City of West Covina.

The location of USGVMWD's existing recycled water facilities is provided in Figure 1-4. A summary of the recycled water deliveries for each system is provided in Table 1-1.

FIGURE 1-4



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UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT
PROPOSED SOUTH EL MONTE RECYCLED WATER PROJECT

USGVMWD RECYCLED WATER PROGRAM

E:\JOBS\1046\1046-52\14- El Monte RW Extension FS\FIGURE 1-4.DWG
F:\JOBS\1046-52 14.CTB

Table 1-1 USGVMWD Current Recycled Water Deliveries

USGVMWD Recycled Water Projects	Current Deliveries (AFY)	Anticipated Ultimate Deliveries (AFY)	Source of the Recycled Water
Phase I	660	1,190	SJCWRP
Phase IIA	850	1,025	WNWRP
Phase IIA Extensions	360	720	WNWRP
Phase IIB (Package 1)	See Note[1]	500	SJCWRP
Phase IIB (Package 2)	See Note[1]	357	SJCWRP
Phase IIB (Package 3)	0	279	SJCWRP
Phase IIB (Package 4)	0	107	SJCWRP
Totals	1,870	4,178	

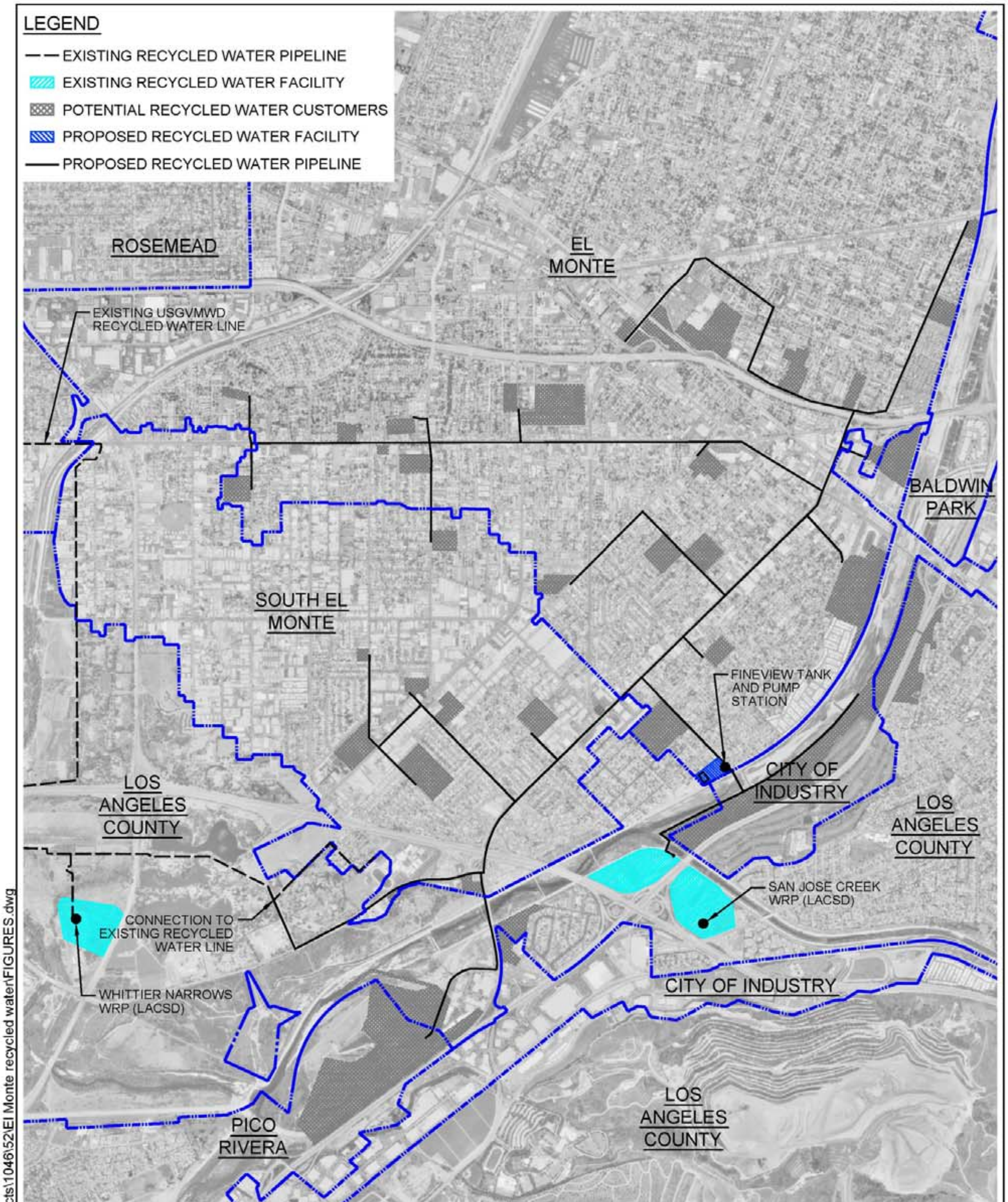
Note: [1]USGVMWD began wholesaling recycled water (to Suburban Water Systems) for Phase IIB in July 2012. From July 2012 to February 2013, the total amount of recycled water delivered to Phase IIB (including Packages 1 and 2) was approximately 310 AF.

1.4 Location of Project

The Project is located within the San Gabriel Valley, located in the eastern portion of Los Angeles County. The San Gabriel Valley is approximately 200 square miles in size and lies to the east of Los Angeles, to the north of the Puente Hills, to the south of the San Gabriel Mountains, and to the west of the Inland Empire. The Project also overlies the Main San Gabriel Groundwater Basin (See Figure 1-3), which has an overlying area of approximately 167 square miles. The groundwater storage capacity of the Main Basin is approximately 10 million AF and groundwater extractions are approximately 230,000 AFY. Average rainfall in the area is approximately 18.5 inches per year.

The proposed Project will be located within the Cities of South El Monte, El Monte, Industry, and Pico Rivera (See Figure 1-5) and is bounded by Ramona Avenue (to the north), the 605 Freeway (to the east), Bicentennial Park Access Road (to the south), and Loma Avenue (to the west). The topography of the Project area is generally gently sloping from northeast to southwest with ground surface elevations ranging from approximately 300 feet above mean sea level (msl) on the northeast to 250 feet msl on the southwest. The majority of the Project's recycled water service area is highly urbanized and includes residential and commercial land use. The Project's recycled water service area also includes recreational/open space/flood control areas at the southern end of the Project. The proposed Project will be located within the certificated service area of SGVWC (with the exception of five (5) customers in the City of El Monte). The Project is located within the planning area for USGVMWD's "Integrated Resources Plan" (IRP), prepared by CDM Smith in November 2012 , USGVMWD's Urban Water Management Plan" (USGVMWD's UWMP), prepared by Stetson Engineers Inc. in June 2011 and SGVWC's Urban Water Management Plan" (SGVWC's UWMP), prepared by Stetson Engineers Inc. in July 2011.

FIGURE 1-5



SOURCE: Aerial photo from http://www.atlas.ca.gov

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APPROXIMATE SCALE
1,500' 0 1,500'

UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT
PROPOSED SOUTH EL MONTE RECYCLED WATER PROJECT

CITIES WITHIN PROJECT AREA

F:\DATA\Covina Office Projects\1046\52\El Monte recycled water\FIGURES.dwg

1.5 Confirmation of Wastewater Treatment Plant Permitting

Recycled water for the Project will be obtained from LACSD's SJCWRP and WNWRP. According to correspondence with LACSD staff on March 11, 2013, applicable regulatory permits related to the two WRPs include the following:

- The water reclamation and monitoring and reporting requirements for the San Jose Creek WRP are contained in the following documents:
  - Order No. 87-50 adopted on April 23, 1987 by the California Regional Water Quality Control Board, Los Angeles Region (LARWQCB). These requirements were re-adopted May 12, 1997 in Order 97-092.
  - Monitoring and Reporting Program (MRP) No. 6372 ordered on April 23, 1987 by the Executive Officer of the Regional Board.
- The water reclamation and monitoring and reporting requirements for the Whittier Narrows WRP are contained in the following documents:
  - Board Order No. 88-107, adopted October 24, 1988 by the LARWQCB. These requirements were re-adopted May 12, 1997 in Board Order 97-072.
  - MRP No. 6844, ordered October 24, 1988 by the Executive Officer of the Regional Board.
- Groundwater recharge requirements are contained in the following documents:
  - On September 9, 1991, the LARWQCB adopted Board Order No. 91-100. On April 2, 2009, the LARWQCB adopted Board Order No. R4-2009-0048, amending the water reclamation requirements.
  - The monitoring and reporting requirements for the Montebello Forebay Groundwater Recharge Project are contained in MRP No. 5728, adopted by the LARWQCB on September 9, 1991 and amended on April 2, 2009. On July 25, 1996, the LARWQCB approved the Montebello Forebay Groundwater Sampling and Analysis Plan for MRP No. 5728.

1.6 Project Partners

The potential Project Participants include SGVWC and USGVMWD as potential Project Partners and the City of El Monte and LACSD as Associated Partners. A description of each partner is provided below.

SGVWC is a privately owned public utility water company subject to the regulatory jurisdiction of the California Public Utilities Commission (CPUC). SGVWC provides public utility water service to approximately 47,000 customers within its service area which includes portions of the Cities of Arcadia, Baldwin Park, El Monte, Industry, Irwindale, La Puente, Montebello, Monterey Park, Pico Rivera, Rosemead, San Gabriel, Santa Fe Springs, South El Monte, West Covina, Whittier, and unincorporated areas of Los Angeles County including Hacienda Heights and South San Gabriel (See Figure 1-3). SGVWC's CPUC-approved service area encompasses approximately 45 square miles. SGVWC currently derives its water supply from groundwater wells that produce water from two groundwater basins, the Main Basin and the Central Basin, with the Main Basin as SGVWC's primary groundwater source. In addition, SGVWC has supplied recycled water to customers for non-potable irrigation uses since the mid 1990's. SGVWC is a member agency of USGVMWD.

USGVMWD is located within the San Gabriel Valley in Los Angeles County, and overlies the Main Basin. USGVMWD's service area (see Figure 1-3) is about 144 square miles and includes all or portions of the Cities of Arcadia, Azusa, Baldwin Park, Bradbury, Covina, Duarte, El Monte, Glendora, Industry, Irwindale, La Puente, Monrovia, Rosemead, San Gabriel, South El Monte, South Pasadena, Temple City, and West Covina. USGVMWD is a wholesale water supplier that provides treated imported water to its member agencies and untreated imported water to replenish groundwater supplies of the Main Basin. USGVMWD is a member agency of MWD. In addition, USGVMWD has supplied wholesale recycled water to water purveyors within USGVMWD for non-potable reuse uses since 2003.

LACSD consists of 23 independent special districts serving about 5.4 million people in Los Angeles County. LACSD is a public agency created under State law to manage wastewater and solid waste on a regional scale. LACSD's service area covers approximately 815 square miles and encompasses 78 cities and unincorporated territory. LACSD operates ten water reclamation plants (WRPs) and one ocean discharge facility. Recycled water for the Project will be obtained from LACSD's San Jose Creek WRP and Whittier Narrows WRP. The locations of the San Jose Creek WRP and Whittier Narrows WRP are provided in Figure 1-1.

The City of El Monte provides public utility water service to approximately 3,500 customers within its service area. The City of El Monte is bordered to the north by the City of Arcadia and Temple City, to the west by the City of Rosemead, to the east by the San Gabriel River and to the south by the City of South El Monte. The City of El Monte's southern border is adjacent to SGVWC. Several customers in the Project area are served by the City of El Monte. As part of the Project, it is anticipated the City of El Monte will allow SGVWC to serve recycled water to five (5) of these customers without duplication of service.

SECTION 2 – NEED FOR THE PROPOSED RECYCLED WATER PROJECT

2.1 Current Cost, Availability and Demand for Potable and Recycled Water

SGVWC will enter into an agreement with LACSD for the purchase of recycled water in order to supply SGVWC's potential recycled water customers. SGVWC currently pays approximately $355 per acre foot (AF) for recycled water directly from LACSD.

SGVWC retails recycled water at a rate of approximately $980 per AF based on SGVWC's Schedule No. LA-6 ("Recycled Water Metered Service") approved by the CPUC effective on July 25th, 2013. Depending upon the ultimate funding and supply agreements, SGVWC also has the alternative to purchase recycled water through USGVMWD if this is needed to secure agreements.

According to LACSD's "Annual Status Report on Recycled Water Fiscal Year 2010-2011", the SJCWRP produces approximately 76,000 AFY of recycled water, of which approximately 36,000 AFY (or 47 percent) is beneficially used. In addition, the WNWRP produces approximately 8,700 AFY of recycled water, of which approximately 8,300 AFY (or 96 percent) is beneficially used. Based on LACSD's Annual Report, there is a total of approximately 40,000 AFY of recycled water from the SJCWRP and WNWRPs that is not currently beneficially used and is discharged to the lined portion of the San Gabriel River.

Based on previous discussions with LACSD staff in April 2010, LACSD is evaluating projects that could potentially increase recycled water availability from SJCWRP by approximately 47,000 AFY. In addition, it appears that some of the agencies with recycled water contracts from SJCWRP and WNWRP may not require all of the contracted recycled water. LACSD has initiated discussions with all agencies with recycled water contracts in order to determine the amount of required recycled water in order to potentially decrease their contracted recycled water volume in order to contract with agencies developing projects that require recycled water in the near future for either indirect potable or non-potable reuse projects.

2.2 Potential Project Customer Demand

The proposed Project will serve approximately 559 AFY to 44 customers within the Cities of South El Monte, El Monte, Industry, and Pico Rivera. A summary of the potential recycled water customers and demands is provided in Table 2-1. The locations of the potential recycled water customers, identified by the Water Customer Numbers in Table 2-1, are provided in Figure 1-2.

Table 2-1 Estimated Potential Recycled Water Demands

Package	Customer Number	User Site Description	Estimated Recycled Water Demand (AFY)[1]
1	1	Cortada Elementary School	4
	2	Potrero Intermediate School	6
	6	New Lexington Elementary School (El Monte)	5
	7	Wilkerson Elementary School (El Monte)	5
	8	Miramonte Elementary School	4
	12	Tony Arceo Memorial Park (El Monte)	4
	13	El Monte High School (El Monte)	49
	27	Superkleen Car Wash	1
	28	Garvey Court Senior Apartments	2
	29	Bubble Bath Car Wash	3
2	16	Payne Elementary School	4
	17	Parkview Elementary School	8
	18	Mountain View Park	11
	19	Maxson Elementary School	3
	20	Kranz Intermediate School	20
3	3	Mary Van Dyke Park	3
	4	Dean L. Shively Park	8
	5	Dean L. Shively Middle School	4
	9	Epiphany Catholic School	4
	10	New Temple Park	14
	11	New Temple Elementary School	7
	15	Monte Vista Elementary School	8
	30	El Monte Community Hospital	10
	35	USA Gasoline	3
	37	Durfee Business Park	3
	41	Nature Center	8
4	14	Cogswell Elementary School	5
	25	Madrid Middle School	16
	26	Mountain View High School	41
	38	Peck Road Industrial Center	7
	39	Equestrian Center	13
	40	Sports Arena / Bicentinnial Park	128
	42	Watershed Conservation Authority (Duck Farm)	60
	43	Coiner Nursery [2]	-
5	21	Baker Elementary School	4
	22	Voorhis Elementary School	5
	23	La Primaria Elementary School	5
	24	Twin Lakes Elementary School	8
	31	Star Car Wash (El Monte)	2
	32	Nelson Honda	7
	33	Win Hyundai	2
	34	Ross Nissan	4
	36	Longo Toyota	33
	44	Maclaren Hall	18
	Total		**559**

Notes:

[1] Recycled water use is assumed to be 80% of the current total metered water use.

[2] Coiner Nursery's recycled water demands are approximately 110 AFY. However, Coiner Nursery is not included in the Project demands due to existing water pricing arrangements.

2.3 Potential Recycled Water Customer Review

Several proposed customer sites stand out as potentially impactful to the overall Project. These sites should be further reviewed before the project is constructed. The findings could have significant impacts to the estimated recycled water demands.

Site 12 – Tony Arceo Memorial Park (4 to 7 AFY)

This park appears to have municipal water well located on the northern half of the property. If this is a well the site can still be retrofitted, but there will be added costs to comply with health department regulations regarding recycled water in close proximity to domestic water wells. It is recommended to determine the owner of the existing well so that the well drilling report can be requested in order to determine the existing well age, sanitary seal depth, and quality of water produced.

Site 13 – El Monte High School (21 to 49 AFY)

The schools estimated demand (49 AFY) is much higher than what we have estimated based on the actual irrigation areas (21 AFY). A site inspection is recommended in order to determine if other site demands could be driving the high estimated demand (i.e. cooling towers, swimming pool, etc.). Even with the lower possible estimated demand this will still be the anchor user for the Package 1 Pipeline.

Site 40 – Bicentennial Park / Sports Arena (128 AFY)

Bicentennial Park consists of several campground spots for public camping, and an arena used for Rodeo shows several times per month. The City of Pico Rivera is currently considering a remodel of the park campground. The renovation plans could impact the amount of water used by the site for irrigation.

The sports arena is used predominantly for equestrian and rodeo shows (about 25 shows per year per the City's website). It seems reasonable that the large majority of the water used by the sports arena is for wetting down the arena dirt before events for dust control.

Site 39 – Equestrian Center (13 AFY)

Equestrian Center has an estimated demand of 13 AFY. However, the demand does not appear to be used for irrigation. It is likely that the majority of the water used at this site is for dust control for the horse arena, training pins, and equestrian care (washing, watering, cleaning horse stalls, etc.). Dust control is an accepted use for recycled water, but it should be confirmed that water trucks are used for dust control, and not an irrigation systems. In previous equestrian site (Maverick Field – West Covina), the site conversion would have require a completely new irrigation system be constructed for the site. This was due to the plumbing for the horse watering stations being common to the irrigation systems used to wet down the dirt for dust control. If water trucks are used at the site, they will require an air gap fill pipe to the tank, and recycled water identification signs attached to the tank.

Site 42 – Watershed Conservation Authority – Duck Farm (60 AFY)

Site 42 is currently under renovation by the Watershed Conservation Authority. The plan is to create a community park including walking trails, native wildflower gardens, native landscaping, and irrigation systems. It would be well to contact the Watershed Conservation Authority to get a more detailed plan for their renovation of the site in order to better estimate the amount of irrigation that is needed. The site will require the construction of a pipeline from the Fairview Pump Station back across the San Gabriel River in order to serve the site with adequate recycled water pressure for irrigation.

Some of the major potential recycled water issues that could impact this site are the use of native plants, potential use of drip irrigation systems, and a fresh water marsh.

Based on our past experience with the native sage scrub surrounding Big League Dreams Sports Complex in West Covina, an irrigation system was only constructed to establish the native plants. Once established the irrigation was turned off permanently. Also, if drip irrigation is used the expected demand will be about half that of a traditional irrigation system. Finally, the fresh water marsh appears to be filled by the adjacent San Gabriel River. It is unclear if there could be discharge issues relating to potential recycled water running off into the marsh (water impoundment), not to mention increased nutrient loading resulting in more algae growth potential. These are all important issues that should be addressed prior to constructing a pipeline to serve this park.

Site 36 – Longo Toyota (33 AFY)

Longo Toyota / Lexus is the anchor user of the Package 5 Pipeline. The two dealerships make up the largest car dealership in the world according to their website. The property is nearly 30 acres in size but there is very little irrigated area (less than an acre).

The majority of the water used on site is likely used for washing cars. Recycled water is not suitable for washing cars without some form of water treatment added. This would likely add an undesirable expense and burden for the dealership to use the recycled water.

If Longo Toyota cannot use recycled water for washing cars than the Package 5 Pipeline west of Site 21 should be deleted. The other dealerships in the area will have similar conversion problems, and have relatively small potential demands.

Furthermore if Longo Toyota is determined to not be a viable recycled water user, the feasibility of Package 5 Pipeline may no longer be cost effective given the remaining demand north of Interstate 10.

2.4 Potential Displacement of Potable Water Delivery

The proposed Project will serve approximately 559 AFY to 44 customers within the Cities of South El Monte, El Monte, Industry, and Pico Rivera. These potential recycled water customers currently rely on potable water supplies in order to meet all of their water demands. For the total demand of approximately 559 AFY, approximately 494 AFY of demands are within SGVWC's service area and approximately 65 AFY of demands are within the City of El Monte's service area. As described in Section 1.6, it is anticipated the City of El Monte will allow SGVWC to provide and sell recycled water to five (5) Project customers currently served by the City of El Monte. All potential customers are located within USGVMWD's service area. Delivery of recycled water to these customers will displace an equal amount of potable water (groundwater and/or imported water) deliveries (or 559 AFY of potable water). A summary of the potential recycled water customers and demands is provided in Table 2-1.

2.5 Proposed Project and the Applicable Integrated Water Resources Plan

USGVMWD's IRP considered various water supply options in terms of potential supply yield, costs, technology, water quality, and reliability. These options (including the use of recycled water) were bundled into several integrated alternatives that were evaluated against a set of goals and objectives for USGVMWD in order to develop a preferred strategy for meeting current and projected water demands in a reliable, cost-effective, and environmentally sound manner.

USGVMWD's IRP indicates USGVMWD's direct use recycled water program is projected to ultimately provide a total of approximately 5,400 AFY of recycled water. Currently, USGVMWD serves approximately 3,300 AFY of recycled water to existing customers. For the additional 2,100 AFY (or 5,400 AFY – 3,300 AFY) of recycled water to be served by USGVMWD, approximately 500 AFY is planned to result from extensions of USGVMWD's non-potable recycled water program. This proposed Project will be a part of an extension of USGVMWD's non-potable recycled water program, as recommended in USGVMWD's IRP.

SGVWC's 2010 UWMP indicates SGVWC may potentially supply up to about 7,000 AFY of recycled water to customers within SGVWC's service area by 2035. SGVWC's UWMP indicates additional availability of recycled water supplies within SGVWC's service area will result from potential extensions of USGVWMD's recycled water program, including the proposed Project (through extension of USGVMWD's existing Phase IIA project) in the near future.

2.6 Current Water Conservation/ Demand Management Efforts

SGVWC is a member of the California Urban Water Conservation Council (CUWCC). As a member of the CUWCC, SGVWC signed a Memorandum of Understanding (MOU) pledging to implement "Best Management Measures", which are cost-effective water conservation programs. For the purposes of this Feasibility Study, the Best management Practices (BMPs) are equivalent to Demand Management Measures (DMM). SGVWC submits biennial Best Management Practices report to the CUWCC.

SGVWC is an investor owned public water utility regulated by the CPUC. Under its regulatory authority, the CPUC has established a water conservation goal for SGVWC and all other Class A Water Companies to reduce annual consumption by one (1) percent to two (2) percent. The CPUC's goal, as outlined in its Water Action Plan adopted in 2005 and subsequently updated in October 2012, requires public water utilities to strengthen their water conservation programs to a level comparable to energy utilities. The CPUC's conservation goal compliments the statewide mandate that requires water utilities to reduce per capita consumption by 20 percent by 2020. In response to these mandates and with CPUC approval, SGVWC has implemented a number of conservation programs including conservation pricing (tiered rates), cost effective BMP programs including programs for public information and education and annual reporting requirements. Further description of SGVWC's water conservation measures and DMMs are provided in Chapter 6 of SGVWC's 2010 UWMP (See Attachment 2).

USGVWMD is also a member of the CUWCC. As a member of the CUWCC, Upper District also signed an MOU pledging to implement "Best Management Measures" for water conservation. USGVMWD submits annual Best Management Practices reports to the CUWCC. USGVWMWD has implemented a number of water conservation measures that include, but are not limited to the following: public information outreach, water conservation kits, residential water use surveys, high efficiency toilet distribution, incentive rebate programs, and water conservation partnerships. Additional information regarding USGVMWD's conservation activities and DMMs are provided in Chapter 5 of USGVMWD's 2010 UWMP (See Attachment 3).

SECTION 3 – GENERAL STRUCTURE OF PROPOSED PROJECT

3.1 Estimated Project Costs

The estimated Capital Cost of the proposed Project is approximately $24 million and includes costs for recycled water pipelines, pump station, a reservoir, and customer retrofits. The estimated Capital Costs for recycled water pipelines, a pump station, a reservoir, and retrofits are provided in Table 3-1. The estimated cost for customer retrofits is broken down per site in Table 3-2.

The total Operations and Maintenance (O&M) costs associated with the Project, are currently estimated at approximately $100 per AF, which includes energy costs ($40 per AF), LACSD O&M costs ($45 per AF), and SGVWC O&M costs ($15 per AF).

Upper San Gabriel Valley Municipal Water District
Proposed South El Monte Recycled Water Project
Feasibility Study

Table 3-1 - Engineer's Estimate of Probable Construction Costs

Description	*Recycled Demand (AFY)*	*Price*
Package 1 Pipeline	83	$3,000,000
Package 2A Pipeline	46	$4,000,000
Package 2B Pump Station and Reservoir	-	$3,220,000
Package 3 Pipeline	72	$3,475,000
Package 4 Pipeline	270	$3,525,000
Package 5 Pipeline	70	$2,560,000
Customer Retrofits		$4,220,000
Total Project Demand	**541**	
Total Project Cost		***$24,000,000***

This cost estimate is subject to change. This is an estimate only. These figures are supplied as a guide only.
This firm is not responsible for fluctuation in cost of material, labor, or components, or unforeseen contingencies.

Table 3-2 Opinion of Probable Construction Costs on Recycled Water Customer Retrofits

Package	Customer Number	User Site Description	Estimated Recycled Water Demand (AFY)(1)	Estimated Cost
1	1	Cortada Elementary School	4	$ 50,000
	2	Potrero Intermediate School	6	$ 50,000
	6	New Lexington Elementary School (El Monte)	5	$ 50,000
	7	Wilkerson Elementary School (El Monte)	5	$ 50,000
	8	Miramonte Elementary School	4	$ 50,000
	12	Tony Arceo Memorial Park (El Monte)	4	$ 80,000
	13	El Monte High School (El Monte)	49	$ 150,000
	27	Superkleen Car Wash	1	$ 40,000
	28	Garvey Court Senior Apartments	2	$ -
	29	Bubble Bath Car Wash	3	$ 40,000
		Package 1 Sub Total	***83***	***$ 560,000***
2	16	Payne Elementary School	4	$ 50,000
	17	Parkview Elementary School	8	$ 60,000
	18	Mountain View Park	11	$ 80,000
	19	Maxson Elementary School	3	$ 50,000
	20	Kranz Intermediate School	20	$ 100,000
		Package 2 Sub Total	***46***	***$ 340,000***
3	3	Mary Van Dyke Park	3	$ 40,000
	4	Dean L. Shively Park	8	$ 80,000
	5	Dean L. Shively Middle School	4	$ 50,000
	9	Epiphany Catholic School	4	$ 45,000
	10	New Temple Park	14	$ 80,000
	11	New Temple Elementary School	7	$ 80,000
	15	Monte Vista Elementary School	8	$ 80,000
	30	El Monte Community Hospital	10	$ 40,000
	35	USA Gasoline	3	$ 20,000
	37	Durfee Business Park	3	$ 35,000
	41	Nature Center	8	$ 60,000
		Package 3 Sub Total	***72***	***$ 610,000***
4	14	Cogswell Elementary School	5	$ 50,000
	25	Madrid Middle School	16	$ 80,000
	26	Mountain View High School	41	$ 150,000
	38	Peck Road Industrial Center	7	$ 60,000
	39	Equestrian Center	13	$ 80,000
	40	Sports Arena / Bicentinnial Park	128	$ 200,000
	42	Watershed Conservation Authority (Duck Farm)	60	$ 300,000
	43	Coiner Nursery (2)	-	$ -
		Package 4 Sub Total	***270***	***$ 920,000***
5	21	Baker Elementary School	4	$ 60,000
	22	Voorhis Elementary School	5	$ 50,000
	23	La Primaria Elementary School	5	$ 50,000
	24	Twin Lakes Elementary School	8	$ 50,000
	31	Star Car Wash (El Monte)	2	$ 40,000
	32	Nelson Honda	7	$ 45,000
	33	Win Hyundai	2	$ 45,000
	34	Ross Nissan	4	$ 45,000
	36	Longo Toyota	33	$ 50,000
	44	Maclaren Hall	18	$ 75,000
		Package 5 Sub Total	***88***	***$ 510,000***
			Customer Retrofit Project Total	**$ 2,940,000**
			Engineering and Permitting	**$ 850,000**
			Contingency (15%)	**$ 430,000**
		Project Total	**559**	**$ 4,220,000**

Notes:

(1) Recycled water use is assumed to be 80% of the current total metered water use.

(2) Coiner Nursery's recycled water demands are approximately 110 AFY. However, Coiner Nursery is not included in the Project demands due to existing water pricing arrangements.

3.2 Proposed Cost- Allocation

SGVWC's Capital Costs would be $24 million and SGVWC would pay the O&M costs (including recycled water purchases) which are estimated to currently be $455 per AF (or $355 per AF + $100 per AF), or approximately $254,345 per year (based on deliveries of 559 AFY).

3.3 Proposed Price Discounting

SGVWC will retail recycled water to its customers at a rate of approximately $980 per AF based on SGVWC's Schedule No. LA-6 ("Recycled Water Metered Service") for fiscal year 2012-13. SGVWC's rate will provide a discount to SGVWC customers of approximately 15 percent compared to the cost of potable water. In addition, it is anticipated SGVWC will establish a separate recycled water rate which will provide a discount to City of El Monte customers of approximately 15 percent compared to the cost of potable water from the City of El Monte. Additional discussion regarding price discounting and customer savings is provided in Section 6.1.

3.4 Proposed Escalation Rates

It is anticipated the rate SGVWC will charge its customers will be adjusted to maintain a 15 percent discount when compared to the potable water rate. These recycled water rate increases will be presented to the CPUC for review and approval.

3.5 Explanation of Benefits

Project customers (including customers within SGVWC and the City of El Monte) can save approximately 15 percent on the cost of recycled water compared to the cost they are currently paying for potable water they are purchasing for the same uses. Additional discussion regarding Project customer savings is provided in Section 6.1.

Use of recycled water by the Project will reduce SGVWC's dependence on Main Basin groundwater supplies (and the imported water supplies that are required to replace some of the groundwater that SGVWC produces) and allow SGVWC to further meet the water conservation and water infrastructure investment objectives of the CPUC's Water Action Plan. The Water Action Plan provides guidance and establishes priorities for water utilities to deliver clean, safe, and reliable water efficiently to customers at reasonable rates. The Water Action Plan includes the following main objectives:

- Maintain highest standards of water quality
- Strengthen water conservation programs to a level comparable to those of energy utilities
- Promote water infrastructure investment
- Assist low income ratepayers
- Streamline CPUC regulatory decision-making
- Set rates that balance investment, conservation, and affordability

SGVWC served approximately 2,400 AF of recycled water during calendar year 2012.
Based on the potential Project demands of 559 AFY, SGVWC will increase its recycled water service by approximately 25 percent.

Due to recent water supply shortages, USGVMWD is exploring options for possible additional sources of water supply outside of the Main Basin, including recycled water, to supplement untreated imported water received from MWD. As discussed in Section 2.4, USGVMWD's IRP considers various water supply options in terms of potential supply yield, costs, technology, water quality, and reliability. The proposed Project is consistent with the IRP recommendation that USGVMWD continue implementation of it recycled water projects (indirect and non-potable) in order to meet future water demands.

3.6 Summary of Proposed Project Phasing

The Project is divided into five (5) Packages (Phases) to ensure orderly expansion of the recycled water system. The five (5) Packages are shown in Figure 1-2, and detailed as follows:

3.6.1 Package 1 Pipeline

The Package 1 Pipeline will connect the first group of South El Monte recycled water customers to the existing USGVMWD Phase IIA recycled water system with recycled water being generated by the LACSD Whittier Narrows Water Reclamation Plant (WNWRP). The Package 1 Pipeline will serve El Monte High School's large turf areas as the anchor user for this portion of the project. This estimated recycled water demand for all the Package 1 Customers is roughly 88 acre-ft per year.

3.6.2 Package 2 Pipeline, Reservoir and Pump Station

Package 2 will construct a pipeline (Package 2A) that will connect the Package 1 Pipeline to the proposed Fairview Pump Station and Reservoir (Package 2B). The Fairview Pump Station and Reservoir will pump recycled water produced by the San Jose Creek WRP on the west side of the 605 freeway. The main objective of Package 2 Pipeline is to provide a backup source of recycled water to the Phase IIA system in the event that the Whittier Narrows WRP or pump station experiences an outage. A small low head transfer pump may also be necessary to transport the recycled water from the SJCWRP to the proposed Fairview RW Reservoir.

3.6.3 Package 3 Pipeline

The Package 3 Pipeline will connect the Package 2 Pipeline to the existing Phase IIA system near South El Monte High School near the intersection of Durfee Ave. and Santa Anita Ave. Once built, the existing Phase IIA System and proposed South El Monte System will be connected at two points. This second point of connection will form a loop between both systems, and provide better hydraulic pressure during peak hour flow, or in the event of a plant outage. System pressures will be critical at the highest elevation sites that are also furthest from the pump stations.

3.6.4 Package 4 Pipeline

The Package 4 Pipeline will connect several potential customer sites adjacent to the first three pipeline packages. Upon verification of the demands for each of these customer sites, the individual pipeline segments may be constructed, or deleted from this Package. This Package also consists of crossing the 60 freeway and San Gabriel River in order to pick up the anchor user Pico Rivera Bicentennial Park and Equestrian Center. These crossings will be very costly, and the estimated demands south of the freeway should be confirmed prior to construction of this portion of pipeline.

3.6.5 Package 5 Pipeline

The Package 5 Pipeline will be constructed from the northern most Package 4 Pipeline to serve demands north of Interstate 10. Half of the proposed recycled water sites are for car dealerships, and the other half for irrigation sites. It seems likely that each car dealerships uses a large quantity of water for car washing. If the car dealerships do use the majority of their demand for washing vehicles, it is unlikely that conventional recycled water conversion will be a viable option. The Package 5 sites are also at the highest elevations in the proposed South El Monte Recycled Water System. Being at the highest elevations, and furthest from either recycled water pump station, the sites will consequently have the lowest available water pressures. This Package also consists of crossing the 10 freeway in order to pick up the majority of the proposed customers. This freeway crossing will be very costly, and the pressure requirement, estimated demand, and recycled water suitability verified for each customer prior to constructing this phase of the Project.

The estimated cost per Project Package is provided in the Table 3-3 through 3-8.

Upper San Gabriel Valley Municipal Water District
Proposed South El Monte Recycled Water Project
Feasibility Study

Table 3-3 - Engineer's Estimate of Probable Construction Costs
Package 1 Pipeline

Item No.	*Estimated Qty*	*Unit*	*Description*	*Unit Price*	*Total Price*
Package 1 Pipeline					
1	1	LS	Mobilization, Demobilization, and Cleanup	$97,500	$97,500
2	1	LS	Prepare and Implement SWPPP	$10,000	$10,000
3	1	LS	Sheeting, Shoring and Bracing	$10,000	$10,000
4	0	LF	Furnish and install 16-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$120	$0
5	0	LF	Furnish and install 12-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$85	$0
6	11000	LF	Furnish and install 8-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$60	$660,000
7	0	LF	Furnish and install 6-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$41	$0
8	6850	LF	Furnish and install 4-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$38	$260,300
9	0	EA	Furnish and Install 12-inch Gate Valves	$3,500	$0
10	2	EA	Furnish and Install 8-inch Gate Valves	$1,300	$2,600
11	0	EA	Furnish and Install 6-inch Gate Valves	$900	$0
12	6	EA	Furnish and Install 4-inch Gate Valves	$700	$4,200
13	2	EA	Furnish and Install 2-inch Blow Offs	$5,700	$11,400
14	1	EA	Furnish and Install 2-inch End of Line Blow Offs	$4,300	$4,300
15	1	EA	Furnish and Install Air and Vacuum Release Valves	$6,300	$6,300
16	1	LS	Furnish and Install Connection to Existing Phase IIA Pipeline	$7,000	$7,000
17	0	LF	Bore and Jack under Freeway / Channel Crossing	$600	$0
18	17850	LF	Furnish and Install Trench Detail	$30	$535,500
19	53550	SF	Furnish and Install Street Paving	$0.25	$13,388
20	2350	LF	Furnish and Install PCC Street Pavment	$150.00	$352,500
21	1	LS	Replace Damaged Traffic Loops, Detectors and Wiring	$5,000	$5,000
22	1	LS	Traffic Control	$10,000	$10,000
23	1	LS	Perform Pipeline Pressure Test	$10,000	$10,000
			Subtotal for Package 1 Pipeline		**$1,999,988**
			Engineering, Surveying, and Permitting (20%)		$399,998
			Contingency (15%), Tax and Overhead (10%), Bonding & Insurance (5%)		$600,014
			Total for Package 1 Pipeline		***$3,000,000***

This cost estimate is subject to change. This is an estimate only. These figures are supplied as a guide only.
This firm is not responsible for fluctuation in cost of material, labor, or components, or unforeseen contingencies.

Upper San Gabriel Valley Municipal Water District
Proposed South El Monte Recycled Water Project
Feasibility Study

Table 3-4 - Engineer's Estimate of Probable Construction Costs
Package 2A Pipeline

Item No.	*Estimated Qty*	*Unit*	*Description*	*Unit Price*	*Total Price*
Package 2A Pipeline					
1	1	LS	Mobilization, Demobilization, and Cleanup	$149,000	$149,000
2	1	LS	Prepare and Implement SWPPP	$10,000	$10,000
3	1	LS	Sheeting, Shoring and Bracing	$10,000	$10,000
4	2950	LF	Furnish and install 16-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$120	$354,000
5	6500	LF	Furnish and install 12-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$85	$552,500
6	7500	LF	Furnish and install 8-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$60	$450,000
7	0	LF	Furnish and install 6-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$41	$0
8	760	LF	Furnish and install 4-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$38	$28,880
9	3	EA	Furnish and Install 12-inch Gate Valves	$3,500	$10,500
10	3	EA	Furnish and Install 8-inch Gate Valves	$1,300	$3,900
11	0	EA	Furnish and Install 6-inch Gate Valves	$900	$0
12	2	EA	Furnish and Install 4-inch Gate Valves	$700	$1,400
13	4	EA	Furnish and Install 2-inch Blow Offs	$5,700	$22,800
14	1	EA	Furnish and Install 2-inch End of Line Blow Offs	$4,300	$4,300
15	2	EA	Furnish and Install Air and Vacuum Release Valves	$6,300	$12,600
16	1	LS	Furnish and Install Connection to Existing Phase IIA Pipeline	$7,000	$7,000
17	700	LF	Bore and Jack under Freeway / Channel Crossing	$600	$420,000
18	17710	LF	Furnish and Install Trench Detail	$30	$531,300
19	53130	SF	Furnish and Install Street Paving	$0.25	$13,283
20	400	LF	Furnish and Install PCC Street Pavment	$150.00	$60,000
21	1	LS	Replace Damaged Traffic Loops, Detectors and Wiring	$5,000	$5,000
22	1	LS	Traffic Control	$10,000	$10,000
23	1	LS	Perform Pipeline Pressure Test	$10,000	$10,000
			Subtotal for Package 2 Pipeline		**$2,666,463**
			Engineering, Surveying, and Permitting (20%)		$533,293
			Contingency (15%), Tax and Overhead (10%), Bonding & Insurance (5%)		$800,244
			Total for Package 2A Pipeline		***$4,000,000***

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Upper San Gabriel Valley Municipal Water District
Proposed South El Monte Recycled Water Project
Feasibility Study

Table 3-5 - Engineer's Estimate of Probable Construction Costs
Package 2B Pump Station and Reservoir

Item No.	Estimated Qty	Unit	Description	Unit Price	Total Price
Package 2B Pump Station					
1	1	LS	Mobilization, Demobilization, and Cleanup	$32,000	$32,000
2	3	EA	Pumps (1,200 gpm)	$30,000	$90,000
3	1	LS	Electrical and Controls	$125,000	$125,000
4	1	LS	Installation	$60,000	$60,000
5	1	LS	Building (Masonry)	$250,000	$250,000
			Subtotal for Package 2B Pump Station		**$557,000**
			Engineering, Surveying, and Permitting (20%)		$111,000
			Contingency (15%), Tax and Overhead (10%), Bonding & Insurance (5%)		$167,000
			Total for Package 2B Pump Station		***$835,000***

Item No.	Estimated Qty	Unit	Description	Unit Price	Total Price
Package 2B Reservoir					
1	1	LS	Mobilization, Demobilization, and Cleanup	$90,000	$90,000
2	1	EA	1 MG Welded Steel Reservoir	$1,500,000	$1,500,000
			Subtotal for Package 2B Reservoir		**$1,590,000**
			Engineering, Surveying, and Permitting (20%)		$318,000
			Contingency (15%), Tax and Overhead (10%), Bonding & Insurance (5%)		$477,000
			Total for Package 2B Reservoir		***$2,385,000***

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Upper San Gabriel Valley Municipal Water District
Proposed South El Monte Recycled Water Project
Feasibility Study

Table 3-6 - Engineer's Estimate of Probable Construction Costs
Package 3 Pipeline

Item No.	*Estimated Qty*	*Unit*	*Description*	*Unit Price*	*Total Price*
Package 3 Pipeline					
1	1	LS	Mobilization, Demobilization, and Cleanup	$125,000	$125,000
2	1	LS	Prepare and Implement SWPPP	$10,000	$10,000
3	1	LS	Sheeting, Shoring and Bracing	$10,000	$10,000
4	0	LF	Furnish and install 16-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$120	$0
5	10900	LF	Furnish and install 12-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$85	$926,500
6	4400	LF	Furnish and install 8-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$60	$264,000
7	0	LF	Furnish and install 6-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$41	$0
8	5550	LF	Furnish and install 4-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$38	$210,900
9	0	EA	Furnish and Install 12-inch Gate Valves	$3,500	$0
10	3	EA	Furnish and Install 8-inch Gate Valves	$1,300	$3,900
11	2	EA	Furnish and Install 6-inch Gate Valves	$900	$1,800
12	5	EA	Furnish and Install 4-inch Gate Valves	$700	$3,500
13	2	EA	Furnish and Install 2-inch Blow Offs	$5,700	$11,400
14	1	EA	Furnish and Install 2-inch End of Line Blow Offs	$4,300	$4,300
15	2	EA	Furnish and Install Air and Vacuum Release Valves	$6,300	$12,600
16	1	LS	Furnish and Install Connection to Existing Phase IIA Pipeline	$7,000	$7,000
17	0	LF	Bore and Jack under Freeway / Channel Crossing	$600	$0
18	20850	LF	Furnish and Install Trench Detail	$30	$625,500
19	62550	SF	Furnish and Install Street Paving	$0.25	$15,638
20	400	LF	Furnish and Install PCC Street Pavment	$150.00	$60,000
21	1	LS	Replace Damaged Traffic Loops, Detectors and Wiring	$5,000	$5,000
22	1	LS	Traffic Control	$10,000	$10,000
23	1	LS	Perform Pipeline Pressure Test	$10,000	$10,000
			Subtotal for Package 3 Pipeline		**$2,317,038**
			Engineering, Surveying, and Permitting (20%)		$463,408
			Contingency (15%), Tax and Overhead (10%), Bonding & Insurance (5%)		$694,554
			Total for Package 3 Pipeline		***$3,475,000***

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Upper San Gabriel Valley Municipal Water District
Proposed South El Monte Recycled Water Project
Feasibility Study

Table 3-7 - Engineer's Estimate of Probable Construction Costs
Package 4 Pipeline

Item No.	*Estimated Qty*	*Unit*	*Description*	*Unit Price*	*Total Price*
Package 4 Pipeline					
1	1	LS	Mobilization, Demobilization, and Cleanup	$97,000	$97,000
2	1	LS	Prepare and Implement SWPPP	$10,000	$10,000
3	1	LS	Sheeting, Shoring and Bracing	$10,000	$10,000
4	0	LF	Furnish and install 16-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$120	$0
5	0	LF	Furnish and install 12-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$85	$0
6	9200	LF	Furnish and install 8-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$60	$552,000
7	6850	LF	Furnish and install 6-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$41	$280,850
8	3500	LF	Furnish and install 4-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$38	$133,000
9	0	EA	Furnish and Install 12-inch Gate Valves	$3,500	$0
10	2	EA	Furnish and Install 8-inch Gate Valves	$1,300	$2,600
11	2	EA	Furnish and Install 6-inch Gate Valves	$900	$1,800
12	1	EA	Furnish and Install 4-inch Gate Valves	$700	$700
13	2	EA	Furnish and Install 2-inch Blow Offs	$5,700	$11,400
14	1	EA	Furnish and Install 2-inch End of Line Blow Offs	$4,300	$4,300
15	2	EA	Furnish and Install Air and Vacuum Release Valves	$6,300	$12,600
16	1	LS	Furnish and Install Connection to Existing Phase IIA Pipeline	$7,000	$7,000
17	1000	LF	Bore and Jack under Freeway / Channel Crossing	$600	$600,000
18	19550	LF	Furnish and Install Trench Detail	$30	$586,500
19	58650	SF	Furnish and Install Street Paving	$0.25	$14,663
20	0	LF	Furnish and Install PCC Street Pavment	$150.00	$0
21	1	LS	Replace Damaged Traffic Loops, Detectors and Wiring	$5,000	$5,000
22	1	LS	Traffic Control	$10,000	$10,000
23	1	LS	Perform Pipeline Pressure Test	$10,000	$10,000
			Subtotal for Package 4 Pipeline		**$2,349,413**
			Engineering, Surveying, and Permitting (20%)		$469,883
			Contingency (15%), Tax and Overhead (10%), Bonding & Insurance (5%)		$705,704
			Total for Package 4 Pipeline		***$3,525,000***

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Upper San Gabriel Valley Municipal Water District
Proposed South El Monte Recycled Water Project
Feasibility Study

Table 3-8 - Engineer's Estimate of Probable Construction Costs
Package 5 Pipeline

Item No.	*Estimated Qty*	*Unit*	*Description*	*Unit Price*	*Total Price*
Package 5 Pipeline					
1	1	LS	Mobilization, Demobilization, and Cleanup	$80,000	$80,000
2	1	LS	Prepare and Implement SWPPP	$10,000	$10,000
3	1	LS	Sheeting, Shoring and Bracing	$10,000	$10,000
4	0	LF	Furnish and install 16-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$120	$0
5	0	LF	Furnish and install 12-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$85	$0
6	0	LF	Furnish and install 8-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$60	$0
7	4800	LF	Furnish and install 6-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$41	$196,800
8	10105	LF	Furnish and install 4-inch Purple PVC Pipe (AWWA C900, DR14), Fittings and Appurtenances	$38	$383,990
9	0	EA	Furnish and Install 12-inch Gate Valves	$3,500	$0
10	0	EA	Furnish and Install 8-inch Gate Valves	$1,300	$0
11	1	EA	Furnish and Install 6-inch Gate Valves	$900	$900
12	3	EA	Furnish and Install 4-inch Gate Valves	$700	$2,100
13	4	EA	Furnish and Install 2-inch Blow Offs	$5,700	$22,800
14	1	EA	Furnish and Install 2-inch End of Line Blow Offs	$4,300	$4,300
15	4	EA	Furnish and Install Air and Vacuum Release Valves	$6,300	$25,200
16	1	LS	Furnish and Install Connection to Existing Phase IIA Pipeline	$7,000	$7,000
17	300	LF	Bore and Jack under Freeway / Channel Crossing	$600	$180,000
18	14905	LF	Furnish and Install Trench Detail	$30	$447,150
19	44715	SF	Furnish and Install Street Paving	$0.25	$11,179
20	2000	LF	Furnish and Install PCC Street Pavment	$150.00	$300,000
21	1	LS	Replace Damaged Traffic Loops, Detectors and Wiring	$5,000	$5,000
22	1	LS	Traffic Control	$10,000	$10,000
23	1	LS	Perform Pipeline Pressure Test	$10,000	$10,000
			Subtotal for Package 5 Pipeline		**$1,706,419**
			Engineering, Surveying, and Permitting (20%)		$341,284
			Contingency (15%), Tax and Overhead (10%), Bonding & Insurance (5%)		$512,297
			Total for Package 5 Pipeline		***$2,560,000***

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3.7 USGVMWD Phase IIA Recycled Water System Interconnection

In order to provide both the proposed South El Monte Recycled Water Project and the existing Phase IIA customers with a more reliable recycled water supply, the Upper District is considering interconnecting the existing Phase IIA RW System with the proposed South El Monte Recycled Water System.

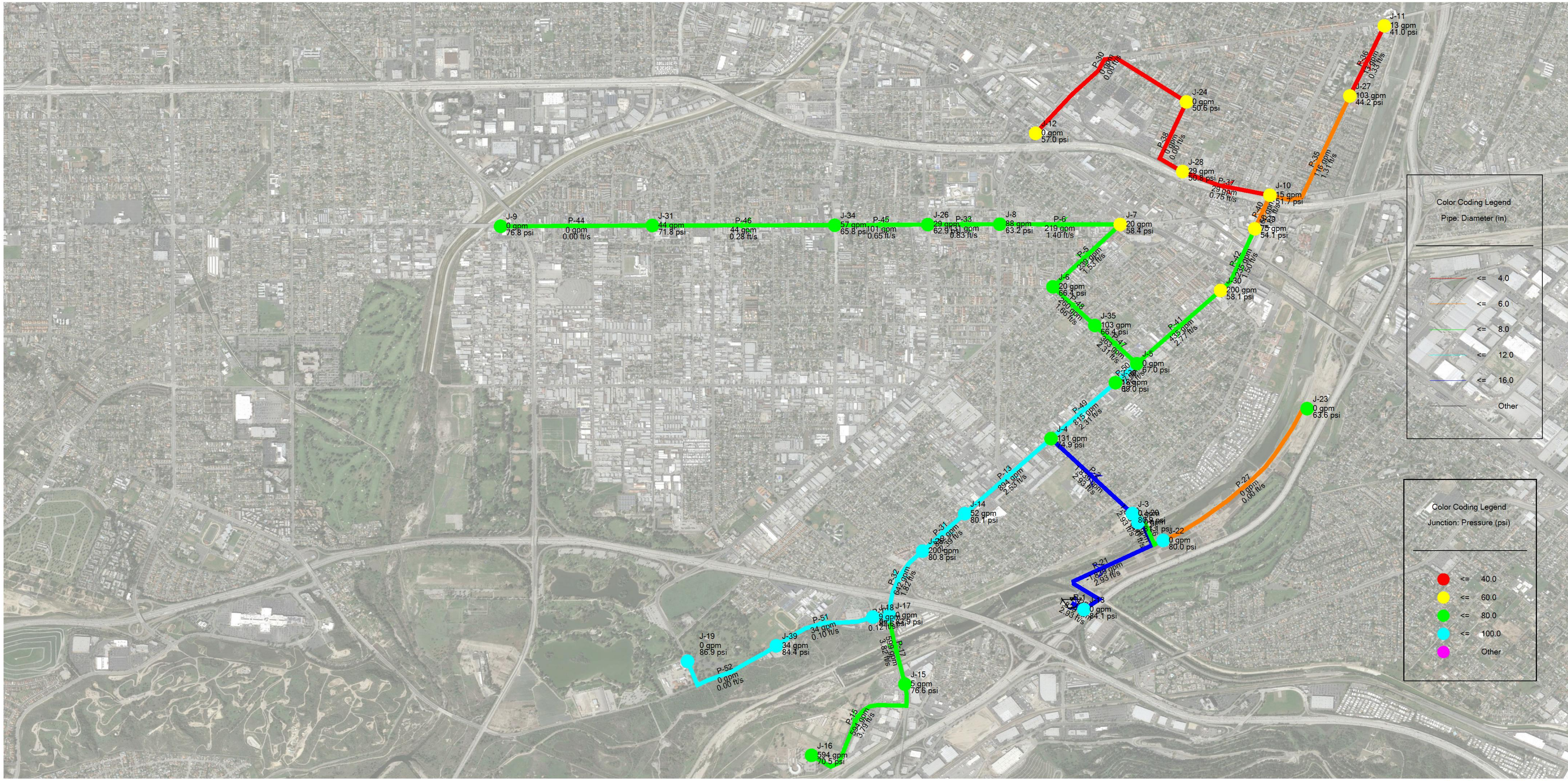
In order for either system to provide backup redundancy, the system pressures will need to be the same. This will assure that both recycled water pump stations will operate as designed, and provide similar pressures currently delivered to end users. However, if the Proposed South El Monte RW System requires a higher HGL than the existing Phase IIA system, the ability to interconnect these systems for redundancy will become more difficult.

The existing Phase IIA system pressure (450 feet hydraulic grade line) may not be adequate to serve all of the proposed South El Monte Recycled Water Customers. This is critical for the customer sites that are furthest from the pump station, and at higher elevations (higher elevations are typically to the north and east).

A skeleton flow model has been developed to approximate the expected recycled water pressures available to the furthest customers at a pumped system pressure of 450 feet HGL per Figure 3-9.

Figure 3-9 - Conceptual Skeleton Hydraulic Model

Proposed South El Monte Recycled Water Project



3.7.1 Existing Whittier Narrows Recycled Water Pump Station (Phase IIA System)

Reviewing available record drawings for the existing USGVMWD's Recycled Water Pump Station at the Whittier Narrows Water Reclamation Plant, we have verified the existing recycled water pump design. The existing pump station consists of three (3) 350hp pumps, and one (1) 200hp pump. All pumps are powered by variable frequency drive. The design points are summarized in Table 3-9.

Table 3-9 – Phase IIA Recycled Water Pump Station Design Points

Pump No.	P-1	P-2, P-3, and P-4
Design Rated Flow, gpm	2000	4000
Design Rated Head, ft	244	244
Pump Speed (100%)	1,170 rpm	1,170 rpm
Motor Horsepower	200	350

Based on the pump design head of 244 feet, and the water elevation of the wet well (about 206 feet above sea level), the discharge HGL for the existing Phase IIA recycled water pump station is about 450 feet hydraulic grade line (HGL).

3.7.2 Proposed Recycled Water System Pressure

The existing Phase IIA system pressure (450 feet HGL) may not be adequate to serve all of the Proposed South El Monte Recycled Water Customers. This is especially true for the customer sites that are furthest away from the pump station, and at higher elevations. It is also not know if the pumps have adequate flow potential to serve both the existing Phase IIA System and the proposed South El Monte System simultaneously.

Based on the data provided by the skeleton model (Figure 3-9) we have determine a few system pressure scenarios that are possible for the proposed system, and how that affects the ability to provide system redundancy in the event of an outage

Scenario 1 - 450 feet HGL Phase IIA and South El Monte System

Based on the model, the proposed recycled water customers north of Interstate 10 will have less than 65 psi of pressure (static) at each site. These sites are expected to have less than 50 psi during overnight peak hour irrigation times. The dynamic pressure available for these customers will not be adequate to serve typical irrigation systems. A minimum pressure of 60 psi is necessary for most irrigation systems to operate, and a recommended pressure of 80 psi is common in the industry. Individual irrigation pumps could be added for these users, but the added cost for the pumps and ongoing cost to run the pump (electrical costs) would make the site retrofit costs increase significantly and likely overshadow any potential customer savings for using recycled water.

Scenario 2 – 520 feet HGL El Monte System / 450 feet Phase IIA System

The South El Monte RW System pressure would need to be increased to about 520 feet HGL in order to eliminate the need for individual irrigation pumps. An increase in the proposed South El Monte RW system pressure will mean the Phase IIA system will not be able to directly connect to the Phase IIA system due to the pressure difference. A pressure reducing station (PRS) could be constructed at each point of connection between the two systems to provide backup water from the South El Monte System to the Phase IIA system. These turn outs could open by hydraulic controlled valves in order to maintain the Phase IIA system pressure in the event of an outage of the Whittier Narrows Plant. However, due to the pressure difference, water would not flow from the Phase IIA system to the proposed South El Monte System.

Scenario 3 – 520 feet HGL Phase IIA and South El Monte System

The Whittier Narrows Pump Station is operated with variable speed pump drives. These allow the pumps to maintain a relatively steady downstream system pressure while adjusting speed of the pump to meet the flow demand of the system. If the pump station is not currently pumping to capacity, it may be possible to increase the target discharge pressure with a resulting reduction in pump flow capacity. The impact of increasing the discharge pressure is not easily determined. It would also be necessary to determine the impact to the existing Phase IIA system customers. The higher pressure may require pressure reducing valves be constructed at sites at lower elevations and to normalize system pressure.

Once the existing customer pressures are determined for the Proposed South El Monte Recycled Water Project Customers, the recycled water system pressure can be determined.

4.1 Project Cost Compared to Next Least Cost Alternative

The Capital and O&M costs for the proposed Project are discussed in Section 3. In order to compare Project costs to alternative water supply costs, the current annual costs per AF (based on 559 AFY of recycled water deliveries) for the Project were calculated and are summarized in Table 4-1.

Table 4-1 Summary of Project Costs (Excluding Revenues)

Phase	Capital Cost	Amortized Capital Cost [1]	Annual O&M Cost[2]	Annual Recycled Water Purchase Cost[3]	Total Annual Cost[4]	Cumulative Cost (perAF) [5]
Package 1 (83 AFY)	$3,000,000	$195,154	$8,300	$29,465	$232,965	$2,807
Package 2A	$4,000,000	$260,206	$4,600	$16,330	$281,230	$5,599
Package 2B (129 AFY)	$3,200,000	$208,165			$208,200	
Package 3 (201 AFY)	$3,475,000	$226,054	$7,200	$25,560	$258,860	$4,881
Package 4 (471 AFY)	$3,525,000	$229,306	$27,000	$95,850	$352,250	$2,831
Package 5 (559 AFY)	$2,560,000	$166,532	$8,800	$31,240	$206,640	$2,755
Customer Retrofits (559 AFY)	$4,220,000	$274,517	-	-	$274,517	$491[(6)]
Project Total	**$24,000,000**	**$1,561,235**	**$55,900**	**$198,445**	**$1,815,645**	**$3,248**

Notes:

[1] Ammortized yearly payment at 5% over 30 years.

[2] Approximately $100 per AF

[3] The proposed cost approximately $355 per AF in order to purchase recycled water from LACSD.

[4] Based on 559 AFY of recycled water deliveries to Project

[5] Cumulative including previous Package Costs per total Converted usage

[6] Cost of the retrofits divided by the total 559 AFY

Alternative sources of water currently available to SGVWC to meet increased demands include treated Tier 1 water from Central Basin Municipal Water District, groundwater from the Central Basin, and groundwater from the Main Basin. Because SGVWC currently produces all of its available water rights in the Central Basin it would be required to lease unused water rights from another producer in the Central Basin in order to increase Central Basin production. SGVWC's annual groundwater production in the Main Basin currently exceeds its share of the Operating Safe Yield (the amount of groundwater that can extracted without paying a Replacement Water assessment) so any additional production of water from the Main Basin would be subject to the Replacement Water Assessment. The current costs for each of these alternative sources of water and the estimate cost of water from the Project are shown in Table 4-2.

Table 4-2 SGVWC's Current Alternative Water Supply Costs

Water Supply Source	Cost per AF ($ per AF)
Treated Tier 1 (CBMWD)	$814 per AF
Central Basin Groundwater[1]	$1,077 per AF
Main Basin Groundwater[2]	$740 per AF
Proposed Project	$3,248 per AF

Notes:

[1]Central Basin ground water cost includes $733/AF for lease rate equal to 90% of Treated Tier 1 CBMWD rate plus Water Replenishment District of Southern California's Replenishment Assessment of $244/AF plus an assumed energy cost of $100/AF to produce water.

[2]Main Basin ground water cost includes $640/AF for Watermaster's Replacement Water assessment plus an assumed energy cost of $100/AF to produce water.

As shown in Table 4-2, the estimated unit cost of water from the Project is more than SGVWC's current alternative water supply costs.

USGVMWD's IRP evaluated alternative water supply projects to meet future water demands. These water supplies included non-potable reuse, centralized stormwater capture, active water conservation, and indirect potable recycled water use. The estimated current costs for each of these alternative sources of water (based on the IRP), the current cost of treated Tier 2 water from MWD and the estimates cost of water from the Project are shown in Table 4-3.

Non-monetized Project benefits from using recycled water include improved water supply reliability, enhanced positive recognition for environmental stewardship, and enhanced system self-sufficiency through reduced dependence on imported water supplies.

Table 4-3 USGVMWD's Current Alternative Water Supply Costs

Water Supply Source	Cost per AF ($ per AF)
Recycled Water Projects (Direct Use)[1]	
Phase I Expansion	$451 per AF
Phase IIB (Package 3)	$742 per AF
Phase IIB (Package 4)	$1,243 per AF
Phase III (Membrane Bioreactor Plant)	$1,500 per AF
Future System Extensions	$1,590 per AF
Recycled Water Projects (Indirect Use / Groundwater Recharge)[1]	
Tertiary Treatment	$624 per AF
Advanced Water Treatment (AWT)	$1,882 per AF
Hybrid (Tertiary / AWT)	$1,315 per AF
Stormwater Capture Projects[1]	
Miller Pit	$289 per AF
Olive Pit	$280 per AF
Peck Road Spreading Basin	$557 per AF
Walnut Spreading Basin	$347 per AF
Buena Vista Spreading Basin	$368 per AF
Tier 2 Treated Full Service Water (MWD)	$997 per AF

Notes:

[1]Obtained from USGVMWD IRP (Cost table excerpts from the IRP are provided in Attachment 6).

4.2 Cost Benefit Analysis

The present value of the revenue from the sale of 559 AFY of recycled water has been compared to the present value of all Project costs under the two alternatives to determine benefit cost ratios. As discussed in Section 4.1, the Capital Costs of the Project were amortized at a rate of five (5) percent per year over 30 years, consistent with the economic analysis conducted in USGVMWD's IRP, to determine the annual Capital Cost. All O&M costs, all revenues from recycled water sales, and SGVWC's cost to purchase recycled water were assumed to escalate at six (6) percent per year. USGVMWD's cost to purchase recycled water from LACSD was assumed to escalate at eight (8) percent per year.

Present worth of costs to SGVWC, including the Capital ($24 million), O&M ($1.9 million), and recycled water costs ($6.9 million), is approximately $32.8 million. The present worth of SGVWC's annual revenue is approximately $18.9 million. The present worth of O&M costs, recycled water costs, and annual revenue are summarized in Table 4-9. The benefit cost ratio to SGVWC is approximately 0.59 ($18.9 million / $32.8 million). Present worth costs for each Project Package is shown in Table 4-4 through 4-8 (assumes build out of each previous Package).

Table 4-4 Present Worth of SGVWC's Annual Costs and Benefits (Package 1)

Year	Expenses						Revenues		
	O&M[1]			Recycled Water Purchases[3]			Recycled Water Sales[4]		
	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)
1	100	$ 8,300	$ 8,300	355	$ 29,465	$ 29,465	980	$ 81,340	$ 81,340
2	106	$ 8,798	$ 8,379	376	$ 31,233	$ 29,746	1039	$ 86,220	$ 82,114
3	112	$ 9,326	$ 8,459	399	$ 33,107	$ 30,029	1101	$ 91,393	$ 82,896
4	119	$ 9,886	$ 8,540	423	$ 35,093	$ 30,315	1167	$ 96,877	$ 83,686
5	126	$ 10,479	$ 8,621	448	$ 37,199	$ 30,604	1237	$ 102,690	$ 84,483
6	134	$ 11,108	$ 8,703	475	$ 39,431	$ 30,895	1311	$ 108,851	$ 85,288
7	142	$ 11,774	$ 8,786	504	$ 41,797	$ 31,190	1390	$ 115,382	$ 86,100
8	151	$ 12,480	$ 8,869	534	$ 44,305	$ 31,487	1473	$ 122,305	$ 86,920
9	160	$ 13,229	$ 8,954	566	$ 46,963	$ 31,786	1561	$ 129,643	$ 87,747
10	170	$ 14,023	$ 9,039	600	$ 49,781	$ 32,089	1655	$ 137,422	$ 88,583
11	180	$ 14,864	$ 9,125	636	$ 52,768	$ 32,395	1754	$ 145,667	$ 89,427
12	191	$ 15,756	$ 9,212	674	$ 55,934	$ 32,703	1859	$ 154,407	$ 90,279
13	202	$ 16,701	$ 9,300	714	$ 59,290	$ 33,015	1971	$ 163,671	$ 91,138
14	214	$ 17,703	$ 9,388	757	$ 62,847	$ 33,329	2089	$ 173,491	$ 92,006
15	227	$ 18,765	$ 9,478	802	$ 66,618	$ 33,647	2214	$ 183,900	$ 92,882
16	241	$ 19,891	$ 9,568	850	$ 70,615	$ 33,967	2347	$ 194,934	$ 93,767
17	255	$ 21,084	$ 9,659	901	$ 74,852	$ 34,291	2488	$ 206,630	$ 94,660
18	270	$ 22,349	$ 9,751	955	$ 79,343	$ 34,617	2637	$ 219,028	$ 95,561
19	286	$ 23,690	$ 9,844	1012	$ 84,104	$ 34,947	2795	$ 232,170	$ 96,471
20	303	$ 25,111	$ 9,937	1073	$ 89,150	$ 35,280	2963	$ 246,100	$ 97,390
21	321	$ 26,618	$ 10,032	1137	$ 94,499	$ 35,616	3141	$ 260,866	$ 98,318
22	340	$ 28,215	$ 10,128	1205	$ 100,169	$ 35,955	3329	$ 276,518	$ 99,254
23	360	$ 29,908	$ 10,224	1277	$ 106,179	$ 36,297	3529	$ 293,109	$ 100,199
24	382	$ 31,702	$ 10,321	1354	$ 112,550	$ 36,643	3741	$ 310,696	$ 101,154
25	405	$ 33,604	$ 10,420	1435	$ 119,303	$ 36,992	3965	$ 329,338	$ 102,117
26	429	$ 35,620	$ 10,519	1521	$ 126,461	$ 37,344	4203	$ 349,098	$ 103,090
27	455	$ 37,757	$ 10,619	1612	$ 134,049	$ 37,700	4455	$ 370,044	$ 104,071
28	482	$ 40,022	$ 10,720	1709	$ 142,092	$ 38,059	4722	$ 392,247	$ 105,063
29	511	$ 42,423	$ 10,822	1812	$ 150,618	$ 38,422	5005	$ 415,782	$ 106,063
30	542	$ 44,968	$ 10,925	1921	$ 159,655	$ 38,788	5305	$ 440,729	$ 107,073
Total			$ 286,641			$ 1,017,611			$ 2,809,141

Notes:

[1] O&M is assumed to escalate at 6% per year

[2] Based on a 5% interest rate over 30 years

[3] SGVWC recycled water purchases are assumed to escalate at 6% per year

[4] Recycled water rate is assumed to escalate at 6% per year

Table 4-5 Present Worth of SGVWC's Annual Costs and Benefits (Package 2)

Year	Expenses						Revenues		
	O&M[1]			Recycled Water Purchases[3]			Recycled Water Sales[4]		
	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)
1	100	$ 12,900	$ 12,900	355	$ 45,795	$ 45,795	980	$ 126,420	$ 126,420
2	106	$ 13,674	$ 13,023	376	$ 48,543	$ 46,231	1039	$ 134,005	$ 127,624
3	112	$ 14,494	$ 13,146	399	$ 51,456	$ 46,672	1101	$ 142,045	$ 128,839
4	119	$ 15,364	$ 13,272	423	$ 54,543	$ 47,116	1167	$ 150,568	$ 130,066
5	126	$ 16,286	$ 13,399	448	$ 57,816	$ 47,565	1237	$ 159,602	$ 131,305
6	134	$ 17,263	$ 13,526	475	$ 61,285	$ 48,018	1311	$ 169,178	$ 132,555
7	142	$ 18,299	$ 13,655	504	$ 64,962	$ 48,476	1390	$ 179,329	$ 133,818
8	151	$ 19,397	$ 13,785	534	$ 68,860	$ 48,938	1473	$ 190,089	$ 135,093
9	160	$ 20,561	$ 13,916	566	$ 72,992	$ 49,404	1561	$ 201,494	$ 136,379
10	170	$ 21,795	$ 14,049	600	$ 77,372	$ 49,875	1655	$ 213,584	$ 137,678
11	180	$ 23,103	$ 14,183	636	$ 82,014	$ 50,349	1754	$ 226,399	$ 138,989
12	191	$ 24,489	$ 14,318	674	$ 86,935	$ 50,829	1859	$ 239,983	$ 140,313
13	202	$ 25,958	$ 14,454	714	$ 92,151	$ 51,313	1971	$ 254,382	$ 141,649
14	214	$ 27,515	$ 14,592	757	$ 97,680	$ 51,802	2089	$ 269,645	$ 142,999
15	227	$ 29,166	$ 14,731	802	$ 103,541	$ 52,295	2214	$ 285,824	$ 144,361
16	241	$ 30,916	$ 14,871	850	$ 109,753	$ 52,793	2347	$ 302,973	$ 145,735
17	255	$ 32,771	$ 15,013	901	$ 116,338	$ 53,296	2488	$ 321,151	$ 147,123
18	270	$ 34,737	$ 15,156	955	$ 123,318	$ 53,803	2637	$ 340,420	$ 148,524
19	286	$ 36,821	$ 15,300	1012	$ 130,717	$ 54,316	2795	$ 360,845	$ 149,939
20	303	$ 39,030	$ 15,445	1073	$ 138,560	$ 54,833	2963	$ 382,496	$ 151,367
21	321	$ 41,372	$ 15,593	1137	$ 146,874	$ 55,355	3141	$ 405,446	$ 152,808
22	340	$ 43,854	$ 15,741	1205	$ 155,686	$ 55,882	3329	$ 429,773	$ 154,264
23	360	$ 46,485	$ 15,891	1277	$ 165,027	$ 56,414	3529	$ 455,559	$ 155,733
24	382	$ 49,274	$ 16,042	1354	$ 174,929	$ 56,952	3741	$ 482,893	$ 157,216
25	405	$ 52,230	$ 16,195	1435	$ 185,425	$ 57,494	3965	$ 511,867	$ 158,714
26	429	$ 55,364	$ 16,349	1521	$ 196,551	$ 58,042	4203	$ 542,579	$ 160,225
27	455	$ 58,686	$ 16,505	1612	$ 208,344	$ 58,595	4455	$ 575,134	$ 161,751
28	482	$ 62,207	$ 16,662	1709	$ 220,845	$ 59,153	4722	$ 609,642	$ 163,292
29	511	$ 65,939	$ 16,821	1812	$ 234,096	$ 59,716	5005	$ 646,221	$ 164,847
30	542	$ 69,895	$ 16,981	1921	$ 248,142	$ 60,285	5305	$ 684,994	$ 166,417
Total			$ 445,514			$ 1,581,609			$ 4,366,042

Notes:

[1] O&M is assumed to escalate at 6% per year

[2] Based on a 5% interest rate over 30 years

[3] SGVWC recycled water purchases are assumed to escalate at 6% per year

[4] Recycled water rate is assumed to escalate at 6% per year

Table 4-6 Present Worth of SGVWC's Annual Costs and Benefits (Package 3)

Year	Expenses						Revenues		
	O&M[1]			Recycled Water Purchases[3]			Recycled Water Sales[4]		
	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)
1	100	$ 20,100	$ 20,100	355	$ 71,355	$ 71,355	980	$ 196,980	$ 196,980
2	106	$ 21,306	$ 20,291	376	$ 75,636	$ 72,034	1039	$ 208,799	$ 198,856
3	112	$ 22,584	$ 20,484	399	$ 80,174	$ 72,720	1101	$ 221,327	$ 200,750
4	119	$ 23,939	$ 20,679	423	$ 84,984	$ 73,412	1167	$ 234,607	$ 202,662
5	126	$ 25,375	$ 20,876	448	$ 90,083	$ 74,112	1237	$ 248,683	$ 204,592
6	134	$ 26,898	$ 21,075	475	$ 95,488	$ 74,817	1311	$ 263,604	$ 206,541
7	142	$ 28,512	$ 21,276	504	$ 101,217	$ 75,530	1390	$ 279,420	$ 208,508
8	151	$ 30,223	$ 21,479	534	$ 107,290	$ 76,249	1473	$ 296,185	$ 210,493
9	160	$ 32,036	$ 21,683	566	$ 113,727	$ 76,975	1561	$ 313,956	$ 212,498
10	170	$ 33,958	$ 21,890	600	$ 120,551	$ 77,708	1655	$ 332,793	$ 214,521
11	180	$ 35,995	$ 22,098	636	$ 127,784	$ 78,448	1754	$ 352,761	$ 216,565
12	191	$ 38,155	$ 22,308	674	$ 135,451	$ 79,195	1859	$ 373,927	$ 218,627
13	202	$ 40,444	$ 22,521	714	$ 143,578	$ 79,950	1971	$ 396,363	$ 220,710
14	214	$ 42,871	$ 22,735	757	$ 152,193	$ 80,711	2089	$ 420,145	$ 222,812
15	227	$ 45,443	$ 22,952	802	$ 161,325	$ 81,480	2214	$ 445,354	$ 224,934
16	241	$ 48,170	$ 23,171	850	$ 171,005	$ 82,256	2347	$ 472,075	$ 227,076
17	255	$ 51,060	$ 23,391	901	$ 181,265	$ 83,040	2488	$ 500,400	$ 229,239
18	270	$ 54,124	$ 23,614	955	$ 192,141	$ 83,830	2637	$ 530,424	$ 231,422
19	286	$ 57,371	$ 23,839	1012	$ 203,669	$ 84,629	2795	$ 562,249	$ 233,626
20	303	$ 60,813	$ 24,066	1073	$ 215,889	$ 85,435	2963	$ 595,984	$ 235,851
21	321	$ 64,462	$ 24,295	1137	$ 228,842	$ 86,248	3141	$ 631,743	$ 238,097
22	340	$ 68,330	$ 24,527	1205	$ 242,573	$ 87,070	3329	$ 669,648	$ 240,365
23	360	$ 72,430	$ 24,760	1277	$ 257,127	$ 87,899	3529	$ 709,827	$ 242,654
24	382	$ 76,776	$ 24,996	1354	$ 272,555	$ 88,736	3741	$ 752,417	$ 244,965
25	405	$ 81,383	$ 25,234	1435	$ 288,908	$ 89,581	3965	$ 797,562	$ 247,298
26	429	$ 86,266	$ 25,475	1521	$ 306,242	$ 90,434	4203	$ 845,416	$ 249,654
27	455	$ 91,442	$ 25,717	1612	$ 324,617	$ 91,296	4455	$ 896,141	$ 252,031
28	482	$ 96,929	$ 25,962	1709	$ 344,094	$ 92,165	4722	$ 949,909	$ 254,432
29	511	$ 102,745	$ 26,210	1812	$ 364,740	$ 93,043	5005	$ 1,006,904	$ 256,855
30	542	$ 108,910	$ 26,459	1921	$ 386,624	$ 93,929	5305	$ 1,067,318	$ 259,301
Total			$ 694,164			$ 2,464,287			$ 6,802,916

Notes:

1 O&M is assumed to escalate at 6% per year

2 Based on a 5% interest rate over 30 years

3 SGVWC recycled water purchases are assumed to escalate at 6% per year

4 Recycled water rate is assumed to escalate at 6% per year

Table 4-7 Present Worth of SGVWC's Annual Costs and Benefits (Package 4)

Year	Expenses						Revenues		
	O&M[1]			Recycled Water Purchases[3]			Recycled Water Sales[4]		
	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)
1	100	$ 47,100	$ 47,100	355	$ 167,205	$ 167,205	980	$ 461,580	$ 461,580
2	106	$ 49,926	$ 47,549	376	$ 177,237	$ 168,797	1039	$ 489,275	$ 465,976
3	112	$ 52,922	$ 48,002	399	$ 187,871	$ 170,405	1101	$ 518,632	$ 470,415
4	119	$ 56,097	$ 48,459	423	$ 199,143	$ 172,027	1167	$ 549,750	$ 474,895
5	126	$ 59,463	$ 48,920	448	$ 211,092	$ 173,666	1237	$ 582,735	$ 479,418
6	134	$ 63,031	$ 49,386	475	$ 223,758	$ 175,320	1311	$ 617,699	$ 483,983
7	142	$ 66,813	$ 49,857	504	$ 237,183	$ 176,990	1390	$ 654,761	$ 488,593
8	151	$ 70,822	$ 50,332	534	$ 251,414	$ 178,675	1473	$ 694,047	$ 493,246
9	160	$ 75,071	$ 50,811	566	$ 266,499	$ 180,377	1561	$ 735,690	$ 497,944
10	170	$ 79,575	$ 51,295	600	$ 282,489	$ 182,095	1655	$ 779,831	$ 502,686
11	180	$ 84,350	$ 51,784	636	$ 299,438	$ 183,829	1754	$ 826,621	$ 507,474
12	191	$ 89,411	$ 52,277	674	$ 317,404	$ 185,580	1859	$ 876,218	$ 512,307
13	202	$ 94,776	$ 52,775	714	$ 336,448	$ 187,347	1971	$ 928,791	$ 517,186
14	214	$ 100,463	$ 53,278	757	$ 356,635	$ 189,131	2089	$ 984,518	$ 522,111
15	227	$ 106,491	$ 53,785	802	$ 378,033	$ 190,932	2214	$ 1,043,589	$ 527,083
16	241	$ 112,880	$ 54,297	850	$ 400,715	$ 192,751	2347	$ 1,106,204	$ 532,103
17	255	$ 119,653	$ 54,814	901	$ 424,758	$ 194,587	2488	$ 1,172,576	$ 537,171
18	270	$ 126,832	$ 55,336	955	$ 450,243	$ 196,440	2637	$ 1,242,931	$ 542,287
19	286	$ 134,442	$ 55,863	1012	$ 477,258	$ 198,311	2795	$ 1,317,507	$ 547,451
20	303	$ 142,509	$ 56,396	1073	$ 505,893	$ 200,199	2963	$ 1,396,557	$ 552,665
21	321	$ 151,060	$ 56,933	1137	$ 536,247	$ 202,106	3141	$ 1,480,350	$ 557,928
22	340	$ 160,124	$ 57,475	1205	$ 568,422	$ 204,031	3329	$ 1,569,171	$ 563,242
23	360	$ 169,731	$ 58,023	1277	$ 602,527	$ 205,974	3529	$ 1,663,321	$ 568,606
24	382	$ 179,915	$ 58,575	1354	$ 638,679	$ 207,936	3741	$ 1,763,120	$ 574,021
25	405	$ 190,710	$ 59,133	1435	$ 677,000	$ 209,916	3965	$ 1,868,907	$ 579,488
26	429	$ 202,153	$ 59,696	1521	$ 717,620	$ 211,915	4203	$ 1,981,041	$ 585,007
27	455	$ 214,282	$ 60,265	1612	$ 760,677	$ 213,933	4455	$ 2,099,903	$ 590,578
28	482	$ 227,139	$ 60,839	1709	$ 806,318	$ 215,971	4722	$ 2,225,897	$ 596,203
29	511	$ 240,767	$ 61,418	1812	$ 854,697	$ 218,028	5005	$ 2,359,451	$ 601,881
30	542	$ 255,213	$ 62,003	1921	$ 905,979	$ 220,104	5305	$ 2,501,018	$ 607,613
Total			$ 1,626,676			$ 5,774,575			$ 15,941,140

Notes:

[1] O&M is assumed to escalate at 6% per year

[2] Based on a 5% interest rate over 30 years

[3] SGVWC recycled water purchases are assumed to escalate at 6% per year

[4] Recycled water rate is assumed to escalate at 6% per year

Table 4-8 Present Worth of SGVWC's Annual Costs and Benefits (Package 5)

Year	Expenses						Revenues		
	O&M[1]			Recycled Water Purchases[3]			Recycled Water Sales[4]		
	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)	($ / AF)	($)	Present Worth[2] ($)
1	100	$ 55,900	$ 55,900	355	$ 198,445	$ 198,445	980	$ 547,820	$ 547,820
2	106	$ 59,254	$ 56,432	376	$ 210,352	$ 200,335	1039	$ 580,689	$ 553,037
3	112	$ 62,809	$ 56,970	399	$ 222,973	$ 202,243	1101	$ 615,530	$ 558,304
4	119	$ 66,578	$ 57,513	423	$ 236,351	$ 204,169	1167	$ 652,462	$ 563,621
5	126	$ 70,573	$ 58,061	448	$ 250,532	$ 206,113	1237	$ 691,610	$ 568,989
6	134	$ 74,807	$ 58,613	475	$ 265,564	$ 208,076	1311	$ 733,107	$ 574,409
7	142	$ 79,295	$ 59,171	504	$ 281,498	$ 210,058	1390	$ 777,093	$ 579,879
8	151	$ 84,053	$ 59,735	534	$ 298,388	$ 212,059	1473	$ 823,719	$ 585,402
9	160	$ 89,096	$ 60,304	566	$ 316,291	$ 214,078	1561	$ 873,142	$ 590,977
10	170	$ 94,442	$ 60,878	600	$ 335,268	$ 216,117	1655	$ 925,531	$ 596,606
11	180	$ 100,109	$ 61,458	636	$ 355,384	$ 218,175	1754	$ 981,063	$ 602,288
12	191	$ 106,116	$ 62,044	674	$ 376,707	$ 220,253	1859	$ 1,039,927	$ 608,024
13	202	$ 112,483	$ 62,635	714	$ 399,309	$ 222,350	1971	$ 1,102,323	$ 613,815
14	214	$ 119,232	$ 63,231	757	$ 423,268	$ 224,468	2089	$ 1,168,462	$ 619,660
15	227	$ 126,386	$ 63,834	802	$ 448,664	$ 226,606	2214	$ 1,238,570	$ 625,562
16	241	$ 133,969	$ 64,441	850	$ 475,584	$ 228,764	2347	$ 1,312,884	$ 631,520
17	255	$ 142,007	$ 65,055	901	$ 504,119	$ 230,943	2488	$ 1,391,657	$ 637,534
18	270	$ 150,527	$ 65,674	955	$ 534,366	$ 233,142	2637	$ 1,475,156	$ 643,606
19	286	$ 159,559	$ 66,300	1012	$ 566,428	$ 235,363	2795	$ 1,563,665	$ 649,735
20	303	$ 169,133	$ 66,932	1073	$ 600,414	$ 237,604	2963	$ 1,657,485	$ 655,923
21	321	$ 179,281	$ 67,569	1137	$ 636,439	$ 239,867	3141	$ 1,756,934	$ 662,170
22	340	$ 190,038	$ 68,213	1205	$ 674,625	$ 242,151	3329	$ 1,862,350	$ 668,476
23	360	$ 201,440	$ 68,862	1277	$ 715,103	$ 244,458	3529	$ 1,974,091	$ 674,843
24	382	$ 213,526	$ 69,518	1354	$ 758,009	$ 246,786	3741	$ 2,092,536	$ 681,270
25	405	$ 226,338	$ 70,180	1435	$ 803,490	$ 249,136	3965	$ 2,218,088	$ 687,758
26	429	$ 239,918	$ 70,848	1521	$ 851,699	$ 251,509	4203	$ 2,351,173	$ 694,308
27	455	$ 254,313	$ 71,523	1612	$ 902,801	$ 253,904	4455	$ 2,492,243	$ 700,920
28	482	$ 269,572	$ 72,204	1709	$ 956,969	$ 256,323	4722	$ 2,641,778	$ 707,596
29	511	$ 285,746	$ 72,892	1812	$ 1,014,387	$ 258,764	5005	$ 2,800,285	$ 714,335
30	542	$ 302,891	$ 73,586	1921	$ 1,075,250	$ 261,228	5305	$ 2,968,302	$ 721,138
Total			$ 1,930,577			$ 6,853,488			$ 18,919,522

Notes:
1 O&M is assumed to escalate at 6% per year
2 Based on a 5% interest rate over 30 years
3 SGVWC recycled water purchases are assumed to escalate at 6% per year
4 Recycled water rate is assumed to escalate at 6% per year

A summary of the benefit cost ratios for each Project Package is provided in Table 4-9. In general, the benefit cost ratios for the Project in this Study are below 1.0, and therefore may not be economically feasible. However, the benefit cost ratio for various grant funding levels has been included to illustrate the required funding necessary for the Project to be potentially beneficial (1.0 or greater). Public Grants and Loans are discussed in Section 7.

Table 4-9 Summary of Project Benefit Cost Ratios

	Benefits (B)	Costs (C)				Benefit / Cost Ratio Grant Funding Level (%)			
Project Phase	Present Worth of Revenues (Sales)	Capital Costs	Present Worth of O&M	Present Worth of Recycled Water Purchases	Total Costs	No Funds	25%	40%	60%
Package 1	$ 2,809,141	$ 3,560,000	$ 286,641	$ 1,017,611	$ 4,864,252	**0.58**	**0.71**	**0.82**	**1.03**
Package 2	$ 4,366,042	$ 11,100,000	$ 445,514	$ 1,581,609	$ 13,127,123	**0.33**	**0.41**	**0.47**	**0.59**
Package 3	$ 6,802,916	$ 15,185,000	$ 694,164	$ 2,464,287	$ 18,343,451	**0.37**	**0.45**	**0.52**	**0.66**
Package 4	$ 15,941,140	$ 19,630,000	$ 1,626,676	$ 5,774,575	$ 27,031,251	**0.59**	**0.72**	**0.83**	**1.05**
Package 5 (Complete Project)	$ 18,919,522	$ 24,000,000	$ 1,930,577	$ 6,853,488	$ 32,784,065	**0.58**	**0.71**	**0.82**	**1.03**

Package 1 has about the same benefit level as the completed Project due to the relative low capital cost of extending the existing Phase IIA System. Once the Package 2 pump station, reservoir, and pipeline are constructed the Project benefit cost ratio is sharply reduced due to the large Capital cost. This Benefit Cost ratio improves as more of the Project is completed. There is a slight decrease in benefit cost ratio from Package 4 to Package 5. This is due to the high cost to construct across Interstate 10, and the relatively small demand served for this Package.

5.1 Source and Availability of Recycled Water Supply

The source and availability of the recycled water supply for the Project is discussed in Section 2.1. In summary, recycled water for the Project will be obtained from LACSD's SJCWRP with point of connection to be supplied by the WNWRP, if necessary. Approximately 40,000 AF of recycled water produced at these facilities in 2011 was unused and LACSD is researching and identifying improvements that can make more recycled water available in the future. Although LACSD has contracts with other agencies that could allow those agencies to use a large portion of the currently unused recycled water it appears that many of these agencies will not utilize the water and LACSD has initiated discussions to reduce the amount of recycled water currently included in these contracts.

5.2 Demonstration of Customer Commitments

A Mandatory Use Ordinance requires property owners to utilize recycled water if the recycled water is economically feasible to the customer to purchase and meets the customer's water quality requirements. The goal of a Mandatory Use Ordinance is to maximize the use of recycled water in the State of California. Customers within the designated recycled water use areas are required to use recycled water.

USGVMWD has an existing Mandatory Use Ordinance for recycled water use ("Ordinance of the Upper San Gabriel Valley Municipal Water District Mandating the Use of Recycled Water", dated November 7, 2006). The Mandatory Use Ordinance, which is provided in Attachment 7, requires entities within USGVMWD's service area, including SGVWC and its customers, to use recycled water to the extent it is available at a reasonable cost.

SGVWC can request approval of a Mandatory Use Ordinance for recycled water through the CPUC. A draft mandatory use ordinance is provided in Attachment 8.

The City of El Monte has previously indicated potentially allowing SGVWC to serve recycled water to five (5) City of El Monte customers within the Project area, so it is anticipated the City of El Monte will be supportive of the Project.

In addition, the El Monte Union High School District has previously demonstrated support for the use of recycled water facilities (South El Monte High School is currently served recycled water through USGVMWD's existing Phase IIA recycled water project), so it is anticipated the District will be supportive of recycled water use at schools within its District that are in the Project area, including El Monte High School and Mountain View High School.

6.1 Marketing Incentives/Rate Discounts

In addition to the reliability incentive locally obtained recycled water provides, USGVWMD and SGVWC are encouraging use of recycled water by providing economic incentives to their customers. These incentives also help the end user overcome costs, which are typically funded by the end user.

SGVWC will retail recycled water to its customers at a rate of approximately $980 per AF based on SGVWC's Schedule No. LA-6 ("Recycled Water Metered Service") approved by the CPUC effective on July 25th, 2013. SGVWC typically retails potable water at a rate of approximately $1,151 per AF based on SGVWC's Schedule No. LA-1 ("General Metered Service") approved by the CPUC effective on July 25th, 2013. SGVWC's customers will receive a discount of approximately 15 percent through use of recycled water instead of potable water. As discussed previously, the City of El Monte currently sells potable water to its customers at approximately $780 per AF (based on its Tier 1 and Tier Water Consumption Charges). It is anticipated the rate SGVWC will charge recycled water customers in the City of El Monte will be adjusted to maintain a 15 percent discount when compared to the City of El Monte's potable water rate. The recycled water rate for customers in the City of El Monte will be presented to the CPUC for approval.

SECTION 7 – Public Grants and Loans

7.1 Public Grants and Loans

USGVMWD can pursue local, State and Federal funding opportunities in order to reduce costs associated with the Project, including capital and O&M costs. The proposed Project was recently submitted by the USGVMWD, in cooperation with SGVWC, as part of a planning process under the State Water Resources Control Board (SWRCB) Integrated Regional Water Management grant program (described below), as a first step in potentially becoming eligible for future SWRCB Proposition 84 funds and other funding programs.

A summary of available potential funding opportunities is provided below.

Local Funding Programs

- MWD Local Resources Program (LRP)
    - MWD's LRP provides funding of up to $250 per AF for new and expansion of existing recycled water projects. Public and private water utilities within MWD's service area can apply for LRP funding. However, LRP applications must be made through the applicant's respective MWD member agency

State Funding Programs

- CALFED Water Use Efficiency Grant Funding Opportunity
    - Under the USBR CALFED Water Use Efficiency Grant Funding Opportunity, entities receiving funding must provide at least 50-percent non-federal cost-shared funding.

- SWRCB Water Recycling Funding Program

    - Under the facilities planning grant program of the SWRCB Water Recycling Funding Program, grants for recycled water facilities planning studies will cover 50 percent of eligible costs up to $75,000

    - Under the construction funding program of the SWRCB Water Recycling Funding Program, construction grants for water recycling facilities are limited to 25 percent of the eligible construction cost of a proposed project or $5 million, whichever is less.

- SWRCB Proposition 84 - Integrated Regional Water Management Grant Program o For IRWM Implementation Grants, the minimum funding match is 25 percent. For IRWM implementation projects that address the needs of a disadvantaged community (DAC) and are seeking Proposition 84 funds, the funding match may be waived.

Federal Funding Programs

- USBR WaterSMART Title XVI Water Reclamation and Reuse Feasibility Studies Funding Opportunity
    - The USBR WaterSMART Title XVI Water Reclamation and Reuse Feasibility Studies Funding Opportunity will fund up to $150,000 per applicant. Applicants must provide at least 50 percent non-federal cost-shared funding for the feasibility study.

- USBR WaterSMART Water and Energy Efficiency Grant Funding Opportunity
    - Under the USBR WaterSMART Water and Energy Efficiency Grant Funding Opportunity, entities receiving study funding must provide at least 50-percent non-federal cost-shared funding.

- USBR WaterSMART Title XVI Water Reclamation and Reuse Program Construction Funding Opportunity

- Under the USBR WaterSMART Title XVI Water Reclamation and Reuse Program Construction Funding Opportunity, USBR provides up to 25% of project capital costs, with a limit of $4,000,000 per applicant.

7.2 Project Costs with Grant Funding

Due to the high capital cost for the Project, grant funds will likely be necessary to make each phase of the project feasible. For the purposes of this feasibility study we will assume various degrees of grant funding for the Project in order to understand the possible recycled water costs per AF as summarized in Table 7-1.

Table 7-1 Summary of Project Costs with Assumed Grant Funding

	Capital Cost	Amortized Capital Cost[1]	Annual O&M Cost[2]	Annual Recycled Water Purchase Cost[3]	Total Annual Cost	Cost (perAF)[4]
Without Grant Funding						
0%	$24,000,000	$1,561,235	$55,900	$198,445	$1,815,645	$3,248
Assumed Grant Funding (%)						
25%	$18,000,000	$1,170,926	$55,900	$198,445	$1,425,271	$2,550
40%	$14,400,000	$936,741	$55,900	$198,445	$1,191,086	$2,131
60%	$9,600,000	$624,494	$55,900	$198,445	$878,839	$1,573

Notes:

[1]Ammortized yearly payment at 5% over 30 years

[2]Approximately $100 per AF

[3]The proposed cost approximately $355 per AF in order to purchase recycled water from LACSD.

[4]Cumulative including previous Package Costs per total Converted usage

[5]Cost of the retrofits divided by the total 559 AFY

SECTION 8– PROJECT COSTS

8.1 Breakdown of Proposed Project Costs

As discussed in Section 3, the Capital Cost of the proposed Project is approximately $24 million and includes costs for recycled water pipelines, pump station, a reservoir, and customer retrofits. The estimated breakdown of costs for recycled water pipelines, pump station, and a reservoir are provided in Table 3-1. The estimated breakdown of cost for retrofits is provided in Table 3-2.

A breakdown of the estimated O&M and recycled water purchase costs is provided in Table 8-1. The costs shown are for each Project Package.

Table 8-1 Breakdown of Project O&M and Recycled Water Purchase Costs

	O&M Costs					Recycled Water Purchase Costs		Total Annual O&M and Recycled Water Purchase Costs[1]
	Unit Costs ($ per AF)							
	Energy	LACSD O&M	SGVWC O&M	Total O&M Unit Cost	Total Annual O&M Cost [1]	Unit Cost (per AF)	Annual Cost[1]	
Package 1 (83 AFY)	$40	$45	$15	$100	$8,300	**$355**	**$29,465**	**$37,765**
Package 2 (46 AFY)	$40	$45	$15	$100	$4,600	**$355**	**$20,930**	**$20,930**
Package 3 (72 AFY)	$40	$45	$15	$100	$7,200	**$355**	**$25,560**	**$32,760**
Package 4 (270 AFY)	$40	$45	$15	$100	$27,000	**$355**	**$95,850**	**$122,850**
Package 5 (88 AFY)	$40	$45	$15	$100	$8,800	**$355**	**$31,240**	**$40,040**
Total Project	**$40**	**$45**	**$15**	**$100**	**$55,900**	**$355**	**$198,445**	**$254,345**

Notes:

[1]Based on Total Project recycled water deliveries of 559 AFY

8.2 Breakdown of Proposed Project Components to be funded by Public Grants

As described in Section 7.1, USGVMWD can pursue local, State and Federal funding opportunities in order to reduce costs associated with the Project, including Capital and O&M costs. Available USBR and SWRCB funding would be applied to the Capital Cost components of the Project (pipeline, reservoir, and pump station). Available MWD funding would be applied to the O&M cost component of the Project (recycled water purchase and O&M costs). Customer retrofit construction costs cannot be funded using Public monies.

8.3 One time and Ongoing Expenses

A breakdown of the Capital, O&M, and recycled water purchase costs is presented in Section 8.1. Administrative and general expenses may also be required for the Project. Although those costs have not been estimated at this time, they are anticipated to be minor.

SECTION 9 – ENVIRONMENTAL REVIEW, PERMITS AND CERTIFICATIONS

9.1 CEQA/NEPA Compliance

The California Environmental Quality Act (CEQA) / National Environmental Policy Act (NEPA) both require that the potential environmental impacts of a proposed project be assessed, quantified, disclosed, minimized, and eliminated whenever possible. The CEQA/NEPA evaluation and compliance process has not been initiated for the Project at this time. The CEQA/NEPA process will begin with the preparation of an Initial Study (IS) of the potential environmental impacts of the Project which will provide the information needed to determine whether a negative declaration, mitigated negative declaration, or Environmental Impact Report (EIR) and Environmental Impact Statement (EIS) under NEPA is required. Environmental Compliance will be initiated following compliance of the Feasibility Study and authorization for the Project to proceed.

SGVWC will work with an appropriate public lead agency (e.g. California Department of Public Health or City) to insure compliance with CEQA.

Potential environmental impacts that have tentatively been identified and should be considered in the initial study include:

- Construction activity for crossing the San Gabriel River (a water of the United States)
- Construction related noise that may impact sensitive wildlife species, particularly adjacent to the San Gabriel River and in the Whittier Narrows area.
- Excavation activities that may impact historical properties, including archaeological sites.
- Construction activities that would generate air emissions.

9.2 Required Permits / Certifications

It is anticipated the following regulatory permits and requirements will be associated with the proposed Project:

- CEQA/NEPA (as discussed in Section 9.1)
- The Clean Water Act (CWA) Section 404: CWA Section 404 enables the U.S. Army Corps of Engineers (USACE) to grant permits for certain activities within waterways and wetlands.
- California Department of Fish and Wildlife – Project consultation and review
- U.S Fish and Wildlife – Project consultation and review
- Bureau of Indian Affairs – Project consultation and review.
- Los Angeles County Department of Public Works (Los Angeles County Flood Control District) encroachment permit
- Los Angeles Department of Water and Power encroachment permit
- Caltrans plan review and encroachment permit (605 Freeway and 60 Freeway)
- California Department of Public Health plan review
- Regional Water Quality Control Board – Los Angeles Region Title 22 Engineering Report
- Los Angeles County Department of Public Health customer retrofit plan review
- Los Angeles County Sanitation District plan review (point of connection at SJCWRP)
- Southern California Edison encroachment permit and plan review
- City of South El Monte encroachment permit and plan review
- City of El Monte encroachment permit and plan review
- City of Pico Rivera encroachment permit and plan review
- City of Industry encroachment permit and plan review

<u>Rose Hills Memorial Park and Cemetery</u>

<u>Recycled Water Evaluation for Phase 2</u>

<u>Letter Report</u>

February 2013

Phoenix Civil Engineering, Inc.

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DRAFT

Mr. Reymundo Trejo February 11, 2013
Assistant General Manager and Chief Engineer
Upper San Gabriel Valley Municipal Water District
602 E. Huntington Drive, Suite B
Monrovia, CA 91016

Rose Hills Memorial Park and Cemetery – Recycled Water Evaluation for Phase 2

Dear Mr. Trejo:

This letter report provides a historical project background of the recycled water program that supplies Rose Hills. The letter report provides four recommended alternatives in order to increase the usage of recycled water at Rose Hills Memorial Park and Mortuary (Rose Hills). Finally in support of Alternatives No. 1 through No. 4, Alternative No. 5 and Alternative No. 6 were developed for the hose bib recycled water retrofit conversion of Gates 14 through 20 in order to obtain California Department of Public Health and County of Los Angeles Department of Public Health approval. This letter report provides an opinion of probable construction cost (OPCC) for the Alternatives No. 1 through No. 5 as well as hose bib recycled water retrofit conversion. The Site Overview figure provides an overall aerial view of the potential project site and the recycled water infrastructure in place currently supplying Rose Hills with recycled water for irrigation purposes. This existing infrastructure is part of Alternative No. 4 – Existing Condition.

Historical Project Background

Los Angeles County Sanitation District and Rose Hills:

In September 1992, the Los Angeles County Sanitation District (LACSD) and Rose Hills entered into an agreement with no sunset clause to which LACSD will sell recycled water to Rose Hills for non-potable use in lieu of groundwater or potable water usage. Two other highlights from the Agreement include:

- LACSD will coordinate with Rose Hills to store recycled water via a series of two reservoirs (Tank 10 and Tank 11) on Rose Hills property for use at LACSD Puente Hills Landfill site; and
- Rose Hills secured an entitlement of 3,200 acre-feet per year of the recycled water produced at San Jose Creek Water Reclamation Plant (SJCWRP).

Currently, Rose Hills is utilizing approximately 600 acre-feet per year (AFY) at an approximate usage rate cost of $180 per AF. However, due to the take or pay clause of the current Agreement, Rose Hills is required to purchase 50 AFY in addition to the current 600 AFY they currently purchase. Due to this take or pay clause, Rose Hills is currently purchasing approximately 1,100 AFY(600 AFY currently utilized and 500 AFY not utilized but required to be purchased due to the Agreement. . Based on this, the cost to Rose Hills to purchase recycled water from LACSD will be approximately $234,000 in fiscal year 2011-2012.

LACSD and San Gabriel Valley Water Company (SGVWC) have a separate agreement which allows LACSD to sell recycled water directly to Rose Hills and does not violate the services duplication act as the Rose Hills facility is within the SGVWC service area.

Refer to Attachment No. 1 for the LACSD/Rose Hills Agreement and the Site Overview figure for the general location of the existing recycled water transmission pipelines and reservoir specific to this system.

Upper San Gabriel Valley Municipal Water District, Central Basin Municipal Water District, San Gabriel Valley Water Company, and Rose Hills:

In June 2001, Upper San Gabriel Valley Municipal Water District (USGVMWD) and Central Basin Municipal Water District (CBMWD) executed an agreement which outlines the wholesale recycled water purchase agreement specifically dealing supplying recycled water to Rose Hills and other recycled water customers in the vicinity of Rose Hills. In this agreement, USGVMWD purchases recycled water from CBMWD at the CBMWD prevailing declining block rate plus a prevailing out of service area charge which is tiered at less than 50 AF and more than 50 AF. Currently, the prevailing declining block rate is $558/AF including a prevailing out of service area charge of $22/AF for the first 50 AF and $488/AF including the prevailing out of service area charge of $21/AF. For ease of calculations purposes, this letter report will utilize the prevailing declining block rate of $558/AF which includes the prevailing out of service area charge of $22/AF. Per the agreement, CBMWD provides a $180/AF credit to USGVMWD so the cost of the recycled water is $558/AF - $180/AF = $378/AF.

In June 2002, USGVMWD, Rose Hills and SGVWC entered into a three party agreement sometimes referred to as the Main Agreement. In that agreement, USGVMWD is to provide recycled water at a wholesale rate of $175/AF to SGVWC and then SGVWC is to provide recycled water at a retail rate of $266/AF to Rose Hills and other recycled water customers in the vicinity of Rose Hills. This recycled water is for non-potable use in lieu of potable water and groundwater use. The Main Agreement expires in 2017.

In June 2002, USGVMWD and SGVWC entered into a separate agreement which outlines the wholesale and retail recycled water purchase agreement as well as the operational and maintenance of the recycled water distribution system that supplies recycled water to Rose Hills and other recycled water customers in the vicinity of Rose Hills.

Refer to Attachment No. 2 for the USGVMWD/CBMWD agreement, Attachment No. 3 for the USGVMWD/SGVWC/Rose Hills agreement and Attachment No. 4 for the USGVMWD/SGVWC agreement. Refer to Figure 3 for the general location of the recycled water transmission system specific to this system.

Currently, Rose Hills is utilizing 565 AFY on a five year average with the cost of recycled water at $266 per AF. The cost to Rose Hills to purchase recycled water from SGVWC has been $150,290 per year based on the average usage.

San Gabriel Valley Water Company and Rose Hills:

On an annual basis, Rose Hills leases unused groundwater capacity to SGVWC. This groundwater is leased at 90% of the Metropolitan Water District (MWD) replenishment rate. The current MWD replenishment rate is $640/AF and at 90% of that cost equates to $576/AF. Rose Hills has the rights to 1,787 AF of groundwater and for fiscal year 2011-2012 SGVWC leased 1,500 AFY. Based on the 2011-

2012 fiscal year groundwater lease, Rose Hills has realized approximately $864,000 in groundwater leased sales.

Existing Recycled Water System

As part of the scope of services, Phoenix Civil Engineering, Inc. (Phoenix) conducted a field visit of the Rose Hills facility and conducted a series of meetings with representatives of the agencies involved in different water agreements including Upper District, Rose Hills, SGVWC and LACSD. Based on the field visits at the Rose Hills facility and historical document review, the following existing conditions are understood:

- LACSD is providing Rose Hills with recycled supply water that is supplying the irrigation demands east of Sky Chapel via Tank 10 and Tank 11.
- USGVMWD in conjunction with SGVWC is providing Rose Hills with recycled water that is supplying the irrigation demands west of Sky Chapel (Area 1 on the Alternative No. 4 figure entitled Site Overview) via Tank 4, Tank 6, Tank 8 and Tank 9.
- All the hose bibs via Gate 1 are utilizing potable water retailed to Rose Hills by SGVWC.
- All the hose bibs via Gates 8 through 12 are utilizing potable water retailed to Rose Hills by SGVWC (Area 2 on the Alternative No. 4 figure entitled Site Overview).
- All the hose bibs via Gates 14 through 20 are utilizing groundwater supplied by Rose Hills via existing groundwater rights.

Recommendations

As part of the scope of services, Phoenix will provide an opinion of probable construction cost (OPCC) for the following alternatives:

Alternative No. 1 - Modification to Rose Hills System
Alternative No. 2 - Connection to LACSD
Alternative No. 3 - Connection to LACSD via 0.65 MG Tank
Alternative No. 4 - Existing Condition
Alternative No. 5 - Hose Bib Retrofit with New Potable Water Distribution System
Alternative No. 6 - Hose Bib Retrofit in Accordance with Proposed CDPH Water Policy

All of the six (6) alternatives have an OPCC based upon 2011 Engineering News-Record construction costs with labor rates from Los Angeles County as well as 2012 construction costs for similar projects completed in Los Angeles County.

Alternative No. 1 – Modification to Rose Hills System

Alternative No. 1 involves the least amount of design and construction efforts and is considered a relatively simple and least costly solution when compared to Alternative No. 2 and Alternative No. 3. In addition, Alternative No. 1 is fiscally prudent when compared to Alternative No. 4 which is the Existing Condition alternative. Alternative No. 1 includes the following improvements:

- Installation of a new 12-inch diameter pipeline to connect Tank No. 9 to Tank No. 10;
- Modification of the recycled water pipeline by installing a new gate valve in Workman Mill Road just south of Mill Elementary School
- Modification to the pump station located at Tank 4;
- Installation of four (4) altitude valves on the inlet piping to Tank 4, Tank 6, Tank 8 and Tank 9; and
- Disconnection, removal of the 16-inch diameter meter connection and installation of blind flanges on the pipeline at Strong Avenue and Pioneer Blvd.

Alternative No. 1 assumes that this construction will be conducted within the next twelve (12) months sufficiently before the expiration of the Main Agreement. The preliminary opinion of probable construction cost for this alternative is estimated at $154,000. Please refer to **Table 1** for a breakdown of Alternative No. 1 and Figure No. 1 for the modifications at Tank No. 9.

Table 1: Alternative No. 1 – Modification to Rose Hills System
Opinion of Probable Construction Cost

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization/Demobilization	1	LS	$10,000	$10,000
2	New 12-inch Diameter Pipeline	100	LF	180	$18,000
3	Workman Mill Pipeline Modification	1	LS	$5,000	$5,000
4	Misc. Metal, Concrete and Landscaping	1	LS	$2,500	$2,500
5	Tank Altitude Valves	4	EA	$10,000	$40,000
6	CBMWD Meter Removal	1	LS	$7,500	$7,500
7	Tank #4 Pump Station Modification	1	LS	$15,000	$15,000
	Subtotal				$98,000
	Contingency	15%			$15,000
	Tax Overhead/Profit/Bonds/Insurance(3)	15%			$15,000
	Subtotal				$128,000
	Engineering Fee (Design and CM Services)	20%			$25,600
	Total(1)				**$154,000**

Notes:
1. Rounded to the nearest 1,000
2. Labor rates per CA DIR Rates for Los Angeles County.
3. Contractor’s overhead and profit estimated to be 15% of project construction cost. Costs associated with insurance, bonds, etc., are included in that value.

Alternative No. 2 – Connection to LACSD

The Alternative No. 2 concept was identified in 1999, but LACSD suggested USGVMWD move forward with the project supplying recycled water to Rose Hills in conjunction with CBMWD. LACSD based this suggestion on future capacity commitment to the Puente Hills Landfill Pump Station No. 1 for Puente Hills Landfill system. However, in recent discussions with LACSD staff the concept of extending the recycled water pipeline from the current termination at Workman Mill Road and Peck Avenue further northeast within Workman Mill Road to the Puente Hills Landfill Pump Station No. 1 was considered a feasible alternative for USGVMWD to evaluate. This alternative has higher construction costs than Alternative No. 1and includes modifications to the existing pipeline in Workman Mill Road south of Mill Elementary School. Alternative No. 2 includes the following:

- Modification of the Puente Hills Pump Station including the installation of a dedicated vertical turbine pump and motor, valves, electrical and instrumentation and controls;
- Installation of approximately 4,000 feet of new 16-inch diameter pipeline including a crossing of the tunnel for LACSD's Puente Hills Intermodal Facility;
- Modification of the recycled water pipeline by installing a new gate valve in Workman Mill Road just south of Mill Elementary School; and
- Disconnection, removal of the 16-inch diameter meter connection and installation of blind flanges on the pipeline at Strong Avenue and Pioneer Blvd.

Alternative No. 2 significantly increases the project pipeline installation requirements along Workman Mill Road and requires modifications to the Puente Hills Pump Station. The pump station modifications are because the existing pump station is a closed looped system that will not function correctly with the connection to the USGVMWD open looped system. The preliminary opinion of probable construction cost is estimated at $1,625,000 for this alternative. Please see **Table 2** for a breakdown of Alternative No. 2 and Figure No. 2 for the connection to LACSD.

Table 2: Alternative No. 2 – Connection to LACSD
Opinion of Probable Construction Cost

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization/Demobilization	1	LS	$10,000	$10,000
2	Pump Station Modification	1	LS	$55,000	$55,000
3	New 16-inch Pipeline	4,000	LF	$240	$960,000
4	Workman Mill Pipeline Modification	1	LS	$5,000	$10,000
5	CBMWD Meter Removal	1	LS	$7,500	$7,500
	Subtotal				$1,042,500
	Contingency	15%			$156,000
	Tax Overhead/Profit/Bonds/Insurance[3]	15%			$156,000
	Subtotal				$1,354,500
	Engineering Fee (Design and CM Services)	20%			$270,900
	Total[1]				**$1,625,000**

Notes:
1. Rounded to the nearest 1,000
2. 2. Labor rates per CA DIR Rates for Los Angeles County.
3. Contractor's overhead and profit estimated to be 15% of project construction cost. Costs associated with insurance, bonds, etc., are included in that value.

Alternative No. 3 – Connection to LACSD via 0.65 MG Tank

Alternative No. 3 is a modification to Alternative No. 2. This alternative does not require any modification to the Puente Hills Pump Station. This is accomplished by connecting to the 0.65 MG tank that is a part of the Puente Hills Landfill irrigation system. This will allow Rose Hills and the other customers (Mill Elementary School, Rio Hondo College and Gateway Pointe) to be served recycled water without any additional pumping. This is because the LACSD Puente Hills Landfill Pump Station No. 1 will supply the existing 0.65 MG irrigation tank and the elevation of the tank will not require additional pumping at the proposed point of connection to supply Alternative No. 3. For purposes of this analysis, it is assumed that a pipeline route can be achieved from the 0.65 MG irrigation tank to the point of connection at Workman Mill Road. While Alternative No. 3 has increased improvement costs when compared to Alternative No. 2, depending on the selected pipeline alignment the construction cost may decrease. Additionally, Alternative No. 3 will have a lower operation and maintenance costs versus Alternative No. 2 because of the elimination of power costs associated with the Puente Hills Landfill Pump Station No. 1. Alternative No. 3 will incorporate the following improvements:

- Installation of approximately 4,300 feet of new 16-inch diameter pipeline from the 0.65 MG tank through the northern property of Rio Hondo College to Workman Mill Road;
- Modification of the recycled water pipeline by installing a new gate valve in Workman Mill Road just south of Mill Elementary School; and
- Disconnection, removal of the 16-inch diameter meter connection and installation of blind flanges on the pipeline at Strong Avenue and Pioneer Blvd.

Alternative No. 3 assumes no improvements to the Puente Hills Landfill roads (i.e. replace in kind with no improvements). The preliminary construction and engineering cost opinion is estimated at $1,676,000 for this alternative. Please see the below **Table 3** for a breakdown of Alternative No. 3 and Figure No. 3 for the connection to LACSD via the 0.65 MG Reservoir.

Table 3: Alternative No. 3 – Connection to LACSD via 0.65 MG Reservoir
Opinion of Probable Construction Cost

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization/Demobilization	1	LS	$10,000	$10,000
2	Pump Station Modification	1	LS	$15,000	$15,000
3	New 16-inch Pipeline	4,300	LF	$240	$1,032,000
4	Workman Mill Pipeline Modification	1	LS	$10,000	$10,000
5	CBMWD Meter Removal	1	LS	$7,500	$7,500
	Subtotal				$1,074,500
	Contingency	15%			$161,000
	Tax Overhead/Profit/Bonds/Insurance(3)	15%			$161,000
	Subtotal				$1,396,500
	Engineering Fee (Design and CM Services)	20%			$279,300
	Total(1)				**$1,676,000**

Notes:
1. Rounded to the nearest 1,000
2. Labor rates per CA DIR Rates for Los Angeles County.
3. Contractor's overhead and profit estimated to be 15% of project construction cost. Costs associated with insurance, bonds, etc., are included in that value.

Alternative No. 4 – Existing Condition

Alternative No. 4 is the existing condition where no modifications are made to the existing recycled water system. USGVMWD would continue purchasing recycled water from CBMWD and providing the recycled water to SGVWC at the agreed upon wholesale rate until the expiration of the Main Agreement. This alternative will involve the following:

- Purchase recycled water from CBMWD;
- Operations and Maintenance costs for the recycled water system via SGVWC; and
- Sell the recycled water at the wholesale rate to SGVWC.

Alternative No. 4 provides the base cost to USVMWD for the next five years (calendar year 2013 through 2017). The preliminary operating costs are estimated at $615,000 for this alternative. Please see **Table 4** for a breakdown of Alternative No. 4 and refer to the Site Overview figure for the existing recycled water infrastructure.

Table 4: Alternative No. 4 – Status Quo
Opinion of Probable Construction Cost

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Purchase of RW from CBMWD	565	LS	$378	$213,570
2	Operation and Maintenance Cost	565	LS	$15	$8,475
	Subtotal				$222,045
3	Wholesale of RW to SGVWC	565	LS	$175	($98,875)
	Subtotal(1)				$123,000
	Five Additional Year Operation	**Total(1)**			**$615,000**

Notes:

1. Rounded to the nearest 1,000
2. Labor rates per CA DIR Rates for Los Angeles County.
3. Contractor's overhead and profit estimated to be 15% of project construction cost. Costs associated with insurance, bonds, etc., are included in that value.

Hose Bib Retrofit of Gates 14 through 20

The purpose of this section is to present Alternative No. 5 and Alternative No. 6 to convert the remaining hose bibs at Gates 14 through 20 at Rose Hills to allow irrigation with recycled water. Alternative No. 5 installs a new dedicated potable water distribution system to supply the hose bibs and the existing irrigation system will be supplied with recycled water. Alternative No. 6 maintains the existing hose bib connections to the irrigation system and converts the system from groundwater to recycled water via a proposed State of California Department of Public Health (CDPH) water policy which will allow the use of hose bibs on a recycled water system (not allowed based on existing Title 22 regulations).

Alternative No. 5 – Hose Bib Retrofit with New Potable Water Distribution System

Alternative No. 5 involves the conversion of the remaining hose bibs within Gates 14 through 20. The conversion process will include the design and installation of a dedicated potable water distribution system to supply the hose bibs within these Gates in accordance with the State of California Department of Public Health regulations as defined in Title 22 of the California Administrative Code. In addition, the potable water will supply Hillside Church Gardens and the visitors information booth/restrooms located near the entrance at Gate 17. Once converted, all potential recycled water use in the project area would be for irrigation purposes only. This is acceptable to Rose Hills (the end use customer) and the County of Los Angeles Department of Public Health who is responsible for the permitting and cross connection conversions within these Gates. Alternative No. 5 will incorporate the following improvements:

- Modifications to the SGVWC potable water pipeline and infrastructure in Workman Mill Road
- Installation of approximately 3,040 feet of new 2-inch diameter pipeline within the Gates 14 and 15 area;
- Installation of approximately 5,700 feet of new 2-inch and 4-inch diameter pipelines within Gate 17 (System 17A) to serve elevations below 435 feet;
- Installation of approximately 8,200 feet of new 2-inch and 4-inch diameter pipelines within Gate 17 (System 17B) to serve elevations 435 to 680 feet;
- Installation of approximately 5,200 feet of new 2-inch and 4-inch diameter pipelines within Gate 17 (System 17C) to serve elevations above 680 feet;
- Installation of a 10,000 gallon tank and associated booster pump station to supply the proposed potable water hose bib system above elevation 680 feet;
- Disconnection and removal of approximately 150 hose bibs connected to the existing irrigation sprinkler risers. The sprinklers will be connected to the recycled water system; and
- Installation of the required identification requirements on the hose bibs, valve boxes, pipelines, signs, quick couplers as well as providing the necessary coordination required for the preliminary and final cross connection testing after conversion of the irrigation system to recycled water.

Alternative No.5 assumes no improvements to the Rose Hills roads beyond those areas affected by construction. The preliminary construction and engineering cost opinion is estimated at $1,728,000 for this alternative. Please refer to **Table 5** for a breakdown of Alternative No. 5 and Figure No. 4 for the hose bib retrofit and proposed potable water distribution system.

Table 5: Alternative No. 5 – Hose Bib Retrofit with Proposed Potable Water System Opinion of Probable Construction Cost

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization/Demobilization	1	LS	$10,000	$10,000
2	SGVWC Infrastructure Improvements	1	LS	$12,000	$12,000
3	Gates 14/15 New 2-inch pipeline	3,040	LF	$35	$106,400
4	Gate 17 (Below Elev. 435) – New 2" & 4" pipeline	5,700	LF	$48	$273,600
5	Gate 17 (Elev. 435 to 680) – New 2" & 4" pipeline	8,200	LF	$48	$393,600
6	Gate 17 (Above Elev. 680) – New 2" & 4" pipeline	5,200	LF	$48	$249,600
7	Disconnect and remove hose bibs	150	EA	$50	$7,500
8	Reservoir (10,000 gallons) and pump station	1	LS	$25,000	$25,000
9	LACDPH Identification Requirements	1	LS	$30,000	$30,000
	Subtotal				$1,107,700
	Contingency	15%			$166,000
	Tax Overhead/Profit/Bonds/Insurance(3)	15%			$166,000
	Subtotal				$1,439,700
	Engineering Fee (Design and CM Services)	20%			$287,940
	Total(1)				**$1,728,000**

Notes:

1. Rounded to the nearest 1,000
2. Labor rates per CA DIR Rates for Los Angeles County.
3. Contractor's overhead and profit estimated to be 15% of project construction cost. Costs associated with insurance, bonds, etc., are included in that value.

Alternative No. 6 – Hose Bib Retrofit in Accordance with Proposed CDPH Water Policy

This Alternative No.6 includes the conversion of the remaining hose bibs within Gates 14 through 20. This conversion process will retain the current hose bibs connected to the irrigation system. The existing irrigation system will be converted to Title 22 quality recycled water. Alternative 6 is different than Alternative No. 5 because Alternative No. 6 will not require design and installation of a dedicated potable water hose bib system to supply the hose bibs within these Gates in accordance with the State of California Department of Public Health as defined in Title 22 of the California Administrative Code. This alternative assumes that Title 22 is amended to allow this type of use/connection.

Alternative No. 6 will require the design and installation of two potable water pipelines to supply Hillside Church Gardens and the visitor's information booth/restrooms located near the entrance at Gate 17. All potential recycled water use in the project area would be for irrigation and hose bib supply only which is acceptable to Rose Hills. Alternative No. 6 will incorporate the following improvements:

- Modifications to SGVWC potable water pipeline and infrastructure in Workman Mill Road;
- Installation of approximately 1,000 feet of a proposed 2-inch diameter pipeline to supply Hillside Church Gardens;
- Installation of approximately 1,200 feet of a proposed 2-inch diameter pipeline to supply the visitors/information center at Gate 17; and
- Installation of the required identification requirements on the hose bibs, valve boxes, pipelines, signs, and quick couplers as well as provide the necessary coordination required for the preliminary and final cross connection testing after conversion of the system.

Alternative No.6 assumes no improvement to the Rose Hills roads beyond those areas affected by construction. The preliminary construction and engineering cost opinion is estimated at $200,000 for this alternative. Please see the below **Table 6** for a breakdown of Alternative No. 6.

Table 6: Alternative No. 6 – Hose Bib Retrofit with New CDPH Water Policy
Opinion of Probable Construction Cost

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization/Demobilization	1	LS	$10,000	$10,000
2	SGVWC Infrastructure Improvements	1	LS	$12,000	$12,000
3	New 2-inch pipeline to Hillside Church Chapel	1,000	LF	$35	$35,000
4	New 2-inch Pipeline to visitor booth & restrooms	1,200	LF	$35	$42,000
5	LACDPH Identification Requirements	1	LS	$30,000	$30,000
	Subtotal				$129,000
	Contingency	15%			$19,000
	Tax Overhead/Profit/Bonds/Insurance(3)	15%			$19,000
	Subtotal				$167,000
	Engineering Fee (Design and CM Services)	20%			$33,400
	Total(1)				**$200,000**

Notes:
1. Rounded to the nearest 1,000
2. Labor rates per CA DIR Rates for Los Angeles County.
3. Contractor's overhead and profit estimated to be 15% of project construction cost. Costs associated with insurance, bonds, etc., are included in that value.

Conclusion

Existing Recycled Water System

The original USGVMWD project supplied recycled water for irrigation purposes for the Rose Hills facility that is not already provided recycled water by LACSD. However after reviewing the existing LACSD/Rose Hills agreement (Attachment 1) and USGVMWD/SGVWC/Rose Hills agreement (Attachment 3) it is clear that it is in the best interest of Rose Hills, LACSD, SGVWC and USGVMWD to move forward with Alternative No. 1 as this is a fiscally incentivized recycled water supply solution within the USGVMWD service area. Alternative No. 1 has the following benefits:

1. Utilization of additional recycled water at the Rose Hills facility which is a benefit to Rose Hills, LACSD, SGVWC and USGVMWD;

2. Financially prudent for Rose Hills (eliminates paying approximately $90,000 for recycled water not utilized for irrigation purposes via the LACSD agreement);

3. Financially prudent for USGVMWD (saves approximately $203/AF from calendar year 2013 through the expiration of the USGVMWD/SGVWC/Rose Hills agreement (Year 2017) then will save $383/AF after expiration of the agreement in 2017); and

4. Allows Rose Hills to lease its additional groundwater rights not being used to prospective water agencies typically this has been to SGVWC. This is potentially an additional 787 AFY (approximately $453,000 per year for Rose Hills).

Hose Bib Retrofit of Gates 14 through 20

The recommended Alternative No. 1 should be merged with the hose bib retrofit for Gates 14 through 20 which is either Alternative No. 5 (significant potable water infrastructure) or Alternative No. 6 (legislation changes to modify Title 22).

After reviewing Attachment No. 1, it is clear that it is in the best interest of Rose Hills, LACSD, SGVWC and USGVMWD to move forward with Alternative No. 5 as this is fiscally incentivized recycled water supply solution in combination with recycled water supplied from LACSD. Alternative No. 5 which involves the installation of a new potable water system to supply the hose bib system in order to comply with Title 22 will immediately, after construction is completed, allow recycled water to be utilized not only within Gates 14 through 20 but also Gates 8 through 12 which have been previous retrofitted in 2002. Alternative No. 5 is worth pursuing because it is:

1. While substantially higher fiscal impact when compared to Alternative No. 6 this alternative keeps the cost of recycled water from LACSD lower during the period of capital cost reimbursement outlined in Agreement No. 1;

2. Once completed allows the immediate leasing of unutilized groundwater to SGVWC;

3. Minimizes CDPH issues at Rose Hills as it will comply with Title 22;

4. Potentially can be approved sooner than the legislative change linked to of Alternative No. 6; and

5. Provides required potable water improvements to the Rose Hills facilities.

Sincerely,

______________________________ ______________________

Jon Turner, PE
Principal Engineer

John Robinson
Consultant

Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District

March, 2007

Robert C. Wilkinson, Ph.D.

Energy Intensity of Water Supplies for West Basin Municipal Water District

	af/yr	Percentage of Total Source Type	kWh/af Conveyance Pumping	kWh/af MWD Treatment	kWh/af Recycled Treatment	kWh/af Groundwater Pumping	kWh/af Groundwater Treatment	kWh/af Desalination	kWh/af WBMWD Distribution	Total kWh/af	Total kWh/year
Imported Deliveries											
State Water Project (SWP) [1]	57,559	43%	3,000	44	NA	NA	NA	NA	0	3,044	175,209,596
Colorado River Aqueduct (CRA) [1] (other that replenishment water)	76,300	57%	2,000	44	NA	NA	NA	NA	0	2,044	155,957,200
Groundwater[2]											
natural recharge	19,720	40%	NA	NA	NA	350	0	NA	0	350	6,902,030
replenished with (injected) SWP water [1]	9,367	19%	3,000	44	NA	350	0	NA	0	3,394	31,791,598
replenished with (injected) CRA water [1]	11,831	24%	2,000	44	NA	350	0	NA	0	2,394	28,323,432
replenished with (injected) recycled water	8,381	17%	205	0	790	350	0	NA	220	1,565	13,116,278
Recycled Water											
West Basin Treatment, Title 22	21,506	60%	205	NA	0	NA	NA	NA	285	490	10,537,940
West Basin Treatment, RO	14,337	40%	205	NA	790	NA	NA	NA	285	1,280	18,351,360
	35,843										
Ocean Desalination	20,000	100%	200	NA	NA	NA	NA	3,027	460	3,687	82,588,800

Notes:

NA Not applicable

1 Imported water based on percentage of CRA and SWP water MWD received, averaged over an 11-year period. Note that the figures for imports do not include an accounting for system losses due to evaporation and other factors. These losses clearly exist, and an estimate of 5% or more may be reasonable. The figures for imports above should therefore be understood to be conservative (that is, the actual energy intensity is in fact higher for imported supplies than indicated by the figures).

2 Groundwater values include entire basin, West Basin service area covers approximately 86% of the basin. Groundwater values are specific to aquifer characteristics, including depth, within the basin.

Groundwater Assessment Study

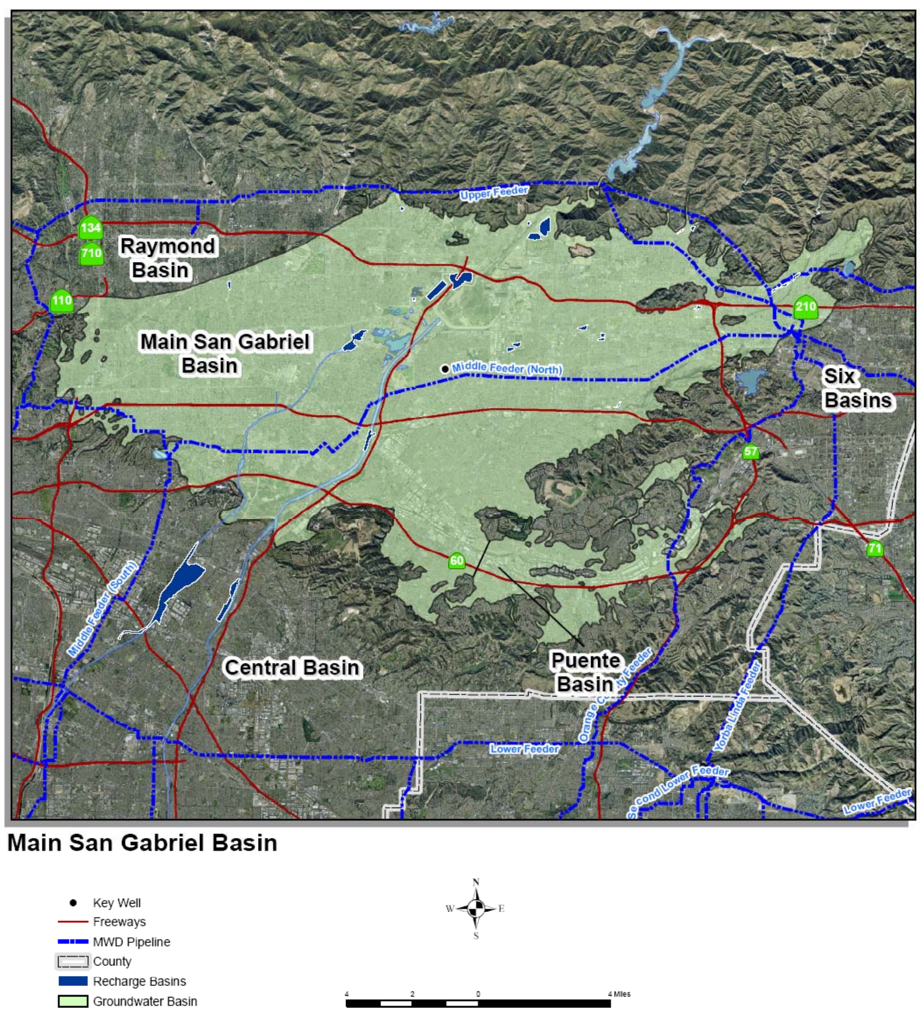
A Status Report on the Use of Groundwater in the Service Area of the Metropolitan Water District of Southern California

Report Number 1308

September 2007

The Main San Gabriel and Puente Basins lie in eastern Los Angeles County, California. The hydrologic basin or watershed coincides with a portion of the upper San Gabriel River watershed, and the aquifer or groundwater basin underlies most of the San Gabriel Valley. Metropolitan member agencies overlying the Main San Gabriel Basin (or Main Basin) include: Upper San Gabriel Municipal Water District (Upper District), Three Valleys Municipal Water District (Three Valleys) and the City of San Marino. The service areas of three member agencies (cities of Azusa, Alhambra and Monterey Park) of the State Water Project contractor, San Gabriel Valley Municipal Water District (SGVMWD), also overlie the Main San Gabriel Basin. The Metropolitan member agency overlying the Puente Basin is Three Valleys. Overlying communities include: Arcadia, Azusa, Baldwin Park, Bradbury, Covina, Duarte, El Monte, Glendora, Industry, Irwindale, La Puente, Monrovia, Rosemead, San Gabriel, San Marino, South El Monte, South Pasadena, Temple City, Walnut, and West Covina. A map of the Main San Gabriel and Puente Basins is provided in **Figure 7-1**.

Figure 7-1
Map of the Main San Gabriel and Puente Basins



BASIN CHARACTERIZATION

The following section provides a physical description of the Main San Gabriel and Puente Basins including geographic location and hydrogeologic character.

Basin Producing Zones and Storage Capacity

The Main San Gabriel and Puente Basins are bounded by the San Gabriel Mountains to the north, San Jose Hills to the east, Puente Hills to the south, and by a series of hills and the Raymond Fault to the west. The watershed is drained by the San Gabriel River and Rio Hondo, a tributary of the Los Angeles River.

The physical groundwater basin is divided into two main parts, the Main Basin and the Puente Basin. The Puente Basin, lying in the southeast portion of the map above, is tributary to the Main Basin and hydraulically connected to it, with no barriers to groundwater movement. Each basin is separately adjudicated and managed by a watermaster. **Table 7-1** provides a summary of the hydrogeologic parameters of the Main San Gabriel and Puente Basins. Each basin is discussed separately in the following section.

Table 7-1
Summary of Hydrogeologic Parameters of Main San Gabriel and Puente Basins

Parameter	Main San Gabriel Basin	Puente Basin
Structure		
Aquifer(s)	Unconfined	Unconfined
Depth of groundwater basin	800 to 1,600 feet MSL	25 to 1,300 feet
Thickness of water-bearing units	300 to 2,000 feet	70 to 200 feet
Yield and Storage		
Natural Safe Yield	152,700 AFY	4,400 AFY
Operating Yield	FY 2005/06: 240,000 AFY	FY 2006/07: 1,530 AFY
Total Storage	8.6 million AF	979,650 AF
Unused Storage Space	~500,000 AF	Unknown
Portion of Unused Storage Available for Storage (in 2005/06)	None	Unknown

Sources: Stetson, 2006 and Main San Gabriel Basin Watermaster, 2006
Puente Basin Watermaster, 2006; Ecological Systems Corporation, 1975; Geotechnical Consultants, Inc, 1979; CH2MHill, 1997. Main San Gabriel Basin

Main San Gabriel Basin

The Main San Gabriel Basin occupies most of the San Gabriel Valley and encompasses a surface area of more than 73,000 acres. Principal water-bearing formations of the Main Basin are unconsolidated and semi-consolidated unconfined alluvial sediments that range in size from coarse gravel to fine-grained sands. Total thickness of water-bearing sediments ranges from about 300 feet to more than 2,000 feet (Stetson, 2006).

The total amount of water in storage for the Main San Gabriel Basin is approximately 8.6 million AF (Main San Gabriel Watermaster, 2006b). Usable storage within the operating range is approximately 800,000 AF while the unused storage space is about 500,000 AF (Stetson, 2006). Supplemental imported water cannot be stored in the Main San Gabriel Basin when the groundwater elevation at the key well exceeds 250 feet MSL. Water levels at this time are near or above the target level. Therefore, available storage space for supplemental water is currently limited.

Puente Basin

The Puente Basin occupies the western end of the San Jose Valley and contains nearly 8,870 acres. For the most part, the basin is relatively shallow, and in several locations, bedrock is found at the surface. Boundaries of the Puente Basin are formed on the north and south by the nonwater-bearing rocks of the San Jose and Puente Hills. The eastern boundary is contiguous with the western boundary of the Spadra Basin and is defined by a bedrock ridge and groundwater divide. As discussed above, the Puente Basin is bounded by the Main San Gabriel Basin to the west. Groundwater freely flows from the Puente Basin into the Main San Gabriel Basin. (Engineering Science, Inc, 1979).

Primary water-bearing sediments include weathered alluvium from the adjacent hills and recent deposits within San Jose Creek. The alluvial fill in the Puente Basin tends to be finer-grained and has higher clay content than the sediments in the Main Basin and ranges in depth from 25 feet to 1,300 feet (CH2MHill, 1997). Water-bearing sediments range in thickness between 70 and 120 feet throughout most of the basin but increase in thickness toward the west (maximum thickness of about 500 feet near the boundary with the Main Basin (Engineering Science, Inc, 1979; Ecological Systems Corporation, 1975). Well depths range from about 75 feet to 300 feet in the Puente Basin (Engineering Science, Inc, 1979). Total storage within the Puente Basin has been estimated to be approximately 979,650 AF (Engineering Science Inc, 1979).

Safe Yield/Long-Term Balance of Recharge and Discharge

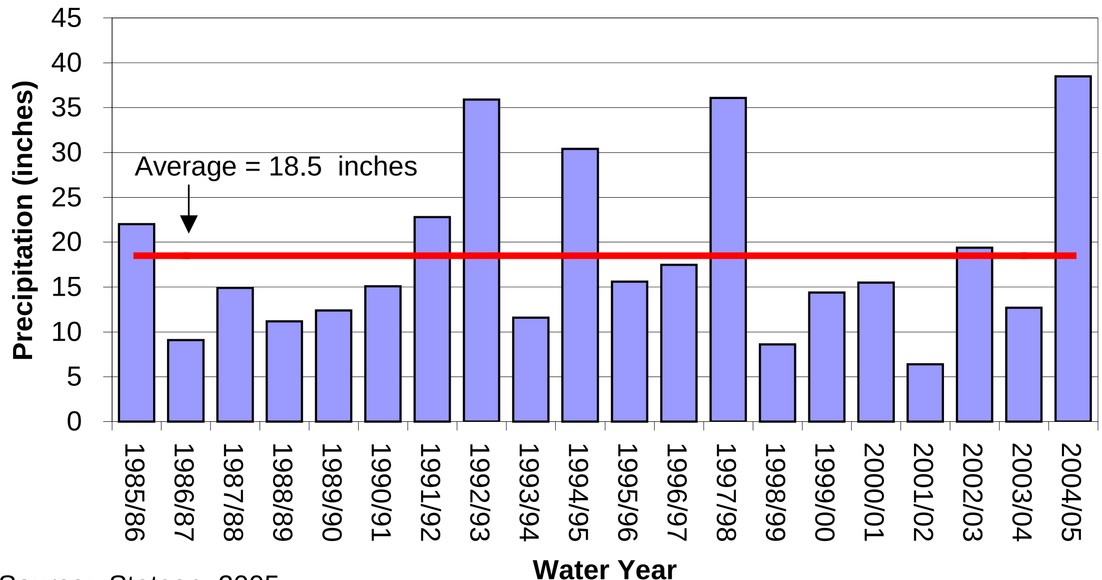
The natural sources of recharge and long-term balance for the Main San Gabriel and Puente Basins are discussed separately in the following section.

Main San Gabriel Basin

The major sources of natural recharge to the Main San Gabriel Basin are infiltration of rainfall on the valley floor and percolation of runoff from the adjacent mountains. Historical precipitation in the Main San Gabriel Basin is summarized in **Figure 7-2**. The average precipitation over the past 20 years is approximately 18.5 inches. The basin also receives imported water and return flow from applied water.

According to the Main San Gabriel Basin Judgment (discussed below), the natural safe yield of the Main San Gabriel Basin is defined as 152,700 AFY (Main San Gabriel Basin Judgment, 1989).

Figure 7-2
Historical Precipitation in the Main San Gabriel Basin



Source: Stetson, 2005

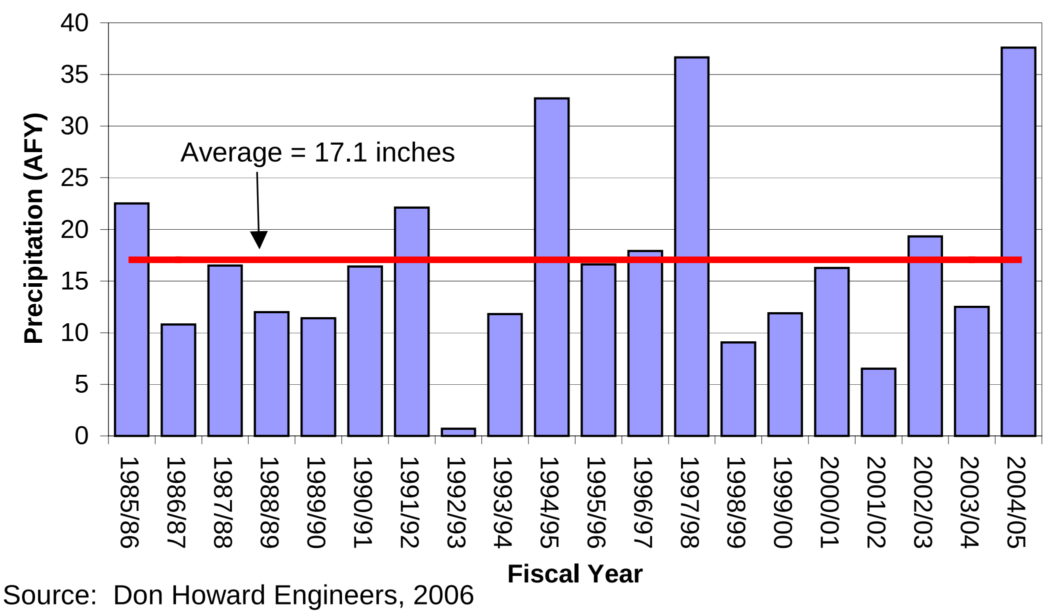
The Operating Safe Yield (OSY) is the quantity of water that the Main San Gabriel Basin Watermaster (Watermaster) determines may be pumped from the Basin in a fiscal year, without Replacement Water assessments. Watermaster considers a wide range of data in setting the OSY, including provisions of the Main San Gabriel Basin Judgment, key well water level, current hydrologic conditions in the basin such as precipitation, storage of local runoff in surface reservoirs, conservation of local runoff, amount of water in cyclic storage accounts, carryover rights and others. In accordance with the Main San Gabriel Basin Judgment, Watermaster at its regular meeting in May of each year determines the OSY applicable to the succeeding fiscal year (July 1 through June 30) and estimates the OSY for the next succeeding four fiscal years. On May 11, 2005, Watermaster adopted an OSY of 240,000 AF for fiscal year 2005-06 and an estimated OSY of 210,000 AF for fiscal year 2006-07.

Since 1975, Watermaster has used cyclic storage accounts to store imported water against future replenishment requirement. Three current cyclic storage accounts (Metropolitan Water District on behalf of its member agencies (140,000 AF) and San Gabriel Valley Municipal Water District (40,000 AF), totaling 180,000 AF of potential water storage capacity are maintained for providing supplemental water to the basin. These accounts allow delivery of imported water when it is available and the water is stored in the basin for sale to Watermaster at a later date.

Puente Basin

The major sources of natural recharge to the Puente Basin are infiltration of rainfall on the valley floor and percolation of runoff from the adjacent mountains. In addition, water is imported into the basin from the Pomona Water Reclamation Plant (recycled water) and from Metropolitan via the Rowland and Walnut water districts (CH2MHill, 1997). Historical precipitation in the Puente Basin is summarized in **Figure 7-3**. The average precipitation over the past 20 years has been approximately 17.1 inches, lower than the long-term average of about 18 inches per year. The basin also receives imported water and return flows from applied water.

Figure 7-3
Historical Precipitation in the Puente Basin



Source: Don Howard Engineers, 2006

According to the Puente Basin Judgment (discussed below), the declared safe yield of the Puente Basin is 4,400 AFY (Puente Basin Judgment, 1986). However, the basin is managed on the basis of Operating Safe Yield determined annually by the Watermaster and has averaged 1,666 AFY since 1988.

The Operating Safe Yield (OSY) is the quantity of water that the Puente Basin Watermaster (Watermaster) determines may be pumped from the basin in a fiscal year. Watermaster determines the OSY in consideration of five factors specified in the Judgment: water levels, Puente Narrows Agreement, subsurface flows, cost of availability of alternate sources of water, and groundwater pumping. In accordance with the Puente Basin Judgment, Watermaster makes the preliminary determination of OSY by the first Monday in April for upcoming fiscal year and estimates the OSY for the next succeeding four fiscal years. On April 27, 2006, Watermaster adopted an OSY of 1,530 AF for fiscal year 2006-07 and an estimated OSY of 1,500 AF for the subsequent four years.

GROUNDWATER MANAGEMENT

The following section describes how the Main San Gabriel and Puente Basins are currently managed. This includes a discussion of the governing structure and relationship with adjoining basins.

Basin Governance

The following section describes the governing structure and adjudication of the Main San Gabriel and Puente Basins. A summary of the agencies contributing to the management of each basin is provided in **Table 7-2.**

Main San Gabriel Basin

The Main San Gabriel Basin is an adjudicated basin. On January 4, 1973, after extensive negotiations, a stipulated Judgment in this case was entered (Main San Gabriel Basin Judgment) that created Watermaster, governing body and specified a program for management of water in the Main Basin. Since the Main San Gabriel Basin Judgment was originally entered, there have been subsequent amendments to it that extend and clarify Watermaster's role.

The Watermaster is a nine-person board appointed by the Los Angeles County Superior Court that administers and enforces the provisions of the Main San Gabriel Basin Judgment, which established water rights and responsibility for efficient management of the quantity and quality of the Basin’s groundwater. The Watermaster manages and controls the withdrawal of groundwater/surface water and replenishment of imported water supplies in the basin and determines the amount that can be safely extracted. The Watermaster coordinates imported water deliveries and recharge. Watermaster coordinates local involvement in efforts to preserve and restore the quality of groundwater in the basin. The Watermaster assists and encourages regulatory agencies to enforce water quality regulations affecting the basin; collects production, water quality, and other relevant data from producers; prepares an annual report of pumping and diversions; and a Five Year Plan to address water quality management.

The Main San Gabriel Basin Judgment allows a producer to pump or divert more water than its share, but the producer must pay for replenishment water for any amount produced above its water rights. Producers can carryover up to 100 percent of their water rights for only one year.

Any entity, public or private, desiring to spread and store supplemental water within the basin for subsequent recovery and use for Watermaster credit must have a cyclic storage agreement pursuant to Watermaster's Rules and Regulations. Cyclic storage agreements are for a term of five years and may extend for additional terms, not to exceed five years. The cyclic storage agreement notes the maximum amount of supplemental water that may be stored at any point in time by a particular storing entity.

Table 7-2
Summary of Management Agencies in the Main San Gabriel and Puente Basins

Agency	Role
Main San Gabriel Basin	
Main San Gabriel Basin Watermaster	Court appointed Watermaster to manage water quantity/quality; coordinate U.S. EPA Operable Unit cleanup.
Upper San Gabriel Valley Municipal Water District	Delivery of Supplemental Water
Three Valleys Municipal Water District	Delivery of Supplemental Water
San Gabriel Valley Municipal Water District	Delivery of Supplemental Water
County of Los Angeles, Department of Public Works (LACDPW)	Recharge local runoff/supplemental water
San Gabriel Basin Water Quality Authority	Obtain funding for Basin clean up activities
San Gabriel River Watermaster	Calculates credits/debits between Main San Gabriel Basin and Central Basin
Puente Basin	
Puente Basin Watermaster	Appointed by the Principal Parties to the Judgment to determine the annual Operating Safe Yield and Annual Pumping Rights and components.
Puente Narrows Watermaster	Calculates credits/debits between Puente Basin and Main Basin.
Los Angeles County Department of Public Works	Monitors water levels in Puente Basin
Los Angeles Regional Water Quality Control Board	Oversees clean-up in Puente Basin of groundwater contamination
U.S. Environmental Protection Agency	Oversees remediation of Puente Valley Operable Unit component of the San Gabriel Valley Superfund Site.
Three Valleys Municipal Water District	Delivery of supplemental imported water
County Sanitation Districts of Los Angeles County	Provider of recycled water for landscape irrigation.
Walnut Valley Water District Rowland Water District	Puente Basin water quality sampling since 1992

Puente Basin

The Puente Basin was adjudicated in 1986. Under the Judgment, a management plan was executed by the Principal Parties to the Judgment and is administered by a three-person Watermaster. The three Watermasters are nominated and appointed by the Principal Parties according to directives of the Judgment. The Judgment specifies the duties of the Watermaster to include determining Operating Safe Yield and notifying the Court and Principal Parties of Annual Pumping Rights and components thereof. Import return flow credits are calculated separately from Operating Safe Yield. The Judgment provides for up to 100 percent carryover of unpumped water rights for one year, up to 10 percent excess pumping, restricts exportation of groundwater, and makes no provisions for storage of surplus supplies within the groundwater basin.

Interactions with Adjoining Basins

The Long Beach Judgment (City of Long Beach v. San Gabriel Valley Water Company) guarantees the Lower Area (Central and West Coast Basin) an average annual water supply of approximately 98,000 AFY through Whittier Narrows and is administered by the three-person court appointed San Gabriel River Watermaster. As part of that Judgment, subsurface flow from the Main San Gabriel Basin into Central Basin is calculated and is included in the determination of usable water provided to Lower Area.

Subsurface outflow from the Puente Basin into the Main San Gabriel Basin is governed and calculated pursuant to the provisions of the Puente Narrows Agreement between Puente Basin Water Agency (comprised of Walnut Valley Water District and Rowland Water District) and Upper San Gabriel Valley Municipal Water District. The Puente Narrows Agreement is Exhibit F to the Puente Basin Judgment. The Agreement calls for an average Base Underflow of 580 acre-feet per year from Puente Basin to the Main San Gabriel Basin, with credits and debits accumulating. Credit is also given to the Puente Basin Water Agency for pumping associated with some water quality clean-up operations pursuant to the Clean-Up Production Agreement that discharge treated water to the concrete-lined San Jose Creek.

WATER SUPPLY FACILITIES AND OPERATIONS

The following provides a summary of the facilities within the Main San Gabriel and Puente basins. Key storage and extraction facilities include more than 300 production wells and associated facilities and 17 spreading basins for groundwater recharge.

Municipal Production Wells

Table 7-3 provides a summary of the production wells in the Main San Gabriel and Puente basins.

Main San Gabriel Basin

In the Main San Gabriel Basin, there are 305 wells in the basin (250 active wells and 55 inactive wells). About 10 of these wells (less than 3 percent) are projected to be replaced or rehabilitated in the next 5 years (Stetson, 2006). Historical production in the Main San Gabriel Basin is summarized in **Figure 7-4**. Between fiscal years 1985/86 and 2004/05, production ranged from about 224,000 AFY to 283,000 AFY with an average of 255,525 AFY. The groundwater production exceeded the operating yield, which has ranged from 140,000 AFY to 240,000 AFY during the same period. Therefore, producers must provide for replacement water.

Table 7-3
Summary of Production Wells in the Main San Gabriel and Puente Basins

<table>
<tr><th>Category</th><th>Number of Wells</th><th>Estimated Production Capacity (AFY)</th><th>Average Production 1985-2004 (AFY)</th><th>Well Operation Cost ($/AF)</th></tr>
<tr><td>Main San Gabriel Basin</td><td></td><td rowspan="4">~500,000 AFY (active wells) [1]
~80,000 AFY (inactive wells)</td><td rowspan="4">255,525</td><td rowspan="4">$85 Power
$1.74 Disinfection
$2.50 O&M
Total [2] $89.24</td></tr>
<tr><td>Municipal</td><td>250</td></tr>
<tr><td>Other</td><td>55</td></tr>
<tr><td>Total Main San Gabriel Basin</td><td>305</td></tr>
<tr><td>Puente Basin
Non-potable-supply</td><td>5</td><td>300 to 600 gpm</td><td>905</td><td></td></tr>
</table>

Notes: 1 Stetson, 2006
2 Does not include treatment costs

Puente Basin

There are five production wells in the Puente Basin. (Don Howard Engineers, December 2006). Due to the poor quality of the Puente Basin groundwater, groundwater is used for non-potable purposes including blending with reclaimed water, construction water, and irrigation (Puente Watermaster, April 2006). Historical production in the Puente Basin is shown in **Figure 7-5**.

Bureau of Labor Statistics

Average Energy Prices

Los Angeles-Riverside-Orange County

April 2014

NEWS RELEASE

BUREAU OF LABOR STATISTICS
U.S. DEPARTMENT OF LABOR

WEST INFORMATION OFFICE
San Francisco, Calif.

For release Tuesday, May 20, 2014 **14-910-SAN**

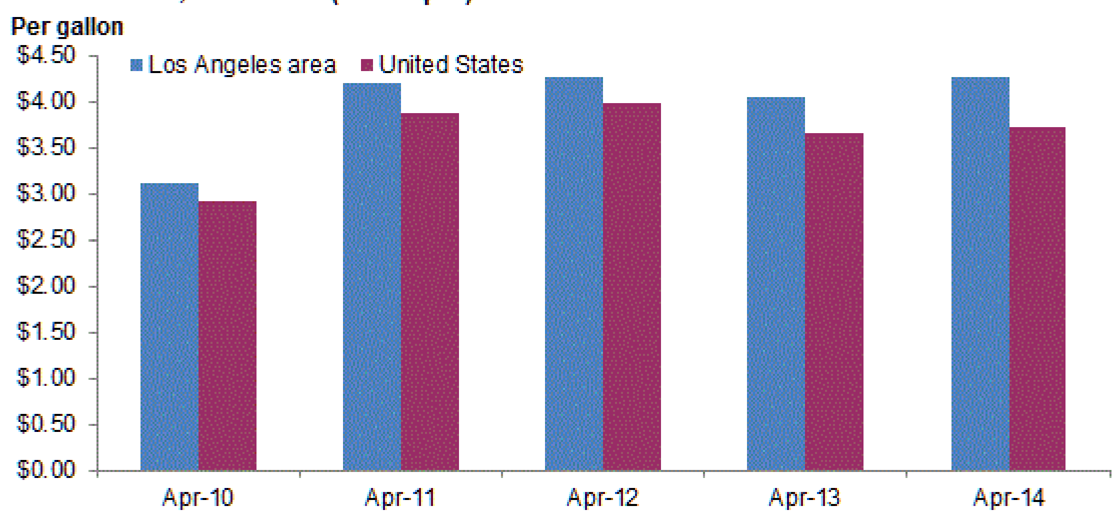
Technical information: (415) 625-2282 • BLSinfoSF@bls.gov • www.bls.gov/ro9
Media contact: (415) 625-2270

AVERAGE ENERGY PRICES, LOS ANGELES-RIVERSIDE-ORANGE COUNTY APRIL 2014

Gasoline prices averaged $4.263 a gallon in the Los Angeles-Riverside-Orange County area in April 2014, the U.S. Bureau of Labor Statistics reported today. Regional Commissioner Richard J. Holden noted that area gasoline prices were down 22.0 cents compared to last April when they averaged $4.043 per gallon. Los Angeles area households paid an average of 17.8 cents per kilowatt hour (kWh) of electricity in April 2014, down from 21.6 cents per kWh in April 2013. The average cost of utility (piped) gas at $1.211 per therm in April was more than the 1.077 cents per therm spent last year. (Data in this release are not seasonally adjusted; accordingly, over-the-year-analysis is used throughout.)

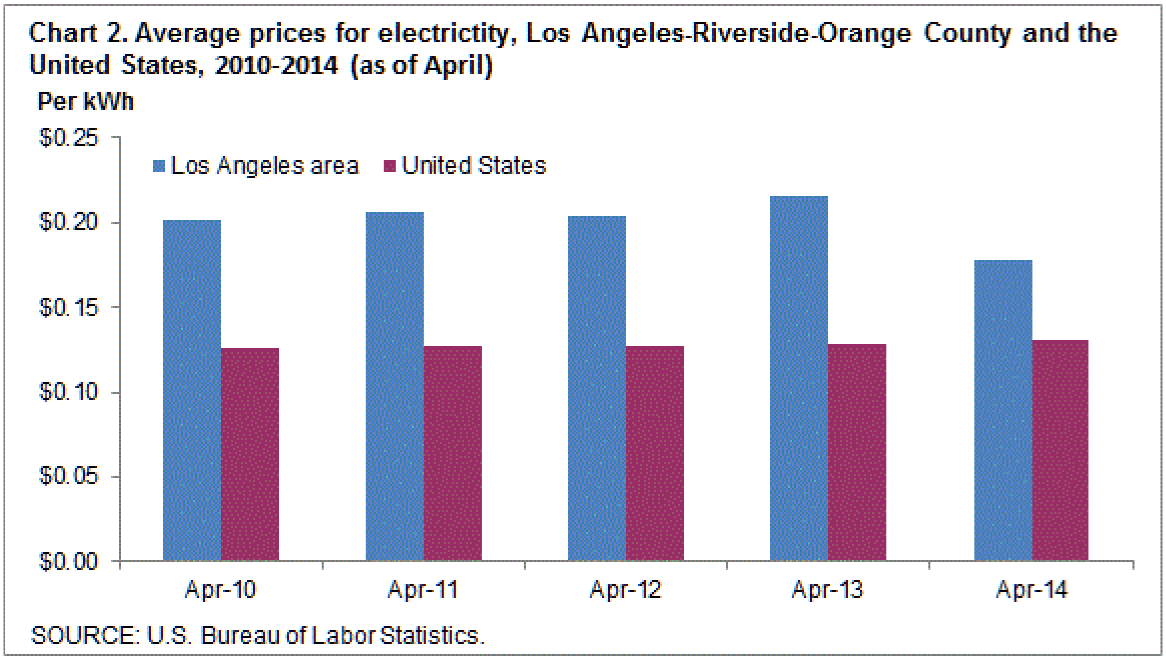
At $4.263 a gallon, Los Angeles area consumers paid 14.7 percent more than the $3.717 national average in April 2014. A year earlier, consumers in the Los Angeles area paid 10.9 percent more than the national average for a gallon of gasoline. The local price of a gallon of gasoline has exceeded the national average by at least 6 percent in the month of April in each of the past five years.
(See chart 1.)

Chart 1. Average prices for gasoline, Los Angeles-Riverside-Orange County and the United States, 2010-2014 (as of April)

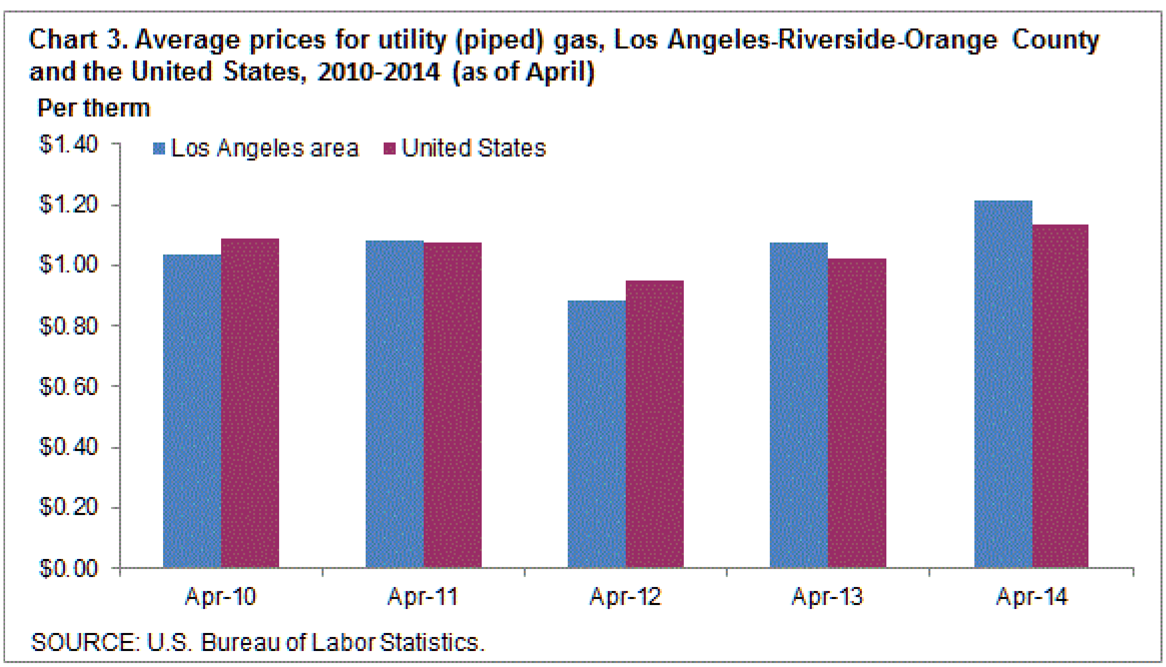


SOURCE: U.S. Bureau of Labor Statistics.

The 17.8 cents per kWh Los Angeles households paid for electricity in April 2014 was 35.9 percent more than the nationwide average of 13.1 cents per kWh. Last April, electricity costs were 68.8 percent higher in Los Angeles compared to the nation. In the past five years, prices paid by Los Angeles area consumers for electricity exceeded the U.S. average by 35.9 percent or more in the month of April. (See chart 2.)



Prices paid by Los Angeles area consumers for utility (piped) gas, commonly referred to as natural gas, were $1.211 per therm, or 6.5 percent more compared to the national average in April 2014 ($1.137 per therm). A year earlier, area consumers paid 5.6 percent more per therm for natural gas compared to the nation. In the Los Angeles area over the past five years, the per therm cost for natural gas in April has varied between 7.2 percent below and 6.5 percent above the U.S. average.
(See chart 3.)



The Los Angeles-Riverside-Orange County, Calif. metropolitan area consists of Los Angeles, Orange, Riverside, San Bernardino and Ventura Counties in California.

Technical Note

Average prices are estimated from Consumer Price Index (CPI) data for selected commodity series to support the research and analytic needs of CPI data users. Average prices for electricity, utility (piped) gas, and gasoline are published monthly for the U.S. city average, the 4 regions, the 3 population size classes, 10 region/size-class cross-classifications, and the 14 largest local index areas. For electricity, average prices per kilowatt-hour (kWh) and per 500 kWh are published. For utility (piped) gas, average prices per therm, per 40 therms, and per 100 therms are published. For gasoline, the average price per gallon is published. Average prices for commonly available grades of gasoline are published as well as the average price across all grades.

Price quotes for 40 therms and 100 therms of utility (piped) gas and for 500 kWh of electricity are collected in sample outlets for use in the average price programs only. Since they are for specified consumption amounts, they are not used in the CPI. All other price quotes used for average price estimation are regular CPI data.

With the exception of the 40 therms, 100 therms, and 500 kWh price quotes, all eligible prices are converted to a price per normalized quantity. These prices are then used to estimate a price for a defined fixed quantity.

The average price per kilowatt-hour represents the total bill divided by the kilowatt-hour usage. The total bill is the sum of all items applicable to all consumers appearing on an electricity bill including, but not limited to, variable rates per kWh, fixed costs, taxes, surcharges, and credits. This calculation also applies to the average price per therm for utility (piped) gas.

Information from this release will be made available to sensory impaired individuals upon request. Voice phone: 202-691-5200, Federal Relay Service: 800-877-8339.

Table 1. Average prices for gasoline, electricty, and utility (piped) gas, Los Angeles-Riverside-Orange County and the United States, April 2013-April 2014, not seasonally adjusted

	Gasoline per gallon		Electricity per kWh		Utillity (piped) gas per therm	
	Los Angeles area	United States	Los Angeles area	United States	Los Angeles area	United States
2013						
April	$4.043	$3.647	$0.216	$0.128	$1.077	$1.020
May	4.060	3.682	0.216	0.131	1.200	1.036
June	4.073	3.693	0.203	0.137	1.275	1.038
July	4.115	3.687	0.203	0.137	1.239	1.025
August	3.955	3.658	0.203	0.137	1.230	1.003
September	4.008	3.616	0.203	0.137	1.183	1.000
October	3.767	3.434	0.215	0.132	1.175	0.999
November	3.651	3.310	0.215	0.130	1.113	0.999
December	3.661	3.333	0.220	0.131	1.109	0.998
2014						
January	3.665	3.378	0.215	0.134	1.195	1.040
February	3.812	3.422	0.215	0.134	1.236	1.078
March	4.046	3.590	0.215	0.135	1.321	1.154
April	4.263	3.717	0.178	0.131	1.211	1.137

Calculations for USGVMWD

Annual Project Physical Benefits Tables

Energy and GHG Emissions Calculations

Energy Calculations for USGVMWD Recycled Water Program Expansion Project

WITH PROJECT	**Energy Usage**	**AF**			**kWh/Year Used**		
	kWh/AF	**2015**	**2016**	**2017**	**2015**	**2016**	**2017**
Rose Hills	790	60	600	600	47,400	474,000	474,000
LPV	280	0	47	52	-	13,160	14,560
SEM	320	0	75	83	-	24,000	26,560
Total benefit supplied for portion of Project completed		60	722	735	47,400	511,160	515,120
Portion supplied by GW pumped and replenished with SWP Imported water	3,596	675	13	0	2,427,300	46,748	0
Total With Project					**2,474,700**	**557,908**	**515,120**

WITHOUT PROJECT	**kWh/AF**	**2015**	**2016**	**2017**	**2015**	**2016**	**2017**
Total Without Project	3,596	735	735	735	2,643,060	2,643,060	2,643,060

Change Resulting from Project					**168,360**	**2,085,152**	**2,127,940**

Energy Savings Benefit (2,127940kWh/year)/735AFY = 2895.1565 kWh/AF

GHG Emissions Calculations		**2015**	**2016**	**2017**
Energy rate of recycled water conveyance based on proportion of benefit supplied by expansion site		790	708	701
Amount of recycled water supplied each year		60	722	735
Energy rate of GW with SWP replenishment		3,596	3,596	3,596
Amount of GW supplied that needs to be replenished with SWP water each year		675	13	0
GHG from RW		16	168	169
GHG from GW with SWP replenishment		797	15	0
Total GHG emissions		**813**	**183**	**169**


California Climate Action Registry General Reporting Protocol

Reporting Entity-Wide Greenhouse Gas Emissions

Version 3.1 | January 2009

Thus, regional/power pool emission factors for electricity consumption can be used to determine emissions based on electricity consumed. If you can obtain verified emission factors specific to the supplier of your electricity, you are encouraged to use those factors in calculating your indirect emissions from electricity generation. If your electricity provider reports an electricity delivery metric under the California Registry's Power/Utility Protocol, you may use this factor to determine your emissions, as it is more accurate than the default regional factor. Utility-specific emission factors are available in the Members-Only section of the California Registry website and through your utility's Power/Utility Protocol report in CARROT.

This Protocol provides power pool-based carbon dioxide, methane, and nitrous oxide emission factors from the U.S. EPA's eGRID database (see Figure III.6.1), which are provided in Appendix C, Table C.2. These are updated in the Protocol and the California Registry's reporting tool, CARROT, as often as they are updated by eGRID.

To look up your eGRID subregion using your zip code, please visit U.S. EPA's "Power Profiler" tool at www.epa.gov/cleanenergy/energy-and-you/how-clean.html.

Fuel used to generate electricity varies from year to year, so emission factors also fluctuate. When possible, you should use emission factors that correspond to the calendar year of data you are reporting. CO_2, CH_4, and N_2O emission factors for historical years are available in Appendix E. If emission factors are not available for the year you are reporting, use the most recently published figures.

U.S. EPA Emissions and Generation Resource Integrated Database (eGRID)

The Emissions & Generation Resource Integrated Database (eGRID) provides information on the air quality attributes of almost all the electric power generated in the United States. eGRID provides search options, including information for individual power plants, generating companies, states, and regions of the power grid. eGRID integrates 24 different federal data sources on power plants and power companies, from three different federal agencies: EPA, the Energy Information Administration (EIA), and the Federal Energy Regulatory Commission (FERC). Emissions data from EPA are combined with generation data from EIA to produce values like pounds per megawatt-hour (lbs/MWh) of emissions, which allows direct comparison of the environmental attributes of electricity generation. eGRID also provides aggregated data to facilitate comparison by company, state or power grid region. eGRID's data encompasses more than 4,700 power plants and nearly 2,000 generating companies. eGRID also documents power flows and industry structural changes. www.epa.gov/cleanenergy/egrid/index.htm.

Figure III.6.1 eGRID Subregions

Source: eGRID2007 Version 1.1, December 2008 (Year 2005 data).

La Puente Valley County Water District

Recycled Water Feasibility Study Report

March 2012

Table of Contents

Section Name **Page Number**

Appendices

LIST OF TABLES

Table Name **Page Number**

LIST OF FIGURES

Figure Name **Page Number**

Section 1
Introduction

This section provides overview of the proposed project and an outline of the Recycled Water Feasibility Study for the La Puente Valley County Water District (LPVCWD). A brief background of the planning work conducted to date, a discussion of the objectives and scope of work, a description of the report sections to follow, and a listing of abbreviations and definitions used in this report are included in this section.

1.1 PROJECT BACKGROUND

LPVCWD currently has approximately 2,500 potable water service connections in City of La Puente, portions of City of Industry, and some unincorporated area in Los Angeles County. Treated groundwater from three wells in the Main San Gabriel Basin is the primary source of water for LPVCWD customers. Due to its proximity to existing recycled water facilities owned and operated by neighboring cities and agencies such as City of Industry and Upper San Gabriel Valley Municipal Water District (USGVMWD), LPVCWD intends to explore the feasibility of serving recycled water to potential customers within its service area.
Figure 1-1 shows the LPVCWD service area and the existing recycled water facilities in its vicinity. The recycled water will be supplied by the City of Industry, which in turn obtains the recycled water from Sanitation Districts of Los Angeles County (LACSD) San Jose creek Water Reclamation Plant (SJCWRP). The intent of this study is to evaluate the feasibility of constructing a recycled water system for LPVCWD.

This study has been prepared in accordance with the State Water Resources Control Board (SWRCB) Water Recycling Funding Program (WRFP) Study No. 3432-010.

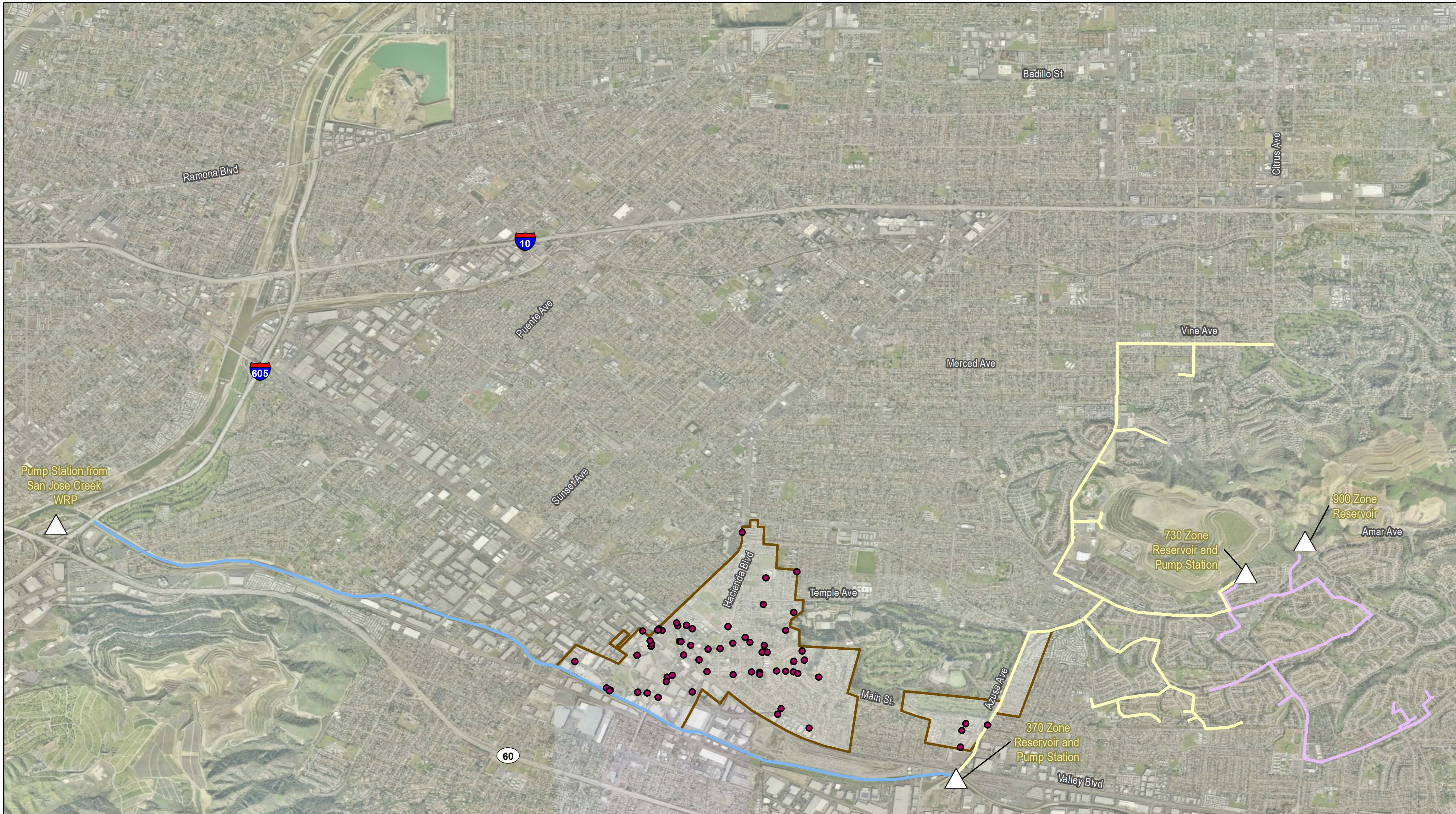
1.2 SCOPE OF WORK

The scope of work for this study includes the following tasks.

- Data Gathering
- Data Assessment
- Customer Evaluation
- Recycled Water Alternatives
- Recycled Water Supply and Facility Evaluation
- Life Cycle Cost Evaluation
- Construction Financing Options

1.3 DATA SOURCES

In preparation of this recycled water feasibility study, LPVCWD staff supplied relevant reports, studies and other sources of information. In addition, LPVCWD provided 2005 through 2010 customer billing data and Geographical Information System (GIS) data.



Key to Features

Booster Station and Reservoir

La Puente Valley County Water District Boundary

Potential Recycled Water Customers

City of Industry

370 Zone

Upper San Gabriel Valley Municipal Water District Pipeline

730 Zone

900 Zone

N

0 0.25 0.5 1 Miles

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Date: May 17, 2011

LPVCWD Service Area and Adjacent Agencies' Existing Recycled Water Systems

Figure 1-1

MWH

Pertinent materials included water system master plan with water system maps, design drawings, planning and development information, historical records, billing data and detailed facility information. Numerous meetings were held with the District staff.

1.4 AUTHORIZATION

This recycled water feasibility study has been developed by MWH Americas, Inc. for LPVCWD in accordance with SWRCB's WRFP Study No. 3432-010.

1.5 ACKNOWLEDGMENTS

MWH wishes to acknowledge and thank all of the LPVCWD's staff for their support and assistance in completing this project with special thanks to Greg Galindo (General Manager), Todd Hull (Superintendent), and Gina Herrera (Customer Service Supervisor).

1.6 PROJECT STAFF

The following MWH staff was principally involved in the preparation of this recycled water master plan:

Principal-in-Charge:	John Robinson
Project Manager:	Matthew Huang, P.E.
Project Engineer:	Alok Pandya, P.E., PMP
GIS Analyst:	Jackie Silber
Project Administrator:	Belinda Howell

1.7 FEASIBILITY STUDY OUTLINE

The following sections of this recycled water feasibility study describe the proposed system.

Section 2 discusses the customer evaluation, demands, and lists the potential recycled water customers,. Section 3 describes the hydraulic modeling, the proposed recycled water system alternatives, and recycled water supply and facility evaluation. Section 4 describes the cost evaluation of the proposed alternatives and financing options.

Table 1-1
Abbreviations

Abbreviation	Explanation
ADD	Average Day Demand
acre-ft/yr, AFY	Acre-feet per Year
CIMIS	California Irrigation Management Information System
ET	Evapotranspiration
fps	Feet per second
ft	Feet
GIS	Geographical Information System
gpm	Gallons per Minute
HGL	Hydraulic Grade Line
hp	Horsepower
IEUA	Inland Empire Utilities Agency
in	Inch
LACSD	Sanitation Districts of Los Angeles County
LBWD	Long Beach Water Department
LPVCWD	La Puente Valley County Water District
MDD	Maximum Day Demand
MG	Million Gallon
mgd	Million Gallons per Day
mi	Mile
MWD	Municipal Water District
MWDSC	Metropolitan Water District of Southern California
MWH	MWH Americas, Inc.
PHD	Peak Hour Demand
PS	Pump Station
psi	Pounds per Square Inch
RW	Recycled Water
RWD	Rowland Water District
sec	Second
SJCWRP	San Jose creek Water Reclamation Plant
SWRCB	State Water Resources Control Board
TDH	Total Dynamic Head
USGS	United States Geographic Survey
USGVMWD	Upper San Gabriel Valley Municipal Water District
WRFP	Water Recycling Funding Program
WVWD	Walnut Valley Water District

Section 2
Customer Demand Development

2.1 INTRODUCTION

This section summarizes customer demand data gathering, data assessment, and database development of potential recycled water customers for the La Puente Valley County Water District (LPVCWD). Potential customers are identified by recycled water usage category, prioritized by average annual recycled water usage, and categorized by the likelihood of conversion from potable to recycled water. Peaking factors for recycled water usage by customer category and the peak hour demand for each customer are also discussed in this section.

2.2 CUSTOMER EVALUATION

Customer evaluation is based on available consumption data (bi-monthly billing records) from LPVCWD's largest fifty (50) potable water customers and all potable irrigation customers. Only existing potable water customers having a demand greater than 0.5 acre-feet/year (acre-ft/yr) are considered as potential recycled water customers.

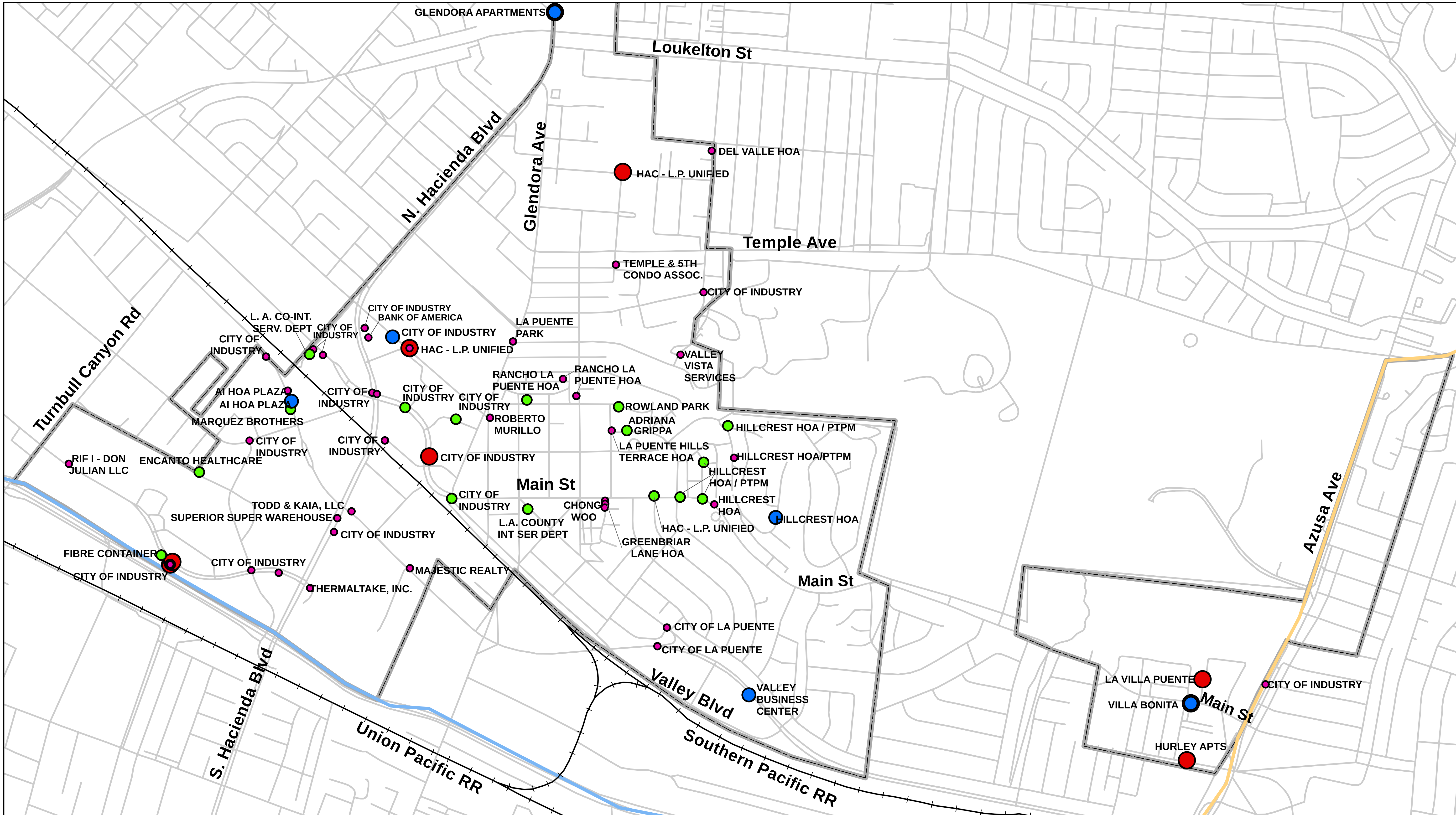
2.2.1 Potential Customers from Billing Data

Seventy five (74) customers within LPVCWD service area have been identified as potential recycled water customers currently using more than 0.5 acre-ft/yr of potable water, as shown in **Appendix A** and on **Figure 2-1**. William Workman High School and Wing Lane Elementary School located outside LPVCWD's service area can also be served with recycled water if LPVCWD implements a project along Temple Avenue (Alternative 4 described in Section 3 of this Report). These customers include schools, parks, hospitals, museum, commercial laundries and other industrial and residential customers, as summarized in **Table 2-1**.

Table 2-1
Summary of Potential Recycled Water Usage in Acre-Feet/Year
(By Customer Type)

Customer Type	Number of customers	Potential Use (AFY)[1]
Commercial	4	13
Industrial (Packaging)	1	5
Irrigation[2]	59	325
Multi-Family Residential	7	33
Public Authority	4	12
Grand Total	**75**	**388**

1 – based on 2005 to 2010 annual average potable usage and assumed recycled water percentages; rounded to the nearest integer
2 – Includes William Workman High School and Wing Lane Elementary School



Key to Features

La Puente Valley County Water District Boundary

City of Industry 370 Zone

Upper San Gabriel Valley Municipal Water District 730 Zone

Potential Recycled Water Customer Water Usage
(Acre Feet per Year)

0-5 AFY

>5 and <=10 AFY

>10 and <=15 AFY

> 15 AFY

N

0 370 740 1,480 Feet

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Date: May 17, 2011

Potential LPVCWD Recycled Water Customers

Figure 2-1

MWH.

In addition to the LPVCWD customers, the Wing Lane Elementary School and the William Workman High School (not in LPVCWD service area) are identified as potential recycled water customers. These schools represent a combined recycled water demand of about 43 acre-ft/yr. These two schools can be supplied with recycled water via a pipeline along Temple Avenue. Further details are provided in Section 3 of this report.

The percentages of the potable water demands that are potentially convertible to recycled water demands are established per land use category. These include the following:

- Industrial/Manufacturing – All food-related industries cannot be converted to recycled water use. Laundries, packaging, and other manufacturing activities that do not lead to human consumption or are sensitive to water quality are assumed to be able to use 90 percent of their potable water consumption as recycled water.
- Office buildings are assumed to be able use 30 percent of their potable water consumption as recycled water for irrigation.
- Multi-family residential units are assumed to be able to use 30 percent of their potable water consumption as recycled water for irrigation of common areas.
- Schools in the LPVCWD service area have separate irrigation meters and thus 100 percent of the irrigation demand can be served with recycled water.
- Parks in the LPVCWD service area have separate irrigation meters and thus 100 percent of the irrigation demand can be served with recycled water.

It should be noted that based on their location and proximity to the proposed recycled system, not all of the potential customers will be served recycled water. The actual number of customers that can be served along with their information (such as customer name, address, usage, etc.) for each of the evaluated alternatives is discussed in Section 3 of this report.

2.3 PEAKING FACTOR ASSUMPTIONS

To account for the seasonal and daily fluctuation in water demands, peaking factors are to the ratio between average day demand (ADD), maximum day demands (MDD), and peak hour demand (PHD). The maximum day peaking factor is defined as MDD divided by ADD, while the peak hour factor is defined as PHD divided by ADD.

Peaking factors can vary greatly and are influenced by several factors including, but not limited to, the type of water customer, climatic seasonal conditions, time of day, soil type, and economics (i.e., the cost of water). Of these factors, the type of water customer, season, and time of day are used to estimate peaking factors.

MWH performed a comparison of peaking factors used in similar studies for other southern California clients. MWH also evaluated the peaking factors using information from the California Irrigation Management Information System (CIMIS). Comparison of these peaking factors is presented in **Table 2-2**. LPVCWD obtained data from the smart meters for seven (7) of their top 50 potential recycled water customers. An evaluation of smart meter data shows peaking factors ranging from 6.0 to 10.0 (PHD:ADD).

Table 2-2
Water Usage Peaking Factor Comparison

Customer Type	CIMIS[1]	Long Beach Water Dept.[2]			IEUA			USGVMWD			CBMWD			LPVCWD[3]		
	MDD:ADD	MDD:ADD	PHD:MDD	PHD:ADD	MDD:ADD	PHD:MDD	PHD:ADD	MDD:ADD	PHD:MDD	PHD:ADD	MDD:ADD	PHD:MDD	PHD:ADD	MDD:ADD	PHD:MDD	PHD:ADD
Public Authority	2.4	2.87	2.57	7.4	2.6	3.0	7.8	2.4	2.4	5.76	-	-	4.98	2.4	2.4	5.76
Multi-Family	2.4	2.87	2.57	7.4	2.6	3.0	7.8	2.4	2.4	5.76	-	-	4.98	2.4	2.4	5.76
Irrigation	2.4	2.87	2.57	7.4	2.6	3.0	7.8	2.4	2.4	5.76	-	-	4.98	2.4	2.4	5.76
Industrial (Packaging)	1.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	2.4	2.4	5.76
Commercial (Irrigation)	2.4	2.87	2.57	7.4	2.6	3.0	7.8	2.4	2.4	5.76	-	-	4.98	2.4	2.4	5.76

1 - CIMIS values based on seasonal ETo data for Southern California

2 - calculated values based on data from LBWD

3 - recommended values for LPVCWD

Landscape irrigation is assumed to occur ten hours a day, resulting in an hourly peaking factor of 2.4. The seasonal variation of landscape irrigation is indicated by the ratio of MDD/ADD and is based on an average of evapotransportation (ET) and precipitation patterns in the Los Angeles Basin. The maximum day peaking factor is assumed to be 2.4. Hence, the PHD/ADD factor during summer is 5.76 (2.4 multiplied by 2.4). Based on MWH's experience on similar systems in Southern California, a peaking factor of 5.76 is recommended for all customer types as shown in **Table 2-2**.

2.4 SUMMARY OF RECYCLED WATER DEMANDS

In the recycled water database, attached in **Appendix A**, there are 74 potential recycled water customers with a total annual demand of approximately 375 acre-ft/yr and a peak demand of 1,200 gallons per minute (gpm). It should be noted that due to geographical location of some of the customers, it might not be feasible to connect these customers to the proposed recycled water system. A more detailed system layout and the resulting customer base from the proposed system is described in Section 3 of this study. The table in the appendix gives details such as service address, customer name, type of usage, average and peak water use.

2.5 MANDATORY USE ORDINANCE

LPVCWD intends to issue a Mandatory Use Ordinance for the use of recycled water by the potential customers identified in this study. In accordance with the Water Recycling Funding Program Guidelines, a copy of the Draft Mandatory Use Ordinance are enclosed in **Appendix B**.

Section 3
Proposed Recycled Water System Alternatives

3.1 INTRODUCTION

This section presents the criteria and approach used in developing the proposed recycled water system. Recommendations for pipeline routing and facilities sizing are presented based upon the established criteria and approach.

3.2 PIPELINE ROUTING APPROACH AND CRITERIA

A number of factors are considered in the routing of proposed pipelines. In general, the alignment seeks to maximize the connections to significantly large-volume potential customers and terminate at the site of a major customer. Other factors considered for pipeline routing include ease of construction due to vehicle traffic, road conditions, crossing of freeways, railroad tracks, and flood control channels, as well as other factors.

3.3 FACILITY SIZING AND EVALUATION CRITERIA

The design criteria utilized for the pipeline, storage reservoirs, regional plant storage, and pump station sizing is summarized in **Table 3-1**.

Table 3-1
Sizing and Evaluation Criteria

Item	Criteria
Pipeline Sizing Conditions	Peak hour demand (PHD) – for pipelines where irrigation demands govern
Maximum Pipeline Velocity	6 ft/sec (fps) under PHD conditions
Head Loss	< 6 ft/1,000 feet preferred under PHD conditions Head loss by itself does not govern pipeline sizing, but is used as sizing indicator. Pressure and velocity govern pipeline sizing
Friction Factor	Hazen-Williams C value of 140 for 12-inch diameter or less
Delivery Pressure Maximum Minimum	 150 psi, where possible 40 psi, where possible
Pump Station Sizing	Size pumps to meet PHD Consider locating in-line boosters at services

Pipeline Sizing

As shown in **Table 3-1,** pipeline sizing is based on a combination of several factors:

- Demand conditions
- Pipeline velocity
- Pipeline head loss
- System pressures

Two demand conditions are considered; peak hour demand (PHD) and average day demand (ADD). The majority of pipeline sizes are governed by PHD conditions due to the effect of nighttime demand for irrigation. Peaking factors used to calculate various demand conditions are discussed in **Section 2**.

Pipelines are sized based on a maximum velocity of 5 to 6 ft/sec, which can either occur during PHD conditions or ADD conditions, depending on the types of customers served and their diurnal patterns. When a pipeline velocity exceeds the velocity criterion under the governing demand condition, the pipeline segment is upsized to the next standard size. Pipelines diameters used are 4-inch, 6-inch, 8-inch, and 12-inch.

Similar to pipeline velocity, head loss by itself does not govern pipeline sizing, but is used as a sizing indicator. Pressure and velocity govern pipeline sizing. However, a maximum head loss of 6 ft/1,000 feet is preferred under PHD conditions for smaller diameter pipelines (< 20-inch diameter).

The minimum system pressures for irrigation and industrial customers is 40 psi, however, in some cases, it will not be possible to deliver a minimum of 40 psi without extensive additional infrastructure. In cases where pressures will be less than 40 psi, a booster pump will be required at the customer's service connection. It is recommended that pipeline pressures do not exceed 150 psi to avoid the need for high-pressure class piping and appurtenances.

Pump Stations

The proposed system does not have any reservoir storage. Pump stations that pump into zones without gravity storage are sized for PHD. To account for spare pump units, 25 percent flow capacity is added to the flow capacity required to meet the demands. To provide adequate motor sizing for long-term operations, pumps are assumed to operate at 75 percent efficiency.

Storage Reservoir

The alternatives discussed later in this section do not require storage within the proposed system. For the gravity system alternatives (Alt 1, Alt 3, and Alt 4 as described later in this section), existing storage in the 730 Zone Reservoir in the City of Industry recycled water system will be utilized to serve the La Puente's (LPVCWD) customers. For the preferred alternative (Alternative 2 - pumped system), City of Industry's 370 Zone pipeline and storage reservoir will be utilized as the source of supply. There is about 3,000 acre-ft/yr of surplus water (on an annual average basis) in the City of Industry's system as described below in Section 3.4. By utilizing existing surplus in the City of Industry recycled water system, LPVCWD can avoid building new storage facility and minimize the overall project cost at this time.

3.4 RECYCLED WATER SUPPLY

As described in Section 1 (see Figure 1-1), the source of recycled water for the proposed project is LACSD's San Jose Creek Water Reclamation Plant (SJCWRP). City of Industry owns and operates a 36-inch pipeline, two pump stations and reservoirs, which serve recycled water systems within the City of Industry (Industry Hills development), Rowland Water District (RWD), Walnut Valley Water District (WVWD), and Upper San Gabriel Valley Municipal Water District (USGVMWD).

The City of Industry has an agreement with LACSD to obtain on an average up to 10,000 acre-ft/yr (afy) of recycled water from the SJCWRP. The agreement also allows for the delivery of up to 20 million gallons per day (mgd) of recycled water on a peak daily basis. City of Industry sells about 7,000 afy of recycled water to USGVMWD, RWD, and WVWD (Joint Use and Development Agreement, City of Industry and USGVMWD dated August 13, 2009). Thus, on an average there is about 3,000 afy of water available from City of Industry's system. Based on the above supply and demand analysis, there is enough excess capacity in City of Industry's system for use in the proposed LPVCWD system.

LPVCWD intends on entering into interagency agreements with City of Industry and USGVMWD for securing an allocation of recycled water for use in their proposed system. Preliminary correspondence with these agencies have been included in **Appendix C** of this report.

3.5 RECYCLED WATER SYSTEM ALTERNATIVES

Four alternatives are developed for serving customers with recycled water. Based upon locations and the requirement to provide enough recycled water to meet the peak hour demand of each user, independent distribution system alternatives are created. Due to lack of sufficient demand in certain areas and the exceedingly higher cost of extending pipelines to these areas, not all the potential recycled water customers discussed in Section 2 and **Appendix A** are included in an alternative. Maps of the alternatives are presented in **Figure 3-1** through **Figure 3-4**. Each alternative is proposed as an independent system. The detailed pipe sizing and pump station sizing calculations (based on the hydraulic model) are provided in **Appendix G** of this report.

3.5.1 Hydraulic Modeling

The proposed customers and the pipelines from the conceptual pipeline routing are loaded into a hydraulic model (MWH Soft's *H_2OMAP* version 9.6). The proposed recycled water customers are included as junctions in the hydraulic model, with the pipelines used to connect the proposed customers. Model elevations are based on United States Geological Survey (USGS) 10 meter digital elevation models (DEMs). Using the hydraulic model, the proposed pipelines and pump stations are sized based on the criteria listed earlier in this section.

3.5.2 Alternative 1 - Gravity System Along Main Street

Alternative 1 would supply recycled water into the proposed system via a connection at the intersection of Main Street and Azusa Avenue as shown in **Figure 3-1**. City of Industry pipeline along Azusa Avenue has a hydraulic grade line (HGL) of 730 feet. This point of connection makes it possible to serve recycled water throughout the proposed system via gravity. Alternative 1 system would supply approximately 280 acre-ft/yr of recycled water to 52 potential customers as shown in **Table 3-2**. The location of these customers can be cross referenced with **Figure 3-1** using the "Unique ID" field in the table.

Table 3-2
Alternative 1 (Main Street) – Potential Customers

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
4	5339-0	CITY OF INDUSTRY	201 STAFFORD ST	Irrigation	1	17.4
8	1970-1	HILLCREST HOA	HILLCREST DR.	Irrigation	1	11.5
9	2245-0	LA VILLA PUENTE	17351 MAIN ST	Multi-Family	1	10.8
12	2326-0	CITY OF INDUSTRY	SOTRO ST	Irrigation	1	7.9
14	2269-0	HURLEY APTS	17341 HURLEY ST	Multi-Family	1	7.4
15	2339-0	CITY OF INDUSTRY	STAFFORD & OLD VALLEY	Irrigation	1	7.3
16	866-0	HILLCREST HOA/PTPM	100 TANGLEWOOD ST (IRRIGATION)	Irrigation	1	6.5
17	853-0	HILLCREST HOA/PTPM	146 TANGLEWOOD ST (IRRIGATION)	Irrigation	1	6.2
18	773-0	HILLCREST HOA / PTPM	DEERPATH LANE (IRRIGATION)	Irrigation	1	6.0
20	924-0	HAC - L.P. UNIFIED	16151 MAIN ST	Irrigation	1	6.0
22	1905-1	HILLCREST HOA	MAIN STREET	Irrigation	1	5.0
25	2246-6	VILLA BONITA	17340 MAIN ST	Multi-Family	1	4.8
27	1114-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	1	4.6
28	809-0	HILLCREST HOA / PTPM	134 HOMESTEAD ST (IRRIGATION)	Irrigation	1	4.2
31	1133-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	1	3.8
41	2327-0	CITY OF INDUSTRY	15651 STAFFORD ST	Public Authority	1	2.9
46	2336-0	CITY OF INDUSTRY	RAUSCH RD	Irrigation	1	2.4

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
52	2302-0	CITY OF INDUSTRY	HACIENDA & STAFFORD ST	Irrigation	1	2.1
54	1134-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	1	2.0
58	1940-1	HILLCREST HOA	MAIN STREET (IRRIGATION)	Irrigation	1	1.7
59	1068-0	L.A. COUNTY INT SER DEPT	15930 CENTRAL AVE	Public Authority	1	1.7
72	1162-1	CHONG WOO	16000 MAIN ST (IRRIGATION)	Irrigation	1	0.5
3	2418-0	CITY OF INDUSTRY	15414 DON JULIAN RD.	Irrigation	2	22.4
5	5416-0	CITY OF INDUSTRY	15415 DON JULIAN RD	Irrigation	2	16.8
11	2410-1	MARQUEZ BROTHERS	15480 VALLEY BLVD	Irrigation	2	8.8
24	2394-0	AI HOA PLAZA	15451 VALLEY BLVD	Irrigation	2	4.8
30	5427-0	CITY OF INDUSTRY	PARIOTT & DON JULIAN	Irrigation	2	3.9
35	2398-0	CITY OF INDUSTRY	ALONG RAILROAD TRACK	Irrigation	2	3.3
42	2304-0	CITY OF INDUSTRY	N HACIENDA & STAFFORD	Irrigation	2	2.9
43	2308-0	CITY OF INDUSTRY	STAFFORD ST.	Irrigation	2	2.8
45	2312-0	BANK OF AMERICA	150 NO HACIENDA BLVD	Irrigation	2	2.5
47	2309-0	CITY OF INDUSTRY	220 NO HACIENDA BLVD(IRRIGATION)	Irrigation	2	2.3
49	5428-3	DELTA PRODUCTS CORPORATION	15700 DON JULIAN RD	Irrigation	2	2.3
51	2307-0	CITY OF INDUSTRY	HUDSON AVE	Irrigation	2	2.1
53	5436-2	THERMALTAKE, INC.	525 PARIOTT PLACE	Irrigation	2	2.0
55	2306-0	L. A. CO-INT. SERV. DEPT	150 HUDSON AVE	Public Authority	2	1.8
60	2433-0	FIBRE CONTAINER	15400 DON JULIAN RD	Packaging	2	4.8
63	2406-0	CITY OF INDUSTRY	PROCTOR & EL ENCANTO	Irrigation	2	1.3
66	2305-0	CITY OF INDUSTRY	211 NO. HACIENDA BLVD	Irrigation	2	1.0
73	2393-0	AI HOA PLAZA	15469717375 VALLEY BLVD	Commercial	2	3.2

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
75	2407-0	EL ENCANTO HEALTHCARE	555 S EL ENCANTO RD	Commercial	2	6.9
2	1460-0	HAC - L.P. UNIFIED	15615 NELSON AVE	Irrigation	3	23.7
10	2315-0	CITY OF INDUSTRY	NELSON AVE	Irrigation	3	10.5
19	601-0	RANCHO LA PUENTE HOA	ROWLAND ST (IRRIGATION)	Irrigation	3	6.0
21	235-0	HAC - L.P. UNIFIED	15801 SIERRA VISTA CT	Public Authority	3	5.3
30	5427-0	CITY OF INDUSTRY	PARIOTT & DON JULIAN	Irrigation	3	3.1
32	550-0	RANCHO LA PUENTE HOA	NO STIMSON AVE	Irrigation	3	3.7
33	1458-0	LA PUENTE PARK	NO. GLENDORA AVE #1	Irrigation	3	3.6
56	699-0	ROWLAND PARK	16016-2636 ROWLAND	Multi-Family	3	1.8
57	700-1	ADRIANA GRIPPA	16011 BAMBOO ST.	Multi-Family	3	1.8
64	642-0	RANCHO LA PUENTE HOA	FALLEN LEAF RD IRRIGATION	Irrigation	3	1.3
69	1020-1	ROBERTO MURILLO	236 NO FIRST ST	Irrigation	3	0.6
					Total	**280.0**

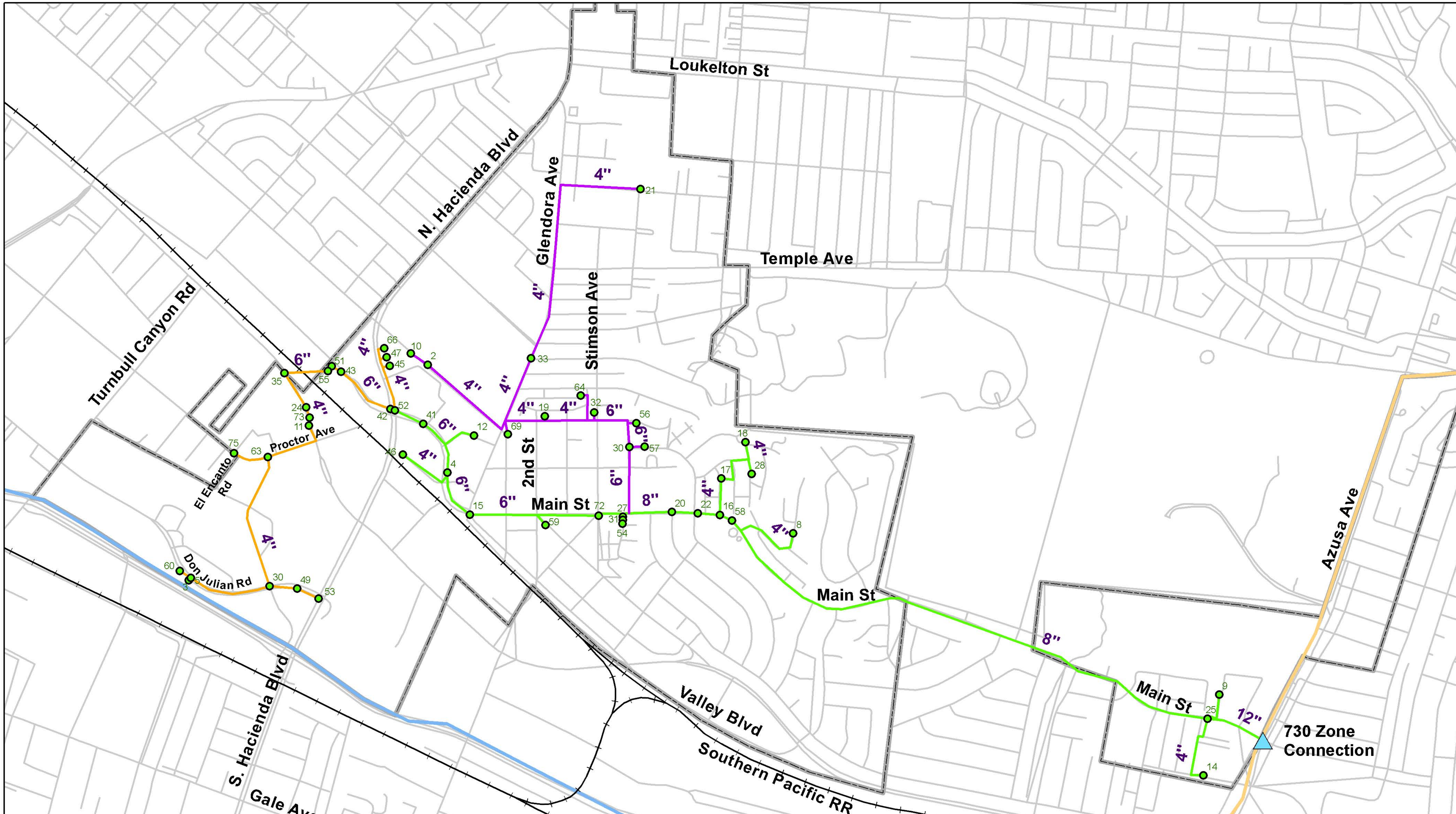
This alternative does not require any pumping within the proposed system. Pipelines categorized by size and length required for this alternative are presented in **Table 3-3**. The phasing scenarios considered for this alternative are also presented in **Figure 3-1** and **Table 3-3**.

Table 3-3
Alternative 1 (Main Street) – Pipelines

Pipeline Diameter (in)	Phase 1 (ft)	Phase 2 (ft)	Phase 3 (ft)	Total (ft)
4	4,900	5,900	7,300	17,600
6	3,600	2,000	1,600	7,200
8	7,600	-	-	7,600
12	700	-	-	700
Total	**16,800**	**7,900**	**8,900**	**33,600**

The hydraulic model for this alternative shows pressure ranging from 60 psi to 137 psi, which are within the specified sizing and evaluation criteria. The maximum velocity criteria of 6 fps is also met.

The cost for implementing this alternative is presented in **Section 4** of this report.



Key to Features

Potential Customers for Gravity Scenario

La Puente Valley County Water District Boundary

Phase 1 Pipeline (Diameters in Inches)

Phase 2 Pipeline (Diameters in Inches)

Phase 3 Pipeline (Diameters in Inches)

City of Industry 370 Zone

Upper San Gabriel Valley Municipal Water District 730 Zone

N

0 500 1,000 2,000 Feet

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Date: March 12, 2012

Proposed Recycled Water System Gravity Scenario - Main Street Alignment

Figure 3-1

MWH

3.5.3 Alternative 2 – Pumped System

Alternative 2 would supply recycled water into the proposed system via a future pump station located at the intersection of Parriott Place and San Jose Creek stormwater channel as shown in **Figure 3-2**. Pipeline along San Jose Creek has a HGL of 370 feet. The elevations in the proposed system vary from 313 feet to 563 feet. Thus in order to serve the proposed system under this alternative, recycled water from the City of Industry pipeline (along San Jose Creek) needs to be pumped into the system. Alternative 2 system would supply approximately 280 acre-ft/yr of recycled water to 52 potential customers as shown in **Table 3-4**. The location of these customers can be cross referenced with **Figure 3-2** using the "Unique ID" field in the table.

Table 3-4
Alternative 2 (Pumped System) – Potential Customers

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
3	2418-0	CITY OF INDUSTRY	15414 DON JULIAN RD.	Irrigation	1	22.6
5	5416-0	CITY OF INDUSTRY	15415 DON JULIAN RD	Irrigation	1	16.8
30	5427-0	CITY OF INDUSTRY	PARIOTT & DON JULIAN	Irrigation	1	3.9
49	5428-3	DELTA PRODUCTS CORPORATION	15700 DON JULIAN RD	Irrigation	1	2.3
53	5436-2	THERMALTAKE, INC.	525 PARIOTT PLACE	Irrigation	1	2.1
60	2433-0	FIBRE CONTAINER	15400 DON JULIAN RD	Packaging	1	4.8
2	1460-0	HAC - L.P. UNIFIED	15615 NELSON AVE	Irrigation	2	23.7
4	5339-0	CITY OF INDUSTRY	201 STAFFORD ST	Irrigation	2	17.4
10	2315-0	CITY OF INDUSTRY	NELSON AVE	Irrigation	2	10.5
11	2410-1	MARQUEZ BROTHERS	15480 VALLEY BLVD	Irrigation	2	8.7
12	2326-0	CITY OF INDUSTRY	SOTRO ST	Irrigation	2	7.9
15	2339-0	CITY OF INDUSTRY	STAFFORD & OLD VALLEY	Irrigation	2	7.3
24	2394-0	AI HOA PLAZA	15451 VALLEY BLVD	Irrigation	2	4.8
35	2398-0	CITY OF INDUSTRY	ALONG RAILROAD TRACK	Irrigation	2	3.2
41	2327-0	CITY OF INDUSTRY	15651 STAFFORD ST	Public Authority	2	2.9
42	2304-0	CITY OF INDUSTRY	N HACIENDA & STAFFORD	Irrigation	2	2.9
43	2308-0	CITY OF INDUSTRY	STAFFORD ST.	Irrigation	2	2.7

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
45	2312-0	BANK OF AMERICA	150 NO HACIENDA BLVD	Irrigation	2	2.6
47	2309-0	CITY OF INDUSTRY	220 NO HACIENDA BLVD(IRRIGATION)	Irrigation	2	2.3
46	2336-0	CITY OF INDUSTRY	RAUSCH RD	Irrigation	2	2.4
51	2307-0	CITY OF INDUSTRY	HUDSON AVE	Irrigation	2	2.1
52	2302-0	CITY OF INDUSTRY	HACIENDA & STAFFORD ST	Irrigation	2	2.1
55	2306-0	L. A. CO-INT. SERV. DEPT	150 HUDSON AVE	Public Authority	2	1.8
63	2406-0	CITY OF INDUSTRY	PROCTOR & EL ENCANTO	Irrigation	2	1.3
66	2305-0	CITY OF INDUSTRY	211 NO. HACIENDA BLVD	Irrigation	2	1.0
73	2393-0	AI HOA PLAZA	15469717375 VALLEY BLVD	Commercial	2	3.2
75	2407-0	EL ENCANTO HEALTHCARE	555 S EL ENCANTO RD	Commercial	2	6.9
8	1970-1	HILLCREST HOA	HILLCREST DR.	Irrigation	3	11.5
9	2245-0	LA VILLA PUENTE	17351 MAIN ST	Multi-Family	3	10.8
14	2269-0	HURLEY APTS	17341 HURLEY ST	Multi-Family	3	7.4
16	866-0	HILLCREST HOA/PTPM	100 TANGLEWOOD ST (IRRIGATION)	Irrigation	3	6.6
17	853-0	HILLCREST HOA/PTPM	146 TANGLEWOOD ST (IRRIGATION)	Irrigation	3	6.3
18	773-0	HILLCREST HOA / PTPM	DEERPATH LANE (IRRIGATION)	Irrigation	3	6.0
19	601-0	RANCHO LA PUENTE HOA	ROWLAND ST (IRRIGATION)	Irrigation	3	6.0
20	924-0	HAC - L.P. UNIFIED	16151 MAIN ST	Irrigation	3	6.0
21	235-0	HAC - L.P. UNIFIED	15801 SIERRA VISTA CT	Public Authority	3	5.3
22	1905-1	HILLCREST HOA	MAIN STREET	Irrigation	3	5.0
25	2246-6	VILLA BONITA	17340 MAIN ST	Multi-Family	3	4.8
27	1114-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	3	4.7

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
28	809-0	HILLCREST HOA / PTPM	134 HOMESTEAD ST (IRRIGATION)	Irrigation	3	4.2
30	5427-0	CITY OF INDUSTRY	PARIOTT & DON JULIAN	Irrigation	3	3.1
31	1133-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	3	3.9
32	550-0	RANCHO LA PUENTE HOA	NO STIMSON AVE	Irrigation	3	3.7
33	1458-0	LA PUENTE PARK	NO. GLENDORA AVE #1	Irrigation	3	3.6
54	1134-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	3	2.1
56	699-0	ROWLAND PARK	16016-2636 ROWLAND	Multi-Family	3	1.8
57	700-1	ADRIANA GRIPPA	16011 BAMBOO ST.	Multi-Family	3	1.8
58	1940-1	HILLCREST HOA	MAIN STREET (IRRIGATION)	Irrigation	3	1.6
59	1068-0	L.A. COUNTY INT SER DEPT	15930 CENTRAL AVE	Public Authority	3	1.6
64	642-0	RANCHO LA PUENTE HOA	FALLEN LEAF RD IRRIGATION	Irrigation	3	1.3
69	1020-1	ROBERTO MURILLO	236 NO FIRST ST	Irrigation	3	0.6
72	1162-1	CHONG WOO	16000 MAIN ST (IRRIGATION)	Irrigation	3	0.5
					Total	**280.0**

Pipelines categorized by size and length required for this alternative are presented in **Table 3-5**. The phasing scenarios considered for this alternative are also presented in **Figure 3-2** and **Table 3-5**. The pump station details required for this alternative are presented in **Table 3-6**.

Table 3-5
Alternative 2 (Pumped System) – Pipelines

Pipeline Diameter (in)	Phase 1 (ft)	Phase 2 (ft)	Phase 3 (ft)	Total (ft)
4	2,200	3,100	12,600	17,900
6	-	1,100	1,800	2,900
8	1,000	5,100	-	6,100
12	200	-	-	200
Total	**7,300**	**14,400**	**5,400**	**27,100**

Table 3-6
Alternative 2 (Pumped System) – Pump Station

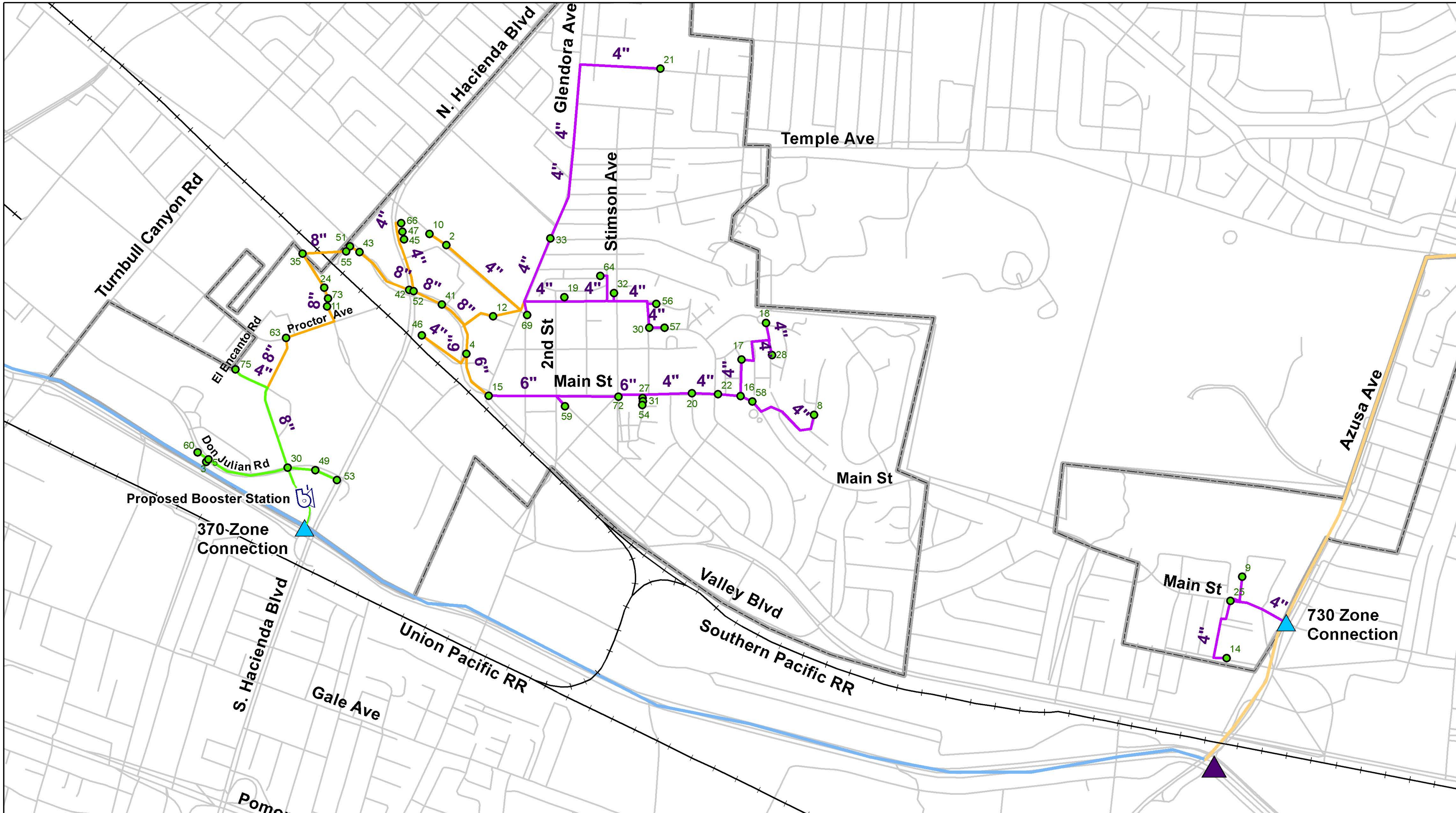
Booster Station	Type	Number of Pumps	Design Flow (gpm)	Design TDH (ft)
Parriott Place	Variable Speed[1]	1+1	900 each	300

1 – variable speed pump required to overcome the lack of system storage

The hydraulic model for this alternative shows pressure ranging from 40 psi to 139 psi, which are within the specified sizing and evaluation criteria. However, the pressure observed at Hillcrest HOA, which is the highest point in the system is too low. The most cost effective and practical option to serve this customer with sufficient pressure would be to install an individual booster at the intersection of Main Street and Hillcrest Drive.

The maximum velocity observed in the system under this alternative is 4.7 fps.

The cost for implementing this alternative is presented in **Section 4** of this report.



Key to Features

Potential Customers for Pumped Scenario

La Puente Valley County Water District Boundary

Phase 1 Pipeline (Diameters in Inches)

Phase 2 Pipeline (Diameters in Inches)

Phase 3 Pipeline (Diameters in Inches)

City of Industry 370 Zone

Upper San Gabriel Valley Municipal Water District 730 Zone

N

0 500 1,000 2,000 Feet

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Date: March 12, 2012

Proposed Recycled Water System Pumped Scenario

Figure 3-2

MWH.

3.5.4 Alternative 3 – Hybrid System

Alternative 3 is a combination of Alternatives 1 and 2. Under this alternative, the southwestern portion of the system (south of the railroad and west of Hacienda Blvd.) would be supplied from the 370 HGL pipeline with individual on-site boosters to ensure adequate pressures to the customers (at approximately 10 customer sites). The eastern and northern portions of the system would be supplied by the 730 HGL pipeline along Azusa as shown in **Figure 3-3**. Pipeline along San Jose Creek has a hydraulic grade line of 398 feet. Alternative 3 system would supply approximately 280 acre-ft/yr of recycled water to 52 potential customers as shown in **Table 3-7**. The location of these customers can be cross referenced with **Figure 3-3** using the "Unique ID" field in the table.

Table 3-7
Alternative 3 (Hybrid System) – Potential Customers

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
3	2418-0	CITY OF INDUSTRY	15414 DON JULIAN RD.	Irrigation	1	22.4
5	5416-0	CITY OF INDUSTRY	15415 DON JULIAN RD	Irrigation	1	16.8
9	2245-0	LA VILLA PUENTE	17351 MAIN ST	Multi-Family	1	10.8
11	2410-1	MARQUEZ BROTHERS	15480 VALLEY BLVD	Irrigation	1	8.8
14	2269-0	HURLEY APTS	17341 HURLEY ST	Multi-Family	1	7.4
24	2394-0	AI HOA PLAZA	15451 VALLEY BLVD	Irrigation	1	4.8
25	2246-6	VILLA BONITA	17340 MAIN ST	Multi-Family	1	4.8
60	2433-0	FIBRE CONTAINER	15400 DON JULIAN RD	Packaging	1	4.8
30	5427-0	CITY OF INDUSTRY	PARIOTT & DON JULIAN	Irrigation	1	3.9
35	2398-0	CITY OF INDUSTRY	ALONG RAILROAD TRACK	Irrigation	1	3.3
73	2393-0	AI HOA PLAZA	15469717375 VALLEY BLVD	Commercial	1	3.2
49	5428-3	DELTA PRODUCTS CORPORATION	15700 DON JULIAN RD	Irrigation	1	2.3
63	2406-0	CITY OF INDUSTRY	PROCTOR & EL ENCANTO	Irrigation	1	1.3
53	5436-2	THERMALTAKE, INC.	525 PARIOTT PLACE	Irrigation	1	2.0
75	2407-0	EL ENCANTO HEALTHCARE	555 S EL ENCANTO RD	Commercial	1	6.9
4	5339-0	CITY OF INDUSTRY	201 STAFFORD ST	Irrigation	2	17.4

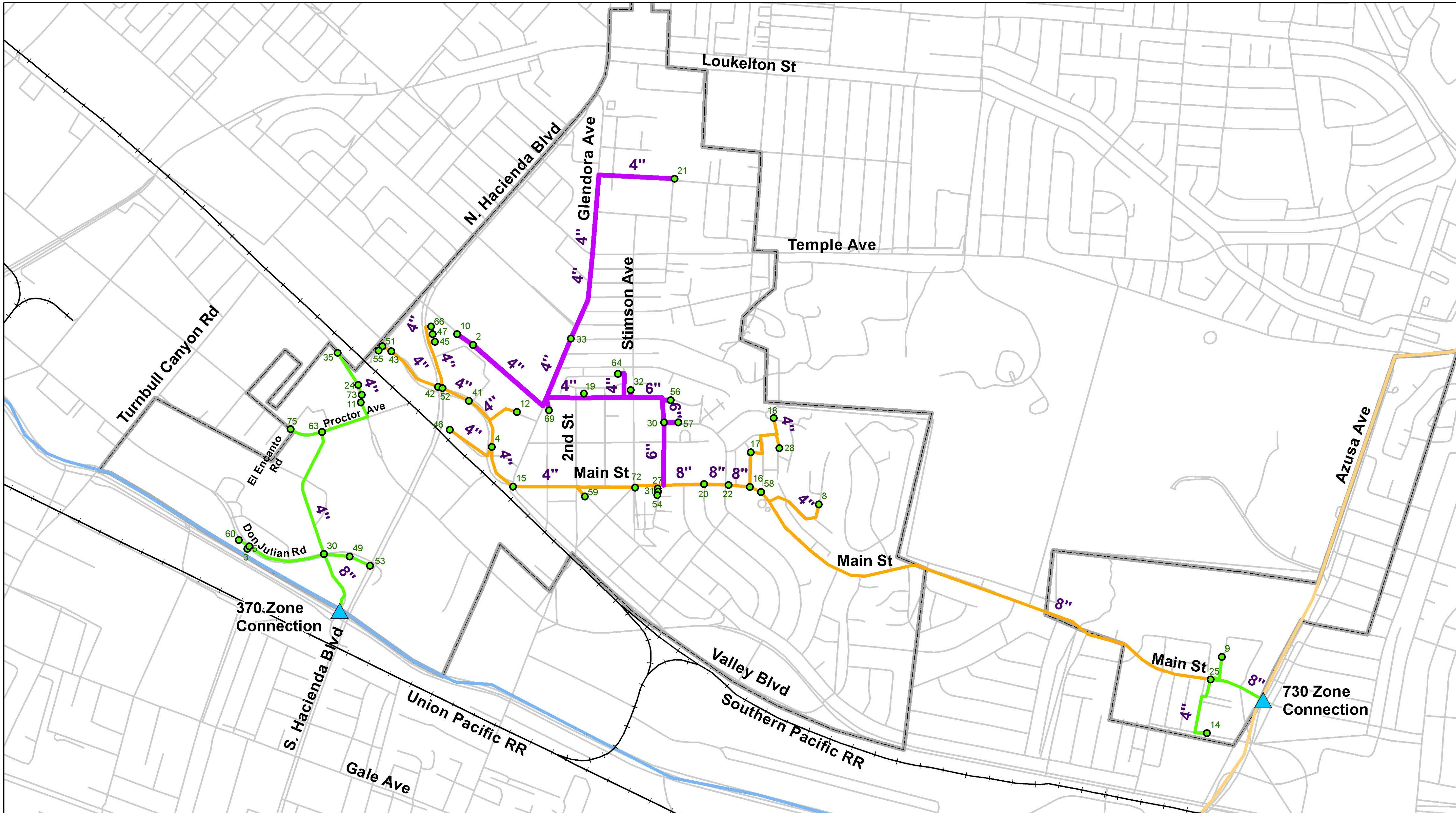
UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
8	1970-1	HILLCREST HOA	HILLCREST DR.	Irrigation	2	11.5
12	2326-0	CITY OF INDUSTRY	SOTRO ST	Irrigation	2	7.9
15	2339-0	CITY OF INDUSTRY	STAFFORD & OLD VALLEY	Irrigation	2	7.3
16	866-0	HILLCREST HOA/PTPM	100 TANGLEWOOD ST (IRRIGATION)	Irrigation	2	6.5
17	853-0	HILLCREST HOA/PTPM	146 TANGLEWOOD ST (IRRIGATION)	Irrigation	2	6.2
18	773-0	HILLCREST HOA / PTPM	DEERPATH LANE (IRRIGATION)	Irrigation	2	6.0
20	924-0	HAC - L.P. UNIFIED	16151 MAIN ST	Irrigation	2	6.0
22	1905-1	HILLCREST HOA	MAIN STREET	Irrigation	2	5.0
27	1114-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	2	4.6
28	809-0	HILLCREST HOA / PTPM	134 HOMESTEAD ST (IRRIGATION)	Irrigation	2	4.2
31	1133-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	2	3.8
41	2327-0	CITY OF INDUSTRY	15651 STAFFORD ST	Public Authority	2	2.9
42	2304-0	CITY OF INDUSTRY	N HACIENDA & STAFFORD	Irrigation	2	2.9
43	2308-0	CITY OF INDUSTRY	STAFFORD ST.	Irrigation	2	2.8
51	2307-0	CITY OF INDUSTRY	HUDSON AVE	Irrigation	2	2.1
52	2302-0	CITY OF INDUSTRY	HACIENDA & STAFFORD ST	Irrigation	2	2.1
54	1134-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	2	2.0
55	2306-0	L. A. CO-INT. SERV. DEPT	150 HUDSON AVE	Public Authority	2	1.8
58	1940-1	HILLCREST HOA	MAIN STREET (IRRIGATION)	Irrigation	2	1.7
59	1068-0	L.A. COUNTY INT SER DEPT	15930 CENTRAL AVE	Public Authority	2	1.7
72	1162-1	CHONG WOO	16000 MAIN ST (IRRIGATION)	Irrigation	2	0.5
66	2305-0	CITY OF INDUSTRY	211 NO. HACIENDA BLVD	Irrigation	2	1.0

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
47	2309-0	CITY OF INDUSTRY	220 NO HACIENDA BLVD(IRRIGATION)	Irrigation	2	2.3
46	2336-0	CITY OF INDUSTRY	RAUSCH RD	Irrigation	2	2.4
45	2312-0	BANK OF AMERICA	150 NO HACIENDA BLVD	Irrigation	2	2.5
2	1460-0	HAC - L.P. UNIFIED	15615 NELSON AVE	Irrigation	3	23.7
10	2315-0	CITY OF INDUSTRY	NELSON AVE	Irrigation	3	10.5
19	601-0	RANCHO LA PUENTE HOA	ROWLAND ST (IRRIGATION)	Irrigation	3	6.0
21	235-0	HAC - L.P. UNIFIED	15801 SIERRA VISTA CT	Public Authority	3	5.3
32	550-0	RANCHO LA PUENTE HOA	NO STIMSON AVE	Irrigation	3	3.7
33	1458-0	LA PUENTE PARK	NO. GLENDORA AVE #1	Irrigation	3	3.6
30	5427-0	CITY OF INDUSTRY	PARIOTT & DON JULIAN	Irrigation	3	3.9
56	699-0	ROWLAND PARK	16016-2636 ROWLAND	Multi-Family	3	1.8
57	700-1	ADRIANA GRIPPA	16011 BAMBOO ST.	Multi-Family	3	1.8
64	642-0	RANCHO LA PUENTE HOA	FALLEN LEAF RD IRRIGATION	Irrigation	3	1.3
69	1020-1	ROBERTO MURILLO	236 NO FIRST ST	Irrigation	3	0.6
					Total	**280.0**

Pipelines categorized by size and length required for this alternative are presented in **Table 3-8**. The pipeline lengths required under this alternative is similar to the pipeline lengths in Alternative 1. However, unlike Alternative 1, this alternative does not require railroad crossing along North Hacienda Blvd. The phasing scenarios considered for this alternative are also presented in **Figure 3-3** and **Table 3-8**.

Table 3-8
Alternative 3 (Hybrid) – Pipelines

Pipeline Diameter (in)	Phase 1 (ft)	Phase 2 (ft)	Phase 3 (ft)	Total (ft)
4	6,100	9,000	7,300	21,900
6	1,000	100	1,600	2,700
8	1,500	7,600	-	9,100
Total	**8,600**	**16,700**	**8,900**	**34,200**



Key to Features

- Potential Customers for Hybrid Scenario
- La Puente Valley County Water District Boundary
- Phase 1 Pipeline (Diameters in Inches)
- Phase 2 Pipeline (Diameters in Inches)
- Phase 3 Pipeline (Diameters in Inches)
- City of Industry 370 Zone
- Upper San Gabriel Valley Municipal Water District 730 Zone

N

0 500 1,000 2,000 Feet

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Date: March 12, 2012

Proposed Recycled Water System
Hybrid Scenario - Main Street Alignment

Figure 3-3

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As described earlier, this alternative is proposed to avoid building a railroad crossing, which could significantly increase the project cost. The approach for this alternative is to serve the customers south of the railroad tracks from City of Industry's 370 Zone pipeline. There are about 10 customer sites south of the railroad tracks. In order to minimize cost, it is recommended that individual boosters be installed at the customer sites as opposed to constructing a dedicated pump station.

The hydraulic model for the gravity fed portion of the system (north of the railroad) shows pressure ranging from 40 psi to 135 psi, which are within the specified sizing and evaluation criteria. The maximum velocity observed in the system is 5.9 fps. The cost for implementing this alternative is presented in **Section 4** of this report.

3.5.5 Alternative 4 – Gravity System Along Temple Avenue

Alternative 4 would supply recycled water into the proposed system via a connection at the intersection of Temple Avenue and Azusa Avenue as shown in **Figure 3-4**. City of Industry pipeline along Azusa Avenue has a HGL of 730 feet. This point of connection makes it possible to serve recycled water throughout the proposed system via gravity. Alternative 4 system would supply approximately 328 acre-ft/yr of recycled water to 56 potential customers as shown in **Table 3-9**. The location of these customers can be cross referenced with **Figure 3-4** using the "Unique ID" field in the table.

Table 3-9
Alternative 4 (Temple Ave Gravity) – Potential Customers

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
2	1460-0	HAC - L.P. UNIFIED	15615 NELSON AVE	Irrigation	1	23.7
4	5339-0	CITY OF INDUSTRY	201 STAFFORD ST	Irrigation	1	17.4
9	2245-0	LA VILLA PUENTE	17351 MAIN ST	Multi-Family	1	10.8
10	2315-0	CITY OF INDUSTRY	NELSON AVE	Irrigation	1	10.6
12	2326-0	CITY OF INDUSTRY	SOTRO ST	Irrigation	1	7.9
14	2269-0	HURLEY APTS	17341 HURLEY ST	Multi-Family	1	7.4
15	2339-0	CITY OF INDUSTRY	STAFFORD & OLD VALLEY	Irrigation	1	7.3
21	235-0	HAC - L.P. UNIFIED	15801 SIERRA VISTA CT	Public Authority	1	5.3
25	2246-6	VILLA BONITA	17340 MAIN ST	Multi-Family	1	4.8
26	347-0	CITY OF INDUSTRY	DEL VALLE	Irrigation	1	4.6
33	1458-0	LA PUENTE PARK	NO. GLENDORA AVE #1	Irrigation	1	3.6
41	2327-0	CITY OF INDUSTRY	15651 STAFFORD	Pub. Authority	1	2.9

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
47	2309-0	CITY OF INDUSTRY	220 NO HACIENDA BLVD(IRRIGATION)	Irrigation	1	2.3
46	2336-0	CITY OF INDUSTRY	RAUSCH RD	Irrigation	1	2.4
52	2302-0	CITY OF INDUSTRY	HACIENDA & STAFFORD ST	Irrigation	1	2.1
66	2305-0	CITY OF INDUSTRY	211 NO. HACIENDA BLVD	Irrigation	1	1.0
67	282-1	TEMPLE & 5TH CONDO ASSOC.	556 NO. 5TH ST.	Irrigation	1	0.8
69	1020-1	ROBERTO MURILLO	236 NO FIRST ST	Irrigation	1	0.6
45	2312-0	BANK OF AMERICA	150 NO HACIENDA BLVD	Irrigation	1	2.5
75	2407-0	EL ENCANTO HEALTHCARE	555 S EL ENCANTO RD	Commercial	1	6.9
1	xxxx-1	William Workman High School	16303 TEMPLE AVE	Irrigation	1	30.0
6	xxxx-2	Wing Lane Elementary School	16605 Wing Lane	Irrigation	1	12.9
8	1970-1	HILLCREST HOA	HILLCREST DR.	Irrigation	2	11.5
16	866-0	HILLCREST HOA/PTPM	100 TANGLEWOOD ST (IRRIGATION)	Irrigation	2	6.5
17	853-0	HILLCREST HOA/PTPM	146 TANGLEWOOD ST (IRRIGATION)	Irrigation	2	6.2
18	773-0	HILLCREST HOA / PTPM	DEERPATH LANE (IRRIGATION)	Irrigation	2	6.0
15	2339-0	CITY OF INDUSTRY	STAFFORD & OLD VALLEY	Irrigation	2	6.0
20	924-0	HAC - L.P. UNIFIED	16151 MAIN ST	Irrigation	2	6.0
22	1905-1	HILLCREST HOA	MAIN STREET	Irrigation	2	5.0
27	1114-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	2	4.6
28	809-0	HILLCREST HOA / PTPM	134 HOMESTEAD ST (IRRIGATION)	Irrigation	2	4.3
31	1133-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	2	3.8
32	550-0	RANCHO LA PUENTE HOA	NO STIMSON AVE	Irrigation	2	3.7
30	5427-0	CITY OF INDUSTRY	PARIOTT & DON JULIAN	Irrigation	2	3.0

UNIQUE ID	SERV ID	USERNAME	ADDRESS	SERV CLASS	PHASE	RW Use (AFY)
54	1134-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	2	2.0
56	699-0	ROWLAND PARK	16016-2636 ROWLAND	Multi-Family	2	1.7
57	700-1	ADRIANA GRIPPA	16011 BAMBOO ST.	Multi-Family	2	1.7
58	1940-1	HILLCREST HOA	MAIN STREET (IRRIGATION)	Irrigation	2	1.7
59	1068-0	L.A. COUNTY INT SER DEPT	15930 CENTRAL AVE	Public Authority	2	1.7
64	642-0	RANCHO LA PUENTE HOA	FALLEN LEAF RD IRRIGATION	Irrigation	2	1.3
72	1162-1	CHONG WOO	16000 MAIN ST (IRRIGATION)	Irrigation	2	0.5
3	2418-0	CITY OF INDUSTRY	15414 DON JULIAN RD.	Irrigation	3	22.6
5	5416-0	CITY OF INDUSTRY	15415 DON JULIAN RD	Irrigation	3	16.8
11	2410-1	MARQUEZ BROTHERS	15480 VALLEY BLVD	Irrigation	3	8.8
24	2394-0	AI HOA PLAZA	15451 VALLEY BLVD	Irrigation	3	4.8
60	2433-0	FIBRE CONTAINER	15400 DON JULIAN RD	Packaging	3	4.8
30	5427-0	CITY OF INDUSTRY	PARIOTT & DON JULIAN	Irrigation	3	3.9
35	2398-0	CITY OF INDUSTRY	ALONG RAILROAD TRACK	Irrigation	3	3.3
73	2393-0	AI HOA PLAZA	15469717375 VALLEY BLVD	Commercial	3	3.2
42	2304-0	CITY OF INDUSTRY	N HACIENDA & STAFFORD	Irrigation	3	2.9
43	2308-0	CITY OF INDUSTRY	STAFFORD ST.	Irrigation	3	2.8
49	5428-3	DELTA PRODUCTS CORPORATION	15700 DON JULIAN RD	Irrigation	3	2.3
51	2307-0	CITY OF INDUSTRY	HUDSON AVE	Irrigation	3	2.1
53	5436-2	THERMALTAKE, INC.	525 PARIOTT PLACE	Irrigation	3	2.0
55	2306-0	L. A. CO-INT. SERV. DEPT	150 HUDSON AVE	Public Authority	3	1.8
63	2406-0	CITY OF INDUSTRY	PROCTOR & EL ENCANTO	Irrigation	3	1.3
54	1134-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIG)	Irrigation	2	2.0
					Total	**328.0**

This alternative does not require any pumping within the proposed system. Pipelines categorized by size and length required for this alternative are presented in **Table 3-10**. The phasing scenarios considered for this alternative are also presented in **Figure 3-4** and **Table 3-10**.

Table 3-10
Alternative 4 (Temple Avenue) – Pipelines

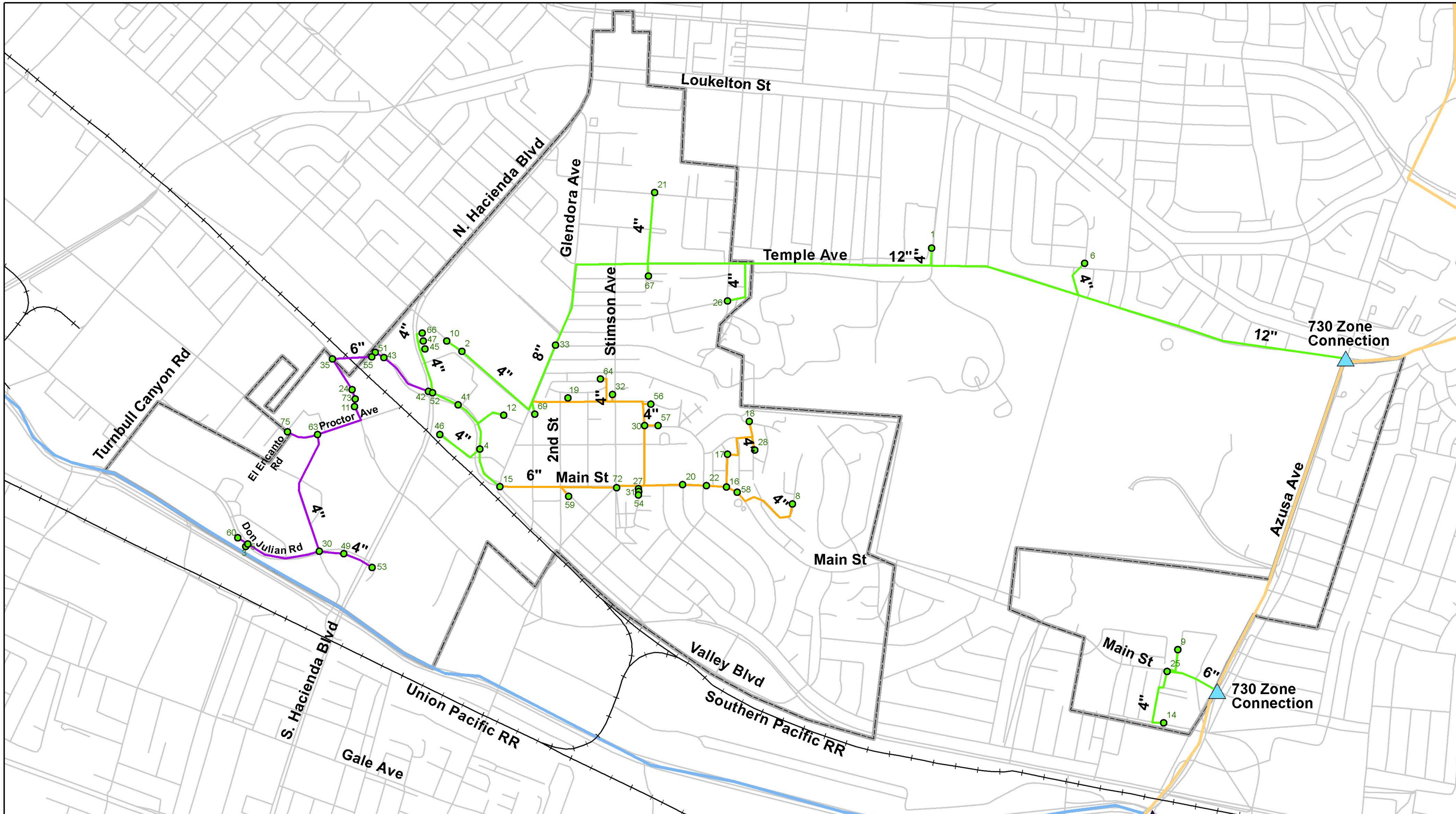
Pipeline Diameter (in)	Phase 1 (ft)	Phase 2 (ft)	Phase 3 (ft)	Total (ft)
4	5,400	3,400	4,800	13,100
6	2,800	5,800	2,100	10,700
8	2,000	-	-	2,000
12	10,200	-	-	10,200
Total	**20,400**	**9,200**	**6,900**	**36,500**

This alternative requires about 1 mile (5,000 feet) of additional pipeline compared to Alternatives 1 and 3. Also, majority of the customers are located away from the connection point at Temple Avenue & Azusa Avenue and thus in order to minimize the dynamic losses in the system, larger (12-inch) diameter pipeline is required along Temple Avenue. This would increase the overall system cost.

The biggest advantage of this alternative is the ability to serve recycled water to customers outside LPVCWD's service area. For this analysis, it is assumed that if this alternative is implemented, LPVCWD will be able serve the William Workman High School (30 acre-ft/yr) and Wing Lane Elementary School (13 acre-ft/yr).

The system pressures observed under this alternative range from 73 psi to about 155 psi. These pressures are generally within the sizing and evaluation criteria described earlier, thus eliminating the need for improving or regulation pressure in the system. The maximum velocity observed in the system is about 5.7 fps, which is within the specified criteria.

The cost for implementing this alternative is presented in **Section 4** of this report.



Key to Features

- Potential Customers for Temple Alignment
- La Puente Valley County Water District Boundary
- Phase 1 Pipeline (Diameters in Inches)
- Phase 2 Pipeline (Diameters in Inches)
- Phase 3 Pipeline (Diameters in Inches)
- City of Industry 370 Zone
- Upper San Gabriel Valley Municipal Water District 730 Zone

N

0 550 1,100 2,200 Feet

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Date: March 12, 2012

Proposed Recycled Water System Temple Alignment

Figure 3-4

MWH

Section 4
Financial Analysis and Funding

The demand on potable water is becoming increasingly greater as the State of California is crawling out of a three-year drought and the population continues to increase. As a result, the development of the recycled water system has become important in alleviating this strain in La Puente Valley County Water District (LPVCWD) service area. This section address the potential funding sources for LPVCWD's recycled water distribution system, the opinion of probable construction cost, and the recommended implementation and phasing.

4.1 FUNDING

The construction of a recycled water distribution system can have a significant outlay of capital, as with implementing any capital improvement project in the current economic environment. In order to help alleviate some of the financial burden that may be associated with the construction of a recycled water distribution system, funding options have been set up by local (Metropolitan Water District of Southern California), State of California, and Federal government. LPVCWD's proposed project might be eligible for funding from local, state and federal funds.

4.1.1 Local Funding

MWDSC administers the Local Resources Program (LRP) to fund water recycling and groundwater recovery projects that replace an existing demand or prevent a new demand on MWDSC's imported water supplies. The LRP pays up to $250 per acre-foot of recycled water produced. In order for LPVCWD to obtain this funding, they might have to partner with Upper San Gabriel Valley Municipal Water District (USGVMWD). MWH recommends that LPVCWD approach USGVMWD for this partnering arrangement, since MWDSC currently has funds available for 2011.

4.1.2 State Funding: Water Recycling Funding Program

The State Water Resources Control Board (SWRCB) provides funding assistance for the planning, design, and construction of water recycling projects that will help alleviate the demand on state or local potable water supplies. The mission of the Water Recycling Funding Program (WRFP) is "To promote the beneficial use of treated municipal wastewater (water recycling) in order to augment fresh water supplies in California by providing technical and financial assistance to agencies and other stakeholders in support of water recycling projects and research." The WRFP is funded through Proposition 50, Proposition 13, and the State Revolving Fund (SRF) Loan Program.

MWH understands that the funds for the Proposition 50 program are currently fully subscribed to but applications are still being accepted in anticipation of the 2012 Water Bill.

4.1.3 Federal Funding

Federal funding for recycled water projects is available through the US Bureau of Reclamation, Title XVI program. This feasibility study report might need to be modified in order to comply with Title XVI requirements in order to obtain funds under this program. Recently, federal funding has also been made available through the American Recovery and Reinvestment Act (ARRA) stimulus package. US Army Corp of Engineers (USACOE) funding is also available, and the USACOE will provide $0.75 per dollar spent by LPVCWD; however, but USACOE would provide project management, design assistance and construction management.

MWH recommends that LPVCWD explore a potential partnering arrangement with the San Gabriel Basin Water Quality Authority in order to obtain funds for the proposed project under the Title XVI program.

4.2 CUSTOMER RETROFIT ALTERNATIVES

When implementing a recycled water system within LPVCWD service area, there are several alternatives for paying for the retrofits at the individual customer sites. The first alternative is for the customer to pay for the retrofit. The second alternative is for LPVCWD to pay for the retrofit, including engineering cost, construction and associated permits. The third alternative is for LPVCWD to pay for the retrofit and the customers pay LVPCWD back using the savings between the recycled water rate and the potable water rate. LPVCWD would base the retrofit financing on a 10 year payback period, which has been successfully used in the past with other utilities. The fourth alternative is to pursue State funding under the Clean Water SRF program. Funding for customer retrofits under the SRF is limited to public facilities (parks, schools, libraries etc.) only.

The financial analysis for this report assumes the third alternative for the customer conversions, however LPVCWD will have conversations with the individual customers. For this study, it is assumed that a typical customer conversion (including customer contact, research of on-site configuration, design of retrofits, permits etc.) would cost $20,000. However, for the hybrid alternative (Alternative 3 in Section 3), this cost would be around $25,000 for customers that require individual on-site boosters. These costs warrant further refinement and revision once the project evolves into preliminary design and design phases.

4.3 OPINION OF PROBABLE CONSTRUCTION COSTS

A planning level opinion of probable construction cost (OPCC) was developed for the recycled water distribution system, and was divided based on the pipeline and pump station. The OPCC for the recycled water distribution system will include pipeline costs and the following additional costs:

- Mobilization/Demobilization;
- Traffic control;
- Potholing;
- Bore and Jack, set up and casing;
- Valves, ARV's and blowoffs;

- Easement Acquisition;
- Meter connections;
- Customer retrofits;
- Surge Tanks and accessories;
- Concrete pads for pumps, cabinets and chemical system; and
- Motor control center, PLCs and VFD's.

The OPCC is summarized in **Table 4-1** below and the detailed estimates along with the assumptions used to develop the OPCC can be found in **Appendix D**.

Table 4-1
OPCC Summary

Alternative	Cost
Alt 1 – Gravity along Main St.	**$ 9,720,000**
Alt 2 – Pumped System	**$ 8,990,000**
Alt 3 – Hybrid System	**$ 9,775,000**
Alt 4 – Gravity along Temple Avenue	**$ 11,410,000**

Based on the capital cost, Alternative 4, which connects to the existing pipeline along Azusa Avenue at Temple Avenue is the most expensive alternative. Alternative 2, which requires pumping from the existing 370 Zone pipeline along San Jose Creek is the most cost-effective alternative. However, in order to determine a recommended alternative, a life cycle cost analysis needs to be performed for all the alternatives under consideration. This economic analysis is discussed below.

4.4 ECONOMIC ANALYSIS OF ALTERNATIVES

An economic analysis was performed to calculate the present worth of the evaluated alternatives and determine the cost per acre-foot of recycled water delivered. The assumptions used for this analysis are as follows:

- Project will use 100% State Revolving Funds, paid back over 20 years at a 2.5% interest rate;
- Power costs are $0.125/kWh with an annual inflation rate of 5%;
- Labor costs are $3,000/month and will use an annual inflation rate of 3%;
- Useful service life for pipelines is 75 years and pump station and other mechanical equipment is 25 years;

Utilizing these assumptions, present worth analysis was performed for the four alternatives using the economic model spreadsheet developed by the SWRCB. The results of this analysis are summarized below in **Table 4-2** and the details are presented in **Appendix E**.

Table 4-2
Present Worth of Alternatives – Capital and O&M Costs

Alternative	Volume of Water Served (acre-ft/yr)	Unit Cost ($/AF)[1]
Alt 1 – Gravity along Main St.	**280**	**$ 1,580**
Alt 2 – Pumped System	**280**	**$ 1,780**
Alt 3 – Hybrid System	**280**	**$ 1,520**
Alt 4 – Gravity along Temple Avenue	**328**	**$ 1,740**

1 – values rounded up to the nearest 10

The above unit cost of the alternatives does not take into account the cost of purchasing water. LPVCWD has the option of purchasing water from City of Industry via the 370 Zone San Jose Creek pipeline or from USGVMWD via the Azusa Avenue pipeline. Based on the discussions with these agencies, the cost of purchasing water from City of Industry and USGVMWD is expected to be $350/acre-ft and $512/acre-ft respectively. The City of Industry purchase will be a direct purchase and for this analysis it is assumed that the City will not participate in constructing the LPVCWD proposed recycled water system. The $512/acre-ft USGVMWD cost is based on the assumption that USGVMWD will partner with LPVCWD in construction of the proposed recycled system. **Table 4-3** presents the total present worth of all four alternatives with the cost of recycled water purchase discounted over 20 years. The table also presents the cost of pumping and treating groundwater for comparison purposes.

Table 4-3
Present Worth of Alternatives Including Cost of Purchasing Recycled Water

Alternative	Volume of Water Served (acre-ft/yr)	Total Cost ($/AF)[2]
Alt 1 – Gravity along Main St.	**280**	**$ 2,000**
Alt 2 – Pumped System	**280**	**$ 2,350**
Alt 3 – Hybrid System	**280**	**$ 1,850**
Alt 4 – Gravity along Temple Avenue	**328**	**$ 2,280**
Groundwater – Pump and Treat	**-**	**$ 1,420**

1 – values rounded up to the nearest 10
2 – Alt 1, 3, and 4 require purchasing water from USGVMWD; Alt 2 requires a purchase from City of Industry

Based on the above analysis, MWH recommends Alternative 3 alignment, which would serve the proposed recycled water system from the existing 370 Zone City of Industry pipeline and the USGVMWD gravity line along Azusa Avenue. The phasing and other details of this recommended alternative along with the cost per phase is presented later in this section.

As discussed previously, groundwater is the primary source of water for LPVCWD. District's current adjudicated water rights in the Main San Gabriel Basin are 1,130 acre-ft per year. Each year LPVCWD extracts its share of groundwater (equal to the safe operational yield established by the Watermaster) and purchases lease water to augment supplies. Any production that exceeds the sum of LPVCWD's share of safe yield and leased water is assessed at the Replenishment Assessment rate (over-production cost). The cost to LPVCWD for groundwater over-production and treatment as of November 2010 is around $700 per acre-ft. In order to compare groundwater production cost and the cost of proposed recycled water project on an equal basis, the $700 per acre-ft over-production costs are discounted over 20 years and presented in **Table 4-3**. The groundwater cost when adjusted over 20 years with an interest rate of 2.5 percent and inflation rate of 5 percent, yields a present worth of $1,420.

4.5 PHASING OF THE RECOMMENDED ALTERNATIVE

As described previously, the OPCC for Alternative 3 – Hybrid System is approximately $9.8 Million. MWH recommends to implement this alternative in three phases. Phase 1 will provide 103 AFY of recycled water to 15 customers, Phase 2 will provide an additional 115 AFY of recycled water to 26 additional customers and Phase 3 will provide an additional 62 AFY of recycled water to 11 additional customers.

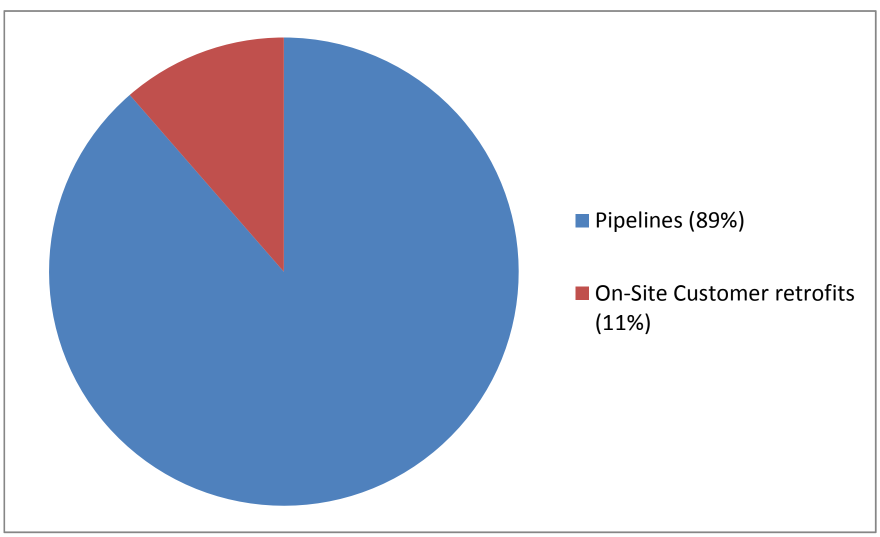
The first phase will be constructed to connect the customers south of the railroad crossing and west of Hacienda Blvd as described in Section 3 via the 370 Zone COI pipeline. It is assumed that the 12 customers being served from the 370 Zone pipeline (see **Figure 3-3**) in this alternative will have on-site boosters to provide required delivery pressures. Phase 1 is also designed to serve three customers located on the east end of the system from USGVMWD's 730 Zone pipeline along Azusa Avenue. The capital cost of the recycled water system by phase is presented in **Table 4-4**. Capital cost by type of facility is presented on **Figure 4-1**.

Table 4-4
Capital Cost of Recommended Alternative by Phase

Cost Item	Phase 1	Phase 2	Phase 3	Total
Pipelines	$ 2,020,000	$ 4,410,000	$ 2,130,000	$ 8,560,000
On-Site Customer retrofits	$ 360,000	$ 520,000	$ 220,000	$ 1,100,000
Total	**$ 2,380,000**	**$ 4,930,000**	**$ 2,350,000**	**$ 9,660,000**

1 - includes 15% contingency
2 - includes 45% for Engineering, project administration, and contractor markups

Figure 4-1
Cost by Facility Type



4.6 RECOMMENDED STRATEGIC IMPLEMENTATION AND CONSTRUCTION FINANCING PLAN

The financing plan will be developed later by LPVCWD and will be provided as Appendix F of this report.

APPENDIX A

Potential Recycled Water Customers for LPVCWD RW System

Serv ID	USERNAME	ADDRESS	SERV CLASS	5-year Annua Avg. Potable Dmd (AFY)	Percent Recycled Water Use	5-year Annual Avg. RW Dmd (AFY)	Peaking Factors	Peak Hour Demand (gpm)
xxxx-1	William Workman High School	16303 TEMPLE AVE	Irrigation	30.00	100%	30.0	5.76	107
1460-0	HAC - L.P. UNIFIED	15615 NELSON AVE	Irrigation	23.68	100%	23.7	5.76	85
2418-0	CITY OF INDUSTRY	15414 DON JULIAN RD.	Irrigation	22.55	100%	22.6	5.76	80
5339-0	CITY OF INDUSTRY	201 STAFFORD ST	Irrigation	17.37	100%	17.4	5.76	62
5416-0	CITY OF INDUSTRY	15415 DON JULIAN RD	Irrigation	16.81	100%	16.8	5.76	60
xxxx-2	Wing Lane Elementary School	16605 Wing Lane	Irrigation	13.00	100%	13.0	5.76	46
1490-2	VALLEY BUSINESS CENTER	16500 VALLEY BLVD	Irrigation	11.61	100%	11.6	5.76	41
1970-1	HILLCREST HOA	HILLCREST DR.	Irrigation	11.50	100%	11.5	5.76	41
2245-0	LA VILLA PUENTE	17351 MAIN ST	Multi-Family	36.01	30%	10.8	5.76	39
2315-0	CITY OF INDUSTRY	NELSON AVE	Irrigation	10.57	100%	10.6	5.76	38
2410-1	MARQUEZ BROTHERS	15480 VALLEY BLVD	Irrigation	8.77	100%	8.8	5.76	31
2326-0	CITY OF INDUSTRY	SOTRO ST	Irrigation	7.86	100%	7.9	5.76	28
2419-0	CITY OF INDUSTRY	15414 DON JULIAN RD	Irrigation	7.44	100%	7.4	5.76	27
2269-0	HURLEY APTS	17341 HURLEY ST	Multi-Family	24.77	30%	7.4	5.76	27
2339-0	CITY OF INDUSTRY	STAFFORD & OLD VALLEY	Irrigation	7.33	100%	7.3	5.76	26
2407-0	EL ENCANTO HEALTHCARE	555 S EL ENCANTO RD	Commercial	22.96	30%	6.9	5.76	25
866-0	HILLCREST HOA/PTPM	100 TANGLEWOOD ST (IRRIGATION)	Irrigation	6.54	100%	6.5	5.76	23
853-0	HILLCREST HOA/PTPM	146 TANGLEWOOD ST (IRRIGATION)	Irrigation	6.22	100%	6.2	5.76	22
773-0	HILLCREST HOA / PTPM	DEERPATH LANE (IRRIGATION)	Irrigation	6.03	100%	6.0	5.76	22
601-0	RANCHO LA PUENTE HOA	ROWLAND ST (IRRIGATION)	Irrigation	6.00	100%	6.0	5.76	21
924-0	HAC - L.P. UNIFIED	16151 MAIN ST	Irrigation	5.96	100%	6.0	5.76	21
235-0	HAC - L.P. UNIFIED	15801 SIERRA VISTA CT	Public Authority	17.59	30%	5.3	5.76	19
1905-1	HILLCREST HOA	MAIN STREET	Irrigation	5.01	100%	5.0	5.76	18
2424-2	RIF I - DON JULIAN LLC	15241-77 DON JULIAN RD	Irrigation	4.95	100%	5.0	5.76	18
2394-0	AI HOA PLAZA	15451 VALLEY BLVD	Irrigation	4.85	100%	4.8	5.76	17
2246-6	VILLA BONITA	17340 MAIN ST	Multi-Family	15.99	30%	4.8	5.76	17
347-0	CITY OF INDUSTRY	DEL VALLE	Irrigation	4.62	100%	4.6	5.76	16
1114-0	GREENBRIAR LANE HOA	GREENBRIAR LANE (IRRIGATION)	Irrigation	4.60	100%	4.6	5.76	16
809-0	HILLCREST HOA / PTPM	134 HOMESTEAD ST	Irrigation	4.26	100%	4.3	5.76	15
2415-0	CITY OF INDUSTRY	15414 DON JULIAN RD.	Irrigation	4.21	100%	4.2	5.76	15
5427-0	CITY OF INDUSTRY	PARIOTT & DON JULIAN	Irrigation	3.95	100%	3.9	5.76	14
1133-0	GREENBRIAR LANE HOA	GREENBRIAR LANE	Irrigation	3.83	100%	3.8	5.76	14
550-0	RANCHO LA PUENTE HOA	NO STIMSON AVE	Irrigation	3.66	100%	3.7	5.76	13
1458-0	LA PUENTE PARK	NO. GLENDORA AVE #1	Irrigation	3.59	100%	3.6	5.76	13
2273-0	CITY OF INDUSTRY	AZUSA WAY	Irrigation	3.49	100%	3.5	5.76	12
2398-0	CITY OF INDUSTRY	ALONG RAILROAD TRACK	Irrigation	3.29	100%	3.3	5.76	12
2375-1	SUPERIOR SUPER	151 SO HACIENDA BLVD	Irrigation	3.24	100%	3.2	5.76	12
2393-0	AI HOA PLAZA	15469717375 VALLEY BLVD	Commercial	10.67	30%	3.2	5.76	11
1-0	GLENDORA APARTMENTS	900 NO. HACIENDA BLVD.	Multi-Family	10.51	30%	3.2	5.76	11
2247-6	VILLA BONITA	17340 MAIN ST.	Multi-Family	10.09	30%	3.0	5.76	11
701-1	LA PUENTE HILLS TERRACE	16001 BAMBOO ST	Irrigation	3.00	100%	3.0	5.76	11
1367-0	CITY OF LA PUENTE	VALLEY & CENTRAL TRIANGLE	Irrigation	2.99	100%	3.0	5.76	11
2327-0	CITY OF INDUSTRY	15651 STAFFORD ST	Public Authority	9.59	30%	2.9	5.76	10
2304-0	CITY OF INDUSTRY	N HACIENDA & STAFFORD	Irrigation	2.87	100%	2.9	5.76	10
2308-0	CITY OF INDUSTRY	STAFFORD ST.	Irrigation	2.77	100%	2.8	5.76	10
2297-0	PACIFIC PALMS	1 INDUSTRY HILLS PKWY	Irrigation	2.54	100%	2.5	5.76	9
2312-0	BANK OF AMERICA	150 NO HACIENDA BLVD	Irrigation	2.54	100%	2.5	5.76	9
2336-0	CITY OF INDUSTRY	RAUSCH RD	Irrigation	2.41	100%	2.4	5.76	9
2309-0	CITY OF INDUSTRY	220 NO HACIENDA BLVD(IRRIGATION)	Irrigation	2.29	100%	2.3	5.76	8
2417-0	CITY OF INDUSTRY	15414 DON JULIAN RD.	Irrigation	2.28	100%	2.3	5.76	8
5428-3	DELTA PRODUCTS	15700 DON JULIAN RD	Irrigation	2.26	100%	2.3	5.76	8
2335-0	CITY OF INDUSTRY	RAUSCH RD	Irrigation	2.23	100%	2.2	5.76	8
2307-0	CITY OF INDUSTRY	HUDSON AVE	Irrigation	2.11	100%	2.1	5.76	8
2302-0	CITY OF INDUSTRY	HACIENDA & STAFFORD ST	Irrigation	2.07	100%	2.1	5.76	7
5436-2	THERMALTAKE, INC.	525 PARIOTT PLACE	Irrigation	2.04	100%	2.0	5.76	7
1134-0	GREENBRIAR LANE HOA	GREENBRIAR LANE	Irrigation	2.03	100%	2.0	5.76	7
2306-0	L. A. CO-INT. SERV. DEPT	150 HUDSON AVE	Public Authority	6.13	30%	1.8	5.76	7
699-0	ROWLAND PARK	16016-2636 ROWLAND	Multi-Family	5.80	30%	1.7	5.76	6
700-1	ADRIANA GRIPPA	16011 BAMBOO ST.	Multi-Family	5.74	30%	1.7	5.76	6
1940-1	HILLCREST HOA	MAIN STREET (IRRIGATION)	Irrigation	1.69	100%	1.7	5.76	6
1068-0	L.A. COUNTY INT SER DEPT	15930 CENTRAL AVE	Public Authority	5.58	30%	1.7	5.76	6
2433-0	FIBRE CONTAINER	15400 DON JULIAN RD	Packaging	5.33	90%	4.8	2	6
348-0	VALLEY VISTA SERVICES	420 DEL VALLE	Irrigation	1.49	100%	1.5	5.76	5
2349-1	MAJESTIC REALTY	15801-11 VALLEY BLVD	Commercial	4.58	30%	1.4	5.76	5
2395-0	AI HOA PLAZA	15451 VALLEY BLVD.	Commercial	4.56	30%	1.4	5.76	5
2406-0	CITY OF INDUSTRY	PROCTOR & EL ENCANTO	Irrigation	1.34	100%	1.3	5.76	5
642-0	RANCHO LA PUENTE HOA	FALLEN LEAF RD IRRIGATION	Irrigation	1.31	100%	1.3	5.76	5
2364-2	TODD & KAIA, LLC	15619 VALLEY BLVD	Irrigation	1.08	100%	1.1	5.76	4
2305-0	CITY OF INDUSTRY	211 NO. HACIENDA BLVD	Irrigation	1.02	100%	1.0	5.76	4
282-1	TEMPLE & 5TH CONDO	556 NO. 5TH ST.	Irrigation	0.77	100%	0.8	5.76	3
1461-0	CITY OF LA PUENTE	NELSON AVE	Irrigation	0.65	100%	0.6	5.76	2
1020-1	ROBERTO MURILLO	236 NO FIRST ST	Irrigation	0.57	100%	0.6	5.76	2
251-0	DEL VALLE HOA	733 DEL VALLE	Irrigation	0.54	100%	0.5	5.76	2
1643-0	CITY OF LA PUENTE	ABBEY & CENTRAL	Irrigation	0.53	100%	0.5	5.76	2
1162-1	CHONG WOO	16000 MAIN ST	Irrigation	0.51	100%	0.5	5.76	2
			Total	**519.0**		**386.7**		**1363.2**

APPENDIX B

MANDATORY RECYCLED WATER USE ORDINANCE (TO BE PROVIDED LATER BY LPVCWD)

APPENDIX C

INTERAGENCY AGREEMENTS (TO BE PROVIDED LATER BY LPVCWD)

APPENDIX D

La Puente Valley County Water District
Proposed Recycled Water System
Opinion of Probable Construction Cost by Scenario

Scenario	Demand Served (AFY)	Pipelines	Pump Station	Conversion Cost ($)	Capital Cost ($)	Annualized Capital Cost[2] ($)			Annual Pumping Cost ($)	Project Cost ($/AF)		
						1%	3%	6%		1%	3%	6%
Gravity - Main St.	280	$ 8,680,000	-	$ 1,040,000	**$ 9,720,000**	$ 184,836	$ 327,253	$ 590,671	$ -	**$ 660**	**$ 1,169**	**$ 2,110**
Pumped	280	$ 6,860,000	$ 1,090,000	$ 1,040,000	**$ 8,990,000**	$ 192,463	$ 321,588	$ 550,979	$ 16,331	**$ 746**	**$ 1,207**	**$ 2,026**
Hybrid[1]	280	$ 8,560,000	-	$ 1,100,000	**$ 9,660,000**	$ 183,695	$ 325,233	$ 587,025	$ -	**$ 656**	**$ 1,162**	**$ 2,097**
Gravity - Temple Ave	328	$ 10,370,000	-	$ 1,040,000	**$ 11,410,000**	$ 216,974	$ 384,151	$ 693,371	$ -	**$ 662**	**$ 1,171**	**$ 2,114**

1 - The hybrid option requires individual boosters for customers; cost of purchasing and installing boosters are covered under conversion costs

2 - Annualized costs are calculated based on 1%, 3% and 6% discount rates

3 - Conversion costs are assumed to be $20,000 for alternatives 1, 2, and 4 and $25,000 for alternative 3 (to account for on-site boosters)

Appendix D - OPCC
Pipeline Costs

Scenario	Pipe diameter	Pipe length	Unit Cost	Raw Cost[1]	Contractor Markup (20%)	Engineering (12.5%) & Proj. Admin (12.5%)	Total OPCC[1]
	(in)	(ft)	$/lf	($)	($)	($)	($)
Gravity - Main St.							
	4	18,100	140	2,534,000	506,800	633,500	4,225,000
	6	7,200	160	1,152,000	230,400	288,000	1,921,000
	8	7,600	180	1,368,000	273,600	342,000	2,281,000
	12	700	220	154,000	30,800	38,500	257,000
Total for Gravity Scenario		**33,600**		**5,210,000**	**1,040,000**	**1,300,000**	**8,680,000**
Pumped							
	4	17,900	140	2,506,000	501,200	626,500	4,179,000
	6	2,900	160	464,000	92,800	116,000	774,000
	8	6,100	180	1,098,000	219,600	274,500	1,831,000
	12	200	220	44,000	8,800	11,000	73,000
Total for Pumped Scenario		**27,100**		**4,110,000**	**820,000**	**1,030,000**	**6,860,000**
Hybrid							
	4	21,900	140	3,066,000	613,200	766,500	5,113,000
	6	2,700	160	432,000	86,400	108,000	720,000
	8	9,100	180	1,638,000	327,600	409,500	2,731,000
Total for Hybrid Scenario		**33,700**		**5,140,000**	**1,030,000**	**1,280,000**	**8,560,000**
Gravity - Temple Ave							
	4	13,600	140	1,904,000	380,800	476,000	3,175,000
	6	10,700	160	1,712,000	342,400	428,000	2,855,000
	8	2,000	180	360,000	72,000	90,000	600,000
	12	10,200	220	2,244,000	448,800	561,000	3,742,000
Total for Temple Ave Scenario		**36,500**		**6,220,000**	**1,240,000**	**1,560,000**	**10,370,000**

Annual Pumping Cost Calculations

Q (gpm)	900	
Avg annual water pumped (gpm)	155	from the model
TDH (ft)	300	
Pump Efficiency	70%	
Calculated hp	17	
Motor hp	20	
Motor kw	14.9	
$/kwh	0.125	
Annual pump usage (hrs)	8760	
Annual pumping cost	**$ 16,331**	

Booster Station	Type	Number of Pumps	Design Flow (gpm)	Design TDH (ft)
Parriott Place	Constant Speed	1+1	900 each	300

Notes:
Boster station shall utilize horizontal split-case centrifugal pumps.
Pump building will be slab on grade with reinforced CMU walls.

CLASS 5 OPCC- Booster Station

BS Bldg Size Anticipated	20' x 20' x 15'
Site Work & Structure Cost	$136,000
Pump HP Anticipated	100
Pump Buy-Out Cost	$53,000
Mechanical & Electrical Cost	$400,000
Subtotal (bare costs)	$651,000
Contractor Markup	20%
Engineering & Project Admin	25%
Total Installed Cost	**$943,950**
Total OPCC	**$1,086,000**

Notes
Bldg includes all immediate-area site work & flat-roof structure installation with monorail & bollards.
Mechanical includes all immediate-area pump & bldg mechanical/piping installation
Electrical includes all immediate-area pump & bldg electrical installation and 480 VAC power/control gear.
No allowances for poor soil conditions, or escalation have been included.
Total OPCC reflects addition of 15% Estimator contingency which is required for class 5 OPCC.

APPENDIX E

ECONOMIC ANALYSIS CALCULATIONS
SUPPORTING DOCUMENTATION

Agency: La Puente Valley County Water District______________________________________
Project Name: Recycled Water Feasibility Study ______________________________________
Additional Description: WRFP Study No. 3432-010 ___________________________________
Date: March 15, 2012 ___________________________ Calculations by: MWH Americas, Inc. __

The purpose of this form is to provide some of the assumptions used in the economic analysis calculations or computer spreadsheets. It also references the sources of data used in the calculations.

This form supplements calculations dated March 15, 2012____________________________.

Assumptions

Discount rate: __2.5____% (The default rate is 6%)

Time base of costs: The costs in the calculations have been adjusted to the following common date or cost index:

Date: ________________________________

Cost Index: Name of index:
- ☐ ENRCCI (Los Angeles)
- ☐ ENRCCI (San Francisco)
- ☐ ENRCCI (20 Cities)
- ☐ Other ______________________________________

Value for given date or index: ______________________________________

Useful Lives:

Facility Type	Useful Life, years	Default Useful Life, years
Pipelines	75	
Pump stations	25	
Storage facilities	n/a	
Treatment facilities, general	n/a	
Equipment intensive treatment or other facilities, e.g., RO	n/a	
Engineering, legal, administrative services	n/a	
Land	n/a	
Other	n/a	

Economic Analysis of LPVCWD - Alternative 1 (Gravity along Main St.)

Year	Reclaimed Water Sales, AF	Design & Construction Cost $ /a/	O&M Costs, $		Salvage Value, $ /c/	Present Worth Factor at 2.5%	Present Worth of Costs, $					Present Worth of Sales, AF
			Fixed /b/	Variable /b/			Design & Construction Cost	O & M Costs Fixed	O & M Costs Variable	Salvage Value	Total	
2013		2,430,000				1.00000	2,430,000	0	0		2,430,000	0
2014		2,430,000				0.97561	2,370,732	0	0		2,370,732	0
2015	123		36,000	73,006		0.95181	0	34,265	69,489		103,754	117
2016	123		37,080	75,197		0.92860	0	34,432	69,828		104,260	114
2017	123	1,117,800	38,192	77,453		0.90595	1,012,672	34,600	70,168		1,117,440	111
2018	123	1,117,800	39,338	79,776		0.88385	987,972	34,769	70,510		1,093,252	109
2019	219		40,518	82,169		0.86230	0	34,939	70,854		105,793	189
2020	219		41,734	84,634		0.84127	0	35,109	71,200		106,309	184
2021	219	1,312,200	42,986	87,174		0.82075	1,076,984	35,281	71,547		1,183,812	180
2022	219	1,312,200	44,275	89,789		0.80073	1,050,716	35,453	71,896		1,158,065	175
2023	280		45,604	92,482		0.78120	0	35,626	72,247		107,873	219
2024	280		46,972	95,257		0.76214	0	35,799	72,600		108,399	213
2025	280		48,381	98,115		0.74356	0	35,974	72,954		108,928	208
2026	280		49,832	101,058		0.72542	0	36,149	73,310		109,459	203
2027	280		51,327	104,090		0.70773	0	36,326	73,667		109,993	198
2028	280		52,867	107,212		0.69047	0	36,503	74,026		110,529	193
2029	280		54,453	110,429		0.67362	0	36,681	74,388		111,069	189
2030	280		56,087	113,742		0.65720	0	36,860	74,750		111,610	184
2031	280		57,769	117,154		0.64117	0	37,040	75,115		112,155	180
2032	280		59,503	120,669		0.62553	0	37,220	75,482		112,702	175
2033	280		61,288	124,289		0.61027	0	37,402	75,850		113,252	171
2034	280		63,126	128,017	6,944,222	0.59539	0	37,584	76,220	4,134,494	(4,020,690)	167
Total		9,720,000					8,929,075	718,014	1,456,100	4,134,494	6,968,695	3,479

Economic Analysis Model.xls

Unit Cost ($/AF) = (Total present worth of costs)/(Total present worth of sales)= **$2,003** per acre-foot

/a/ Capital costs adjusted to 2013 dollars

/b/ Fixed cost contains labor cost assumed at $3,000 a month with an annual inflation rate of 3%

/b/ Variable cost consists of recycled water purchase cost from USGVMWD with an annual inflation rate of 3%

/c/ Useful lives: Pipelines, 75yr; pump station mechanical/electrical, 25 yrs; site work, 100yrs. No salvage value for engineering, legal & administration costs.

Economic Analysis of LPVCWD - Alternative 2 (Pumped from 370 Zone COI Pipeline)

Year	Reclaimed Water Sales, AF	Design & Construction Cost $ /a/	O&M Costs, $ Fixed /b/	O&M Costs, $ Variable /b/	Salvage Value, $ /c/	Present Worth Factor at 2.5%	Present Worth of Costs, $ Design & Construction Cost	O & M Costs Fixed	O & M Costs Variable	Salvage Value	Total	Present Worth of Sales, AF
2013		1,060,000				1.00000	1,060,000	0	0		1,060,000	0
2014		1,060,000				0.97561	1,034,146	0	0		1,034,146	0
2015	52		36,000	37,430		0.95181	0	34,265	35,626		69,891	49
2016	52		37,080	38,879		0.92860	0	34,432	36,103		70,536	48
2017	52	1,475,000	38,192	40,388		0.90595	1,336,277	34,600	36,590		1,407,468	47
2018	52	1,475,000	39,338	41,960		0.88385	1,303,685	34,769	37,087		1,375,541	46
2019	170		40,518	97,484		0.86230	0	34,939	84,060		118,999	147
2020	170		41,734	100,806		0.84127	0	35,109	84,804		119,914	143
2021	170	1,960,000	42,986	104,247		0.82075	1,608,663	35,281	85,560		1,729,504	140
2022	170	1,960,000	44,275	107,812		0.80073	1,569,428	35,453	86,328		1,691,208	136
2023	280		45,604	168,044		0.78120	0	35,626	131,276		166,902	219
2024	280		46,972	173,568		0.76214	0	35,799	132,284		168,083	213
2025	280		48,381	179,282		0.74356	0	35,974	133,306		169,280	208
2026	280		49,832	185,192		0.72542	0	36,149	134,342		170,492	203
2027	280		51,327	191,307		0.70773	0	36,326	135,393		171,719	198
2028	280		52,867	197,633		0.69047	0	36,503	136,459		172,962	193
2029	280		54,453	204,178		0.67362	0	36,681	137,539		174,220	189
2030	280		56,087	210,950		0.65720	0	36,860	138,635		175,495	184
2031	280		57,769	217,957		0.64117	0	37,040	139,747		176,786	180
2032	280		59,503	225,209		0.62553	0	37,220	140,874		178,095	175
2033	280		61,288	232,714		0.61027	0	37,402	142,018		179,420	171
2034	280		63,126	240,481	6,015,155	0.59539	0	37,584	143,179	3,581,341	(3,400,577)	167
Total		8,990,000					7,912,199	718,014	2,131,212	3,581,341	7,180,084	3,056

Economic Analysis Model.xls

Unit Cost ($/AF) = (Total present worth of costs)/(Total present worth of sales)= **$2,350** per acre-foot

/a/ Capital costs adjusted to 2013 dollars
/b/ Fixed cost contains labor cost assumed at $3,000 a month with an annual inflation rate of 3%
/b/ Variable cost consists of recycled water purchase cost from City of Industry and energy costs associated with pumping water from COI pipeline
/c/ Useful lives: Pipelines, 75yr; pump station mechanical/electrical, 25 yrs; site work, 100yrs. No salvage value for

Economic Analysis of LPVCWD - Alternative 3 (Hybrid)

Year	Reclaimed Water Sales, AF	Design & Construction Cost $ /a/	O&M Costs, $		Salvage Value, $ /c/	Present Worth Factor at 2.5%	Present Worth of Costs, $					Present Worth of Sales, AF
			Fixed /b/	Variable /b/			Design & Construction Cost	O & M Costs Fixed	O & M Costs Variable	Salvage Value	Total	
2013		1,207,500				1.00000	1,207,500	0	0		1,207,500	0
2014		1,207,500				0.97561	1,178,049	0	0		1,178,049	0
2015	103		36,000	55,526		0.95181	0	34,265	52,850		87,116	98
2016	103		37,080	57,192		0.92860	0	34,432	53,108		87,541	96
2017	103	2,366,700	38,192	58,907		0.90595	2,144,113	34,600	53,367		2,232,081	93
2018	103	2,366,700	39,338	60,675		0.88385	2,091,818	34,769	53,627		2,180,215	91
2019	218		40,518	62,495		0.86230	0	34,939	53,889		88,828	188
2020	218		41,734	64,370		0.84127	0	35,109	54,152		89,261	183
2021	218	1,255,800	42,986	66,301		0.82075	1,030,694	35,281	54,416		1,120,390	179
2022	218	1,255,800	44,275	68,290		0.80073	1,005,555	35,453	54,682		1,095,689	175
2023	280		45,604	70,338		0.78120	0	35,626	54,948		90,574	219
2024	280		46,972	72,449		0.76214	0	35,799	55,216		91,016	213
2025	280		48,381	74,622		0.74356	0	35,974	55,486		91,460	208
2026	280		49,832	76,861		0.72542	0	36,149	55,756		91,906	203
2027	280		51,327	79,167		0.70773	0	36,326	56,028		92,354	198
2028	280		52,867	81,542		0.69047	0	36,503	56,302		92,805	193
2029	280		54,453	83,988		0.67362	0	36,681	56,576		93,257	189
2030	280		56,087	86,507		0.65720	0	36,860	56,852		93,712	184
2031	280		57,769	89,103		0.64117	0	37,040	57,130		94,169	180
2032	280		59,503	91,776		0.62553	0	37,220	57,408		94,629	175
2033	280		61,288	94,529		0.61027	0	37,402	57,688		95,090	171
2034	280		63,126	97,365	7,069,328	0.59539	0	37,584	57,970	4,208,981	(4,113,427)	167
Total		9,660,000					8,657,728	718,014	1,107,453	4,208,981	6,274,213	3,403

Economic Analysis Model.xls

Unit Cost ($/AF) = (Total present worth of costs)/(Total present worth of sales)= **$1,844** per acre-foot

/a/ Capital costs adjusted to 2013 dollars
/b/ Fixed cost contains labor cost assumed at $3,000 a month with an annual inflation rate of 3%
/b/ Variable cost consists of recycled water purchase cost from USGVMWD with an annual inflation rate of 3%
/c/ Useful lives: Pipelines, 75yr; pump station mechanical/electrical, 25 yrs; site work, 100yrs. No salvage value for

Economic Analysis of LPVCWD - Alternative 4 (Gravity along Temple Avenue)

Year	Reclaimed Water Sales, AF	Design & Construction Cost $ /a/	O&M Costs, $		Salvage Value, $ /c/	Present Worth Factor at 2.5%	Present Worth of Costs, $					Present Worth of Sales, AF
			Fixed /b/	Variable /b/			Design & Construction Cost	O & M Costs Fixed	O & M Costs Variable	Salvage Value	Total	
2013		3,194,800				1.00000	3,194,800	0	0		3,194,800	0
2014		3,194,800				0.97561	3,116,878	0	0		3,116,878	0
2015	168		36,000	99,716		0.95181	0	34,265	94,911		129,177	160
2016	168		37,080	102,708		0.92860	0	34,432	95,374		129,807	156
2017	168	1,426,250	38,192	105,789		0.90595	1,292,112	34,600	95,839		1,422,552	152
2018	168	1,426,250	39,338	108,962		0.88385	1,260,597	34,769	96,307		1,391,673	148
2019	245		40,518	112,231		0.86230	0	34,939	96,777		131,716	211
2020	245		41,734	115,598		0.84127	0	35,109	97,249		132,358	206
2021	245	1,083,950	42,986	119,066		0.82075	889,648	35,281	97,723		1,022,652	201
2022	245	1,083,950	44,275	122,638		0.80073	867,950	35,453	98,200		1,001,602	196
2023	280		45,604	126,317		0.78120	0	35,626	98,679		134,305	219
2024	280		46,972	130,107		0.76214	0	35,799	99,160		134,960	213
2025	280		48,381	134,010		0.74356	0	35,974	99,644		135,618	208
2026	280		49,832	138,030		0.72542	0	36,149	100,130		136,280	203
2027	280		51,327	142,171		0.70773	0	36,326	100,619		136,944	198
2028	280		52,867	146,436		0.69047	0	36,503	101,109		137,612	193
2029	280		54,453	150,830		0.67362	0	36,681	101,603		138,284	189
2030	280		56,087	155,354		0.65720	0	36,860	102,098		138,958	184
2031	280		57,769	160,015		0.64117	0	37,040	102,596		139,636	180
2032	280		59,503	164,816		0.62553	0	37,220	103,097		140,317	175
2033	280		61,288	169,760		0.61027	0	37,402	103,600		141,002	171
2034	280		63,126	174,853	8,141,108	0.59539		37,584	104,105	4,847,104	(4,705,415)	167
Total		11,410,000					10,621,985	718,014	1,988,820	4,847,104	8,481,715	3,731

Economic Analysis Model.xls

Unit Cost ($/AF) = (Total present worth of costs)/(Total present worth of sales)= **$2,273** per acre-foot

/a/ Capital costs adjusted to 2013 dollars

/b/ Fixed cost contains labor cost assumed at $3,000 a month with an annual inflation rate of 3%

/b/ Variable cost consists of recycled water purchase cost from USGVMWD with an annual inflation rate of 3%

/c/ Useful lives: Pipelines, 75yr; pump station mechanical/electrical, 25 yrs; site work, 100yrs. No salvage value for

Economic Analysis of LPVCWD - Groundwater Production & Treatment

Year	Reclaimed Water Sales, AF	Design & Construction Cost $ /a/	O&M Costs, $		Salvage Value, $ /c/	Present Worth Factor at 2.5%	Present Worth of Costs, $					Present Worth of Sales, AF
			Fixed /b/	Variable /b/			Design & Construction Cost	O & M Costs		Salvage Value	Total	
								Fixed	Variable			
2013		0				1.00000	0	0	0		0	0
2014		0				0.97561	0	0	0		0	0
2015	328		293,034	0		0.95181		278,914	0		278,914	312
2016	328		307,686	0		0.92860		285,717	0		285,717	305
2017	328		323,070	0		0.90595		292,686	0		292,686	297
2018	328		339,224	0		0.88385		299,824	0		299,824	290
2019	328		356,185	0		0.86230		307,137	0		307,137	283
2020	328		373,994	0		0.84127		314,628	0		314,628	276
2021	328		392,694	0		0.82075		322,302	0		322,302	269
2022	328		412,329	0		0.80073		330,163	0		330,163	263
2023	328		432,945	0		0.78120		338,216	0		338,216	256
2024	328		454,592	0		0.76214		346,465	0		346,465	250
2025	328		477,322	0		0.74356		354,916	0		354,916	244
2026	328		501,188	0		0.72542		363,572	0		363,572	238
2027	328		526,247	0		0.70773		372,440	0		372,440	232
2028	328		552,560	0		0.69047		381,523	0		381,523	226
2029	328		580,188	0		0.67362		390,829	0		390,829	221
2030	328		609,197	0		0.65720		400,361	0		400,361	216
2031	328		639,657	0		0.64117		410,126	0		410,126	210
2032	328		671,640	0		0.62553		420,129	0		420,129	205
2033	328		705,222	0		0.61027		430,376	0		430,376	200
2034	328		740,483	0	0	0.59539		440,873	0	0	440,873	195
Total		0					0	7,081,200	0	0	7,081,200	4,989

Economic Analysis Model.xls

Unit Cost ($/AF) = (Total present worth of costs)/(Total present worth of sales)= **$1,419** per acre-foot

/a/ All costs adjusted to 2013 dollars

APPENDIX F

CONSTRUCTION FINANCING PLAN (TO BE PROVIDED LATER BY LPVCWD)

APPENDIX G

APPENDIX G
PIPE SIZING CALCULATIONS FOR HYBRID ALTERNATIVE

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)	Status	Flow Reversal Count
101	34	809-0	177.06	4	140	15.19	0.39	0.04	0.2	Open	0
103	36	1940-1	157.8	8	140	588.25	3.75	0.94	5.96	Open	0
105	36	1970-1	870.84	4	140	41.06	1.05	1.1	1.26	Open	0
107	2433-0	5416-0	152.76	4	140	-17.11	0.44	0.04	0.25	Open	0
109	5416-0	2418-0	39.98	4	140	80.49	2.05	0.18	4.38	Open	0
11	2245-0	2246-6	400.61	4	140	-38.56	0.98	0.45	1.12	Open	0
111	5416-0	5427-0	986.58	6	140	-157.6	1.79	2.08	2.11	Open	0
113	5427-0	5428-3	323.48	4	140	15.33	0.39	0.07	0.2	Open	0
115	5427-0	2409	1,629.16	4	140	81.32	2.08	7.28	4.47	Open	0
117	2406-0	2410-1	796.79	4	140	71.76	1.83	2.82	3.54	Open	0
119	2410-1	2393-0	95.79	4	140	40.47	1.03	0.12	1.23	Open	0
121	2393-0	2394-0	131.47	4	140	29.05	0.74	0.09	0.66	Open	0
123	2394-0	2398-0	475.45	4	140	11.75	0.3	0.06	0.12	Open	0
129	38	1458-0	797.51	4	140	31.65	0.81	0.62	0.78	Open	0
13	2246-6	2269-0	891.78	4	100	26.52	0.68	0.93	1.05	Open	0
131	38	1020-1	162.79	4	140	2.04	0.05	0	0	Open	0
133	40	32	992.77	4	140	18.84	0.48	0.3	0.3	Open	0
15	2246-6	36	6,224.51	8	140	629.31	4.02	42.04	6.75	Open	0
161	7002	2246-6	715.77	8	140	711.51	4.54	6.07	8.48	Open	0
165	7000	66	785.18	8	140	268.35	1.71	1.09	1.39	Open	0
17	1940-1	866-0	154.02	8	140	582.21	3.72	0.9	5.85	Open	0
171	64	5427-0	161.41	8	140	268.35	1.71	0.22	1.39	Open	0
175	66	64	442.47	8	140	268.35	1.71	0.62	1.39	Open	0
181	5339-0	2336-0	678.11	4	140	8.62	0.22	0.05	0.07	Open	0
183	2307-0	2306-0	72.41	4	140	6.56	0.17	0	0.04	Open	0
185	5428-3	5436-2	251.04	4	140	7.27	0.19	0.01	0.05	Open	0
187	2302-0	68	592.2	4	140	20.88	0.53	0.21	0.36	Open	0
189	68	2305-0	147.49	4	140	3.65	0.09	0	0.01	Open	0
19	866-0	1905-1	263.62	8	140	499.95	3.19	1.16	4.41	Open	0
191	68	2312-0	54.37	4	140	9.06	0.23	0	0.08	Open	0
193	68	2309-0	73.35	4	140	8.18	0.21	0	0.06	Open	0
195	2409	2406-0	650.19	8	140	76.54	0.49	0.09	0.14	Open	0
197	2409	2407-0	428.56	4	140	4.78	0.12	0.01	0.02	Open	0
21	1905-1	924-0	307.31	8	140	482.07	3.08	1.27	4.12	Open	0

APPENDIX G

PIPE SIZING CALCULATIONS FOR HYBRID ALTERNATIVE

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)	Status	Flow Reversal Count
23	924-0	18	502.42	8	140	460.81	2.94	1.91	3.79	Open	0
25	10	1114-0	35.98	4	140	37.33	0.95	0.04	1.06	Open	0
27	1114-0	1133-0	36.71	4	140	20.91	0.53	0.01	0.36	Open	0
29	1133-0	1134-0	44.3	4	140	7.24	0.18	0	0.05	Open	0
31	10	12	285.06	4	140	205.34	5.24	7.08	24.84	Open	0
33	12	1162-1	21.95	4	140	205.34	5.24	0.55	24.84	Open	0
35	1162-1	14	728.72	4	140	203.51	5.2	17.8	24.43	Open	0
37	14	2339-0	793.39	4	140	197.54	5.04	18.34	23.12	Open	0
39	14	1068-0	158.27	4	140	5.97	0.15	0.01	0.04	Open	0
41	2339-0	5339-0	602.73	4	140	171.39	4.38	10.71	17.77	Open	0
43	5339-0	16	338.99	4	140	100.78	2.57	2.25	6.65	Open	0
45	2327-0	2302-0	367.69	4	140	62.46	1.59	1.01	2.74	Open	0
47	2302-0	2304-0	57.14	4	140	34.19	0.87	0.05	0.9	Open	0
49	2304-0	2308-0	751.42	4	140	23.96	0.61	0.35	0.46	Open	0
51	2308-0	2307-0	131.1	4	140	14.09	0.36	0.02	0.17	Open	0
55	16	2327-0	358.02	4	140	72.73	1.86	1.3	3.63	Open	0
57	16	2326-0	392.09	4	140	28.05	0.72	0.24	0.62	Open	0
59	18	10	72.87	6	140	242.67	2.75	0.34	4.7	Open	0
61	18	701-1	785.78	6	140	218.14	2.48	3.03	3.85	Open	0
63	701-1	20	280.01	6	140	201.29	2.28	0.93	3.32	Open	0
65	20	22	426.6	6	140	195.09	2.21	1.34	3.13	Open	0
67	20	699-0	103.99	4	140	6.21	0.16	0	0.04	Open	0
69	22	28	81.02	6	140	182.02	2.07	0.22	2.76	Open	0
71	24	38	466.67	4	140	155.94	3.98	6.96	14.92	Open	0
73	22	550-0	96.6	4	140	13.07	0.33	0.01	0.15	Open	0
75	24	601-0	52.29	4	140	21.42	0.55	0.02	0.38	Open	0
77	28	24	501.37	4	140	177.36	4.53	9.49	18.93	Open	0
79	28	642-0	374.49	4	140	4.66	0.12	0.01	0.02	Open	0
81	2315-0	1460-0	238.87	4	140	-37.73	0.96	0.26	1.08	Open	0
83	1460-0	30	1,158.68	4	140	-122.26	3.12	11.01	9.51	Open	0
85	30	38	111.83	4	140	-122.26	3.12	1.06	9.51	Open	0
87	1458-0	40	1,101.08	4	140	18.84	0.48	0.33	0.3	Open	0
91	32	235-0	942.62	4	140	18.84	0.48	0.28	0.3	Open	0
93	701-1	700-1	178.87	4	140	6.15	0.16	0.01	0.04	Open	0
95	866-0	853-0	430.85	4	140	58.9	1.5	1.06	2.46	Open	0

APPENDIX G

PIPE SIZING CALCULATIONS FOR HYBRID ALTERNATIVE

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)	Status	Flow Reversal Count
97	853-0	34	566.92	4	140	36.71	0.94	0.58	1.02	Open	0
99	34	773-0	222.37	4	140	21.53	0.55	0.08	0.38	Open	0

<u>Rose Hills Memorial Park and Cemetery</u>

<u>Supplemental Memorandum</u>

<u>May 2014</u>

John Robinson Consulting, Inc.
1055 E. Colorado Blvd., Suite 105
Pasadena, CA 91106

Supplemental Memorandum

Rose Hills Memorial Park and Cemetery

Subject:	Supplemental Memorandum to the Recycled Water Evaluation dated February 11, 2013
Date:	May 22, 2014
Prepared By:	John Robinson, John Robinson Consulting, Inc.
Client:	Reymundo Trejo, Upper San Gabriel Valley Municipal Water District
CC:	Jeff Nordschow, Rose Hills; Mike Baron, Rose Hills, Dan Arrighi, SGVWC; Jeff Helsley, Stetson; John Cardoza, Stetson
USGVMWD No:	Task Order No. 2 **JRC No.:** USGVMWD201301

John Robinson Consulting, Inc. (JRC) has prepared this Supplemental Memorandum to supplement the findings outlined in the draft letter report dated February 11, 2013 for the Rose Hills Memorial Park and Cemetery Recycled Water Evaluation which is attached. The reason for this supplement information is to update Alternative 1 and Alternative 6 as some items have changed over the last 16 months since the completion of the original draft letter report. The following are the key items that have changed the two alternatives.

1. Requirements from the County of Los Angeles Fire Department;
2. Site investigations after the passing of AB803 then having subsequent conversations with County of Los Angeles, Department of Public Health and
3. Found an interconnection between two different water system during Item 2 investigation that will require infrastructure to be designed and constructed before recycled water conversion can be completed.

The combination of Alternative 1 and Alternative 6 will allow Rose Hills to eliminate groundwater pumping and utilize recycled water from Los Angeles County Sanitation District (LACSD) that normally is discharged into the San Gabriel River then discharges to the Pacific Ocean. The combination of alternatives expands the Upper San Gabriel Valley Municipal Water District's (Upper District) recycled water system. Rose Hills has an agreement with LACSD (Attachment No. 1 in the February 11, 2013) memorandum), In addition, Rose Hills has an agreement with Upper District (Attachment No. 3 in the February 11, 2013 memorandum).

The following is an update to the project description and opinion of probable construction costs (OPCC) for Alternative 1 and Alternative 6. The Site Overview figure within the February 11, 2013 memorandum provides an overall aerial view of the potential project site.

Alternative No. 1 – Modification to Rose Hills System

Alternative No. 1 has increased the amount of design and construction efforts but is still the least costly solution when compared to Alternative No. 2 and Alternative No. 3. Alternative No. 1 will allow recycled water to be supplied from Los Angeles County Sanitation District to existing areas that are currently utilizing groundwater for irrigation purposes. In addition, Alternative No. 1 is still fiscally prudent when compared to Alternative No. 4 which is the Existing Condition alternative. Alternative No. 1 includes the following improvements:

- Installation of a new 12-inch diameter pipeline to connect Tank No. 9 to Tank No. 10;
- Installation of a new 12-inch diameter pipeline for a fire protection loop around the administration building;
- Modification to the pump station located at Tank 4;
- Installation of four (4) altitude valves on the inlet piping to Tank 4, Tank 6, Tank 8 and Tank 9; and
- Disconnection, removal of the 16-inch diameter meter connection and installation of blind flanges on the pipeline at Strong Avenue and Pioneer Blvd.

Alternative No. 1 assumes that this construction will be conducted within the next twelve (12) months sufficiently before the expiration of the Main Agreement and before the deadlines by Department of Resources (DWR). The preliminary opinion of probable construction cost for this alternative is estimated at $793,000. Please refer to **Table 1** for a breakdown of Alternative No. 1 and Figure No. 1 for the modifications at Tank No. 9.

Table 1: Alternative No. 1 – Modification to Rose Hills System
Opinion of Probable Construction Cost

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization/Demobilization	1	LS	$10,000	$10,000
2	New 12-inch Diameter Pipeline	100	LF	140	$14,000
3	New 12-inch Diameter Pipeline for Fire Loop	3,000	LF	140	$420,000
4	Misc. Metal, Concrete and Landscaping	1	LS	$2,500	$2,500
5	Tank Altitude Valves	4	EA	$10,000	$40,000
6	SGVWC Meter Removal	1	LS	$7,500	$7,500
7	Tank #4 Pump Station Modification	1	LS	$15,000	$15,000
	Subtotal				$509,000
	Contingency	15%			$76,000
	Tax Overhead/Profit/Bonds/Insurance[3]	15%			$76,000
	Subtotal				$152,000
	Engineering Fee (Design and CM Services)	20%			$132,200
	Total[1]				**$793,000**

Notes:
1. Rounded to the nearest 1,000
2. Labor rates per CA DIR Rates for Los Angeles County.

3. Contractor's overhead and profit estimated to be 15% of project construction cost. Costs associated with insurance, bonds, etc., are included in that value.

Alternative No. 6 – Hose Bib Retrofit in Accordance with Proposed CDPH Water Policy

This Alternative No.6 includes the conversion of the remaining hose bibs within Gates 14 through 20. This conversion process will retain the current hose bibs connected to the irrigation system. The existing irrigation system will be converted to Title 22 quality recycled water. Due to the Governor's signing of Assembly Bill 803, Alternative No. 6 will not require design and installation of a dedicated potable water hose bib system to supply the hose bibs within these Gates in accordance with the State of California Department of Public Health as defined in Title 22 of the California Administrative Code. This alternative assumes that Title 22 is amended to allow this type of use/connection.

Alternative No. 6 will require the design and installation of one potable water pipeline to supply Hillside Church Gardens. All potential recycled water use in the project area would be for irrigation and hose bib supply only which is acceptable to Rose Hills. Alternative No. 6 will incorporate the following improvements:

- Modifications to SGVWC potable water pipeline and infrastructure in Workman Mill Road;
- Installation of approximately 2,200 feet of a proposed 2-inch diameter pipeline to supply Hillside Church Chapel; and
- Installation of the required identification requirements on the hose bibs, valve boxes, pipelines, signs, and quick couplers as well as provide the necessary coordination required for the preliminary and final cross connection testing after conversion of the system.

Alternative No.6 assumes no improvement to the Rose Hills roads beyond those areas affected by construction. The preliminary construction and engineering cost opinion is estimated at $207,000 for this alternative. Please see the below **Table 6** for a breakdown of Alternative No. 6.

Table 6: Alternative No. 6 – Hose Bib Retrofit with New CDPH Water Policy Opinion of Probable Construction Cost

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization/Demobilization	1	LS	$10,000	$10,000
2	SGVWC Infrastructure Improvements	1	LS	$12,000	$12,000
3	New 2-inch pipeline to Hillside Church Chapel	2,200	LF	$36.50	$80,300
4	LACDPH Identification Requirements	1	LS	$30,000	$30,000
	Subtotal				$132,300
	Contingency	15%			$20,000
	Tax Overhead/Profit/Bonds/Insurance(3)	15%			$20,000
	Subtotal				$172,300
	Engineering Fee (Design and CM Services)	20%			$34,460
	Total(1)				**$207,000**

Notes:
1. Rounded to the nearest 1,000
2. Labor rates per CA DIR Rates for Los Angeles County.
3. Contractor's overhead and profit estimated to be 15% of project construction cost. Costs associated with insurance, bonds, etc., are included in that value.

Upper San Gabriel Valley Municipal Water District Recycled Water Program Expansion

Technical Memorandum

June 2014

STETSON
ENGINEERS INC.

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Phone: (626) 967-6202 • FAX: (626) 331-7065 • Web site: www.stetsonengineers.com

Northern California • Southern California • New Mexico • Arizona • Nevada • Colorado

Reply to: Covina

MEMORANDUM

TO: **Reymundo Trejo**
Upper San Gabriel Valley Municipal Water District

FROM: **Stetson Engineers Inc.**

SUBJECT: **Upper San Gabriel Valley Municipal Water District Recycled Water Program Expansion**

JOB NO.: **1046-62**

DATE: **June 10, 2014**

PROJECT BACKGROUND

Faced with a prolonged drought that impacted the water storage conditions in Colorado Basin and California, along with declining water levels in the Main San Gabriel Groundwater Basin (Basin), Upper San Gabriel Valley Municipal Water District (Upper District) prepared an Integrated Resources Plan (IRP) in 2012 to examine water demand and water supply options in integrated alternatives that were evaluated against a set of goals and objectives for the Upper District to develop a preferred strategy for meeting current and projected water demands in a reliable, cost-effective and environmentally sound manner. In response to the continued drought conditions, Upper District evaluated water supply projects that would be the most feasible to implement in a cost and time efficient manner. Table 7-1 (page 7-2) of the IRP showed the options included in each IRP alternative. The options included Indirect Potable Reuse (tertiary/blend), Indirect Potable Reuse (AWT), Non Potable Recycled Water, Centralized Stormwater Capture, Decentralized Stormwater Capture, Conservations (levels 1 to 3), Water Transfers/Storage, and MWD Drought Penalty Purchase. Figure 7-3 (page 7-5) of the IRP showed that Alternative 5 which included a mixture of options including Indirect Potable Reuse (tertiary/blend), Non Potable Recycled Water, Centralized Stormwater Capture, Decentralized Stormwater Capture, Conservations (level 2), and Water Transfers/Storage, ranked the highest amongst six alternatives. The IRP specifically identified the Rose Hills Expansion as a potential component of the recommended increase in nonpotable reuse in Upper District's service area. Upper District has been systematically evaluating how to extend its existing recycled water distribution system to develop 500 AFY of yield recommended in the IRP as the Reuse Future Extensions of Recycled Water Program component of the increase nonpotable reuse in Upper District’s serviced area. The feasibility studies for the South El Monte Recycled Water Project and the La Puente Valley County Water District Water Project referenced below are part of that systematic evaluation. In response to severe drought conditions and declining groundwater levels in its service area, the Recycled Water Program Expansion described in this memorandum was developed for fiscal year 2015-2016 as a first phase to achieve the increased nonpotable reuse goal in the IRP. The proposed reuse expansion for fiscal year 2015-2016 has been developed based on the identification of willing project partners, favorable cost sharing arrangements, and the readiness of the initial improvements to proceed. This memorandum presents a summary of the components of the Upper District Recycled Water Program Expansion Project and the key reasons these components are included in the Project .

<u>Upper District Recycled Water Program Expansion Project</u>

<u>Rose Hills Expansion</u>

The Rose Hills Expansion will be relatively simple to implement because it consists largely of retrofits to an onsite irrigation system. A portion of Rose Hills irrigation system is already on recycled water so this project would be an expansion to serve more recycled water to a larger area within Rose Hills. With the passing of Assembly Bill 803 (AB 803), the recycled water conversion of existing hose bibs will no longer require the design and installation of a potable water hose bib system to supply the hose bibs, which reduces the cost of the retrofits.. Rose Hills is a willing project partner and the current schedule indicates that construction can be completed within about 12 months. Based on Rose Hills Memorial Park’s willingness to proceed and the favorable cost sharing arrangements that have been agreed to, the Rose Hills Expansion has been included in Upper District's Recycled Water Program Expansion for fiscal year 2015-2016 A detailed analysis of the Rose Hills Expansion project including estimated project costs was evaluated in the letter report "Rose Hills Memorial Park and Cemetery – Recycled Water Evaluation for Phase 2" dated February 11, 2013 and subsequent "Supplemental Memorandum to the Recycled Water Evaluation dated February 11, 2013" dated May 22, 2014. The location of the Rose Hills Expansion is shown on Figure 1.

La Puente Valley County Water District Expansion

The LPVCWD Expansion was developed in the IRP as part of the Reuse Future Extensions of Recycled Water Program with a beneficial yield of 500 AFY. The ultimate La Puente Valley County Water District Recycled Water Project consists of the construction of a recycled water distribution system including pipelines, booster pumps, and customer retrofits, to supply recycled water provided by the San Jose Creek Water Reclamation Plant (SJCWRP) to customers in the cities of Industry and La Puente from a connection to the existing Phase IIB Industry Recycled Water Pipeline. In response to the current drought, Upper District and LPVCWD have developed an initial phase of the preferred alternative for the LVCWD Recycled Water Project to include in Upper District's Recycled Water Program Expansion for fiscal year 2015-2016. The initial phase will supply approximately 52 AFY of recycled water to be used for non-potable purposes such as landscape irrigation and industrial purposes. LPVCWD is a willing project partner and the current schedule indicates that construction can begin by March 2015. A detailed analysis of the LPVCWD Recycled Water Project was evaluated in the LPVCWD Recycled Water Feasibility Report dated March 2012 and subsequent memorandum on the initial phase of the project dated May 22, 2014. The location of the LPVCWD Expansion is shown on Figure 1.

South El Monte Expansion

The ultimate South El Monte Recycled Water Project consists of the construction of a recycled water distribution system including pipelines, reservoir, booster pumps, and customer retrofits, to supply recycled water provided by the Whittier Narrows Water Reclamation Plant (WNWRP) to customers in the cities of South El Monte, El Monte, Industry and Pico Rivera from a connection to the existing Phase IIA Recycled Water Pipeline. In response to the current drought, Upper District and San Gabriel Valley Water Company (SGVWC) have decided to proceed with Package 1 of 5 for the South El Monte Recycled Water Project. Package 1 as part of Upper District's Recycled Water Program Expansion for fiscal year 2015-2016 will supply approximately 83 AFY of recycled water to be used for non-potable purposes such as landscape irrigation and industrial purposes. SGVWC is a willing project partner and the current schedule indicates that construction can begin by June 2015. A detailed analysis of the SGVWC Expansion was evaluated in the Draft Feasibility Study for the Proposed South El Monte Recycled Water System dated October 2013. The location of the South El Monte Expansion is shown on Figure 1.

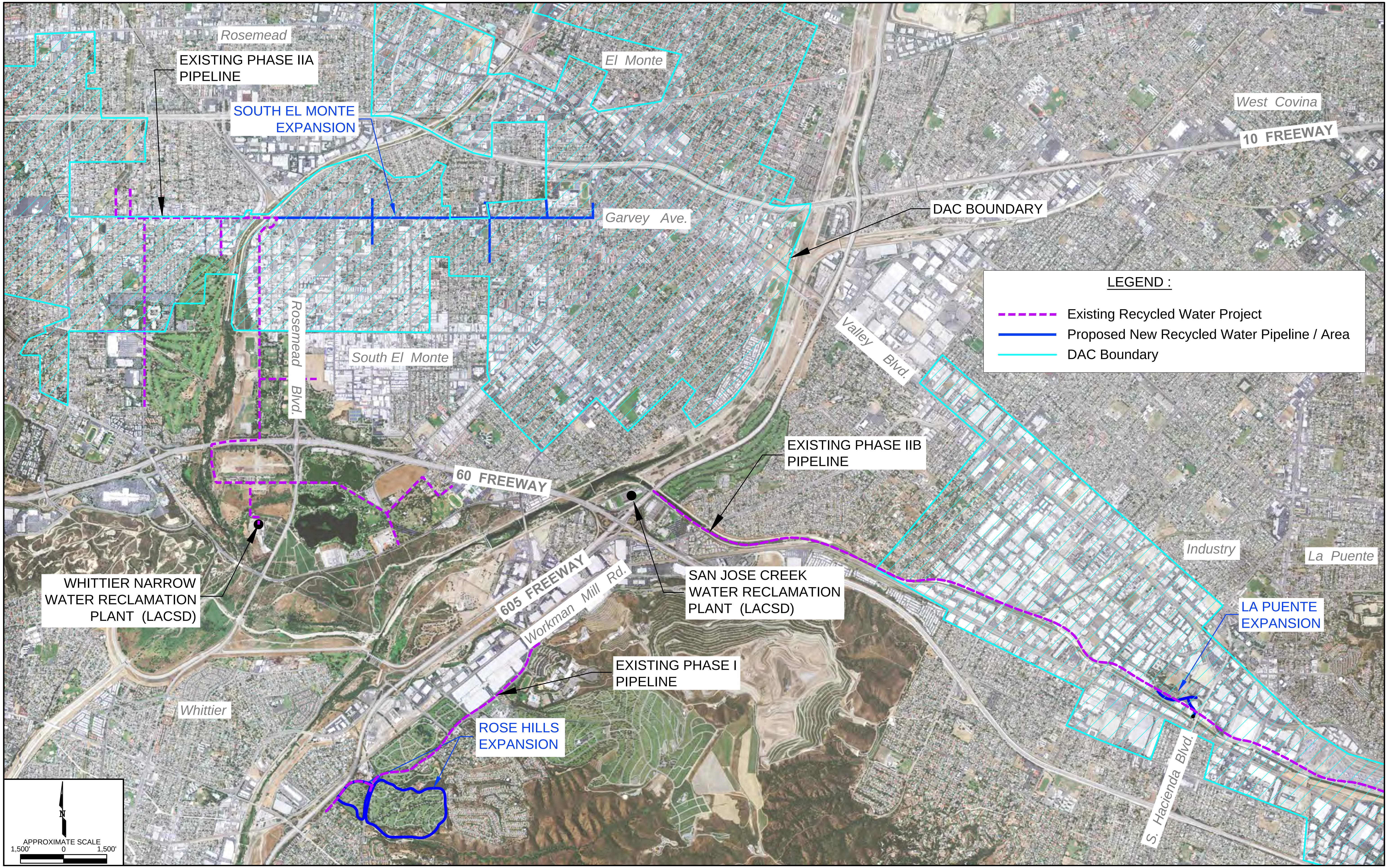
CEQA COMPLIANCE

The Upper District Recycled Water Program Expansion Project will comply with California Environmental Quality Act (CEQA) requirements. The Rose Hills Expansion will be categorically exempted while the LPVCWD and South El Monte Expansions will have an Initial Environmental Study completed in June 2014.

SUMMARY

The Upper District Recycled Water Program Expansion Project will have an estimated beneficial yield of 735 AFY. All three components of the project including the Rose Hills Expansion, LPVCWD Expansion, and South El Monte Expansion were included as part of the Upper District 2012 IRP. In an effort to proceed with recycled water reuse projects that are both cost and time efficient, Upper District along with project partners LPVCWD and SGVWC evaluated phases/packages of the whole project that would provide maximum water conservation benefits. Since the three components of the project are located at geographically distinct areas with different connection points to the existing recycled water system, the implementation of any single component will be not affected by delays in the other two components.

FIGURE 1


Rosemead
EXISTING PHASE IIA PIPELINE
SOUTH EL MONTE EXPANSION
El Monte
West Covina
10 FREEWAY
Garvey Ave.
DAC BOUNDARY
LEGEND :
Existing Recycled Water Project
Proposed New Recycled Water Pipeline / Area
DAC Boundary
Rosemead Blvd.
South El Monte
Valley Blvd.
EXISTING PHASE IIB PIPELINE
60 FREEWAY
Industry
La Puente
WHITTIER NARROW WATER RECLAMATION PLANT (LACSD)
605 FREEWAY
Workman Mill Rd.
SAN JOSE CREEK WATER RECLAMATION PLANT (LACSD)
LA PUENTE EXPANSION
EXISTING PHASE I PIPELINE
Whittier
ROSE HILLS EXPANSION
S. Hacienda Blvd.
N
APPROXIMATE SCALE
1,500'
0
1,500'

UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT

UPPER SAN GABRIEL VALLEY
MUNICIPAL WATER DISTRICT

RECYCLED WATER ACTION PLAN

Fiscal Year 2011-12 through Fiscal Year 2012-13

DRAFT

April 20, 2011

Note: Hi-lited items are subject to change by May 2011

Table of Contents

Figures

Appendices

Executive Summary

Program Background

The Upper District began serving recycled water to the Rose Hills Memorial Park and the Whittier Narrows Recreation Area in 2006. In 2010 the Upper District successfully completed the construction of the Rosemead Extension which will provide approximately 700 acre-feet of recycled water per year to an additional 14 customers. Additionally in 2010, the Upper District expanded its recycled water system in the City of West Covina and the City of Walnut with the initial phases of the Phase IIB Project which will add approximately 16.4 miles of recycled water pipeline to serve approximately 1,600 acre-feet per year to an additional 30 customers. The activities of 2010 lead to the District's recent WateReuse California Project of the Year Award – Medium, awarded at the annual WateReuse Conference this March 2011.

Figure 1 provides a location map of the Upper District recycled water program.

DIRECT USE RECYCLED WATER PROJECTS
(PHASE I, PHASE IIA AND PHASE IIB)

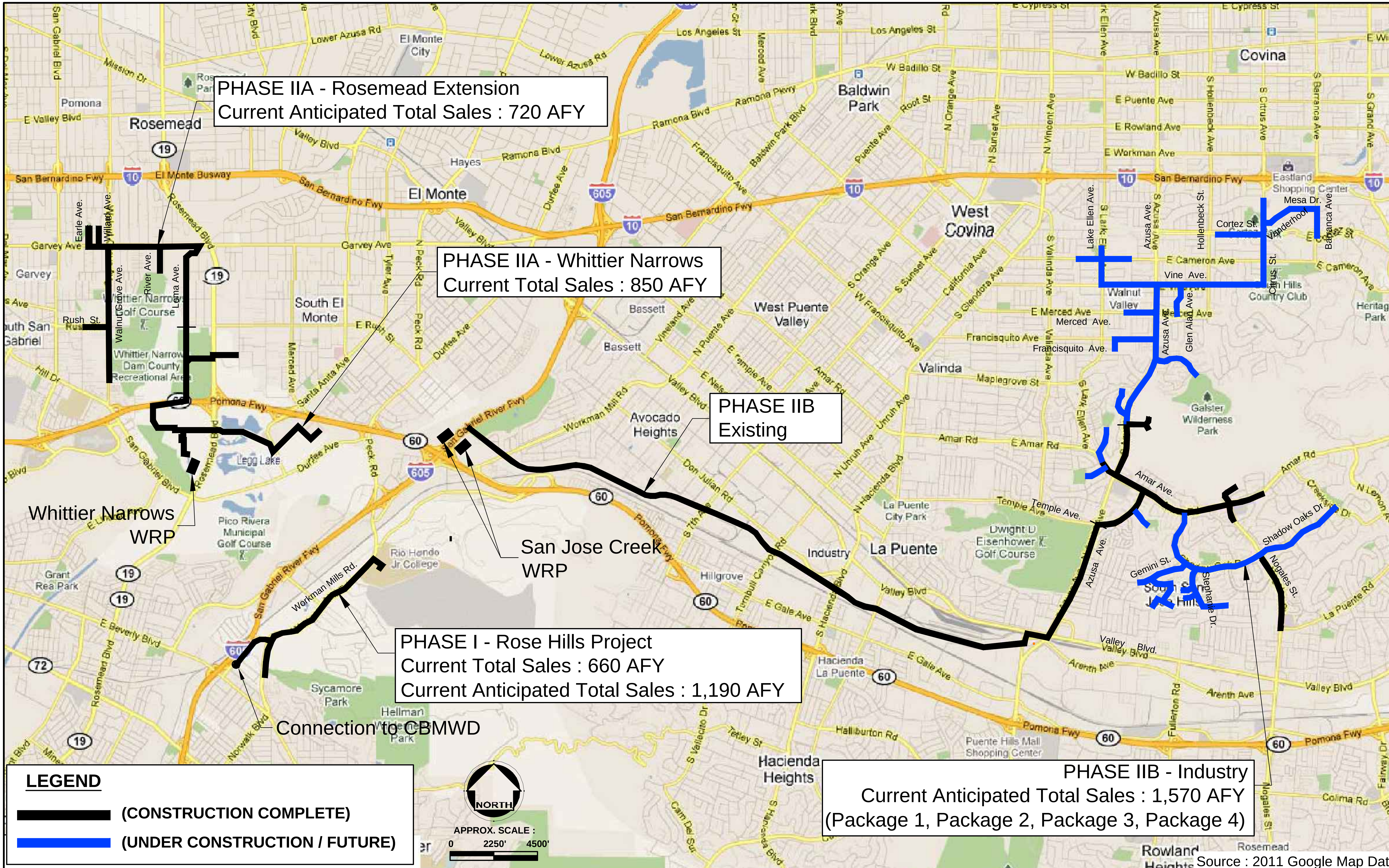


FIGURE 1

On March 1, 2011, the Upper District voted to remove itself from the Groundwater Reliability Improvement Program (GRIP) Joint Powers Authority (JPA). Several reasons lead to this decision including compounding risk associated with the partner's obligation to perform, financing, and timing of the delivery of the project.

Recycled Water Action Plan

As the Upper District continues to move ahead with an award winning program, the adoption of this Recycled Water Action Plan (Action Plan) is important to define the actions necessary to continue implementing a cost effective program that continues to build a reliable resource. The proposed action plan has two major uses of recycled water. The first is direct reuse or purple pipe projects and the second is groundwater recharge.

Direct Reuse Action Items:

Direct reuse has been divided into several major phases including the existing Phase I, Phase IIA, Phase IIB, and a proposed Phase III. The Action Plan will focus on the delivery of projects in the existing phases, to fully utilize available grant funding for the existing program.

Phase I Rose Hills – Update recycled water sales agreement, prepare design to expand service to southwest of existing service, and ultimately double recycled water use.

Phase IIA Whittier Narrows – Begin in-fill strategy by identifying additional users. Develop potential customers, cost benefit analysis, retrofit design and connection to the existing system. This will add demands and revenue for the district.

Phase IIA Rosemead Extension – Complete the retrofit conversions and start up the pipeline distribution system to deliver recycled water. Connect SCE and local schools to recycled water use.

Phase IIB City of Industry – Continue to implement Industry Phase IIB in the City of West Covina. Proceed with the design of Package 3 and Package 4 pipelines and prepare a retrofit package in the fall of 2011, followed by construction in mid 2012, with completion of the project before December 2012.

Phase III (Proposed) - Planning – Conduct a Phase III direct reuse feasibility study in conjunction with State Grant funding. The Phase III Feasibility Study will evaluate a potential Membrane Bioreactor (MBR) treatment plant to produce recycled water for direct reuse in Upper District's service area.

Upper San Gabriel Valley Municipal Water District
Direct Use Recycled Water Project
Cost Summary
Draft

	Project	State and Federal Grants	Total Loans [3]	UD Financing	Total Project Cost
	Phase I - Rose Hills	$1,125,000	$0	$3,375,000	$4,500,000
[1]	**Phase IIA - Whittier Narrows**	$4,115,000	$0	$5,785,000	$9,900,000
[1]	**Phase IIA - Rosemead Extension**	$1,690,000	$0	$4,310,000	$6,000,000
[2]	**Phase IIB - Industry (Package 1)**	$6,031,698	$10,168,302	$0	$16,200,000
[2]	**Phase IIB - Industry (Package 2)**	$1,526,541	$2,573,459	$0	$4,100,000
[2]	**Phase IIB - Industry (Package 3)**	$2,233,962	$3,766,038	$0	$6,000,000
[2]	**Phase IIB - Industry (Package 4)**	$2,047,799	$3,186,000	$266,201	$5,500,000
	Total	$18,770,000	$19,693,799	$13,736,201	$52,200,000

Notes:

[1] MWD's LRP Funding of $200 per AF (2006 and 2007); $80 per AF (2008, 2009, and 2010); $70 per AF (2011 to 2022); $65 per AF (2023 to 2030) not included

[2] MWD's LRP Funding of $200 per AF (2006 and 2007); $150 per AF (2008); $125 per AF (2009 and 2010); $100 per AF (2011 to 2015); $50 per AF(2016 to 2030) not included

[3] The maximum total SWRCB loan for the Phase IIB Project is $23.6 million (Package 1 = $11.9M; Package 2 = $4.2M; Package 3 = $4.3M; and Package 4 = $3.2M). Individual Packages may not require use of maximum individual loan amounts if sufficient state/federal grant funding is available instead.

Groundwater Replenishment Program Action Items:

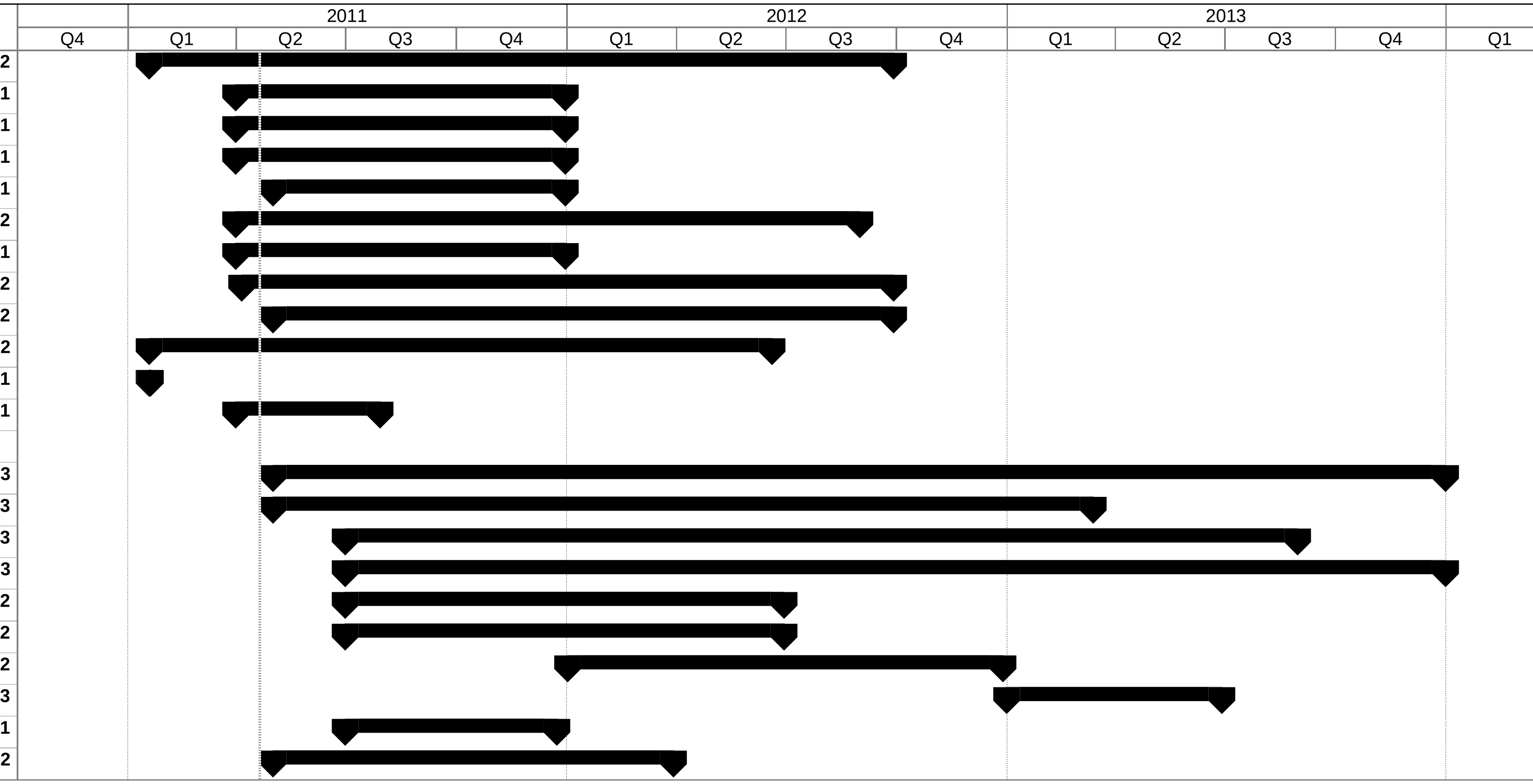
Upper District will continue to procure alignments, identify Advanced Water Treatment Plant sites, continue to apply for grant funding, and develop innovative approaches to advanced treatment in partnership with stakeholders and regulatory agencies.

Schedule of Advanced Water Treatment Piloting and Permitting Actions - First steps involve piloting and demonstration level of technologies. Work in partnership with regulators to demonstrate cost effective and environmentally acceptable projects for groundwater replenishment. Below is a list of actions for the next two years:

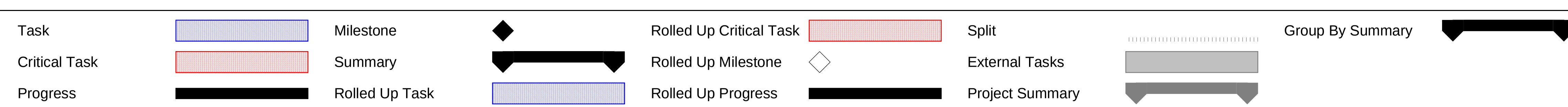
Grant Application for Pilot Project	May-11
Evaluation of Treatment Options	Jul-11
Design Pilot System	Oct-11
Bid and Construct	Jan-12
Pre-Operations Full Testing	Mar-12
Data Analysis - Cost/Permitting	Mar-13

RECYCLED WATER ACTION PLAN
DRAFT SCHEDULE
DRAFT (Original Date: April 6, 2011) (Revisions: XX XX, 2011)

ID	Task Name	Start	Finish
1	**RECYCLED WATER - DIRECT USE PROJECTS**	Wed 1/19/11	Fri 9/28/12
2	1) Phase I - Rose Hills	Fri 4/1/11	Fri 12/30/11
7	2) Phase IIA - Whittier Narrows	Fri 4/1/11	Fri 12/30/11
11	3) Phase IIA - Rosemead Extension	Fri 4/1/11	Fri 12/30/11
18	4) Phase IIB - Package 1A	Mon 5/2/11	Fri 12/30/11
24	5) Phase IIB - Package 1B	Fri 4/1/11	Fri 8/31/12
27	6) Phase IIB - Package 2	Fri 4/1/11	Fri 12/30/11
34	7) Phase IIB - Package 3	Wed 4/6/11	Fri 9/28/12
49	8) Phase IIB - Package 4	Mon 5/2/11	Fri 9/28/12
63	9) Future Extensions of Upper District's Recycled Water Program	Wed 1/19/11	Tue 6/19/12
67	10) Membrane Bioreactor Treatment Plant	Wed 1/19/11	Wed 1/19/11
69	11) Loans and Grants (Direct Use)	Fri 4/1/11	Fri 7/29/11
73			
74	**RECYCLED WATER - GROUNDWATER RECHARGE PROJECT**	Mon 5/2/11	Tue 12/31/13
75	12) Determine Best Treatment Technology	Mon 5/2/11	Wed 3/13/13
81	13) CDPH / RWQCB Permitting	Fri 7/1/11	Fri 8/30/13
88	14) Background Water Quality Monitoring Plan	Fri 7/1/11	Tue 12/31/13
96	15) Secure Pipeline Alignment and Treatment Facility Location	Fri 7/1/11	Fri 6/29/12
103	16) Coordination with LACSD	Fri 7/1/11	Fri 6/29/12
107	17) Coordination with LACDPW	Mon 1/2/12	Fri 12/28/12
111	18) Report of Recommendations of Recharge Project	Tue 1/1/13	Fri 6/28/13
113	19) Coordination with Main San Gabriel Basin Watermaster	Fri 7/1/11	Fri 12/23/11
118	20) New Loans and Grants (Groundwater Replenishment)	Mon 5/2/11	Thu 3/29/12



Project: Overall GRIP Schedule 2011-
Date: Wed 4/20/11



Recycled Water Grant Funding Strategy:

The third component to a successful recycled water action plan is potential financing. Continue to pursue assistance for advanced treatment research and demonstration projects.

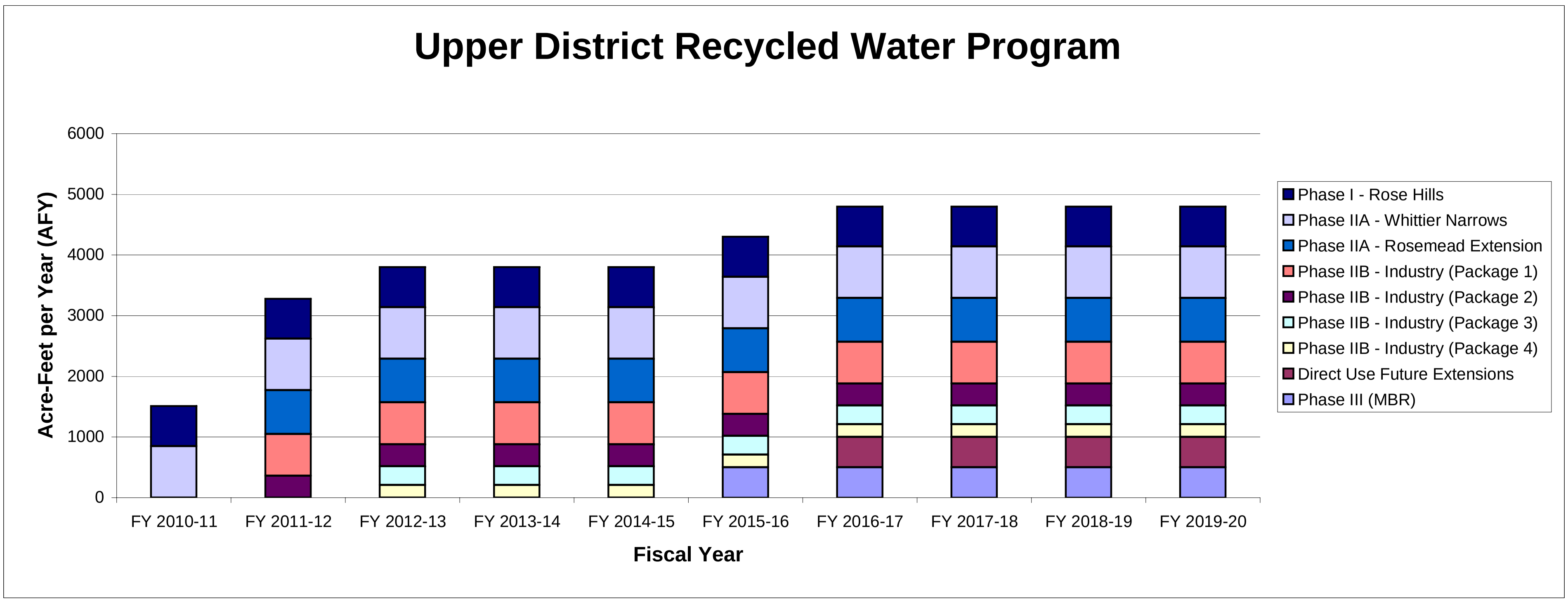
Application for Pilot Project	May 2011
Application for RW Planning Study	August 2011
Application for Demonstration Feasibility Title 16 Funding	February 2012

Future Use

Through the expansion of the direct use recycled water program the Upper District continues to make great strides toward fulfilling our mission to provide a drought-proof and economical supply of recycled water for industrial and irrigation uses. This Action Plan will define a set of focused actions for the next two years, and maximize the use of available grant funds and State revolving loans available to fund the projects while positioning the Upper District for advanced treatment projects to maximize replenishment opportunities with recycled water.

Upper San Gabriel Valley Municipal Water District
Projected Recycled Water Direct Use Project Demands (AFY)
DRAFT

	FY 2010-11	FY 2011-12	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20
Phase I - Rose Hills	660	660	660	1,190	1,190	1,190	1,190	1,190	1,190	1,190
Phase IIA - Whittier Narrows	850	850	850	850	850	850	850	850	850	850
Phase IIA - Rosemead Extension	-	720	720	720	720	720	720	720	720	720
Phase IIB - Industry (Package 1)	-	690	690	690	690	690	690	690	690	690
Phase IIB - Industry (Package 2)	-	360	360	360	360	360	360	360	360	360
Phase IIB - Industry (Package 3)	-	-	310	310	310	310	310	310	310	310
Phase IIB - Industry (Package 4)	-	-	210	210	210	210	210	210	210	210
Direct Use Future Extensions	-	-	-	-	-	-	500	500	500	500
Phase III (MBR)	-	-	-	-	-	500	500	500	500	500
Total	**1,510**	**3,280**	**3,800**	**4,330**	**4,330**	**4,830**	**5,330**	**5,330**	**5,330**	**5,330**



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Recycled Water – Direct Use Projects

1) Phase I – Rose Hills Project (See Figure 2)

Project Description:

- o Currently serves four (4) customers in the City of Whittier including: Rio Hondo College, Rose Hills Memorial Park, Mills Elementary School, and Gateway Pointe Industrial Park. All customers are served by San Gabriel Valley Water Company.
- o San Gabriel Valley Water Company has been contracted for routine operations and maintenance of the system.
- o Currently serves a total recycled water demand of approximately 660 acre-feet per year (AFY).
- o May serve a total recycled water demand of approximately 1,190 AFY if additional areas of Rose Hills Memorial Park are converted to recycled water use.
- o Originally anticipated to serve 1,600 AFY of recycled water.
- o Includes 2 miles of pipeline
- o Construction of the pipeline completed in 2007

Financial:

- o Total Capital Cost: $4.5 million
- o Total Grant Funds: $1.1 million
- o (No Loans)
- o Upper District Funding: $3.4 million
  - ▪ $230,000 per year (based on 3 percent, 20 years)
  - ▪ Capital Recovery = $350 per AF (based on 660 AF)

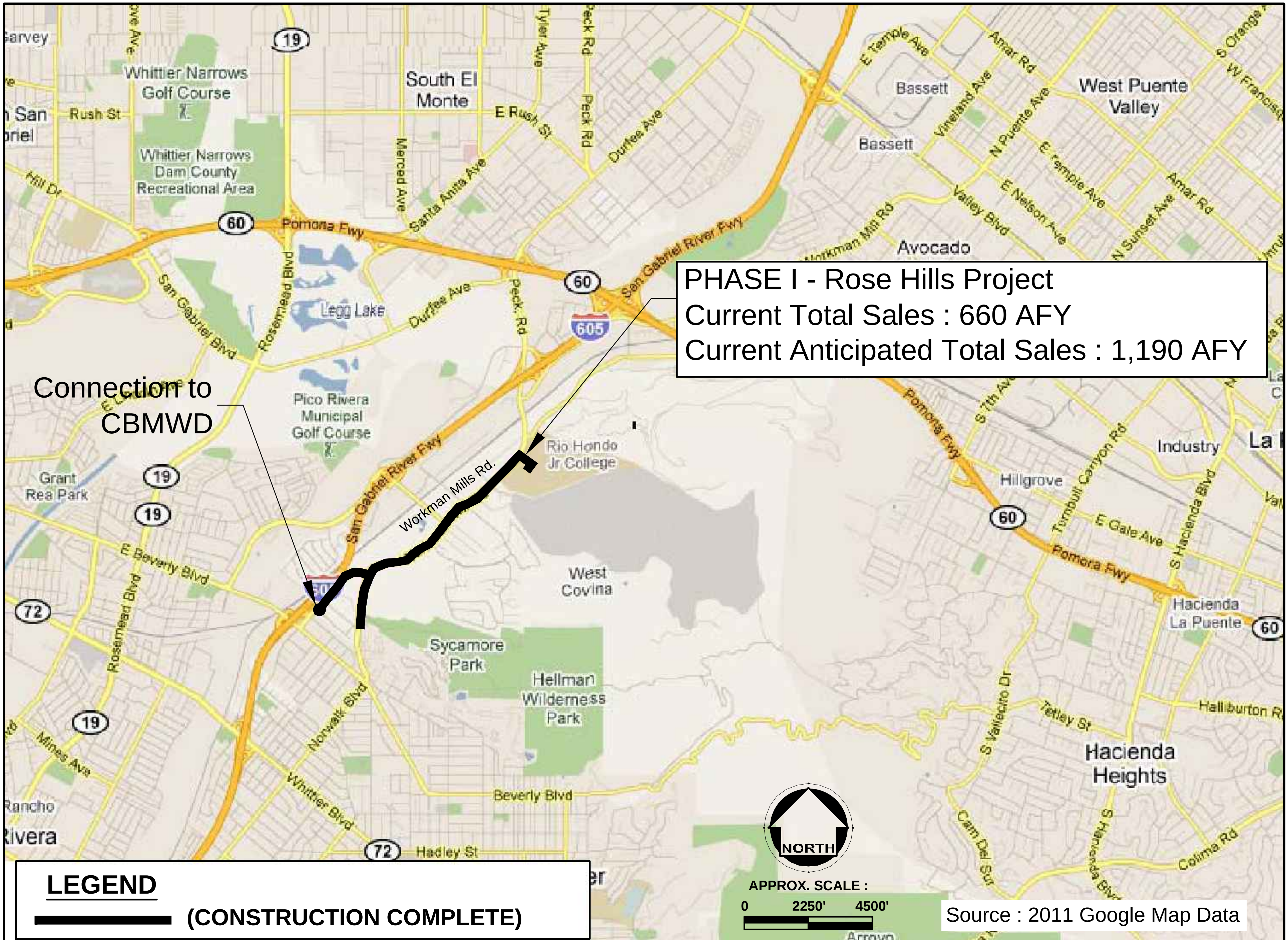
- o Projected Expenses: ($520) per AF
- o Projected Revenues: <u>$185 per AF</u>
- o Projected Net Operating Income: ($335) per AF
  - ▪ (No Capital Recovery)

Action Plan (Two-Year):

- Continue operations of the system
- Continue supporting changes in State laws to allow use of recycled water at hose bibs in cemeteries to reduce cost of conversions
- Prepare preliminary plan and cost estimate of retrofits to expand service of recycled water at Rose Hills Memorial Park to areas (Gates 9, 10, 15, and 17) southwest of existing service **(April 2011 to Dec 2011)**
- Establish a new recycled water rate for Rose Hills Memorial Park to address leasing of water rights, including the expansion area **(April 2011 to Dec 2011)**
- Establish a new recycled water rate for San Gabriel Valley Water Company (for service to Rio Hondo College, Mills Elementary School, and Gateway Pointe Industrial Park) **(April 2011 to Dec 2011)**
- Verify all existing and practical additional users of the existing recycled water system **(July 2011 to Dec 2011)**
  - Document current actual demands
  - Review prior studies and aerial photos and work with retailers to identify potential additional customers
  - Physically verify potential user locations and meters
  - Obtain water use records for potential new users identified
  - Prepare cost / benefit analysis to serve potential new users
  - Contact new users

DIRECT USE RECYCLED WATER PROJECTS
(PHASE I)

FIGURE 2



2) Phase IIA – Whittier Narrows (See Figure 3)

Project Description:

- o Currently serves two (2) customers, Whittier Narrows Recreation Area and South El Monte High School. All customers are served by San Gabriel Valley Water Company.
- o San Gabriel Valley Water Company has been contracted for routine operations and maintenance of the system.
- o Currently serves a total recycled water demand of approximately 850 AFY.
- o Anticipated to serve a total recycled water demand of approximately 890 AFY (based on average deliveries).
- o Originally anticipated to serve 2,258 AFY of recycled water.
- o Includes 3.2 miles of pipeline and a pump station
- o Construction of the pipeline completed in 2006

Financial:

- o Total Capital Cost: $9.9 million
- o Total Grant Funds: $4.1 million
- o (No Loans)
- o Upper District Funding: $5.8 million
  - ▪ $390,000 per year (based on 3 percent, 20 years)
  - ▪ Capital Recovery = $460 per AF (based on 850 AF)

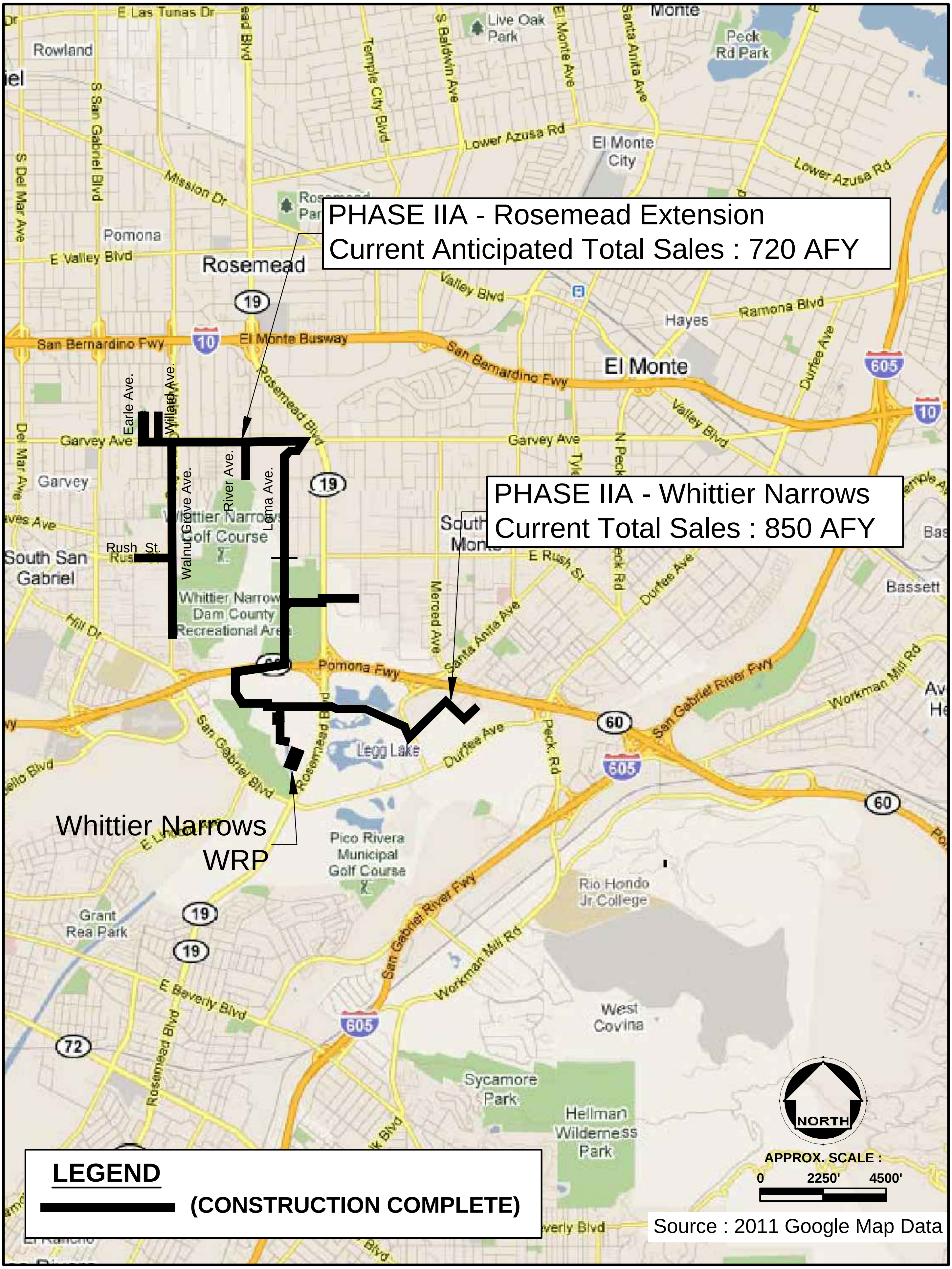
- o Projected Expenses: ($285) per AF
- o Projected Revenues: $455 per AF
- o Projected LRP Funding: $70 per AF
- o Projected Net Operating Income: $240 per AF
  - ▪ (No Capital Recovery)

Action Plan (Two-Year):

- Continue operations of the system
- Continue to provide reporting required by funding agreements (including MWD LRP and SWRCB funding)
- Finalize revision to contract with San Gabriel Valley Water Company for the cost of recycled water to serve South El Monte High School and Rosemead Extension customers (See Item 3 for a description of the Rosemead Extension)
  (April 2011 to Oct 2011)
- Determine the economic feasibility of serving Bicentennial Park
  (April 2011 to July 2011)
- Verify all existing and practical additional users of the existing recycled water system **(July 2011 to Dec 2011)**
  - Document current actual demands
  - Review prior studies and aerial photos and work with retailers to identify potential additional customers
  - Physically verify potential user locations and meters
  - Obtain water use records for potential new users identified
  - Prepare cost / benefit analysis to serve potential new users
  - Contact new users

DIRECT USE RECYCLED WATER PROJECTS
(PHASE IIA)

FIGURE 3



3) Phase IIA – Rosemead Extension (See Figure 3)

Project Description:

- Currently serves the Whittier Narrows Golf Course (WNGC) and will serve 13 additional retrofit customers including the areas within the southeastern portion of the City of Rosemead. San Gabriel Valley Water Company serves the WNGC and will serve 11 other customers. Golden State Water Company will serve two (2) customers.
- San Gabriel Valley Water Company has been contracted for routine operations and maintenance of the system.
- The project is anticipated to serve a total recycled water demand of approximately 720 AFY.
- The project was originally anticipated to serve 620 AFY of recycled water.
- The project includes 3.8 miles of pipeline
- Construction of the pipeline was completed in June 2010
- The retrofit design was completed in April 2011
- The retrofit construction bid documents will be released for bid in May 2011
- Retrofit construction is anticipated to be completed by October 2011.

Financial:

- Total Capital Cost: $6.0 million
- Total Grant Funds: $1.7 million
- (No Loans)
- Upper District Funding: $4.3 million
  - $290,000 per year (based on 3 percent, 20 years)
  - Capital Recovery = $420 per AF (based on 720 AF)

- Projected Expenses: ($290) per AF
- Projected Revenues: $455 per AF
- Projected LRP Funding: <u>$70 per AF</u>
- Projected Net Operating Income: $235 per AF
  - (No Capital Recovery)

Action Plan (Two-Year):

- Upper District to finalize revision to contract with San Gabriel Valley Water Company for the cost of recycled water to serve South El Monte High School and 12 Rosemead Extension customers **(April 2011 to Oct 2011)**
- Upper District to finalize a new contract with Golden State Water Company for the cost of recycled water to serve two (2) Rosemead Extension customers **(April 2011 to Oct 2011)**
- Complete a bid solicitation package **(May 2011 to June 2011)**
- Retain a construction contractor **(June 2011 to July 2011)**
- Perform construction management for retrofits **(July 2011 to Oct 2011)**
- Verify all existing and practical additional users of the recycled water system **(July 2011 to Dec 2011)**
  - Document current actual demands
  - Review prior studies and aerial photos and work with retailers to identify potential additional customers
  - Physically verify potential user locations and meters
  - Obtain water use records for potential new users identified
  - Prepare cost / benefit analysis to serve potential new users
  - Contact new users
- Provide reporting required by funding agreements (including Bureau of Reclamation, MWD LRP, and SWRCB funding)

Recycled Water – Direct Use Phase IIB – City of Industry

4) Phase IIB – City of Industry Package 1A (See Figure 4)

Project Description:

- o Will serve four (4) customers including BKK landfill, Big League Dreams, the Heights Shopping Center, and medians along Amar Avenue in the City of West Covina. The project began serving a portion of the medians along Amar Avenue in Dec 2010. Suburban Water Systems will serve all customers.
- o Suburban Water Systems has been contracted for routine operations and maintenance of the system.
- o Anticipated to serve a total recycled water demand of approximately 690 AFY.
- o Originally anticipated to serve 2,564 AFY of recycled water.
- o Includes 4.1 miles of pipeline
- o Pipeline construction completed in Jan 2011.
- o The retrofit design is anticipated to be completed in April 2011
- o The retrofit construction documents will be released for bid in April / May 2011

Financial:

- o Total Capital Cost: $16.2 million (Includes Package 1B)
- o Total Grant Funds: $6.0 million
- o Total Loans: $10.2 million
- o Upper District Funding: $0.0 million

- o Loan Repayment = $510,000 per year (based on zero percent, 20 years)
- o Capital Recovery = $740 per AF (based on 690 AF)

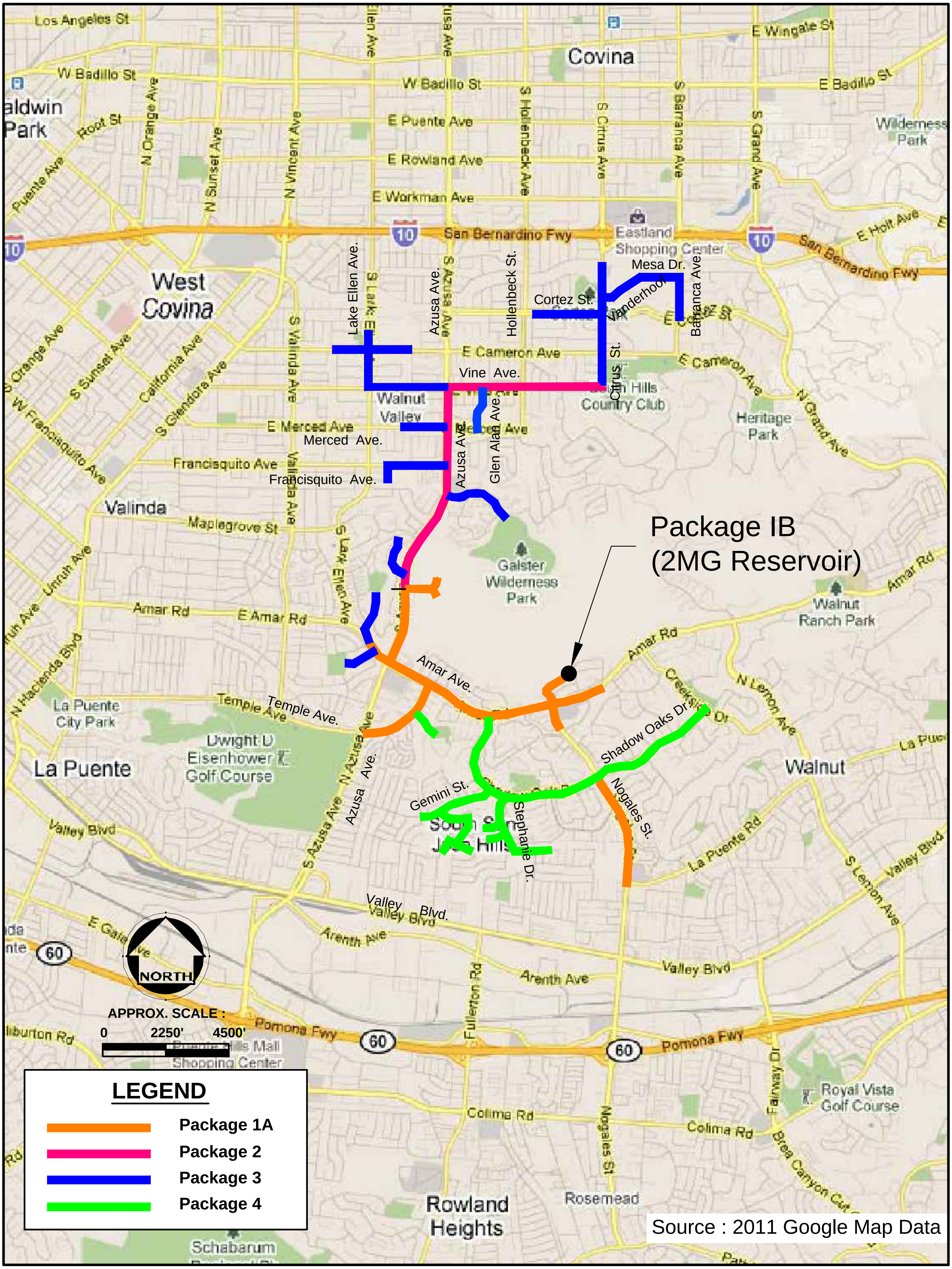
- o Projected Expenses: ($290) per AF
- o Projected Revenues: $455 per AF
- o Projected LRP Funding: $100 per AF
- o Projected Net Operating Income: $265 per AF
  - ▪ (No Capital Recovery)

Action Plan (Two-Year):

- Complete construction of retrofits:
  - Coordinate with the design engineer to complete an RFP for bid solicitation **(May 2011 to June 2011)**
  - Release an RFP and retain a construction contractor **(June 2011 to July 2011)**
  - Make a decision on construction management **(June 2011 to July 2011)**
  - Manage the construction contract to complete retrofits and use the design engineers as-needed **(Aug 2011 to Oct 2011)**
- Verify all existing and practical additional users of the recycled water system **(July 2011 to Dec 2011)**
  - Document current actual demands
  - Review prior studies and aerial photos and work with retailers to identify potential additional customers
  - Physically verify potential user locations and meters
  - Obtain water use records for potential new users identified
  - Prepare cost / benefit analysis to serve potential new users
  - Contact new users
- Provide reporting required by funding agreements (including Bureau of Reclamation, MWD LRP, and SWRCB funding)

DIRECT USE RECYCLED WATER PROJECTS
(PHASE IIB - Industry Packages)

FIGURE 4



5) Phase IIB – City of Industry Package 1B (See Figure 4)

Project Description:

- o Includes construction of a 2 MG reservoir in the City of West Covina.
- o Reservoir is currently being constructed by Pacific Tank.
    - ▪ Construction of the reservoir is anticipated to be completed by Aug 2011

Action Plan (Two-Year):

- ➢ Complete construction of reservoir:
    - ▪ Continue to manage the construction contract to complete the reservoir **(current contract completion by Aug 2011)**
    - ▪ Upper District to coordinate 1-year tank lining performance confirmation **(Sept 2011 to Aug 2012).**
    - ▪ Continue public outreach coordination with the City of West Covina

6) Phase IIB – City of Industry Package 2 (See Figure 4)

Project Description:

- o Will serve three (3) customers including South Hills County Club, Vine Elementary, and medians along Azusa Avenue in the City of West Covina. Suburban Water Systems will serve all customers.
- o Suburban Water Systems has been contracted for routine operations and maintenance of the system.
- o Anticipated to serve a total recycled water demand of approximately 360 AFY.
- o Originally anticipated to serve 506 AFY of recycled water.
- o Includes 2.8 miles of pipeline
- o Pipeline construction contract was awarded Jan 2011.
- o Construction of the pipeline began April 2011
- o Construction of the pipeline is anticipated to be completed by July 2011
- o The retrofit design is anticipated to be completed in April 2011
- o The retrofit construction documents will be released for bid in April / May 2011

Financial:

- o Total Capital Cost: $4.1 million
- o Total Grant Funds: $1.5 million
- o Total Loans: $2.6 million
- o Upper District Funding: $0.0 million

- o Loan Repayment = $130,000 per year (based on zero percent, 20 years)
- o Capital Recovery = $360 per AF (based on 360 AF)

- o Projected Expenses: ($290) per AF
- o Projected Revenues: $455 per AF
- o Projected LRP Funding: <u>$100 per AF</u>
- o Projected Net Operating Income: $265 per AF
  - ▪ (No Capital Recovery)

Action Plan (Two-Year):

- Continue to manage the construction contract to complete the pipeline **(April 2011 to July 2011)**
- Complete construction of retrofits:
  - Coordinate with the design engineer to complete an RFP for bid solicitation **(May 2011 to June 2011)**
  - Release an RFP and retain a construction contractor **(June 2011 to July 2011)**
  - Make a decision on construction management **(June 2011 to July 2011)**
  - Manage the construction contract to complete retrofits and use the design engineers as-needed **(Aug 2011 to Oct 2011)**
- Verify all existing and practical additional users of the recycled water system **(July 2011 to Dec 2011)**
  - Document current actual demands
  - Review prior studies and aerial photos and work with retailers to identify potential additional customers
  - Physically verify potential user locations and meters
  - Obtain water use records for potential new users identified
  - Prepare cost / benefit analysis to serve potential new users
  - Contact new users
- Provide reporting required by funding agreements (including Bureau of Reclamation, MWD LRP, and SWRCB funding)

7) Phase IIB – City of Industry Package 3 (See Figure 4 and Figure 5)

Project Description:

- o Will serve 16 customers, including schools and parks, within the City of West Covina. Suburban Water Systems will serve most customers. Valencia Heights Water Company will serve remaining customers.
- o Suburban Water Systems has been contracted for routine operations and maintenance of the system.
- o Anticipated to serve a total recycled water demand of approximately 310 AFY.
- o Originally anticipated to serve 156 AFY of recycled water.
- o Includes 5.8 miles of pipeline
- o Previously anticipated to include 2.7 miles of pipeline. However, the alignment was redefined in Feb 2011 to improve the economics of the project due to anticipated changes in estimated customer demands.
- o The RFP for pipeline design was released in March 2011
- o The RFP for retrofit design will be released in April / May 2011
- o Retrofit design is anticipated to completed in January 2012

Estimated Financial:

o	Total Capital Cost:	$6.0 million
o	Total Grant Funds:	$2.2 million
o	Total Loans:	$3.8 million
o	Upper District Funding:	$0.0 million

- o Loan Repayment = $190,000 per year (based on zero percent, 20 years)
- o Capital Recovery = $615 per AF (based on 310 AF)

o	Projected Expenses:	($290) per AF
o	Projected Revenues:	$455 per AF
o	Projected LRP Funding:	$100 per AF
o	Projected Net Operating Income:	$265 per AF

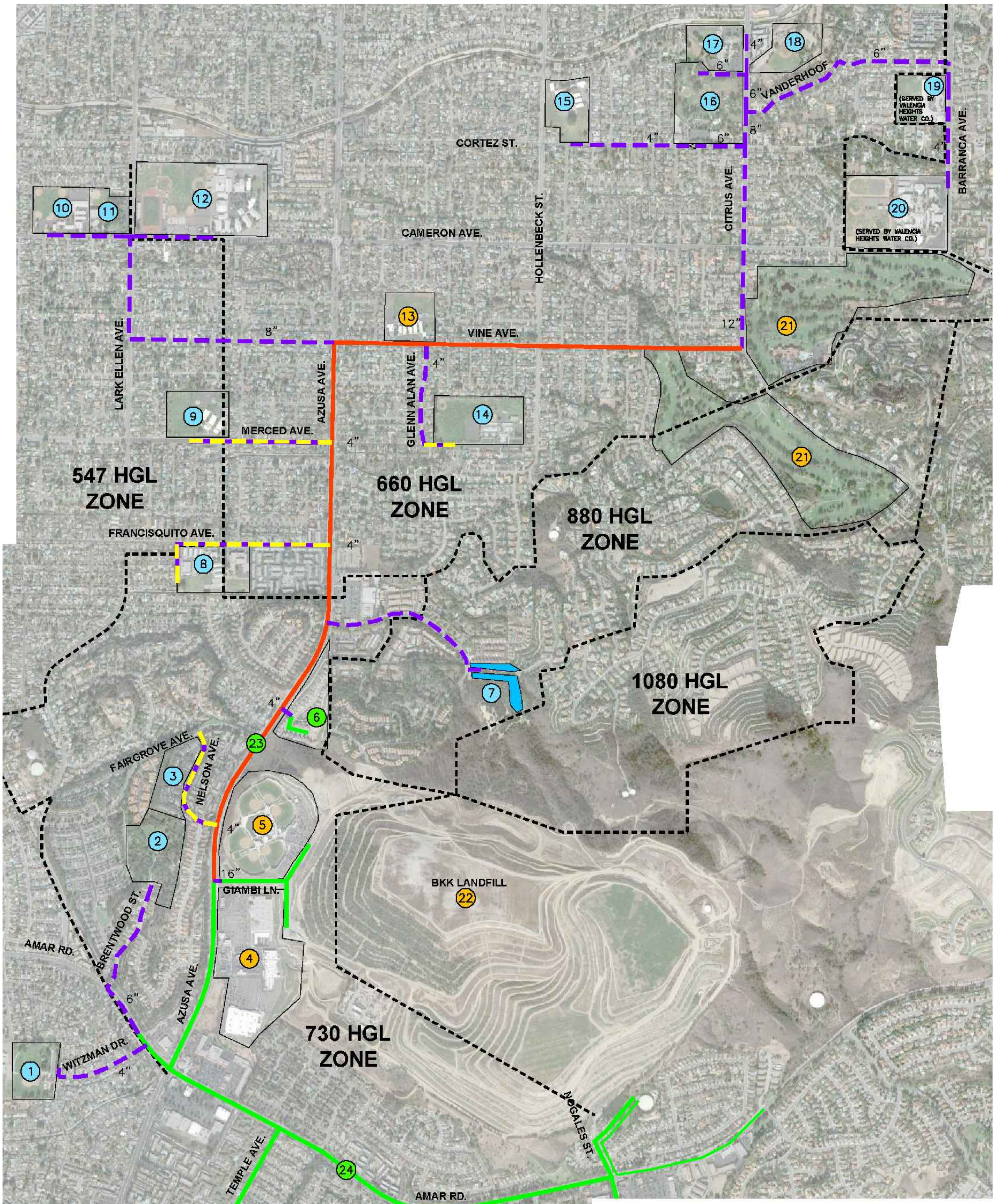
  - ▪ (No Capital Recovery)

Action Plan (Two-Year):

- Negotiate contract with Valencia Heights Water Company for the cost of recycled water to serve Package 3 customers **(April 2011 to Sept 2012)**
- Continue coordination with the City of West Covina and perform public outreach
- Complete design of pipeline:
  - Award a contract and retain a design engineer **(May 2011 to June 2011)**
  - Manage contract to contract to complete pipeline design **(June 2011 to Jan 2012)**
- Complete construction of pipeline:
  - Coordinate with the design engineer to complete a bid solicitation package **(Feb 2012 to Mar 2012)**
  - Release the bid solicitation package to retain a construction contractor **(Mar 2012 to April 2012)**
  - Make a decision on construction management **(Mar 2012 to April 2012)**
  - Manage the construction contract to complete pipeline and use the design engineers as-needed **(May 2012 to Sept 2012)**
- Complete construction of retrofits:
  - Award a contract and retain a design engineer **(May 2011 to June 2011)**
  - Manage contract to contract to complete retrofit design **(July 2011 to Jan 2012)**
  - Coordinate with the design engineer to complete a bid solicitation package **(Feb 2012 to Mar 2012)**
  - Release the bid solicitation package and retain a construction contractor **(Mar 2012 to April 2012)**
  - Make a decision on construction management **(Mar 2012 to April 2012)**
  - Manage the construction contract to complete retrofits and use the design engineers as-needed **(May 2012 to Sept 2012)**
- Verify all existing and practical additional users of the recycled water system **(July 2011 to Dec 2011)**

    - Document current actual demands
    - Review prior studies and aerial photos and work with retailers to identify potential additional customers
    - Physically verify potential user locations and meters
    - Obtain water use records for potential new users identified
    - Prepare cost / benefit analysis to serve potential new users
    - Contact new users
- Provide reporting required by funding agreements (including Bureau of Reclamation, MWD LRP, and SWRCB funding)

FIGURE 5



LEGEND:

- EXISTING PIPELINE
- PACKAGE 2 PIPELINE
- PACKAGE 3 PIPELINE EXTENSIONS (PROPOSED)
- PACKAGE 3 PIPELINE EXTENSIONS (PROPOSED W/ 3-YEAR MORATORIUM)
- X PACKAGE 2 CUSTOMER (CONNECT NOW)
- X PACKAGE 2 CUSTOMER (WAIT FOR RW RESERVOIR)
- X PACKAGE 3 CUSTOMER (SUMMER 2012)
- SUBURBAN WATER SYSTEMS PRESSURE ZONE BOUNDARIES

SCALE: 1" = 1500'

0 1500

FUTURE RW USERS:		DEMAND (AFY)
1.	RIMGROVE PARK	23
2.	WOODGROVE PARK	24
3.	RIDGEWOOD HOA	12
4.	HEIGHTS SHOPPING CENTER	45
5.	BIG LEAGUE DREAMS	67
6.	CP WEST HOA	13
7.	GALSTER PARK	8.1
8.	SOUTH HILLS ACADEMY	8.0
9.	MERCED ELEMENTARY	23
10.	CAMERON ELEMENTARY	12
11.	CAMERON PARK	8.5
12.	WEST COVINA HIGH SCHOOL	29
13.	VINE ELEMENTARY	11
14.	HOLLENCREST MIDDLE SCHOOL	22
15.	CORTEZ SCHOOL	19
16.	CORTEZ PARK	46
17.	CHRIST LUTHERAN PRE-SCHOOL	23
18.	MAVERICK FIELD	9.5
19.	MESA ELEMENTARY	14
20.	SOUTH HILLS HIGH SCHOOL	27
21.	SOUTH HILLS COUNTRY CLUB	330
22.	BKK LANDFILL	571
23.	AZUSA MEDIANS	9.8
24.	AMAR MEDIANS	6.0

USGVMWD - RECYCLED WATER CONVERSIONS PHASE IIB

PACKAGE 3 PIPELINE EXTENSIONS FOR FUTURE RW CUSTOMERS

FIGURE 1

8) Phase IIB – City of Industry Package 4 (See Figure 4 and Figure 6)

Project Description:

- o Will serve seven (7) customers, including schools and parks, within the City of Walnut and the City of West Covina. Suburban Water Systems will serve all customers.
- o Suburban Water Systems has been contracted for routine operations and maintenance of the system.
- o Anticipated to serve a total recycled water demand of approximately 210 AFY.
- o Originally anticipated to serve 474 AFY of recycled water.
- o Includes 4.5 miles of pipeline
- o Previously anticipated to include 3.8 miles of. However, the alignment was redefined in Feb 2011 to improve the economics of the project due to anticipated changes in estimated customer demands.
- o RFP for pipeline design was released in Mar 2011
- o The RFP for retrofit design will be released in April / May 2011
- o Retrofit design is anticipated to completed in January 2012

Estimated Financial:

- o Total Capital Cost: $5.5 million
- o Total Grant Funds: $2.0 million
- o Total Loans: $3.2 million
- o Upper District Funding: $0.3 million

- o Loan Repayment = $160,000 per year (based on zero percent, 20 years)
- o Upper District Funding = $20,000 per year (based on three percent, 20 years)
- o Capital Recovery = $860 per AF (based on 210 AF)

- o Projected Expenses: ($290) per AF
- o Projected Revenues: $455 per AF
- o Projected LRP Funding: $100 per AF

- Projected Net Operating Income: $265 per AF
  - (No Capital Recovery)
  - (No Capital Recovery)

Action Plan (Two-Year):

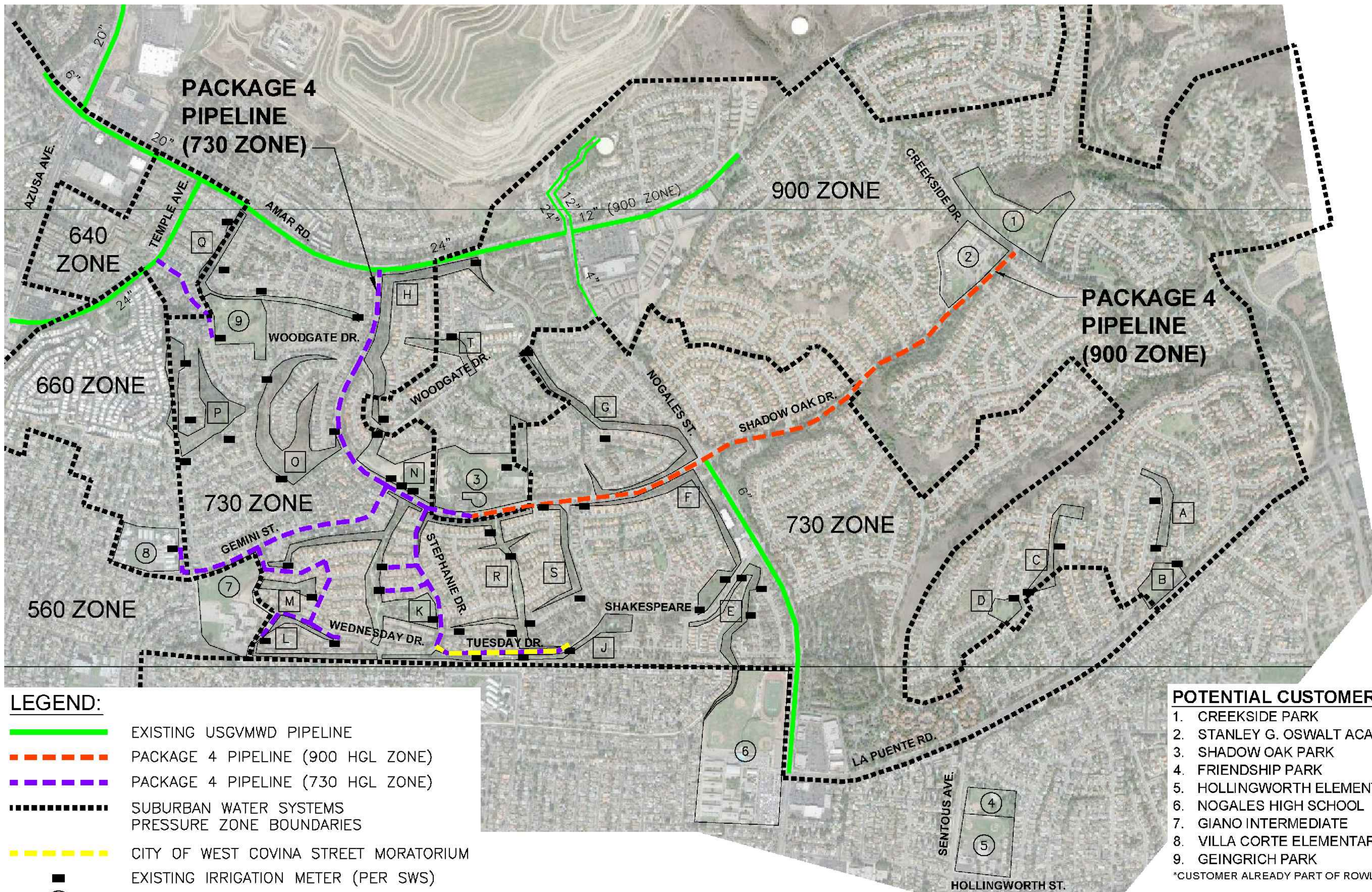
- Continue coordination with the Cities of Walnut and West Covina and perform public outreach
- Complete design of pipeline:
  - Award a contract and retain a design engineer **(May 2011 to June 2011)**
  - Manage contract to complete pipeline design **(June 2011 to Jan 2012)**
- Complete construction of pipeline:
  - Coordinate with the design engineer to complete a bid solicitation package **(Feb 2012 to Mar 2012)**
  - Release the bid solicitation package and retain a construction contractor **(Mar 2012 to April 2012)**
  - Make a decision on construction management **(Mar 2012 to April 2012)**
  - Manage the construction contract to complete pipeline and use the design engineers as-needed **(May 2012 to Sept 2012)**
- Complete construction of retrofits:
  - Award a contract and retain a design engineer **(May 2011 to June 2011)**
  - Manage contract to contract to complete retrofit design **(July 2011 to Jan 2012)**
  - Coordinate with the design engineer to complete a bid solicitation package **(Feb 2012 to Mar 2012)**
  - Release the bid solicitation package and retain a construction contractor **(Mar 2012 to April 2012)**
  - Make a decision on construction management **(Mar 2012 to April 2012)**
  - Manage the construction contract to complete retrofit and use the design engineers as-needed **(May 2012 to Sept 2012)**

- Verify all existing and practical additional users of the recycled water system

  (July 2011 to Dec 2011)

  - Document current actual demands
  - Review prior studies and aerial photos and work with retailers to identify potential additional customers
  - Physically verify potential user locations and meters
  - Obtain water use records for potential new users identified
  - Prepare cost / benefit analysis to serve potential new users
  - Contact new users
- Provide reporting required by funding agreements (including Bureau of Reclamation, MWD LRP, and SWRCB funding)

FIGURE 6



LEGEND:

- EXISTING USGVMWD PIPELINE
- PACKAGE 4 PIPELINE (900 HGL ZONE)
- PACKAGE 4 PIPELINE (730 HGL ZONE)
- SUBURBAN WATER SYSTEMS PRESSURE ZONE BOUNDARIES
- CITY OF WEST COVINA STREET MORATORIUM
- EXISTING IRRIGATION METER (PER SWS)
- (#) POTENTIAL RW CUSTOMERS
- X POTENTIAL RW LANDSCAPING AREAS
- REQUIRED IRRIGATION PUMP (730FT --> 900FT PRESSURE ZONE)

POTENTIAL CUSTOMERS:	DEMANDS
1. CREEKSIDE PARK	(51 AFY)
2. STANLEY G. OSWALT ACADEMY	(11 AFY)
3. SHADOW OAK PARK	(49 AFY)
4. FRIENDSHIP PARK	(*)
5. HOLLINGWORTH ELEMENTARY	(*)
6. NOGALES HIGH SCHOOL	(*)
7. GIANO INTERMEDIATE	(28 AFY)
8. VILLA CORTE ELEMENTARY	(5 AFY)
9. GEINGRICH PARK	(29 AFY)

*CUSTOMER ALREADY PART OF ROWLAND WATER DISTRICT RW SYSTEM

USGVMWD - RECYCLED WATER CONVERSIONS PHASE IIB

PACKAGE 4 PIPELINE
EXTENSIONS FOR FUTURE RW CUSTOMERS

FIGURE
1

Recycled Water – Report on Potential Expansion of Direct Use Projects

9) Future Extensions of Upper District's Recycled Water Program (See Figure 7)

Project Description:

- Identify future customers and demands for future expansion of the recycled water system

Action Plan (Two-Year):

- Identify potential users and demands from existing reports, aerial photos, and retail water agencies **(July 2011 to Dec 2011)**
- Perform a hydraulic analysis of future recycled water expansion projects based on current modeling of the recycled water distribution system **(July 2011 to Sept 2011)**
- Prepare an engineering technical memorandum including an economic evaluation and the incremental costs of expanding the existing recycled water program **(July 2011 to Dec 2011)**

FUTURE DIRECT USE RECYCLED WATER PROJECTS

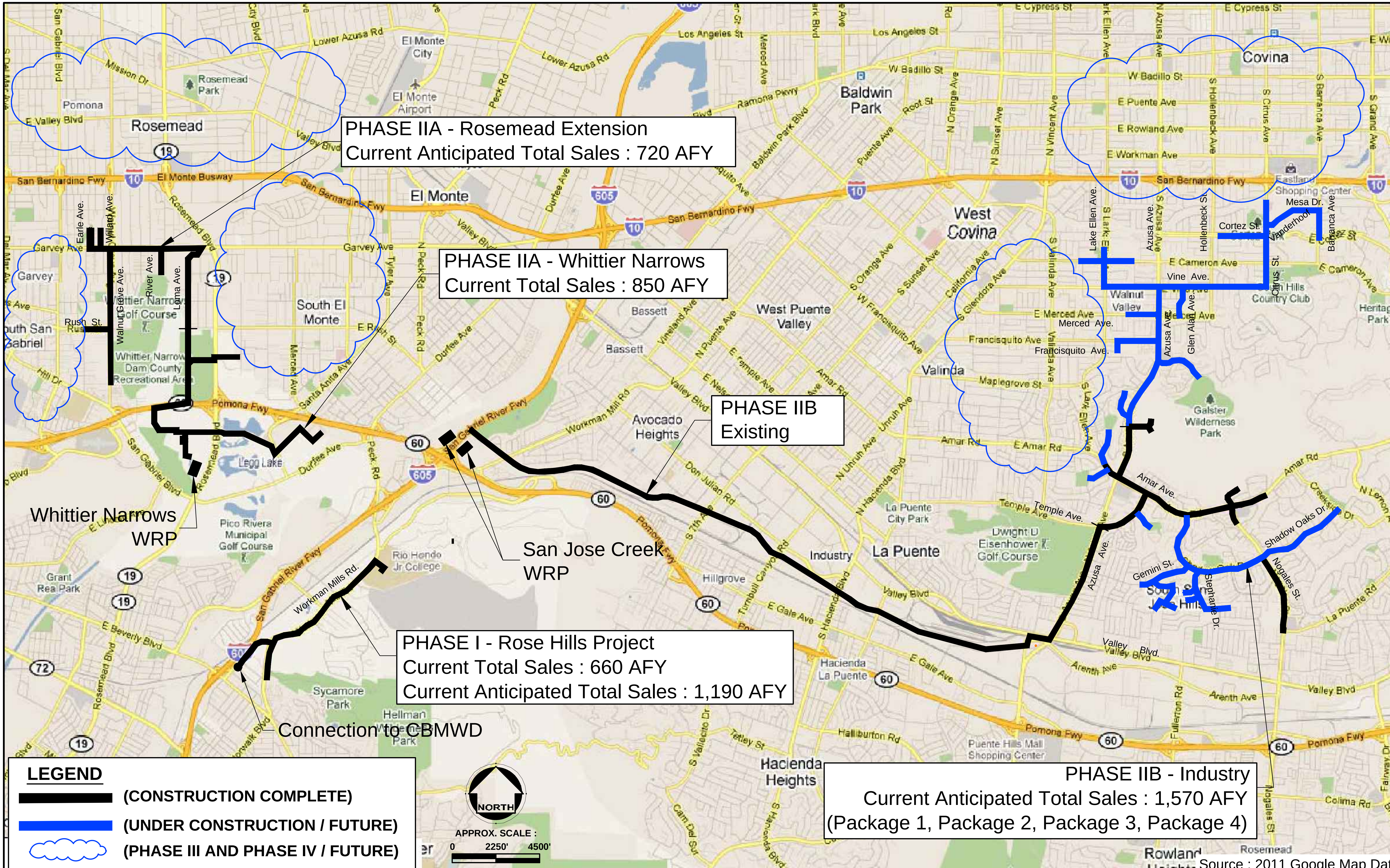


FIGURE 7

10) Phase III – Membrane Bioreactor Treatment Plant (See Figure 8)

Project Description:

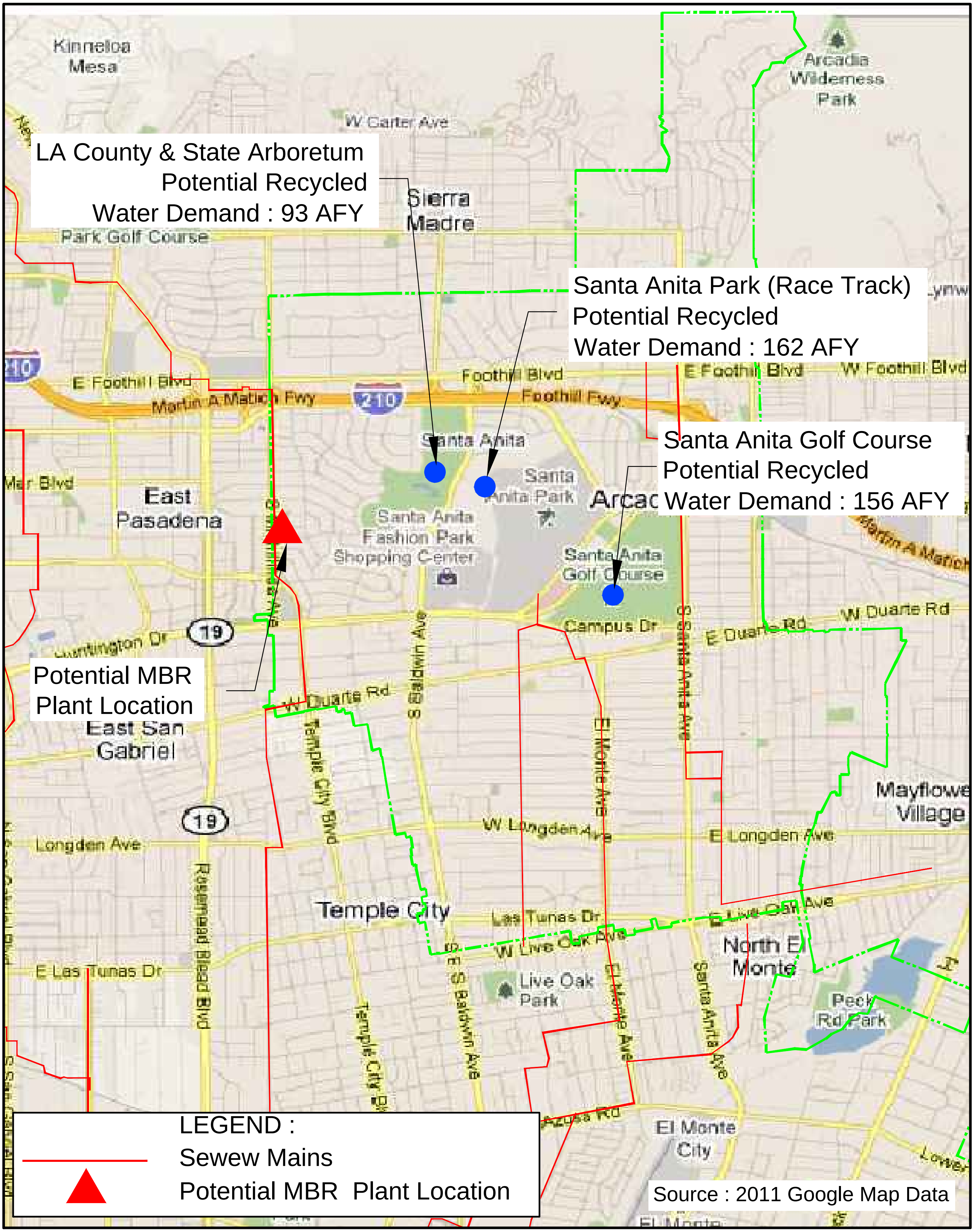
- o Evaluate future expansion of the recycled water system to include a membrane bioreactor (MBR) treatment plant (scalping plant) to treat and serve recycled water in areas that are cost prohibitive to serve from existing plants.

Action Plan (Two-Year):

- ➢ Prepare an engineering technical memorandum regarding wastewater sources, recycled water demands, treatment plant sizing, costs, and potential sites for an MBR treatment plant in addition to or as an alternative to expanding existing recycled water infrastructure **(July 2011 to Sept 2011)**

POTENTIAL LOCATION OF MBR (SCALPING) PLANT

FIGURE 8



11) Loans and Grants (Direct Use Only)

Action Plan (Two-Year):

- Existing loans and grants
  - Continue administering loans and grants
  - Continue reviewing compliance with loans and grants
  - Perform modifications to loans and grants (including SWRCB and Bureau of Reclamation funding) resulting from modifications to the Package 3 and Package 4 alignments and schedules.
    - Prepare amendment to CEQA **(April 2011)**
    - Provide CEQA amendment and revised project description and costs to SWRCB and Bureau of Reclamation **(April 2011)**
- Proposed / new loans and grants for potential expansion
  - Begin preparing Grant Funding Plan, including potential federal funds such as Title 16 and state funds such as SWRCB Recycled Water Facilities Grant and Proposition 84 **(July 2011)**
  - Continue to determine availability of federal, state, and local loans and grants
  - Begin discussions with MWD regarding LRP funding as necessary.

Recycled Water – Groundwater Recharge Project

Upper District will reevaluate the requirements of a groundwater recharge project to identify the most cost effective approach. Upper District will begin implementation of the project.

12) Determine Best Treatment Technology

Project Description:

- o Evaluate the most appropriate treatment technology ranging from tertiary treatment (no additional treatment required) to full advanced treatment (requires installation of an advanced water treatment facility)

Action Plan (Two-Year):

- ➢ Retain a technical team to evaluate the best treatment technology **(July 2011 to Aug 2011)**
- ➢ Coordinate available treatment technologies with regulatory agencies **(Aug 2011 to Oct 2011)**
- ➢ Develop a preliminary design report including costs **(Nov 2011 to Feb 2012)**
- ➢ Coordinate project preliminary design with producers and Board of Directors
- ➢ Upper District, Stetson, and producers will provide input / support
- ➢ Explore demonstration / pilot study opportunities **(May 2011 to Mar 2013)**
  - ▪ Grant Application for Pilot Project **(May 2011)**
  - ▪ Evaluation of Treatment Options **(July 2011)**
  - ▪ Design Pilot System **(Oct 2011)**
  - ▪ Bid and Construct **(Jan 2012)**
  - ▪ Pre-Operations **(Mar 2012)**
  - ▪ Full Testing **(Mar 2012)**
  - ▪ Data Analysis - Cost/Permitting **(Mar 2013)**

13) CDPH / RWQCB Permitting

Project Description:

- o Follow-up selection of treatment technology with regulatory agencies including California Department of Public Health (CDPH) and Regional Water Quality Control Board (RWQCB)

Action Plan (Two-Year):

- ➢ Coordinate with CDPH and initiate Background Water Quality Monitoring Plan (See Item 14) **(July 2011 to Aug 2011)**
- ➢ Upper District to verify the status of the California Toxics Rule with LACSD regarding discharge and recharge of recycled water from LACSD **(July 2011 to Aug 2011)**
- ➢ Stetson to determine the need for developing a potential 3-D model for contaminant transport based on an existing 2-D model **(July 2011 to Aug 2011)**
- ➢ Stetson to determine the assimilative capacity (i.e. TDS, nitrates, etc) of the Main San Gabriel Basin for constituents of interest **(July 2011 to Aug 2011)**
- ➢ Coordinate selected treatment technology with CDPH and RWQCB **(Aug 2011 to May 2012)**
- ➢ Prepare engineering report for CDPH **(Begin Fall 2013)**

14) Background Water Quality Monitoring Plan (BWQMP)

Project Description:

- The BWQMP will provide background information and data to evaluate potential impacts of groundwater recharge, adequate field data for the design and operations, and a foundation for preparation of the monitoring plan as required by regulatory agencies during the permitting process. A BWQMP was originally prepared for the Demonstration project in the late 1990's. A BWQMP was also prepared for the Groundwater Reliability Improvement Program (GRIP) project which may be applicable for recharge of advanced treated water.

Action Plan (Two-Year):

- Provide a description / comparison technical memorandum of the monitoring plans for the Demonstration Project and advanced treatment recharge project **(July 2011 to Aug 2011)**
- Review existing BWQMP reports (Demonstration Project and advanced treatment) with water producers and regulatory agencies **(Aug 2011 to Nov 2011)**
- Decision on BWQMP (Demonstration Project or advanced treatment) **(Dec 2011)**
- If necessary, prepare design of monitoring wells **(Jan 2012 to Mar 2012)**
- If necessary, release an RFP and retain a construction contractor for monitoring wells **(April 2012 to May 2012)**
- If necessary, perform construction management and inspection of monitoring wells **(June 2012 to Dec 2012)**
- Begin background monitoring data collection **(Jan 2013 to Dec 2013)**

15) Secure Pipeline Alignment and Treatment Facility Location

Project Description:

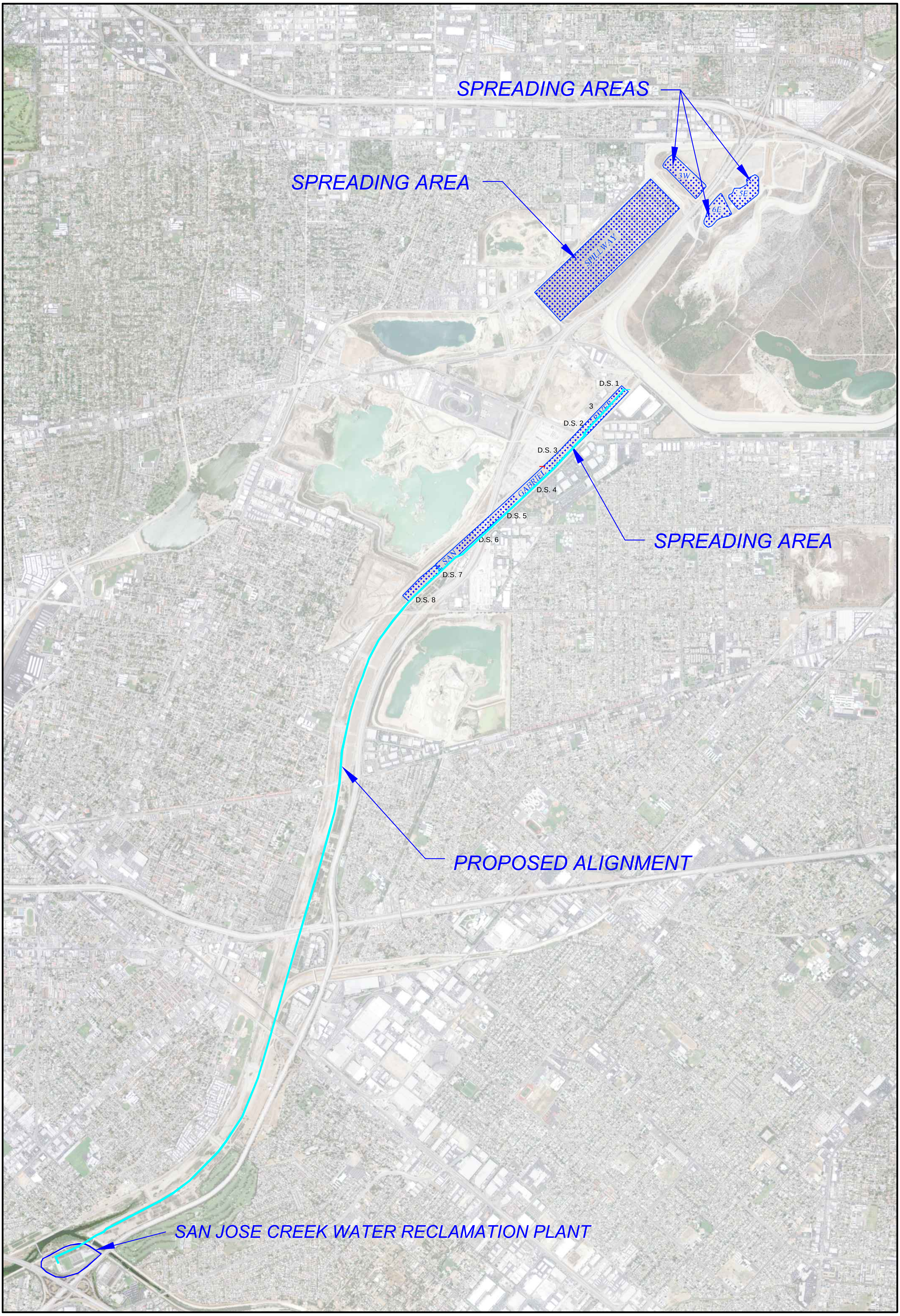
- o The proposed alignment will begin at the San Jose Creek Water Reclamation Plant and end at the vicinity of the Santa Fe Dam (See Figure 9). The proposed treatment facility, if necessary, will be located along the alignment.

Action Plan (Two-Year):

- ➢ Identify potential plant site alternatives and sizes. **(July 2011 to Oct 2011)**
- ➢ Prepare alignment alternatives, pipeline sizes, obstacles (i.e. brine line), and recommendations **(July 2011 to Oct 2011)**
- ➢ Prepare technical memorandum on construction costs and economic feasibility of the alignment alternatives **(Oct 2011 to Dec 2011)**
- ➢ Prepare technical memorandum on construction costs and economic feasibility of the plant sites **(Oct 2011 to Dec 2011)**
- ➢ Begin negotiations for right-of-way alignment procurement **(Jan 2012 to June 2012)**
- ➢ Begin negotiations for treatment plant site procurement (See Item 16) **(Jan 2012 to June 2012)**

POTENTIAL ALIGNMENT AND RECHARGE AREAS OF GROUNDWATER REPLEINISHMENT PROJECT

FIGURE 9



16) Coordination with Los Angeles County Sanitation Districts (LACSD)

Project Description:

- Recycled water will be supplied by LACSD. In addition, recycled water facilities (i.e. pipeline connection point, pumping plant, and / or potential advanced water treatment facility) may be located within LACSD property.

Action Plan (Two-Year):

- Confirm contract for 10,000 AFY of recycled water agreement **(July 2011 to Oct 2011)**
- Upper District to negotiate site for a pipeline connection point, pumping plant, and / or potential advanced water treatment facility **(Jan 2012 to June 2012)**
- If necessary, continue negotiations regarding cost of recycled water, advanced water treatment facility O&M costs, and brine connection fees **(Jan 2012 to June 2012)**

17) Coordination with Los Angeles County Department of Public Works (LACDPW)

Project Description:

- o The proposed groundwater recharge operations will be performed by LACDPW.

Action Plan (Two-Year):

- ➢ Conduct coordination regarding the operations of recycled recharge water and delivery of diluent water **(Jan 2012 to June 2012)**
- ➢ Coordinate spreading of local and imported water and prepare an Operations Plan for Spreading Operations **(July 2012 to Dec 2012)**
- ➢ Confirm agreements with LACDPW **(July 2012 to Dec 2012)**

18) **Report on Recommendation of Recharge Project**

Project Description:

- A conceptual design report (based on information obtained from Items 12 through 17) will provide recommendations regarding the entire recharge project.

Action Plan (Two-Year):

- Stetson will prepare a conceptual design report for the entire recharge project including treatment recommendations and information regarding treatment type, capacities, sizing, land requirements, and costs **(Jan 2013 to June 2013)**

19) Coordination with Main San Gabriel Basin Watermaster

Project Description:

- Coordination with Main San Gabriel Basin Watermaster for Basin replenishment with recycled water

Action Plan (Two-Year):

- Coordinate with Watermaster on preparation of a Salt Nutrient Management Plan **(July 2011 to Dec 2011)**
- Coordinate Watermaster's designation of a "No Pump Zone" **(July 2011 to Dec 2011)**
- Coordinate on the monitoring plan / reports **(July 2011 to Dec 2011)**
- Coordinate producer support / funding agreement **(July 2011 to Dec 2011)**

20) New Loans and Grants (Groundwater Replenishment)

Action Plan (Two-Year):

- Begin preparing Funding Plan including:
  - Pilot and Demonstration Treatment Grant **(Mar 2012)**
  - Title 16 Feasibility Application **(Feb 2012)**
  - Proposition 84 Funds
  - State Revolving Funds and other State funds
- Continue to determine availability of loans and grants
- Continue to coordinate with state and federal staff and elected officials regarding funding opportunities and project support
- Submit preliminary application for LRP funding to MWD **(May 2011)**

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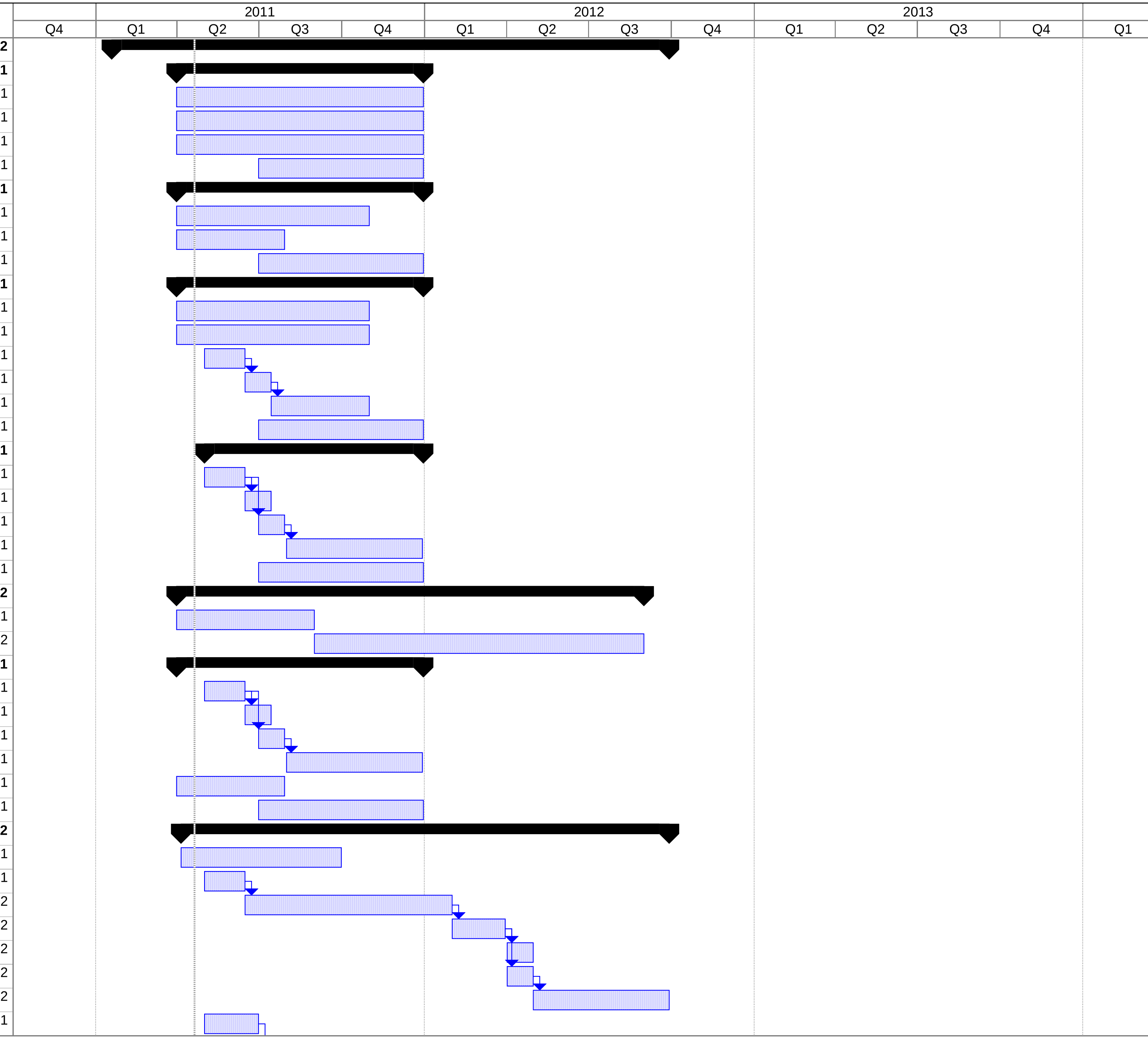
Appendix A

Project/ Component	Customer Description	12/10/10 PwrPnt Est. Demand AF/yr	12/10/10 PwrPnt Pipeline Length (miles)	Revised April 2011 Est. Demand AF/yr	Revised April 2011 Pipeline Length (feet)	Revised April 2011 Pipeline Length (miles)	Comments/source	Capital Costs Pipeline Design Cost ($)	Pipeline Construction Cost ($)	Pipeline PM/CMI Cost ($)	Retrofit Design Cost ($)	Retrofit Construction Cost ($)	Retrofit PM/CMI Cost ($)	Total Design Cost	Total Construction Cost	Total Capital Cost	Unit Cap. Cost ($/AF)	Capital Funding USBR Grant ($)	ARRA Grant ($)	SWRCB Loan ($)	SWRCB Grant ($)	MWD Grant ($)	UD Funds ($)	Unit Cap. Cost minus Grants ($/AF)	Estimated Annual Costs/Revenue: Annual Costs Est. RW Rate ($/AF)	Est. RW Cost ($/yr)	O&M ($/yr)	Loan Payment ($/yr)	Annual Revenue Est. RW Rate ($/AF)	Est. RW Revenue ($/yr)	MWD LRP Funding ($/yr)	Annual Net ($/yr)	Payback Total Net Unit Cost ($/yr/AF)	Payback Period (yrs)	Cost of MWD T2 Untreated ($/yr)	Delta Savings with RW ($/yr)	
Phase I																																					
Rose Hills																																					
Pipeline			2.0			2.0	ER									4,519,705	6,858																				
Customers	Rio Hondo College	34		34										-	-	-	-								480	16,300	8,700		266	9,000		(16,000)	(471)				
	Rose Hills Memorial Park (Phase I)	595		595										-	-	-	-								480	285,600	-		175	104,100		(181,500)	(305)				
	Rose Hills Memorial Park (Phase II)			531							TBD	TBD	TBD	-	-	-	-								480	254,900	-		175	92,900		(162,000)	(305)				
	Mills Elementary School	10		10										-	-	-	-								480	4,800	8,700		266	2,700		(10,800)	(1,080)				
	Gateway Pointe Industrial Park	20		20										-	-	-	-								480	9,600	8,700		266	5,300		(13,000)	(650)				
		659		1,190																																	
Subtotal Phase I		**659**	**2.0**	**1,190**		**2.0**		**-**	**-**	**-**	**-**	**-**		**-**	**-**	**4,519,705**	**3,798**	**1,125,000**					**3,394,705**	**2,853**	**502**	**571,200**	**26,100**		**180**	**214,000**		**(383,300)**	**(322)**	**No Payback**			
Phase IIA																																					
Whittier Narrows																																					
Pipeline			3.2			3.2																															
Customers	Whittier Narrows Recreation Area	798		798			ER							-	-	9,743,650	12,210								106	84,600	143,000		455	363,200	55,860	191,460	240				
	South El Monte High School	52		52			ER									129,196	2,485								106	5,500	9,500		455	23,700	3,640	12,340	237				
	SEMHS Bus Depot	??		??			ER							-	-	29,471	#VALUE!																				
Subtotal Whittier Narrows		***850***	***3.2***	***850***		***3.2***		***-***	***-***	***-***	***-***	***-***		***-***	***-***	***9,902,317***	***11,650***	***2,475,000***			***1,640,000***		***5,787,317***	6,809	***285***	***90,100***	***152,500***		***525***	***386,900***	***59,500***	***203,800***	***240***	***28***			
Rosemead Extension I																																					
Pipeline			1.3			1.3	ER									2,863,677	3,977																				
Rosemead Extension II																																					
Pipeline			2.5			2.5	ER; MWH contract; TE Roberts contr	333,750	1,345,865	545,100				333,750	1,890,965	2,224,715	3,090																				
Customers	Normans Nursery	30		30			MWH contract; MWH 90% submittal				42,600	10,300	12,100	42,600	22,400	65,000	2,167						65,000		106	3,200	5,400		455	13,700	2,100	7,200	240	9			
	Loma Elementary	7		7			MWH contract; MWH 90% submittal				9,940	9,900	2,823	9,940	12,723	22,663	3,238						22,663		106	700	1,300		455	3,200	490	1,690	241	13			
	Temple Intermediate School/Sanchez Element	26		26			MWH contract; MWH 90% submittal				36,920	44,000	10,487	36,920	54,487	91,407	3,516						91,407		106	2,800	4,700		455	11,800	1,820	6,120	235	15			
	Willard Elementary School	4		4			MWH contract; MWH 90% submittal				5,680	16,000	1,613	5,680	17,613	23,293	5,823						23,293		106	400	700		455	1,800	280	980	245	24			
	Zapopan Park	17		17			MWH contract; MWH 90% submittal				24,140	18,500	6,857	24,140	25,357	49,497	2,912						49,497		106	1,800	3,100		455	7,700	1,190	3,990	235	12			
	Edison Capital Building	96		96			MWH contract; MWH 90% submittal				136,320	21,200	38,720	136,320	59,920	196,240	2,044						196,240		106	10,200	17,300		455	43,700	6,720	22,920	239	9			
	Walmart	9		9			MWH contract; MWH 90% submittal				12,780	11,900	3,630	12,780	15,530	28,310	3,146						28,310		106	1,000	1,600		455	4,100	630	2,130	237	13			
	Rice Eldridge Elementary School	4		4			MWH contract; MWH 90% submittal				5,680	46,100	1,613	5,680	47,713	53,393	13,348						53,393		106	400	700		455	1,800	280	980	245	54			
	University of the West	17		17			MWH contract; MWH 90% submittal				24,140	31,700	6,857	24,140	38,557	62,697	3,688						62,697		106	1,800	3,100		455	7,700	1,190	3,990	235	16			
	Panda Express Corporate Office	21		21			MWH contract; MWH 90% submittal				29,820	21,100	8,470	29,820	29,570	59,390	2,828						59,390		106	2,200	3,800		455	9,600	1,470	5,070	241	12			
	Sunshine Nursery	50		50			MWH contract; MWH 90% submittal				71,000	15,700	20,167	71,000	35,867	106,867	2,137						106,867		106	5,300	9,000		455	22,800	3,500	12,000	240	9			
	Jess Gonzales Sports Park	17		17			MWH contract; MWH 90% submittal				24,140	13,300	6,857	24,140	20,157	44,297	2,606						44,297		106	1,800	3,100		455	7,700	1,190	3,990	235	11			
	Rosemead Medians	2		2			MWH contract; MWH 90% submittal				2,840	7,000	807	2,840	7,807	10,647	5,323						10,647		106	200	400		455	900	140	440	220	24			
	Whittier Narrows Golf Course	420		420			ER				97,700			97,700	-	97,700	233						97,700		106	44,500	75,600		455	191,200	29,400	100,500	239	1			
Subtotal Rosemead Extension II		***720***	***2.5***	***720***		***2.5***		***333,750***	***1,345,865***	***545,100***	***523,700***	***266,700***	***121,000***	***857,450***	***2,278,665***	***3,136,115***	***4,356***						***911,400***		***286***	***76,300***	***129,800***		***525***	***327,700***	***50,400***	***172,000***	***239***	***5***			
Subtotal Rosemead Extension I & II		***720***	***3.8***	***720***		***3.8***		***333,750***	***1,345,865***	***545,100***	***523,700***	***266,700***	***121,000***	***857,450***	***2,278,665***	***5,999,792***	***8,333***	***925,000***	***600,000***			***165,000***	***4,309,792***		***286***	***76,300***	***129,800***		***525***	***327,700***	***50,400***	***172,000***	***239***	***25***			
Subtotal Phase IIA		***1,570***	***7.0***	***1,570***		***7.0***		***333,750***	***1,345,865***	***545,100***	***523,700***	***266,700***	***121,000***	***857,450***	***2,278,665***	***15,902,108***	***10,129***	***3,400,000***	***600,000***	-	***1,640,000***	***165,000***	***10,097,108***		***286***	***166,400***	***282,300***		***525***	***714,600***	***109,900***	***375,800***	***239***	***27***			
Industry Phase IIB																																					
Industry Pipeline from 730 Pump Station																																					
Buy-in to Industry Pipeline																6,424,744				6,424,744			-					321,200									
Pump Station/Pipeline			1.0			1.0																															
Package 1																																					
Pipeline (1A)			4.1			4.1	MWH, JFC, PSI contracts; current sta	355,000	$ 4,662,293	$ 1,136,346				355,000	5,798,639	6,153,639			655,814	3,490,785	1,841,940		165,100					174,500									
Reservoir (1B)							MWH, PTC, PSI contracts; current st	420,000	$ 1,886,872	$ 660,608				420,000	2,547,480	2,967,480			765,116	1,758,516	342,410		101,439					87,900									
Customers	BKK Landfill	571		571			Tetra Tech 12/21/10 memo+10% PM/CMI				114,637	360,000	36,000	114,637	396,000	510,637	894						510,637	894	190	108,500	57,100		455	259,900	57,100	151,400	265	3			
	Big League Dreams Sports Park	67		67			Tetra Tech 8/20/10 memo+10% PM/CMI				13,451	32,000	3,200	13,451	35,200	48,651	726						48,651	726	190	12,700	6,700		455	30,500	6,700	17,800	266	3			
	West Covina Heights Shopping Center	45		45			Tetra Tech 12/21/10 memo+10% PM/CMI				9,034	35,000	3,500	9,034	38,500	47,534	1,056						47,534	1,056	190	8,600	4,500		455	20,500	4,500	11,900	264	4			
	Woodgrove Park	23					moved to Package 3																														
	West Covina Medians	6		6			Tetra Tech 12/21/10 memo+10% PM/CMI				1,205	40,000	4,000	1,205	44,000	45,205	7,534						45,205	7,534	190	1,100	600		455	2,700	600	1,600	267	28			
Subtotal Package 1		***712***	***4.1***	***689***		***4.1***		***775,000***	***6,549,165***	***1,796,954***	***138,327***	***467,000***	***46,700***	***913,327***	***8,859,819***	***16,197,890***	***23,509***	***-***	***1,420,930***	***11,674,044***	***2,184,350***	***-***	***918,566***	***18,277***	***290***	***130,900***	***68,900***	***583,700***	***555***	***313,600***	***68,900***	***(401,000)***	***(582)***	***No Payback***			
Package 2																																					
Pipeline			2.8			2.8	MWH, Colich, PSI contracts; current	598,500	1,897,640	583,500				598,500	2,481,140	3,079,640			874,419	1,790,953	414,268		-					89,500									
Customers	Hollencrest Middle School	15					moved to Package 3																														
	Vine Elementary School	8		8			Tetra Tech 12/21/10 memo+10% PM/CMI				1,606	130,000	13,000	1,606	143,000	144,606	18,076						144,606	18,076	190	1,500	800		455	3,600	800	2,100	263	69			
	Galster Park	7					removed																														
	South Hills Country Club	340		340			Tetra Tech 12/21/10 memo+10% PM/CMI				68,260	680,000	68,000	68,260	748,000	816,260	2,401						816,260	2,401	190	64,600	34,000		455	154,800	34,000	90,200	265	9			
	West Covina Medians	9		9			Tetra Tech 12/21/10 memo+10% PM/CMI				1,807	60,000	6,000	1,807	66,000	67,807	7,534						67,807	7,534	190	1,700	900		455	4,100	900	2,400	267	28			
Subtotal Package 2		***379***		***357***				***598,500***	***1,897,640***	***583,500***	***71,673***	***870,000***	***87,000***	***670,173***	***3,438,140***	***4,108,313***	***11,508***	***-***	***874,419***	***1,790,953***	***414,268***	***-***	***1,028,673***	***7,898***	***290***	***67,800***	***35,700***	***89,500***	***555***	***162,500***	***35,700***	***5,200***	***15***	***198***			
Package 3																																					
Pipeline			2.7			5.1	Tetra Tech 3/8/11 memo; 10% PM/C	175,400	4,384,900	438,490				175,400	4,823,390	4,998,790	15,971		1,311,628	2,377,319	1,309,843		-	7,595				118,900									
Customers	Creekside Park	40					moved to Pkg 4																														
	Stanley Oswalt Elementary School	18					moved to Pkg 4																														
	Shadow Oak Park	33					moved to Pkg 4																														
	Arroyo Butterfield Park	10					removed																														
	Walnut Greenbelts	124					removed																														
	Rimgrove Park			23	1,400		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	2,087						48,000	2,087	190	4,400	2,300		455	10,500	2,300	6,100	265	8	14,996	10,596	461
	Woodgrove Park			24	2,300		Tetra Tech 12/21/10 memo+10% design+10% PM/CMI				14,500	145,000	14,500	14,500	159,500	174,000	7,250						174,000	7,250	190	4,600	2,400		455	10,900	2,400	6,300	263	28	15,648	11,048	460
	Ridgewood HOA			12	1,500		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	4,000						48,000	4,000	190	2,300	1,200		455	5,500	1,200	3,200	267	15	7,824	5,524	460
	CP West HOA			13			Tetra Tech est. (July 2010)+10% design+10% PM/CMI				5,000	8,000	800	5,000	8,800	13,800	1,062						13,800	1,062	190	2,500	1,300		455	5,900	1,300	3,400	262	4	8,476	5,976	460
	South Hills Academy/San Jose School			8	2,500		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	6,000						48,000	6,000	190	1,500	800		455	3,600	800	2,100	263	23	5,216	3,716	465
	Merced Elementary			23	1,900		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	2,087						48,000	2,087	190	4,400	2,300		455	10,500	2,300	6,100	265	8	14,996	10,596	461
	Cameron Elementary			12	500		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	4,000						48,000	4,000	190	2,300	1,200		455	5,500	1,200	3,200	267	15	7,824	5,524	460
	Cameron Park			9	500		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	5,647						48,000	5,647	190	1,600	850		455	3,900	850	2,300	271	21	5,542	3,942	464
	West Covina High School			29	5,100		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	1,655						48,000	1,655	190	5,500	2,900		455	13,200	2,900	7,700	266	6	18,908	13,408	462
	Hollencrest Middle School			22	1,700		Tetra Tech 12/21/10 memo+10% design+10% PM/CMI				12,500	125,000	12,500	12,500	137,500	150,000	6,818						150,000	6,818	190	4,200	2,200		455	10,000	2,200	5,800	264	26	14,344	10,144	461
	Cortez School			19	2,400		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	2,526						48,000	2,526	190	3,600	1,900		455	8,600	1,900	5,000	263	10	12,388	8,788	463
	Cortez Park			46	3,150		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	1,043						48,000	1,043	190	8,700	4,600		455	20,900	4,600	12,200	265	4	29,992	21,292	463
	Christ Lutheran			23	500		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	2,087						48,000	2,087	190	4,400	2,300		455	10,500	2,300	6,100	265	8	14,996	10,596	461
	Maverick Field			10	900		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	5,053						48,000	5,053	190	1,800	950		455	4,300	950	2,500	263	19	6,194	4,394	463
	Mesa Elementary			14	1,350		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	3,429						48,000	3,429	190	2,700	1,400		455	6,400	1,400	3,700	264	13	9,128	6,428	459
	South Hills High			27	1,375		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	1,778						48,000	1,778	190	5,100	2,700		455	12,300	2,700	7,200	267	7	17,604	12,504	463
Subtotal Package 3		***225***		***313***	***27,075***			***175,400***	***4,384,900***	***438,490***	***84,000***	***798,000***	***79,800***	***259,400***	***5,701,190***	***5,960,590***	***19,043***	***-***	***1,311,628***	***2,377,319***	***1,309,843***	***-***	***961,800***	***10,668***	***290***	***59,600***	***31,300***	***118,900***	***555***	***142,500***	***31,300***	***(36,000)***	***(115)***	***No Payback***		***144,476***	
Package 4																																					
Pipeline			3.8			4.4	Tetra Tech 3/8/11 memo; 10% PM/C	174,500	4,363,400	436,340				174,500	4,799,740	4,974,240	23,575		1,093,023	2,789,682	1,091,535		-	13,221				139,500									
Customers	Giano Junior High School	14		28	4,730		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	1,714						48,000	1,714	190	5,300	2,800		455	12,700	2,800	7,400	264	6	18,256	12,956	463
	Villacorta Elementary School	14		5	1,270		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	9,600						48,000	9,600	190	1,000	500		455	2,300	500	1,300	260	37	3,260	2,260	452
	Gingrich Park	17		29	1,300		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	1,655						48,000	1,655	190	5,500	2,900		455	13,200	2,900	7,700	266	6	18,908	13,408	462
	West Covina Greenbelts	249					see greenbelts below																														
	Creekside Park			51	7,150		moved from Pkg 3; RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	941						48,000	941	190	9,700	5,100		455	23,200	5,100	13,500	265	4	33,252	23,552	462
	Stanley Oswalt Elementary School			11			moved from Pkg 3; RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	4,364						48,000	4,364	190	2,100	1,100		455	5,000	1,100	2,900	264	17	7,172	5,072	461
	Shadow Oak Park			49	1,350		moved from Pkg 3; RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	980						48,000	980	190	9,300	4,900		455	22,300	4,900	13,000	265	4	31,948	22,648	462
	Greenbelt J			7	1,800		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	6,857						48,000	6,857	190	1,300	700		455	3,200	700	1,900	271	25	4,564	3,264	466
	Greenbelt K			19	2,650		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	2,526						48,000	2,526	190	3,600	1,900		455	8,600	1,900	5,000	263	10	12,388	8,788	463
	Greenbelt L			1	1,300		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	48,000						48,000	48,000	190	200	100		455	500	100	300	300	160	652	452	452
	Greenbelt M			3	1,840		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	16,000						48,000	16,000	190	600	300		455	1,400	300	800	267	60	1,956	1,356	452
	Greenbelt N			8	-		RT estimate+10% design+10%PM/CMI				4,000	40,000	4,000	4,000	44,000	48,000	6,000						48,000	6,000	190	1,500	800		455	3,600	800	2,100	263	23	5,216	3,716	465
Subtotal Package 4		***294***		***211***	***23,390***			***174,500***	***4,363,400***	***436,340***	***44,000***	***440,000***	***44,000***	***218,500***	***5,283,740***	***5,502,240***	***26,077***	***-***	***1,093,023***	***2,789,682***	***1,091,535***	***-***	***528,000***	***15,724***	***290***	***40,100***	***21,100***	***139,500***	***555***	***96,000***	***21,100***	***(83,600)***	***(396)***	***No Payback***		***97,472***	
Subtotal Phase IIB		**1,610**	**14.4**	**1,570**		**17.5**		**1,723,400**	**17,195,105**	**3,255,284**	**338,000**	**2,575,000**	**257,500**	**2,061,400**	**23,282,889**	**31,769,033**	**20,235**	**-**	**4,700,000**	**18,631,998**	**4,999,996**	**-**	**3,437,039**	**14,057**	**290**	**298,400**	**157,000**	**931,600**	**555**	**714,600**	**157,000**	**(515,400)**	**(328)**	**No Payback**			
Total Phase I		**659**	**2.0**	**1,190**		**2.0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**4,519,705**	**3,798**	**1,125,000**	**-**	**-**	**-**	**-**	**3,394,705**	**2,853**	**502**	**571,200**	**26,100**	**-**	**180**	**214,000**	**-**	**(383,300)**	**(322)**	**No Payback**			
Total Phase IIA & IIB		**3,180**	**21.4**	**3,140**		**24.5**		**2,057,150**	**18,540,970**	**3,800,384**	**861,700**	**2,841,700**	**378,500**	**2,918,850**	**25,561,554**	**47,671,141**	**15,182**	**3,400,000**	**5,300,000**	**18,631,998**	**6,639,996**	**165,000**	**13,534,147**	**10,244**	**288**	**464,800**	**439,300**	**931,600**	**540**	**1,429,200**	**266,900**	**(139,600)**	**(44)**	**No Payback**			
GRAND TOTAL		**3,839**	**23.4**	**4,330**		**26.5**		**2,057,150**	**18,540,970**	**3,800,384**	**861,700**	**2,841,700**	**378,500**	**2,918,850**	**25,561,554**	**52,190,847**	**12,053**	**4,525,000**	**5,300,000**	**18,631,998**	**6,639,996**	**165,000**	**16,928,853**	**8,213**	**347**	**1,036,000**	**465,400**	**931,600**	**441**	**1,643,200**	**266,900**	**(522,900)**	**(121)**	**No Payback**			
Total Constructed/Served as of March 2011		1,509	14.1																																		
	Total as percent	0	0.6																																		
	Watermaster Replacement Water Rate																												569								
	Industry (LACSD) RW Rate																								190												
	CBMWD RW Rate																								480												
	LACSD Whittier Narrows RW Rate																								106												
	MWD Tier 2 Untreated Rate																																		652		

Appendix B

RECYCLED WATER ACTION PLAN
DRAFT SCHEDULE
DRAFT (Original Date: April 6, 2011) (Revisions: XX XX, 2011)

ID	Task Name	Start	Finish
1	**RECYCLED WATER - DIRECT USE PROJECTS**	**Wed 1/19/11**	**Fri 9/28/12**
2	**1) Phase I - Rose Hills**	**Fri 4/1/11**	**Fri 12/30/11**
3	Preliminary Expansion Plan and Cost Estimates	Fri 4/1/11	Fri 12/30/11
4	Establish Recycled Water Rate with Rose Hills	Fri 4/1/11	Fri 12/30/11
5	Establish Recycled Water Rate with SGVWC	Fri 4/1/11	Fri 12/30/11
6	Verification of Recycled Water Users	Fri 7/1/11	Fri 12/30/11
7	**2) Phase IIA - Whittier Narrows**	**Fri 4/1/11**	**Fri 12/30/11**
8	Finalize Contract Revisions with SGVWC	Fri 4/1/11	Mon 10/31/11
9	Economic Feasibility of Bicentennial Park	Fri 4/1/11	Fri 7/29/11
10	Verification of Recycled Water Users	Fri 7/1/11	Fri 12/30/11
11	**3) Phase IIA - Rosemead Extension**	**Fri 4/1/11**	**Fri 12/30/11**
12	Finalize Contract Revisions with SGVWC	Fri 4/1/11	Mon 10/31/11
13	Finalize New Contract with GSWC	Fri 4/1/11	Mon 10/31/11
14	Complete Bid Solicitation Package	Mon 5/2/11	Wed 6/15/11
15	Retain a construction contractor	Thu 6/16/11	Thu 7/14/11
16	Perform construction management for retrofits	Fri 7/15/11	Mon 10/31/11
17	Verification of Recycled Water Users	Fri 7/1/11	Fri 12/30/11
18	**4) Phase IIB - Package 1A**	**Mon 5/2/11**	**Fri 12/30/11**
19	Complete Bid Solicitation Package	Mon 5/2/11	Wed 6/15/11
20	Retain a Construction Contractor	Thu 6/16/11	Thu 7/14/11
21	Decision on Construction Management	Fri 7/1/11	Fri 7/29/11
22	Perform Construction Management	Mon 8/1/11	Thu 12/29/11
23	Verification of Recycled Water Users	Fri 7/1/11	Fri 12/30/11
24	**5) Phase IIB - Package 1B**	**Fri 4/1/11**	**Fri 8/31/12**
25	Manage Construction Contract	Fri 4/1/11	Wed 8/31/11
26	Performance Confirmation (1-Year)	Thu 9/1/11	Fri 8/31/12
27	**6) Phase IIB - Package 2**	**Fri 4/1/11**	**Fri 12/30/11**
28	Complete Bid Solicitation Package	Mon 5/2/11	Wed 6/15/11
29	Retain a Construction Contractor	Thu 6/16/11	Thu 7/14/11
30	Decision on Construction Management	Fri 7/1/11	Fri 7/29/11
31	Perform Construction Management	Mon 8/1/11	Thu 12/29/11
32	Manage Construction Contract	Fri 4/1/11	Fri 7/29/11
33	Verification of Recycled Water Users	Fri 7/1/11	Fri 12/30/11
34	**7) Phase IIB - Package 3**	**Wed 4/6/11**	**Fri 9/28/12**
35	Negotiate Contract with VHWC	Wed 4/6/11	Fri 9/30/11
36	Award Contract for Pipeline Design	Mon 5/2/11	Wed 6/15/11
37	Manage Pipeline Design Contract	Thu 6/16/11	Tue 1/31/12
38	Complete Bid Solicitation Package	Wed 2/1/12	Fri 3/30/12
39	Retain a Construction Contractor	Mon 4/2/12	Mon 4/30/12
40	Decision on Construction Management	Mon 4/2/12	Mon 4/30/12
41	Perform Construction Management	Tue 5/1/12	Fri 9/28/12
42	Retain Design Engineer (Retrofits)	Mon 5/2/11	Thu 6/30/11

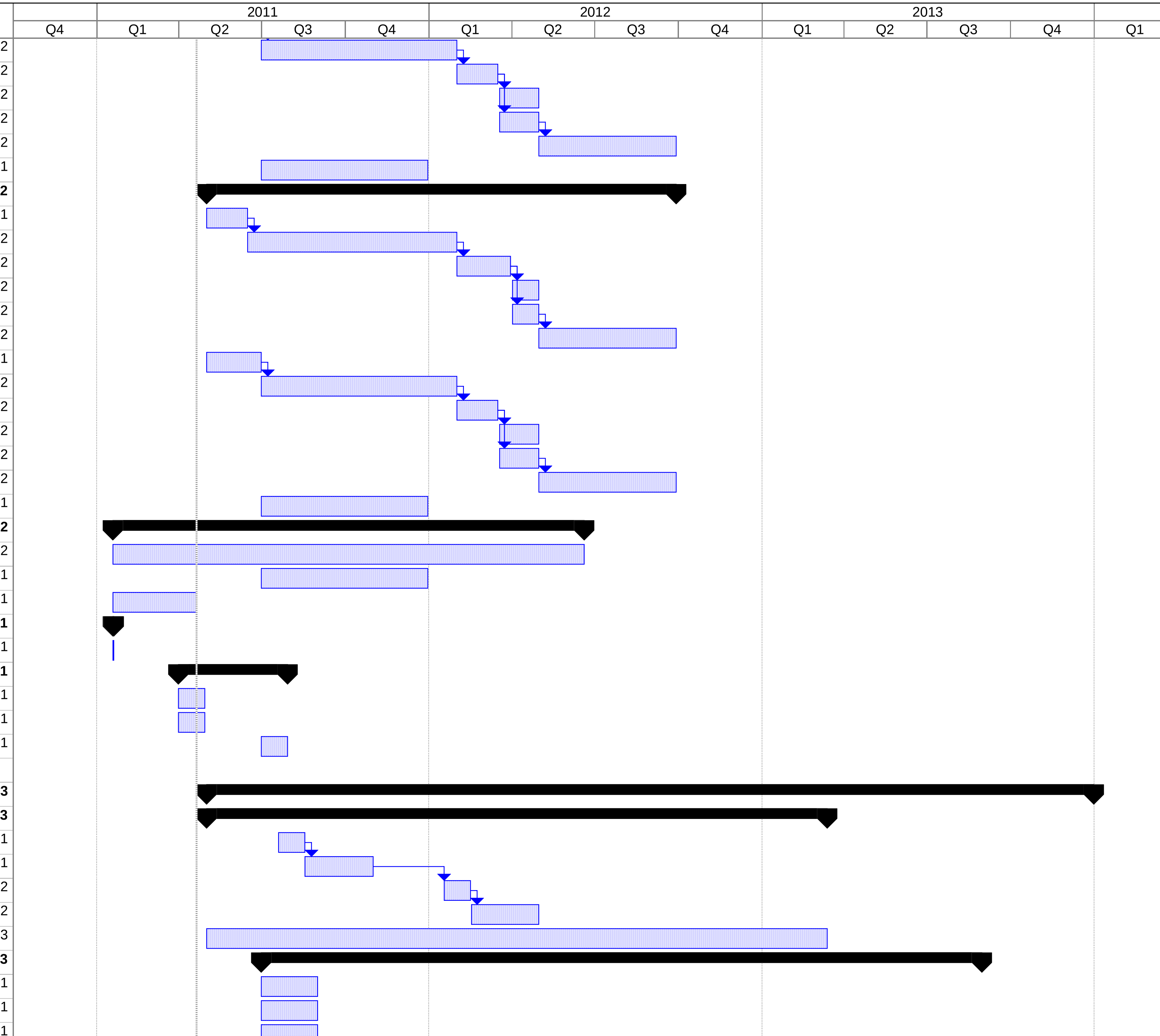


Project: Overall GRIP Schedule 2011-
Date: Wed 4/20/11

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary

RECYCLED WATER ACTION PLAN
DRAFT SCHEDULE
DRAFT (Original Date: April 6, 2011) (Revisions: XX XX, 2011)

ID	Task Name	Start	Finish
43	Manage Design Engineer Contract (Retrofits)	Fri 7/1/11	Tue 1/31/12
44	Complete Bid Solicitation Package (Retrofits)	Wed 2/1/12	Fri 3/16/12
45	Retain a Construction Contractor (Retrofits)	Mon 3/19/12	Mon 4/30/12
46	Decision on Construction Management (Retrofits)	Mon 3/19/12	Mon 4/30/12
47	Perform Construction Management (Retrofits)	Tue 5/1/12	Fri 9/28/12
48	Verification of Recycled Water Users	Fri 7/1/11	Fri 12/30/11
49	**8) Phase IIB - Package 4**	**Mon 5/2/11**	**Fri 9/28/12**
50	Award Contract for Pipeline Design	Mon 5/2/11	Wed 6/15/11
51	Manage Pipeline Design Contract	Thu 6/16/11	Tue 1/31/12
52	Complete Bid Solicitation Package	Wed 2/1/12	Fri 3/30/12
53	Retain a Construction Contractor	Mon 4/2/12	Mon 4/30/12
54	Decision on Construction Management	Mon 4/2/12	Mon 4/30/12
55	Perform Construction Management	Tue 5/1/12	Fri 9/28/12
56	Retain Design Engineer (Retrofits)	Mon 5/2/11	Thu 6/30/11
57	Manage Design Engineer Contract (Retrofits)	Fri 7/1/11	Tue 1/31/12
58	Complete Bid Solicitation Package (Retrofits)	Wed 2/1/12	Fri 3/16/12
59	Retain a Construction Contractor (Retrofits)	Mon 3/19/12	Mon 4/30/12
60	Decision on Construction Management (Retrofits)	Mon 3/19/12	Mon 4/30/12
61	Perform Construction Management (Retrofits)	Tue 5/1/12	Fri 9/28/12
62	Verification of Recycled Water Users	Fri 7/1/11	Fri 12/30/11
63	**9) Future Extensions of Upper District's Recycled Water Program**	**Wed 1/19/11**	**Tue 6/19/12**
64	Identify Potential Users and Demands	Wed 1/19/11	Tue 6/19/12
65	Perform Hydraulic Analysis	Fri 7/1/11	Fri 12/30/11
66	Prepare Engineering Tech Memo on Economic Evaluation	Wed 1/19/11	Wed 4/20/11
67	**10) Membrane Bioreactor Treatment Plant**	**Wed 1/19/11**	**Wed 1/19/11**
68	Prepare Engineering Tech Memo on Costs and MBR Sites	Wed 1/19/11	Wed 1/19/11
69	**11) Loans and Grants (Direct Use)**	**Fri 4/1/11**	**Fri 7/29/11**
70	Prepare Amendment to CEQA (Packages 3 and 4)	Fri 4/1/11	Fri 4/29/11
71	Provide Amendment to SWRCB / BOR (Packages 3 and 4)	Fri 4/1/11	Fri 4/29/11
72	Begin Preparing Grant Funding Plan	Fri 7/1/11	Fri 7/29/11
73			
74	**RECYCLED WATER - GROUNDWATER RECHARGE PROJECT**	**Mon 5/2/11**	**Tue 12/31/13**
75	**12) Determine Best Treatment Technology**	**Mon 5/2/11**	**Wed 3/13/13**
76	Retain a Technical Team	Wed 7/20/11	Wed 8/17/11
77	Coordinate Treatment Technology with Regulatory Agencies	Thu 8/18/11	Mon 10/31/11
78	Develop Preliminary Design Report	Wed 1/18/12	Wed 2/15/12
79	Prepare Tech Memo and Recommendations	Fri 2/17/12	Mon 4/30/12
80	Explore Demonstration / Pilot Studies	Mon 5/2/11	Wed 3/13/13
81	**13) CDPH / RWQCB Permitting**	**Fri 7/1/11**	**Fri 8/30/13**
82	Coordinate with CDPH and Initiate BWQMP	Fri 7/1/11	Wed 8/31/11
83	Verify Status of CA Toxics Rule with LACSD	Fri 7/1/11	Wed 8/31/11
84	Determine Need for 3-D Model	Fri 7/1/11	Wed 8/31/11

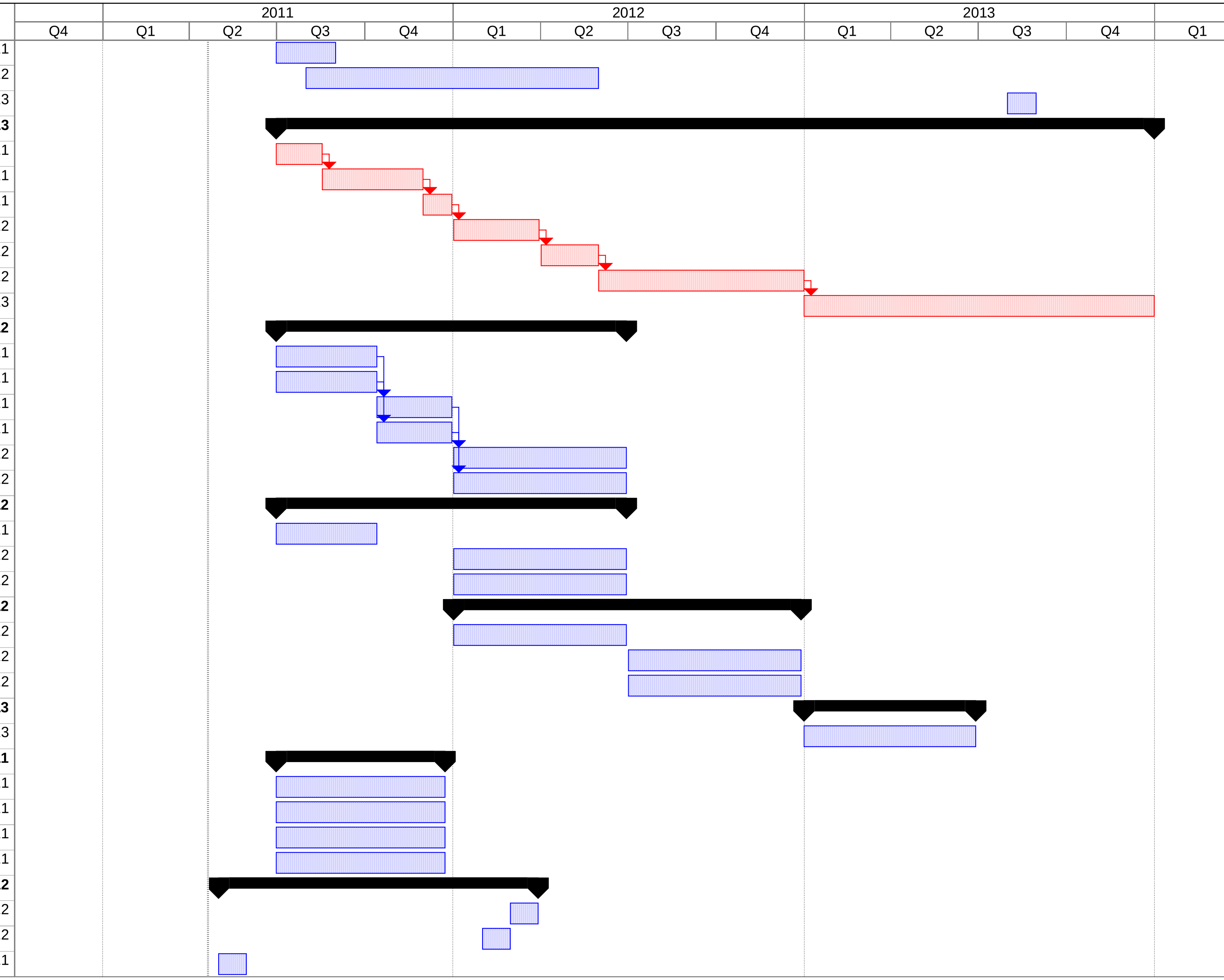


Project: Overall GRIP Schedule 2011-
Date: Wed 4/20/11

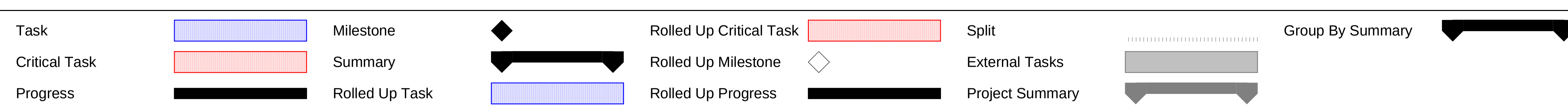
Task		Milestone	◆	Rolled Up Critical Task		Split		Group By Summary	
Critical Task		Summary		Rolled Up Milestone	◇	External Tasks			
Progress		Rolled Up Task		Rolled Up Progress		Project Summary			

RECYCLED WATER ACTION PLAN
DRAFT SCHEDULE
DRAFT (Original Date: April 6, 2011) (Revisions: XX XX, 2011)

ID	Task Name	Start	Finish
85	Determine Assimilative Capacity	Fri 7/1/11	Wed 8/31/11
86	Coordinate Selected Treatment Technology with CDPH and RWQCB	Mon 8/1/11	Thu 5/31/12
87	Begin Preparation of Engineering Report	Thu 8/1/13	Fri 8/30/13
88	**14) Background Water Quality Monitoring Plan**	**Fri 7/1/11**	**Tue 12/31/13**
89	Prepare Tech Memo on Description of Demonstration and GRIP Projects	Fri 7/1/11	Wed 8/17/11
90	Review Existing BWQMP Reports	Thu 8/18/11	Wed 11/30/11
91	Decision on BWQMP Reports	Thu 12/1/11	Fri 12/30/11
92	Design of Monitoring Wells	Mon 1/2/12	Fri 3/30/12
93	Retain Construction Contractor	Mon 4/2/12	Thu 5/31/12
94	Perform Construction Management and Inspection	Fri 6/1/12	Mon 12/31/12
95	Begin Data Collection	Tue 1/1/13	Tue 12/31/13
96	**15) Secure Pipeline Alignment and Treatment Facility Location**	**Fri 7/1/11**	**Fri 6/29/12**
97	Identify Plant Site Alternatives	Fri 7/1/11	Thu 10/13/11
98	Prepare Alignment Alternatives	Fri 7/1/11	Thu 10/13/11
99	Prepare Tech Memo on Pipeline Construction Costs and Economic Feasibility	Fri 10/14/11	Fri 12/30/11
100	Prepare Tech Memo on Plant Construction Costs and Economic Feasibility	Fri 10/14/11	Fri 12/30/11
101	Begin Negotiations for Right-of-Way	Mon 1/2/12	Fri 6/29/12
102	Begin Negotiations for Plant Site	Mon 1/2/12	Fri 6/29/12
103	**16) Coordination with LACSD**	**Fri 7/1/11**	**Fri 6/29/12**
104	Confirm Contract of 10,000 AFY of Recycled Water	Fri 7/1/11	Thu 10/13/11
105	Negotiate Site for Pipeline Connection and Pump Station	Mon 1/2/12	Fri 6/29/12
106	Continue Negotiations Regarding GRIP Agreements	Mon 1/2/12	Fri 6/29/12
107	**17) Coordination with LACDPW**	**Mon 1/2/12**	**Fri 12/28/12**
108	Coordinate Operations and Delivery of Diluent Water	Mon 1/2/12	Fri 6/29/12
109	Coordinate Spreading and Prepare Operations Plan	Mon 7/2/12	Fri 12/28/12
110	Confirm Agreements with LACDPW	Mon 7/2/12	Fri 12/28/12
111	**18) Report of Recommendations of Recharge Project**	**Tue 1/1/13**	**Fri 6/28/13**
112	Prepare Conceptual Design Report	Tue 1/1/13	Fri 6/28/13
113	**19) Coordination with Main San Gabriel Basin Watermaster**	**Fri 7/1/11**	**Fri 12/23/11**
114	Coordination of Salt Nutrient Management Plan	Fri 7/1/11	Fri 12/23/11
115	Coordination of "No Pump Zone"	Fri 7/1/11	Fri 12/23/11
116	Coordination of Monitoring Plan and Reports	Fri 7/1/11	Fri 12/23/11
117	Coordination of Producer Funding and Support	Fri 7/1/11	Fri 12/23/11
118	**20) New Loans and Grants (Groundwater Replenishment)**	**Mon 5/2/11**	**Thu 3/29/12**
119	Pilot and Demonstration Grant	Thu 3/1/12	Thu 3/29/12
120	Title 16 Feasibility Application	Wed 2/1/12	Wed 2/29/12
121	Submit Preliminary Application to MWD for LRP Funding	Mon 5/2/11	Mon 5/30/11



Project: Overall GRIP Schedule 2011-
Date: Wed 4/20/11



Integrated Resources Plan

January 2013

UPPER SAN GABRIEL VALLEY
MUNICIPAL WATER DISTRICT

REPORT PREPARED BY CDM Smith

Table of Contents

List of Tables

List of Figures

Acronyms

AF	acre-feet
AFY	acre-feet per year
AWT	advanced water treatment
CDPH	California Department of Public Health
cfs	cubic feet per second
COG	Council of Governments
gpcd	gallons per capita per day
DOF	California Department of Finance
DWR	California Department of Water Resources
EDD	California Employment Development Department
EPA	U.S. Environmental Protection Agency
FAT	full advanced treatment
GRIP	Groundwater Reliability Improvement Program
GWR	groundwater recharge
IPR	indirect potable reuse (for groundwater recharge)
IRP	Integrated Resources Plan
LACDPW	Los Angeles County Department of Public Works
LACFCD	Los Angeles County Flood Control District
LACSD	Los Angeles County Sanitation District
LTA	Long-Term Accounting (for Watermaster)
MF/MFR	multi-family residential
mgd	million gallons per day
MWD	Metropolitan Water District of Southern California
NPR	non-potable reuse
PERC	Potential Effective Recharge Capabilities Study
RO	reverse osmosis
RWC	recycled water contribution
SF/SFR	single-family residential
SGAG	Southern California Associations of Government
TMDL	total maximum daily load
WRP	water reclamation plant
WWTP	wastewater treatment plant

Section 1
Introduction

The Upper San Gabriel Valley Municipal Water District (Upper District) is a wholesale water agency formed by voters in the San Gabriel Valley in 1959, under California's Municipal Water District Act. In 1963, Upper District joined the Metropolitan Water District of Southern California (MWD) in order to provide supplemental imported water to the region's local groundwater. Early in its history, Upper District played a vital role in determining water rights within the Main San Gabriel Basin (Main Basin) by acting as plaintiff in a 1973 court case. This case resulted in the creation of the Main San Gabriel Basin Watermaster (Watermaster) which was ordered by the court to administer and enforce the basin judgment for managing groundwater in the San Gabriel Valley.

Upper District does not provide direct water deliveries to residential or commercial customers, rather it provides supplemental water for groundwater recharge and some direct sales of imported water. Upper District also provides wholesale deliveries of recycled water for non-potable uses. Included in Upper District's service area are 29 member agencies (producers) that deliver water to over 900,000 residents. These customer agencies include:

- Adams Ranch Mutual Water Company
- Amarillo Mutual Water Company
- City of Arcadia
- City of Azusa
- California American Water Company
- California Domestic Water Company (wholesale)
- Champion Mutual Water Company
- City of Covina
- Covina Irrigation Company(wholesale)
- Del Rio Mutual Water Company
- East Pasadena Water Company
- City of El Monte
- City of Glendora
- Hemlock Mutual Water Company
- Golden State Water Company
- Industry Public Works
- La Puente Valley County Water District
- City of Monrovia
- Rurban Homes Mutual Water Company
- San Gabriel County Water District
- San Gabriel Valley Water Company
- City of South Pasadena
- Sterling Mutual Water Company
- Suburban Water Systems
- Sunny Slope Water Company
- Valencia Heights Water Company
- Valley County Water District
- Valley View Mutual Water Company
- City of Whittier

The Upper District is governed by five elected Directors, elected to serve 4-year terms, representing five geographic divisions within the Upper District's service area. Additionally, as a member agency of MWD, Upper District appoints one representative to sit on the MWD Board of Directors. The Upper District also has representation on both the San Gabriel Basin Water Quality Authority and Watermaster Boards.

1.1 Service Area Background

Upper District's service area is located in the San Gabriel Valley in Los Angeles County, and entirely overlies the Main Basin. The San Gabriel Valley was primarily agriculture until the 1950's when Southern California experienced an economic and population boom. The valley's population tripled from 1950 to 1995, and commercial and industrial activities grew substantially. As communities in the valley became built-out in the 2000's, population growth slowed to just under one percent per year. Recent growth in the valley, however, has been suppressed due to the severe economic recession that started in 2008. The unemployment rate in the region in 2013 is at double-digits and is expected to remain so for the next couple of years.

Figure 1-1
Upper District's Service Area

Upper District's service area is approximately 144 square miles and includes all or portions of the Cities of Arcadia, Azusa, Baldwin Park, Bradbury, Covina, Duarte, El Monte, Glendora, Industry, Irwindale, La Puente, Monrovia, Rosemead, San Gabriel, South El Monte, South Pasadena, Temple City, and West Covina. The service area is now largely urbanized, consisting of mainly residential, commercial and light industry.

The climate of the San Gabriel Valley is considered to be Mediterranean, with hot/dry summers and wet/cooler winters. Average rainfall is about 18 inches, but can vary substantially from a low of 5 to a high of over 40 inches. Rainfall occurs almost entirely between the months of October through March. Summertime average temperatures are in the low 80's but can exceed 90's on very hot days. Winter temperatures average in the mid 60's.

In terms of soil type, most of the service area lies on soils that are conducive to groundwater recharge—meaning that rainfall can deep percolate into the basin. However, as the region urbanized, roads, buildings and parking lots reduced this natural groundwater recharge. To address this, large centralized stormwater capture projects have been constructed to facilitate groundwater recharge from both native stormwater and imported water.

1.2 Water Supply Challenges

Imported water from MWD has been the lifeblood for much of Southern California since the 1960's. At first, MWD brought water from the Colorado River to this region, then from Northern California's Sacramento-San Joaquin Delta (Delta) through the State Water Project (SWP). During the 1990's, conflicts between California's urban, agriculture, environment interests; as well as between the Colorado River Basin States that rely on the Colorado River; began to escalate to new levels. The resulting conflicts in the Colorado River forced California to live within its state's entitlement, and significantly reduced the historical Colorado River deliveries that MWD had relied on in the past. To make matters worse, the Colorado River Basin has just come off of an eight-year drought, the most severe measured in the 20th century. While reservoirs in that system are just starting to recover, recent droughts in the Western United States are a worrisome trend.

The Delta is of particular concern because of its ecosystem fragility and its location, which is the epicenter of where water from the SWP and the federal Central Valley Project is pumped down to central and southern California. Recent droughts and court rullings on endangered species have resulted in significantly reduced deliveries from the Delta to water users, including MWD and its member agencies. In addition, the earthen levies that protect the Delta from seawater are extremely vulnerable to seismic and extreme climatatic conditions.

By 2007, MWD's imported water and storage conditions were severely impacted by the droughts in the Colorado Basin and California, as well as court-ordered pumping restrictions in the Delta for protection of the Delta smelt (an endangered fish). As a result, MWD stopped providing groundwater replenishment deliveries (water sold at a discount off of firm imported water). In 2008, MWD's Board of Directors approved the Water Supply Allocation Plan (WSAP) to manage the limited imported water. The WSAP has 10 different shortage levels and associated actions. In 2008 and 2009, firm imported water was curtailed for the first time since 1991. It was also the first time MWD had to allocate firm imported water two years in a row. Upper District's imported allocation was approximately 31,000 acre-feet per year (AFY) for those years.

In addition to challenges with imported water reliability, groundwater levels in the Main Basin have been declining. Without a long-term, reliable source of replenishment water, more expensive reliance on MWD's firm imported water will be needed. Groundwater quality is also of concern and will require a strategy to keep groundwater production from the Main Basin reliable.

Finally, global climate change can severely impact imported and local water supplies, as well as increase water demands due to increasing temperatures and decreasing precipitation and snowpack. Studies conducted by Scripps Institute, Bureau of Reclamation, and California Department of Water Resources indicate that California and the western United States are most vulnerable

1.3 Purpose of Integrated Resources Plan

To address these water supply issues, Upper District has prepared an Integrated Resources Plan (IRP). IRPs are becoming more common, especially in California. IRPs examine both demand-side and supply-side options, view water more holistically and interconnected, address multiple goals, and incorporate risk and uncertainty.

Upper District's IRP explored various water supply options in terms of potential supply yield, costs, technology, water quality, and reliability. These options were bundled into several integrated alternatives (combinations of options much like a stock portfolio) that were evaluated against a set of goals and objectives for the District in order to develop a preferred strategy for meeting current and projected water demands in a reliable, cost-effective and environmentally sound manner.

Key to the success of this IRP is an adaptive management approach, whereby water supply projects can be phased in over time when needed and adapt to changing future conditions. The IRP is not a capital improvement plan, nor does it make definitive recommendations on specific projects. Rather it is a long-term road map that provides Upper District with a framework for making sound decisions. The IRP is not intended to be a static report, but more a "living" document that will be updated as future conditions unfold and become clearer.

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Section 2

Water Demands and Conservation

At the heart of any water supply plan is a credible water demand forecast that accounts for the major drivers in water use such as weather, housing, employment, water use efficiency, and other factors such as economy and drought.

To develop the water demand forecast for Upper District, two approaches were used. The first approach used a statistical regression analysis of historical monthly water production for Upper District's service area. This monthly production did not include groundwater export out of Upper District's service area. Rather, the production represented the total water consumed by residents and businesses within the service area. The water production included groundwater, surface diversions, imported water and recycled water. This model was used to better understand the variations in water demand from year to year due to weather, economy and drought-related mandatory restrictions.

The other approach was based on water use factors from a sample of the retail water agencies in Upper District's service area. For each category (single-family residential, multifamily residential, commercial and industrial) an aggregate average water use factor was derived for the service area total. These aggregate water use factors were then multiplied by projected demographics for the service area in order to get a total water demand forecast. The demand forecast was calibrated against actual historical water use and informed by the water production statistical model.

2.1 Historical Water Use

To estimate historical water use for Upper District, three sets of data were used. The first data set was actual monthly treated water deliveries from MWD for direct consumption. The second data set included estimates of monthly groundwater pumping, direct surface diversions and non-potable recycled water that were provided by Upper District's engineering consultant Stetson Engineers Inc. The third data set was a database of retail billing water use from a utility survey conducted by CDM Smith and Stetson Engineers for this project.

From fiscal year (FY) 1990 to 2000, total water use in Upper District's service area increased by 26 percent (normalized for weather), growing faster than population during the same period. From 2000 to 2012, water demand remained essentially flat due to increased water use efficiency, drought-related mandatory restrictions and a severe economic recession that started in 2008 (see Figure 2-1).

In terms of sector water use, almost 60 percent of the District's water demand is for residential use (both single-family and multifamily), while approximately 35 percent is for commercial and industrial water use (see Figure 2-2). The remaining water (~ 5 percent) is non-revenue, which includes fire protection, system flushing, and system losses and unaccounted for water.

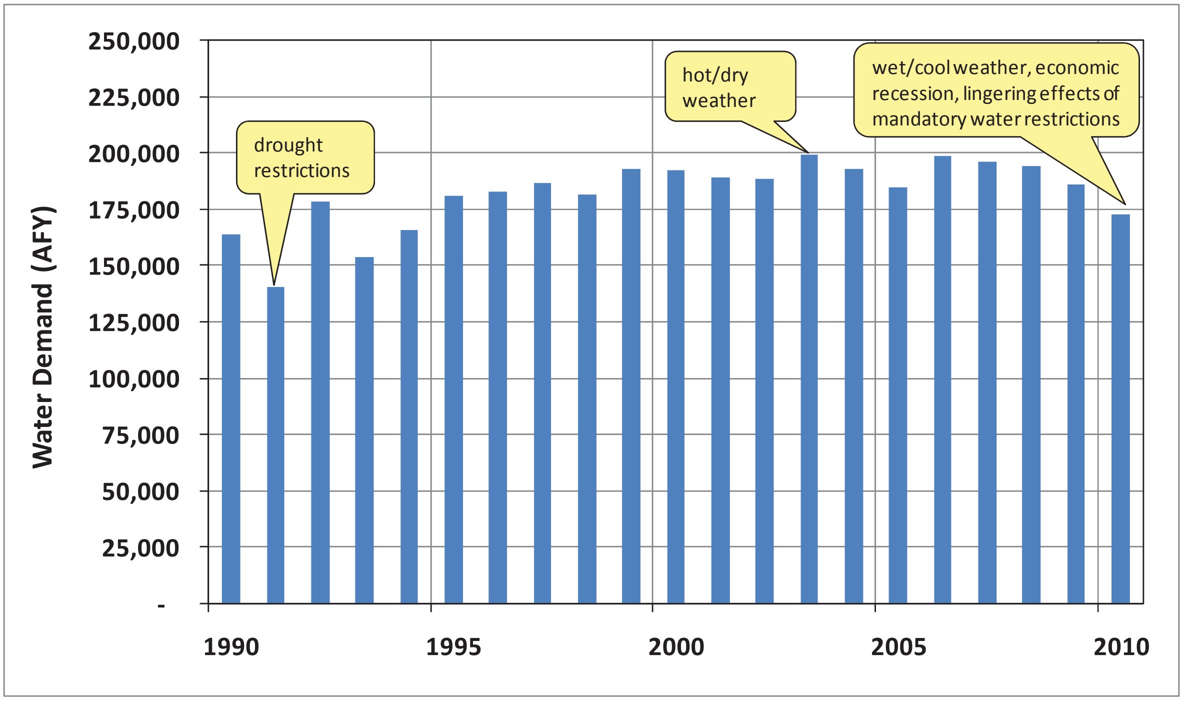


Figure 2-1
Historical Water Demand in Upper District's Service Area

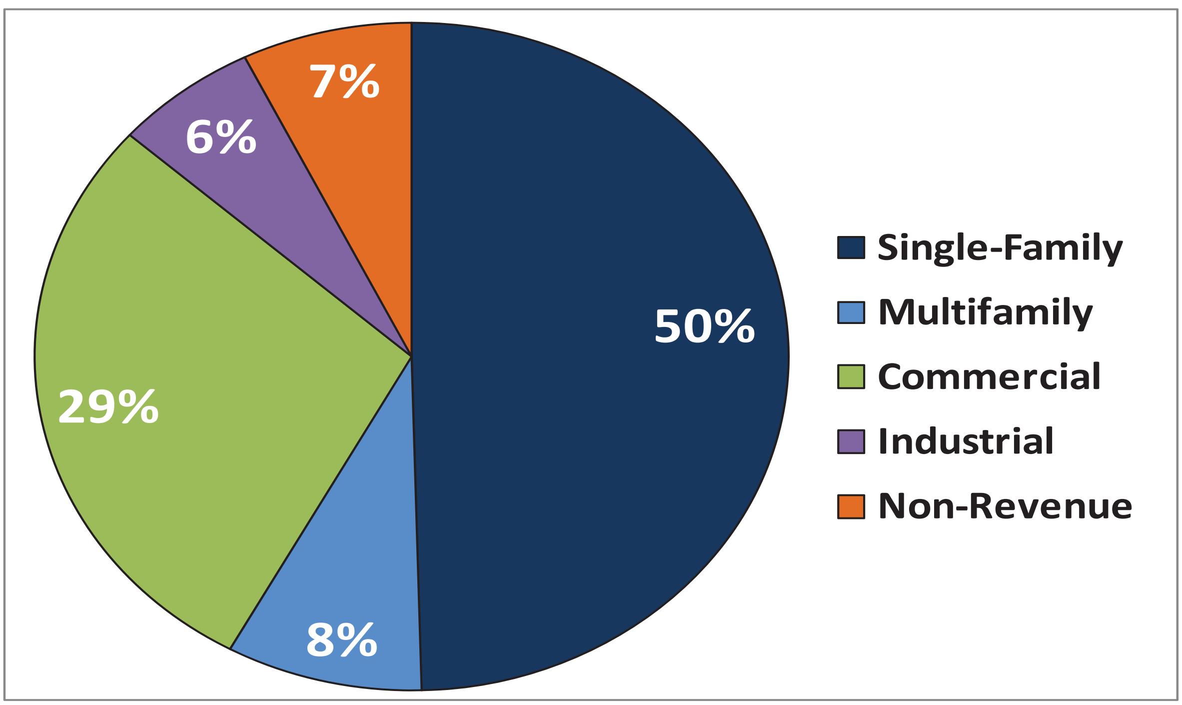


Figure 2-2
Breakdown of Average Water Use for Upper District's Service Area

In terms of seasonal use, average monthly water use was analyzed prior to the drought and economic recession. Typically, seasonal water use is anything above the minimum month (usually January or February). However, based on other empirical studies in Southern California outdoor irrigation even occurs during the minimum month. For Upper District, it was assumed that approximately 15 percent of the average water use in February (the minimum month for Upper District's service area) is for irrigation. Using this percentage, a non-seasonal (base indoor) water use was derived, representing approximately 60 percent of the annual total. To calculate seasonal water use (i.e., water used for irrigation, pool fillings, and cooling), the base indoor water use is subtracted from the total monthly water use, which is estimated to be 40 percent of the annual total. During summer months, however, seasonal water use can comprise over 53 percent of the total demand (see Figure 2-3).

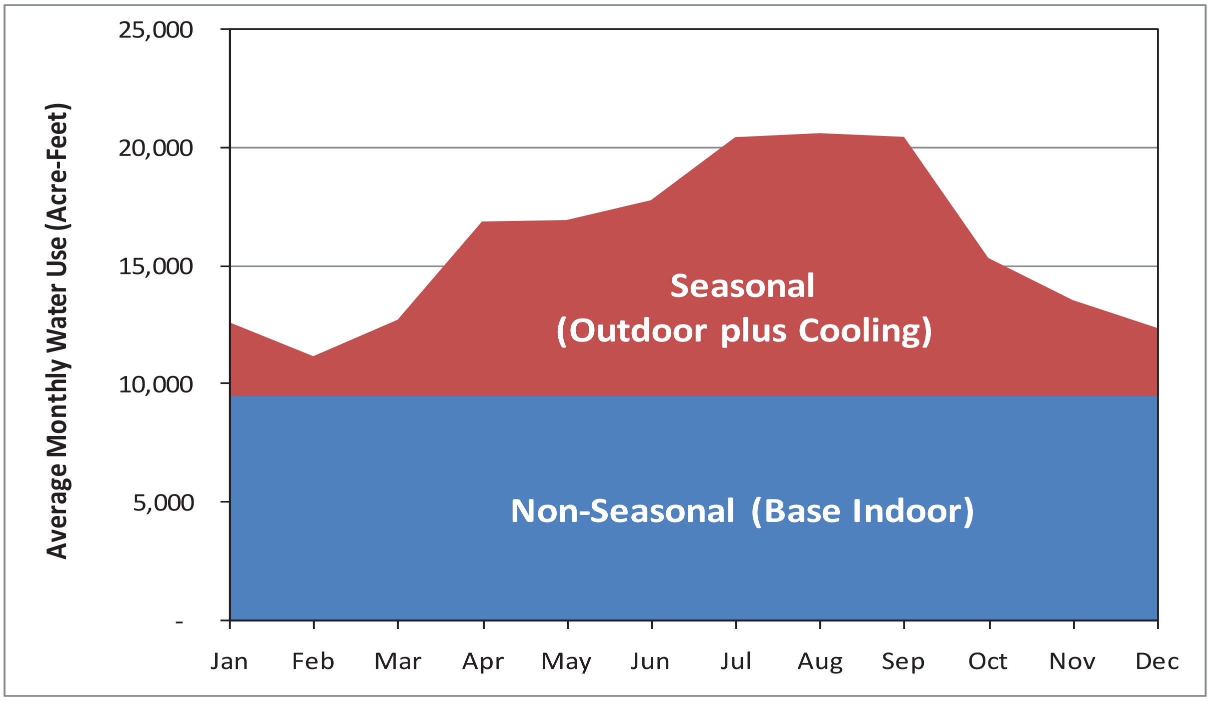


Figure 2-3
Average Seasonal Water Use in Upper District's Service Area

2.2 Water Production Model

To help understand past water use and better inform the water demand forecast, a multivariate statistical regression was conducted using 20 years of historical monthly water production and the following explanatory variables: population, maximum average temperature, precipitation, unemployment rate, and periods in which mandatory water use restrictions were in place. The model had an R^2 value of 0.91 and all of the variables were significant at the 0.001 level, indicating a good overall fit and low model error.

The model was used to explain the variability in past water use as well as to provide an assessment of why recent water demands in 2010 were 20 percent lower than in 2006-2007 (see Figure 2-4). The model verification indicated that the model was able to match historical use within 5 percent. Using the model, the difference in water demand between 2007 and 2010 could be explained. Understanding what caused the difference in variation in demands provides insights as to when and if water demands will bounce back. For example, in 1991 it took less than three years for the effects of mandatory rationing on water use behavior to dissipate. And many economists believe that double-digit unemployment will last for several more years for Los Angeles County.

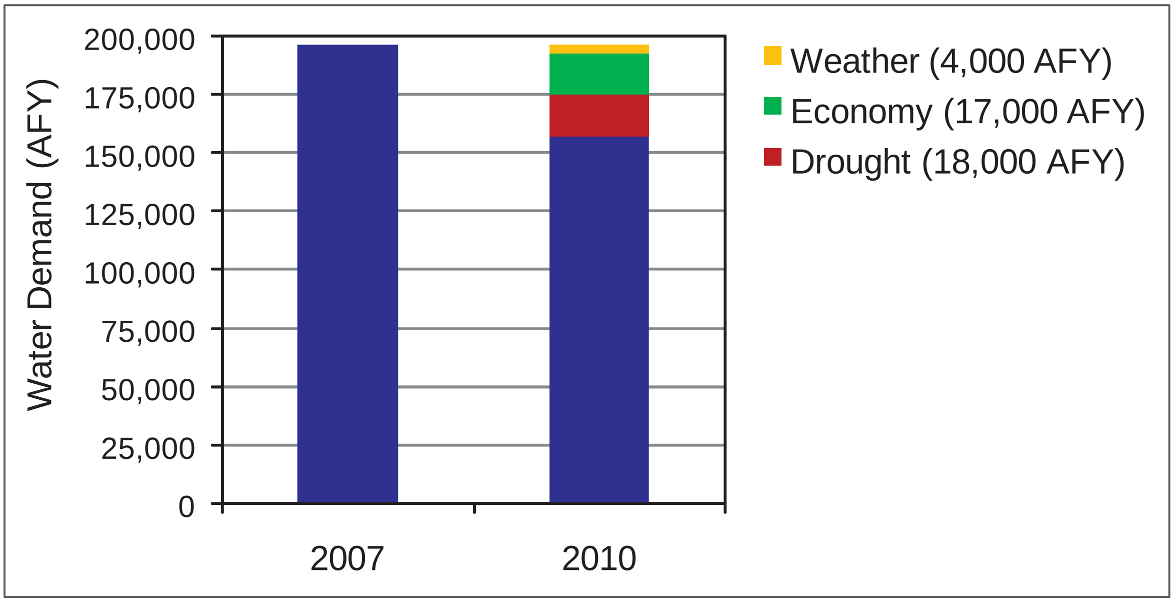


Figure 2-4
Explaining Difference in Water Use Between 2007-2010 Using Statistical Model

The figure above indicates that the economy and drought-related mandatory water use restrictions were responsible for 90 percent of the decrease in water demand between 2007 and 2010. These two factors could change for the better within 5 years based on past trends and latest economic forecasts, indicating demands could bounce back to 2007 levels in the absence of future conservation.

2.3 Water Demand Forecast

To forecast water demands, water use factors were generated from a sample of retail water agencies in Upper District's service area. Average billing water use data from this sample using years before the drought and economic recession were divided by associated demographic data for each utility. For example, to derive the single-family (SF) water use factor the following formula was used:

$$\text{SF Water Factor (gallons per home/day)} = \frac{\text{SF billed water use (gallons per day)}}{\text{Number of SF Households}}$$

Table 2-1 summarizes the water use factors from the utility sample, showing the range of values as well.

Table 2-1. Water Use Factors from Sample of Retail Water Agencies in Upper District

Sector	Unit Use Rate (gal/unit/day)	
	Average Value	Range from Sample
Single Family Residential (per home)	524	300 – 610
Multifamily Residential (per home)	260	200 – 500
Commercial/Institutional (per employee)	192	50 – 280
Industrial (per employee)	256	75 - 500

To forecast water demands, these water use factors were adjusted to reflect assumptions regarding household (HH) income and price of water. Using price and income elasticities (estimates of statistical change) from MWD's econometric demand model, these factors were adjusted net downward based on the following assumptions:

Elasticities (estimated by MWD)[1]

	HH Income	Marginal Price[2]
Single-family Residential	0.27	-0.13
Multifamily Residential	0.25	-0.11
Commercial/Institutional		-0.12
Industrial		-0.12

[1] An elasticity of -0.13 means that a 10% increase in price would lead to a 1.3% decrease in water demand, all other things constant.

[2] Net price elasticity, set not to double count future active water conservation.

Influencing Factors	2010	2015	2020	2025	2030	2035
% change in median household income from base	0%	0%	2%	14%	22%	33%
% change in marginal price from base	0%	22%	41%	56%	62%	62%

How Elasticities are used to modify water use factors

Unit Use Factor f = Unit Use Factor c X

f = future year

c = current year

β = elasticity for water use factor (price or income)

The adjusted water use factors for price and income are then multiplied by projected demographics for Upper District's service area in order to get a baseline water demand. Projected demographics were originally provided by the Southern California Association of Governments (SCAG) using the 2007 Regional Transportation Plan. These demographics were provided at a census track level and aggregated to Upper District's boundary by MWD. However, because these projections were developed prior to the recent, severe economic recession, CDM Smith adjusted downward the projections from 2015 to 2025 using recent trends from the California Department of Finance and the California Employment Development Department. Table 2-2 presents the demographic projections for Upper District, while Table 2-3 presents the baseline water demand forecast (without future conservation) by sector. The 2015 demand forecast was adjusted downward to account for the residual impacts of drought-related water restrictions.

Table 2-2. Demographics for Upper District's Service Area

Sector	Units	2015	2020	2025	2030	2035
Single-family Residential	Households	184,922	188,650	202,065	215,480	219,987
Multifamily Residential	Households	63,095	64,688	70,945	77,202	79,938
Commercial/Institutional	Employment	291,028	298,377	312,363	326,349	333,551
Industrial	Employment	44,393	43,300	42,935	42,570	41,648

* Based on SCAG 2007 RTP, modified by CDM Smith for years 2015-2025 to account for recent recession.

Table 2-3. Baseline Water Demands for Upper District (AFY)

Sector	2015*	2020	2025	2030	2035
Single-family Residential	99,448	103,629	108,591	114,687	118,787
Multifamily Residential	16,902	17,818	19,237	20,851	21,990
Commercial/Institutional	57,460	60,138	59,699	58,862	56,776
Industrial	11,687	11,636	10,941	10,238	9,452
Non-revenue water	14,608	15,216	15,629	16,115	16,301
Total Demand	200,105	208,437	214,097	220,753	223,306

* Adjusted for recent drought impacts: unadjusted demands were lowered by 9% based on water production model described in Section 2.2.

2.4 Water Conservation

In the context of this IRP, water conservation is defined as being either passive or active. Passive conservation is the gain in water use efficiency that occurs because of plumbing codes and ordinances. In California, the current plumbing code requires that all new constructed homes and businesses have ultra-low flush toilets and low-flow showerheads/faucets. Also, any home or business that is remodeled has to replace old fixtures with these conserving fixtures. Los Angeles County and the state also have a model landscape ordinance requiring warm climate turf and irrigation efficiency for all new development. To account for passive conservation, CDM Smith estimated the water use efficiency of a new home/business compared to a current one. Then, using the ratio of new housing/businesses to pre-plumbing code total, plus making assumptions regarding remodeling rates, an estimate of passive conservation was calculated. In 2015, this passive conservation was estimated to be approximately 5,500 AFY, while in 2035 the passive conservation is projected to be almost 18,000 AFY.

California's SB 7-7, enacted in 2009, requires all retail water utilities to reduce their per capita water demands by 20 percent by 2020, with an interim target of 15 percent reduction by 2015. Consequences of not meeting this goal are: ineligibility for state water grants and loans (compliance as of January 1, 2016), and violation of law for administrative or judicial proceedings (after January 1, 2021). To establish a baseline per capita from which to measure compliance, several approved methods were allowed by the state. Using one of these methods, Upper District's baseline per capita water use would be 198.7 gallons per capita per day (gpcd). The 2020 target would therefore be 159.0 gpcd.

Figure 2-5 presents the water demand forecasting for the baseline, passive and 20x2020 conservation target projections. It should be noted, however, that recycled water can count towards meeting the 20x2020 conservation target. So achieving the lower demand forecast is not necessary if future recycled water is developed. Table 2-4 presents the water demand forecast by sector under passive conservation.

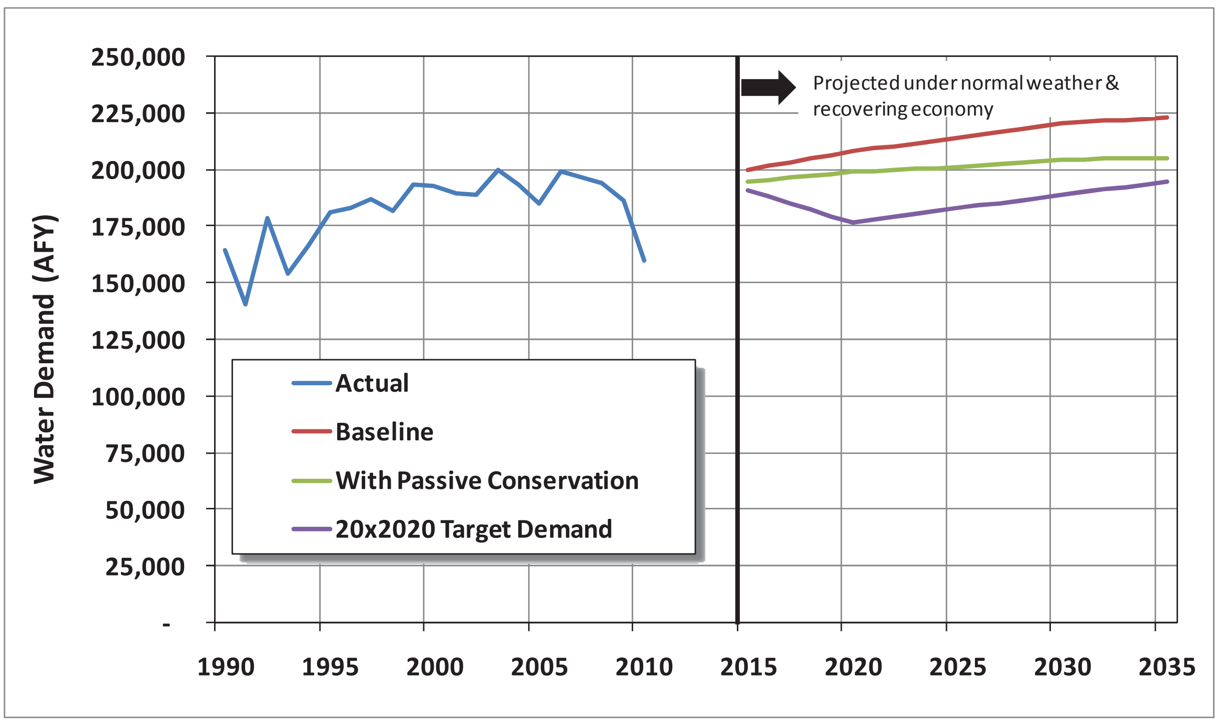


Figure 2-5
Water Demand Forecast for Upper District's Service Area

Table 2-4. Water Demands for Upper District with Passive Water Conservation (AFY)

Sector	2015*	2020	2025	2030	2035
Single-family Residential	96,413	98,648	101,712	106,015	108,658
Multifamily Residential	16,428	16,975	18,028	19,269	20,192
Commercial/Institutional	55,848	57,293	55,947	54,395	52,135
Industrial	11,687	11,636	10,941	10,238	9,452
Non-revenue water	14,204	14,533	14,697	14,956	14,997
Total Demand	194,580	199,085	201,324	204,872	205,433

* Adjusted for recent drought impacts: unadjusted demands were lowered by 9% based on water production model described in Section 2.2.

2.4.1 Future Active Water Conservation

Unlike passive conservation which relies on codes and ordinances to drive water use efficiency, active conservation requires direct utility involvement to drive conservation. This direct involvement usually involves public education and financial incentives (such as rebates for smart irrigation devices). Upper District has had a conservation program for several years and has passed on MWD's financial incentives to its retail member agencies in order to help drive active water conservation. However, a number of factors such as the recent state law requiring 20 percent reduction in per capita water use by 2020 and the possibility of MWD reducing its financial incentives, Upper District developed a Water Use Efficiency Master Plan (WUEMP). A&N Technical Consultants (A&N) developed this master plan in order to assess the benefits and costs of various types of water conservation activities. The IRP team worked closely with A&N to coordinate efforts on both the WUEMP and IRP.

Although the purpose of the IRP is not to make specific recommendations on the types of water conservation Upper District should pursue, it does need to identify the possible broad range of conservation strategies and associated costs.

Drawing from evaluations from the WUEMP, the IRP summarized three broad levels of future active water conservation and their associated unit cost ($/AF), as shown in Table 2-5.

Table 2-5. Active Water Conservation Strategies for IRP*

Strategy Level	General Description	Unit Cost ($/AF)
Low: ~ 2,500 AFY	A continuation of current Upper District conservation activities.	$350
Med: ~ 5,000 AFY	A moderate increase in Upper District conservation activities.	$420
High: ~ 10,000 AFY	A significant increase in Upper District conservation activities, in both types of programs and penetration.	$450

* Based on evaluations from the WUEMP (A&N, 2012). See that report for a more detailed description of the types and costs of conservation activities.

Section 3

Existing Water Supply and Gap Analysis

The major source of water supply in Upper District's service area is pumped from the Main San Gabriel Groundwater Basin (Main Basin) by Upper District's customer agencies (or Producers). In addition to the Producers' (within Upper District) portion of the Main Basin Operating Safe Yield, several agencies have surface runoff diversion rights from the San Gabriel River or other tributaries within the watershed upstream of Whittier Narrows. These local sources of water are prioritized in meeting existing water demands. Water demands in excess of local supplies are met by supplemental sources, including recycled water for direct non-potable use, and imported water for direct potable use and for groundwater replenishment of the Main Basin. Existing water supplies described in this chapter include:

- Local Supplies: Two local supplies are used by Producers within Upper District, groundwater and surface runoff. Upper District customer agencies produce a portion of the Operating Safe Yield of the Main Basin, by well pumping. The Operating Safe Yield is the quantity of groundwater that can be produced without the need for delivery of untreated imported water to replenish the basin. In addition, several retail agencies have surface diversion water rights on the San Gabriel River or tributaries upstream of Whittier Narrows and have facilites to divert and treat surface runoff for direct delivery.

- Imported Water: Imported water sources are used for either spreading of untreated imported water for replacement of groundwater basin production in excess of Operating Safe Yield or for direct delivery of treated imported water to retail agencies supplied through connections to MWD.

- Recycled Water: Recycled water distributed to several Upper District customer agencies, through local distribution networks for direct non-potable use from two water reclamation plants; Whittier Narrows and San Jose Creek.

3.1 Main San Gabriel Basin Groundwater

The Main Basin is adjudicated by the Main Basin Judgment with an annual Operating Safe Yield established by the Watermaster. Watermaster annually establishes an Operating Safe Yield for the Main Basin which is then allocated to each groundwater producer based on their rights in the Basin. No restrictions on extraction quantities are required by the Judgment, but rather the Judgment is focused on establishing a methodology for annually replacing water extracted beyond the Operating Safe Yield. Pumpers extracting water in excess of their annual allocation must pay an assessment to cover the cost of obtaining Replacement Water. Replacement Water is purchased from one of three Responsible Agencies, Upper District, Three Valleys Municipal Water District, or San Gabriel Valley Municipal Water District.

The portion of the Operating Safe Yield that is allocated to pumpers that fall within the service area of each of the three Responsible Agencies is summarized in Table 3-1. Establishment of the annual Operating Safe Yield is influenced by local hydrogeologic conditions, including rainfall, storage in local reservoirs, production, runoff, and local water replenishment.

Table 3-1. Distribution of Main Basin Allocation of Operating Safe Yield to Three Responsible Parties

Responsible Party	Portion of Operating Safe Yield	Allocation based on 2010-11 Operating Safe Yield of 170,000 (AFY)
Upper San Gabriel Valley Municipal Water District	80%	136,630
San Gabriel Valley Municipal Water District	11%	17,890
Three Valleys Municipal Water District	9%	15,480
Total	**100%**	**170,000**

The 39 year average Operating Safe Yield is 198,000 AFY and the 10 year average is 195,000 AFY (Figure 3-1). This average Operating Safe Yield exceeds the 1967estimate of natural safe yield in the Judgment of 152,700 AFY, most likely because of the increased centralized spreading of natural runoff. However, it should be noted that potential climate change could reduce local mountain snowpack and runoff into the San Gabriel Valley.

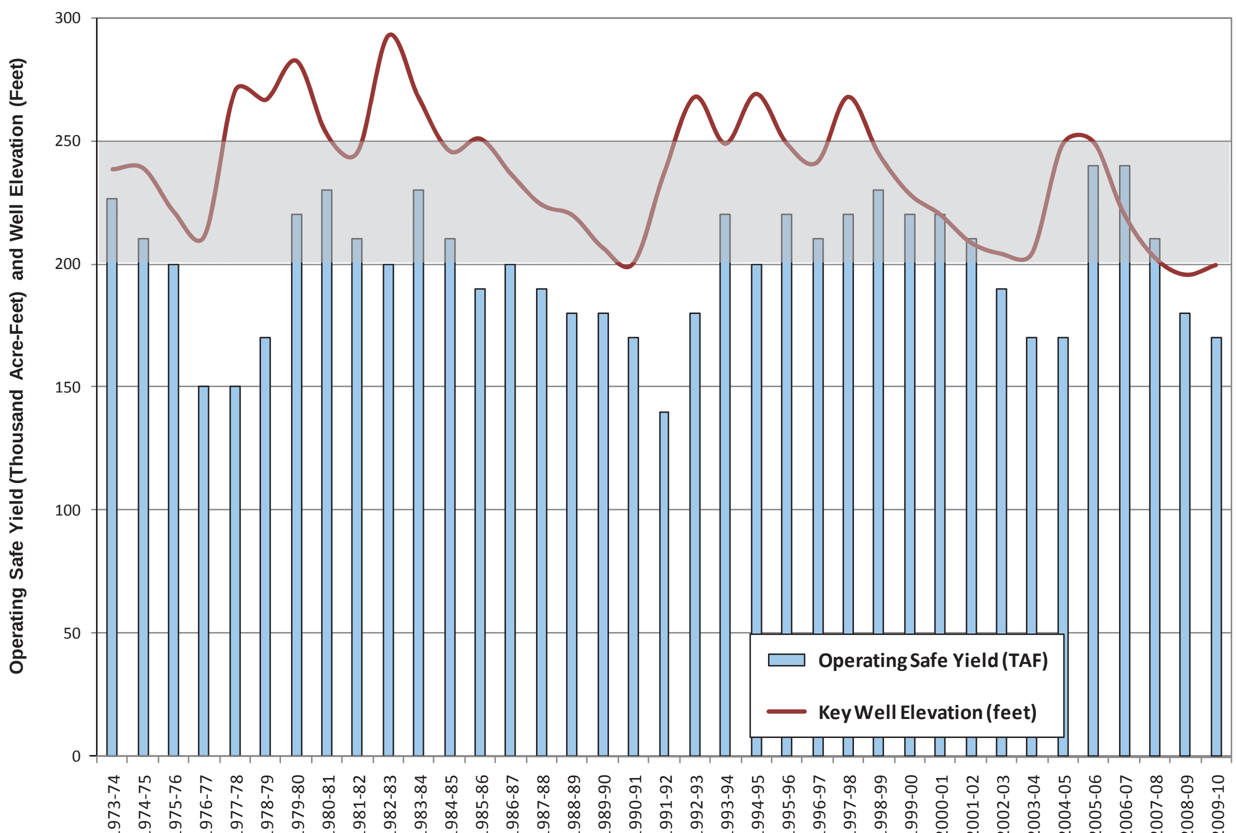


Figure 3-1
Historical Operating Yield and Elevation for the Key Well in Main Basin
(Grey Shading Shows Target Range for Key Well Elevation)

The Main Basin Judgment specifies that Watermaster shall spread Replacement Water, insofar as practicable, to maintain the water level at the Key Well above 200 foot elevation. Figure 3-1 shows the historical fluctuation of the Key Well elevation and illustrates that over the past 39 years, operation has generally achieved a water level elevation between 200-250 feet. In the recent wet season of 2004-05, spreading of local surface runoff increased water level at the Key Well from 200 to 250. The Main Basin had about 7,600,000 AF of water in storage when the Key Well elevation was at about 189 feet above mean sea level, The Key Well elevation has been managed to maintain water levels during extended droughts by allowing for long-term storage of spreading in excess of annual demands. Recharge of surface runoff during wet hydrologic years in excess of the Operating Safe Yield, increases storage to sustain Operating Safe Yield at usable levels during dry hydrologic years.

Surface runoff diversions from the San Gabriel River or tributaries of the watershed to Whittier Narrows are prescribed in the Main Basin Judgment. Retail agencies with rights to divert surface runoff for direct use include Cal American, Covina Irrigation, Monrovia Nursery, and Azusa Valley. The surface diversions since 2001 have averaged about 12,000 AFY. During dry years, the average is closer to 6,700 AFY.

3.2 Imported Water

Upper District provides imported water for groundwater replenishment to its retail agencies through purchases of water from MWD, the largest water purveyor in the State of California. Imported water supplied by MWD is conveyed from Northern California via the State Water Project (SWP) and from the Colorado River via the Colorado River Aqueduct (CRA). MWD provides Upper District with raw imported water for groundwater replenishment and treated imported water for direct delivery to retail agencies.

As stated in Section 1, there are several issues and challenges regarding imported water from MWD. These are summarized below:

- **Sacramento-San Joaquin Delta:** The Delta represents a fragile ecosystem that is at the confluence of the Sacramento and San Joaquin Rivers. It is also the point in which waters from these river systems and surface reservoirs to the north are pumped to central and southern California to meet agricultural and municipal water demands via the federal Central Valley Project and SWP. The Delta's myriad of waterways and canals weave between vast islands of land that are protected from seawater tides and storms by large earthen levees that are susceptible to failure. A break in these levees would inundate the Delta with seawater. The Delta is also home to several threatened and endangered fish species. In 2007, pumping in the Delta was restricted by court order to protect one of these fish species, the Delta Smelt. The Federal government, State of California and major water agencies relying on the Delta have begun an ambitious plan to restore the Delta and provide for a reliable water supply. This plan calls for billions of dollars in new conveyance facilities to reduce the impacts of water diversions on the natural environment. However, this plan will require voter approval for bonds as well as a financial allocation plan to share the costs of both the ecosystem restoration and new conveyance water facilities.

- **Colorado River:** While a seven state basin agreement (Quantification Settlement Agremeent) is in place, which requires California to live within its 4.4 million acre-foot entitlement for the Colorado River, prolonged droughts and over-allocation of the river are of significant concern to all Colorado River water users, including MWD.

- **Imported Water Cost:** From 2007 to 2012, MWD's imported water costs have increased over 12 percent annually and MWD projects it's 2014 full service water rate to be 7 percent greater than its 2012 rate. Costs associated with solving the problems in the Delta will undoubtedly continue to increase future costs for MWD. The other cost issue that pertains directly to Upper District is the fact that for many of the past 7 years, MWD has not had a replenishment water rate (representing a discount off of its firm water rate). This has caused costs for groundwater replenishment of the Main Basin to increase by about 188 percent between 2007 and 2012. It is still uncertain whether a long-term replenishment rate will be re-established by MWD.

- **Climate Change:** Studies by Scripts Institute and the California Department of Water Resources (DWR) indicate that climate change can significantly impact snow melt in the Sierra Nevada mountain range, a main source of Delta water supply. Depending on the climate change scenario, imported water from the Delta may be 15 to 30 percent lower by 2050. In addition, studies by the Bureau of Reclamation indicate similar impacts for the Colorado Basin.

- **Overall Reliability:** In 2008 and 2009 MWD allocated its imported water, the first time it had to do so two years in a row. As a result, MWD is aggressively developing storage, water transfers and helping to finance local resource development in order to improve supply reliability. Through its own regional IRP, MWD has identified a long-term strategy involving core resource development and other options that can be phased in through an adaptive management approach. One key component of MWD's IRP is the assumption of significantly increased local supplies from recycled water, groundwater clean-up and potential seawater desalination.

Figure 3-2 shows the projected supply reliability of MWD's supply, assuming a Delta fix is not in place and with historical hydrology (i.e., no climate change).

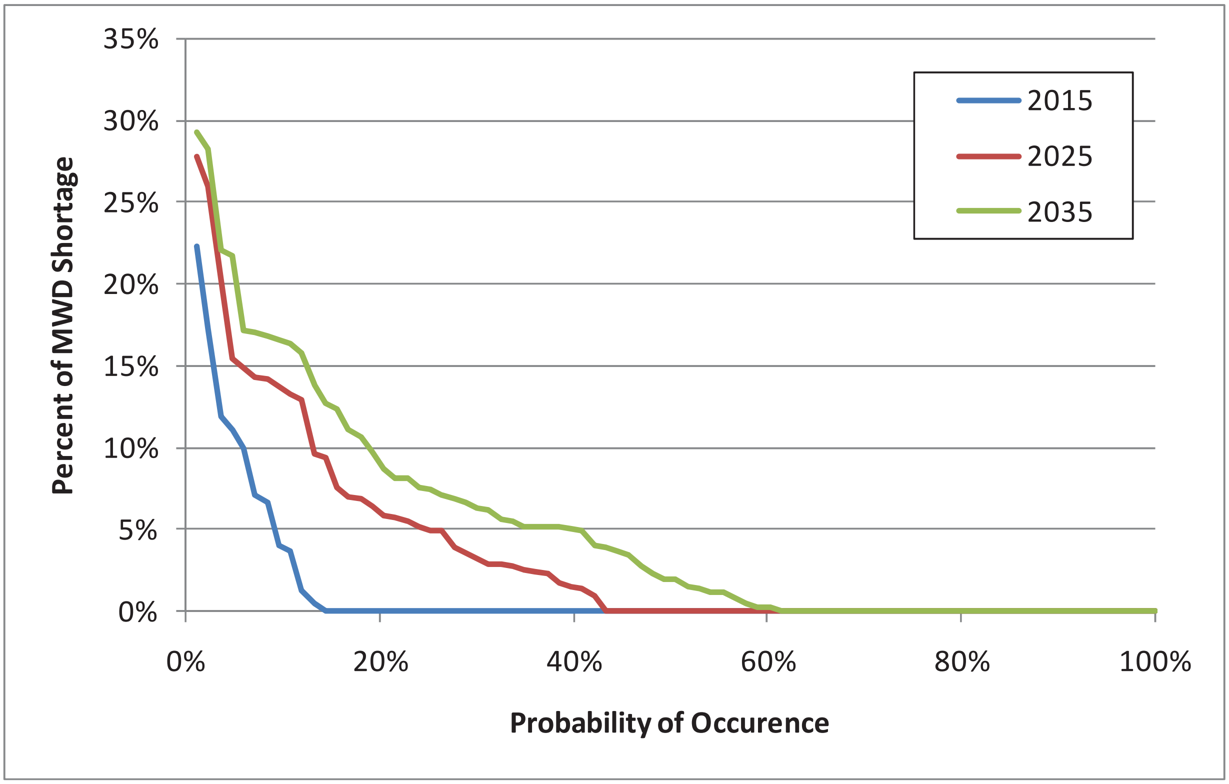


Figure 3-2
MWD Imported Water in Firm Supply (Assumes No Delta Fix and No Climate Change)
Source: Derived from data provided by MWD from 2010 IRP

What Figure 3-2 shows is that by 2035 there is a 60 percent chance that some shortage will occur in future years without a Delta fix. It also shows that by 2035 there is a 20 percent chance that a supply shortage of at least 10 percent will occur. In 2008 and 2009, a regional shortage of 10 percent triggered MWD's allocation of imported water to its member agencies. Put another way, if a Delta fix is not achieved the allocation that Upper District received in 2008 would occur 1 in 5 years (or 20 percent of the time). Climate change, while not quantified in this IRP, will only exacerbate these water shortages. For the purposes of this IRP, it was assumed that MWD will be able to essentially meet all demands for imported water 80 percent of the time, and 20 percent of the time would allocate its imported water similar to what it did in 2008.

Untreated imported water is used is used for groundwater replacement when extractions are in excess of Upper District's retail agencies' share of the Main Basin Operating Safe Yield, and for additions to long-term cyclic storage accounts. Treated imported water is provided to retail agencies as a direct delivery.

Figure 3-3 shows the historical imported water purchases made by Upper District from MWD. In general, there is substantial variability in the purchase of imported water for replacement / storage in the Main Basin, which is largely a function of hydrologic conditions.

In dry hydrologic years, the demand for imported water groundwater replacement is greatest. In wet years, local runoff is prioritized for spreading thus decreasing capacity to recharge imported water.

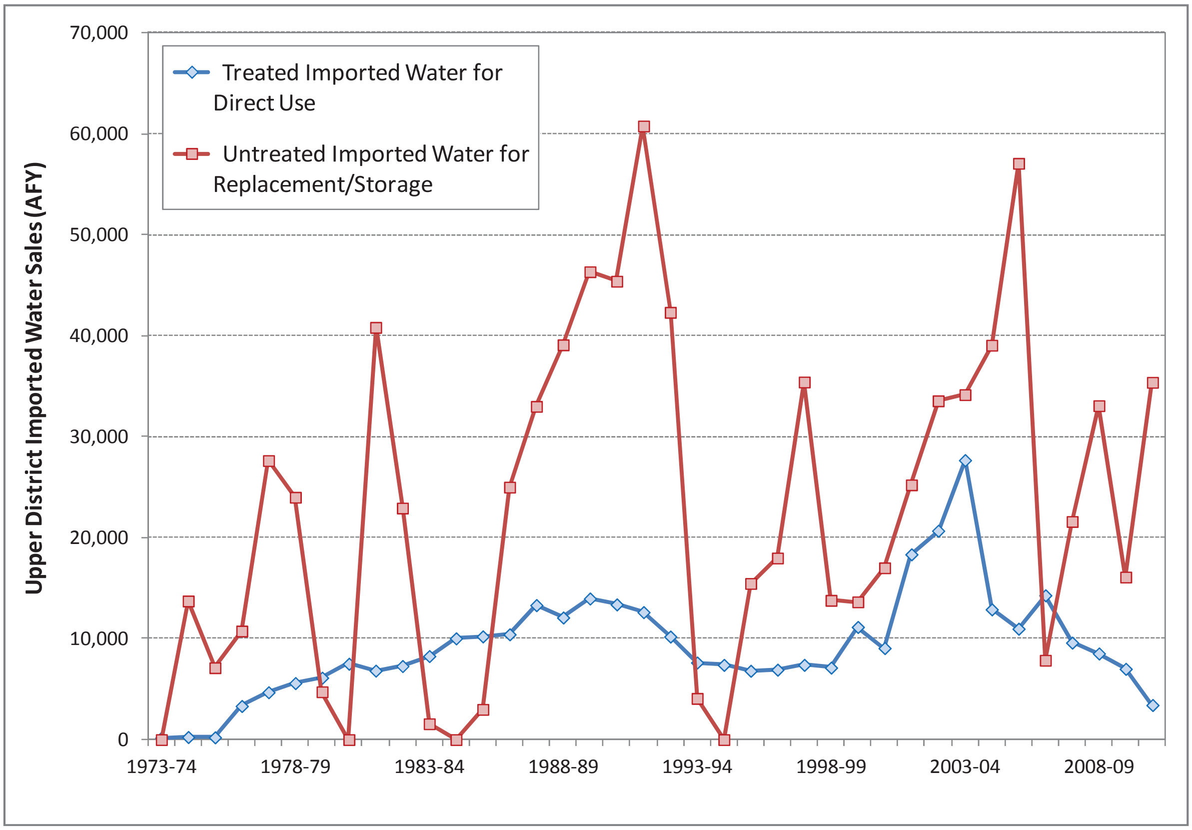


Figure 3-3
Upper District's Historical Treated and Untreated Imported Water Purchases

3.3 Recycled Water

Recycled water is available from two water reclamation plants in the Basin; Whittier Narrows and San Jose Creek Water Reclamation Plants (WRPs), with recent effluent quantities (average of 2010 and 2011 production) of approximately 8,800 AFY and 75,000 AFY, respectively. Both of these plants are owned and operated by the Los Angeles County Sanitation District's. A small portion of this tertiary treated effluent is used to meet non-potable demands in Upper District's service area (see Figure 3-4). In recent years Upper District has begun a Direct Use Recycled Water Program to provide recycled water via contract with its retail agencies to serve irrigation demand at facilities like schools and parks.

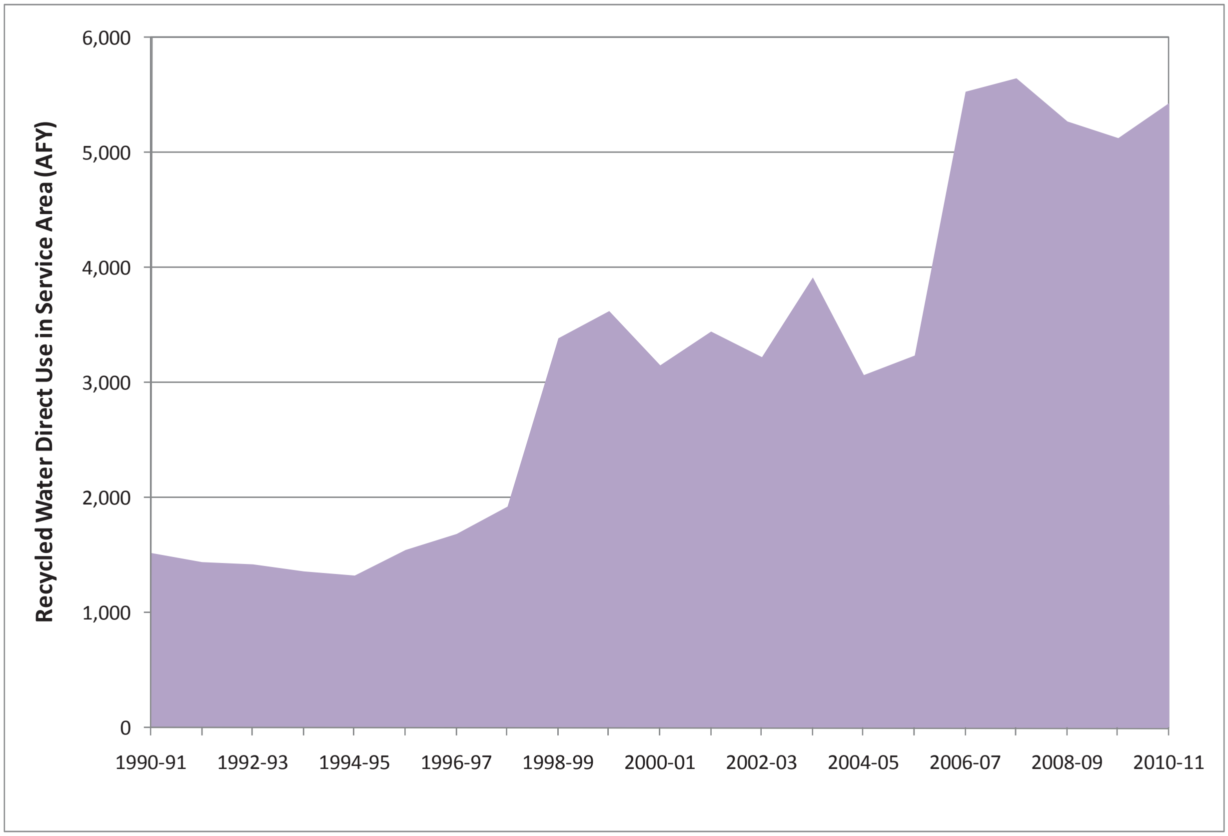


Figure 3-4
Non-Potable Reuse in Upper District's Service Area

3.4 Summary of Existing Water Supply

Historical water supply sources used to meet demands within Upper District's service area are shown in Figure 3-5. The predominant source of water is the natural safe yield from the Main Basin as well as local surface runoff for diversion or spreading to recharge the Main Basin.

In an average hydrologic year, supplemental supplies make up approximately 25 percent of the current supply used to meet demands in the Upper District service area. Supplemental supplies include recycled water for direct non-potable use and imported water for direct use or for replacing Main Basin pumping in excess of the Operating Safe Yield.

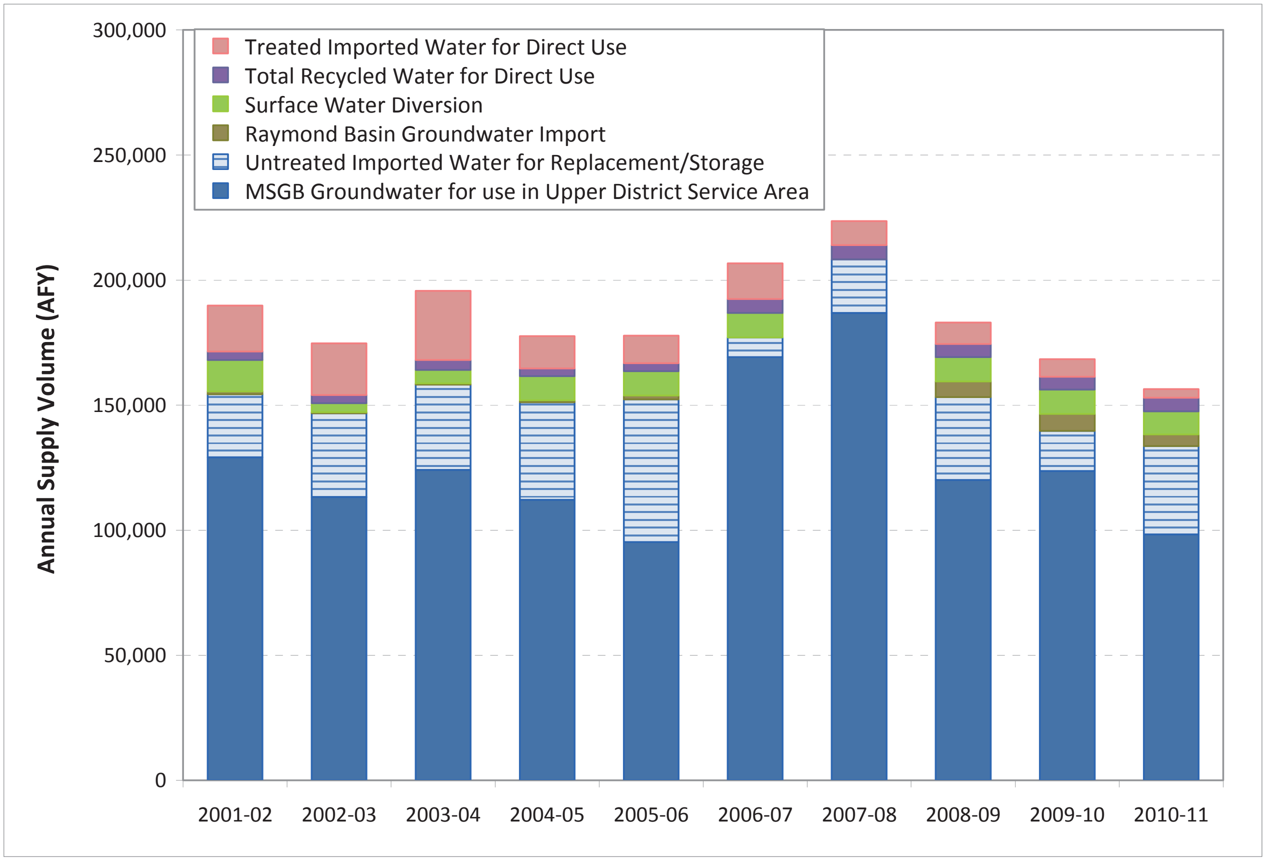


Figure 3-5
Historical Water Supply Sources Used to Meet Water Demands within Upper District's Service Area

3.4.1 Water Quality Issues

There are several groundwater contamination plumes throughout the Main Basin that require treatment to meet maximum contaminant level (MCL) standards for drinking water. Contaminants of concern in the Main Basin include:

- Volatile organic compounds (VOCs) which come from industrial solvents
- 1,4-dioxane, a stabilizer for chlorinated solvents
- Nitrate from use of fertilizer when the lands overlying the Basin was used for agriculture, as well as from livestock (dairies)
- Perchlorate, a solid rock fuel ingredient
- NDMA, a liquid rocket fuel ingredient
- MTBE, a gasoline additive

These contaminants are found in isolated plumes within six operable units throughout the Main Basin (Table 3-2). The ability for Upper District's retail agencies to pump groundwater from the Main Basin could be impacted without treatment. Water quality issues could also limit those strategies that rely on groundwater for conveyance, such as indirect potable reuse, stormwater capture or imported water replenishment. Substantial efforts are underway, led by the Water Quality Authority and Watermaster to maintain, upgrade and operate treatment facilities to remove these contaminants. These efforts have allowed for continued groundwater production and led to less dependence on increasingly expensive imported supplies.

Table 3-2 Summary of Key Contaminants of Concern in Operable Units Overlying the Main Basin

Operable Unit[1]	TCE	PCE	CTC	1,1-DCE	Cis-1,2-DCE	Perchlorate	NDMA	1,2,3-TCP	1,4-Dioxane	Chromium-6	Nitrate
Baldwin Park	X	X	X			X	X	X	X		X
South El Monte	X	X				X			X		
El Monte	X	X				X			X	X	
Whittier Narrows	X	X				X	X		X		
Puente Valley	X	X		X					X		
Area 3	X	X	X		X	X		X			X

[1] Map of approximate operable units boundaries can be found in Main San Gabriel Basin Watermaster Five-Year Water Quality and Supply Plan: http://www.watermaster.org/techinfo.html

3.5 Gap Analysis Between Demand and Supply

In order to evaluate potential new water supplies for the IRP, an assessment of "firm" existing water supply was compared to projections of water demands in order to determine the potential gap (or water shortage). Firm existing water supply is the minimum annual supply volume expected to be available in all hydrologic year types. For this gap evaluation the following assumptions were used:

Imported Water Supplies:

- No Delta "fix" is implemented by 2035.
- A repeat of drought conditions in which MWD allocates imported water to Upper District, similar to 2008.
- Climate change does not impact MWD's imported water supplies within the next 25 years.

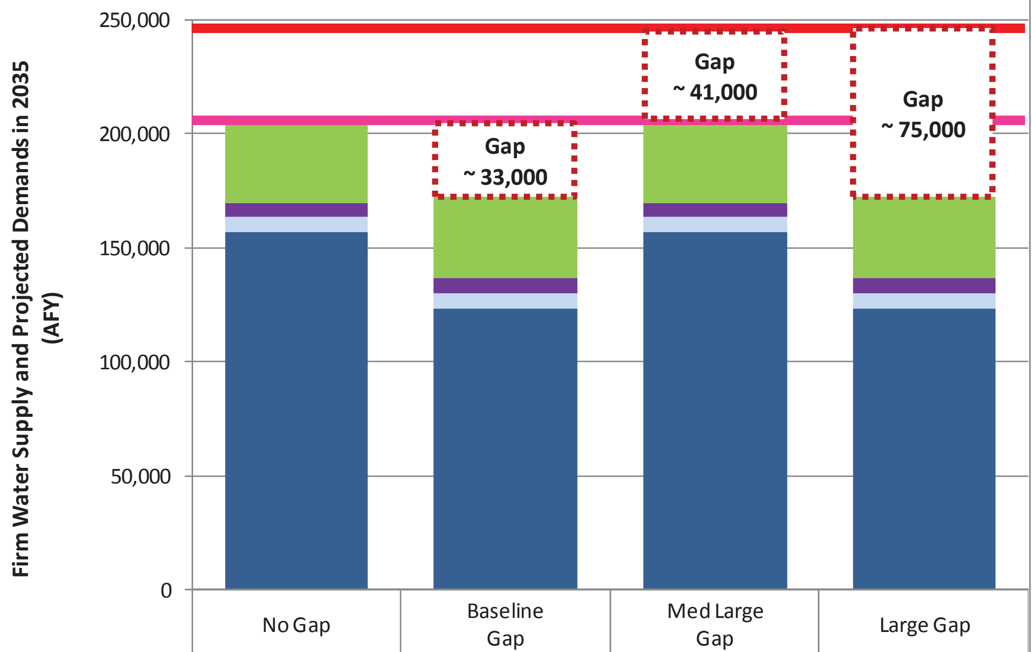
Local Water Supplies:

- Safe yield production of Main Basin was based on a range: with the low range being the 1967 conditions used to develop the Judgment (~152,700 AFY with ~123,600 AFY allocated to Upper District); and the high range based on the normalized average of native water produced under the Judgment from 1973 to 2010 (~195,900 AFY with ~156,700 AFY allocated to Upper District). The reason to use the 1967 conditions as a low range for safe yield production reflects the possibility that climate change could reduce the natural replenishment of the basin.
- Dry hydrologic conditions for surface water diversions.
- Groundwater quality does not limit groundwater pumping from Main Basin.

Water Demands:

- The low range of water demands only includes those retail-level demands within Upper District's service boundary; while the high range of water demands also includes groundwater exports from the Main Basin to meet retail water demands in Central Basin and Orange County of ~41,500 AFY (the average value since 2001).
- Water demands include passive conservation and influence of price of water and income, and existing active conservation, but do not include future active conservation.

Based on the above assumptions, a water supply gap analysis was performed comparing future water demands to existing, firm water supplies (see Figure 3-6). As shown in this figure, the gap between existing, firm water supplies and projected demands in year 2035 could range from zero to a high of 75,000 AFY, with the upper range of the gap being a proxy for potential climate change impacts. For the purpose of comparing and ranking IRP alternatives, a baseline gap assumption of approximately 33,000 AFY was used. However, because of the uncertainty in the gap, an adaptive management strategy was developed and is presented in Section 8.



	No Gap	Baseline Gap	Med Large Gap	Large Gap
Allocated Firm MWD Water	36,000	36,000	36,000	36,000
Existing Recycled Water	6,260	6,260	6,260	6,260
Surface Water (dry year)	6,600	6,600	6,600	6,600
Groundwater (native w/o replen)	156,700	123,600	156,700	123,600
Retail Demands Only	205,433	205,433	205,433	205,433
Retail Demands Plus Exports	246,933	246,933	246,933	246,933

Figure 3-6
Range in Gap between Existing Water Supplies and Projected Water Demands for Upper District in Year 2035

Section 4

IRP Process

Upper District's IRP was based on a proven planning process that explores both demand-side and supply-side options in an integrated manner in order to meet multiple objectives. The IRP also explores risk and develops an overall strategy using an adaptive management framework.

The IRP was prepared using an open, participatory process involving major stakeholders including Upper District's Board of Directors, retail agency managers (producers), Watermaster, and other regional interests. The following lists the all of the Board and stakeholder meetings and workshops for the IRP:

Date	Meeting Group	IRP Discussion Items
August 2 2011	Water Producers	• Project Kick-Off • Goals for IRP
September 20 2011	Board and Public	• Project Kick-Off • Goals for IRP
January 17 2012	Board and Public	• IRP Objectives (Planning Criteria) • Water Demand Forecast Update
January 18 2012	Council of Governments (COG) Group	• IRP Objectives (Planning Criteria) & Weighting • Water Demand Forecast Update
January 19 2012	Water Producers	• IRP Water Demand Forecast (Preliminary Results)
February 14 2012	Watermaster Stormwater Capture Committee	• Update on IRP • Stormwater Capture Discussion
February 22 2012	Water Producers, COG Water Resources Working Group, San Gabriel Valley Economic Partnership	• Demand Forecast and Gap Analysis • Water Supply Options • Preliminary IRP Alternatives
May 15 2012	Board and Public	• Ranking of IRP Alternatives
May 21 2012	Water Producers	• Ranking of IRP Alternatives

In the development of the IRP, the following terms are used:

Objectives	Broadly stated goals of the IRP that drive the evaluation
Performance Metrics	Metrics that indicate how well objectives are being achieved
Options	Individual water supply and demand-side management projects or programs
Alternatives	Combinations of options that are evaluated against the performance metrics

4.1 IRP Process

The IRP process used for Upper District is summarized in Figure 4-1. The process begins with defining the objectives and performance metrics for the IRP. Upper District's Directors developed the objectives in a board workshop, and these objectives were weighted in terms of relative importance by retail water agencies and other regional stakeholders in during a stakeholder workshop. The objectives together with the performance metrics serve as the evaluation criteria by which IRP alternatives were measured against.

Concurrent with the development of objectives, was the identification and characterization of various water supply and conservation options. These options are described in Section 2 (conservation), Section 5 (recycled water), and Section 6 (stormwater and water transfers/storage).

Because no single option can meet all of the IRP objectives, these options were combined in various ways to develop integrated alternatives. These alternatives were developed around themes such as maximize reliability or minimize cost. Then the alternatives were evaluated in terms of how well they achieved the objectives, and then ranked (presented in Section 7).

Based on the ranking of alternatives, an adaptive management approach was used to develop the IRP strategy for Upper District, which is presented in Section 8.

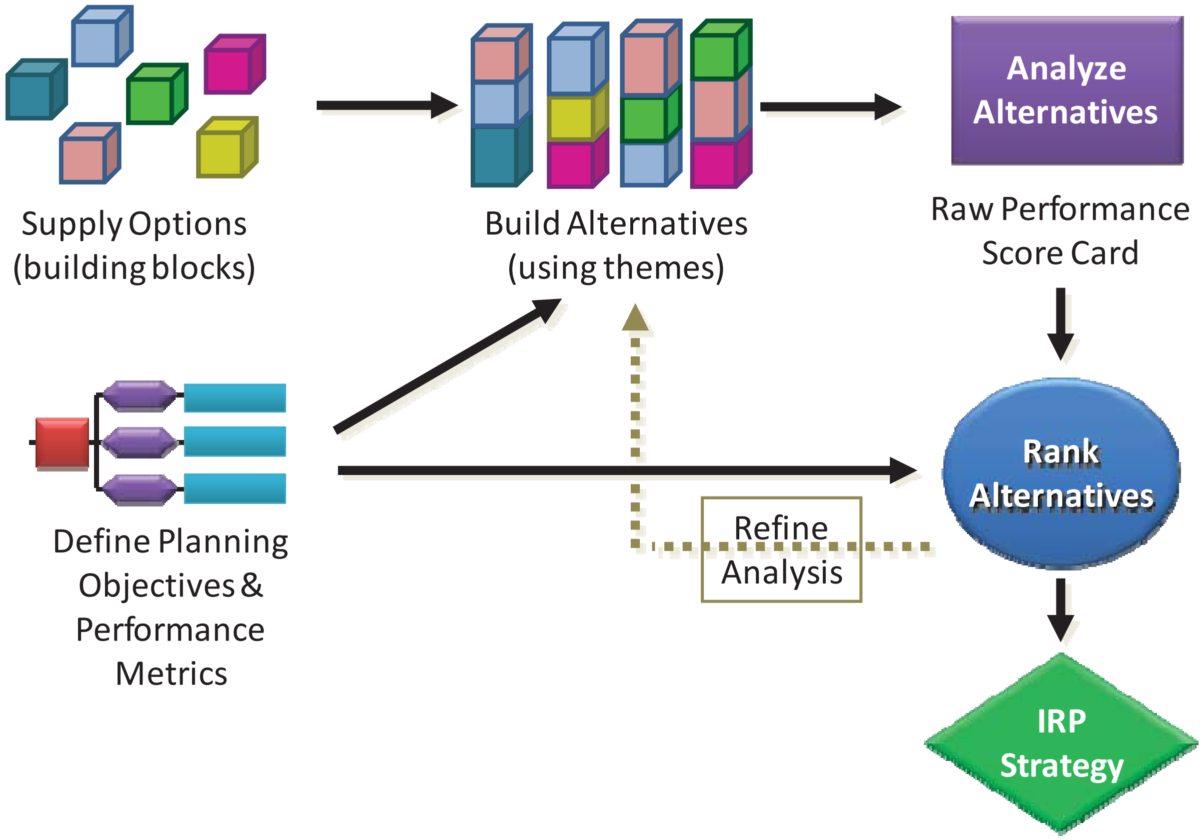


Figure 4-1
IRP Process for Upper District

4.2 IRP Objectives and Performance Metrics

The IRP objectives and associated performance metrics were defined by Upper District's Directors and are summarized in Table 4-1. Because not all of these objectives are equal in importance, a weighting exercise was conducted at a stakeholder workshop. Figure 4-2 summarizes the objective weights, showing both the range of weightings and the average weights for the group.

Table 4-1. IRP Objectives and Performance Measures for Upper District

Objective	Performance Metric
Provide Reliable Water Supply	• Maximum water shortage in year 2035 • Cumulative average water shortages (2012 thru 2035) • Climate change resiliency score
Develop Cost-Effective Solutions	• Total present value lifecycle cost • Total capital costs (in $2012 dollars)
Increase Local Control of Supply	• A score indicating level of local control
Meet Water Quality Basin Goals	• A score indicating Basin water quality impacts
Improve Natural Environment	• Stormwater runoff managed (i.e., not going to the ocean) • Greenhouse gas emissions from operations
Reduce Risk of Implementation	• A score indicating flexibility of alternative • A score indicating permitting challenges • A score indicating institutional complexity • A score indicating customer acceptability

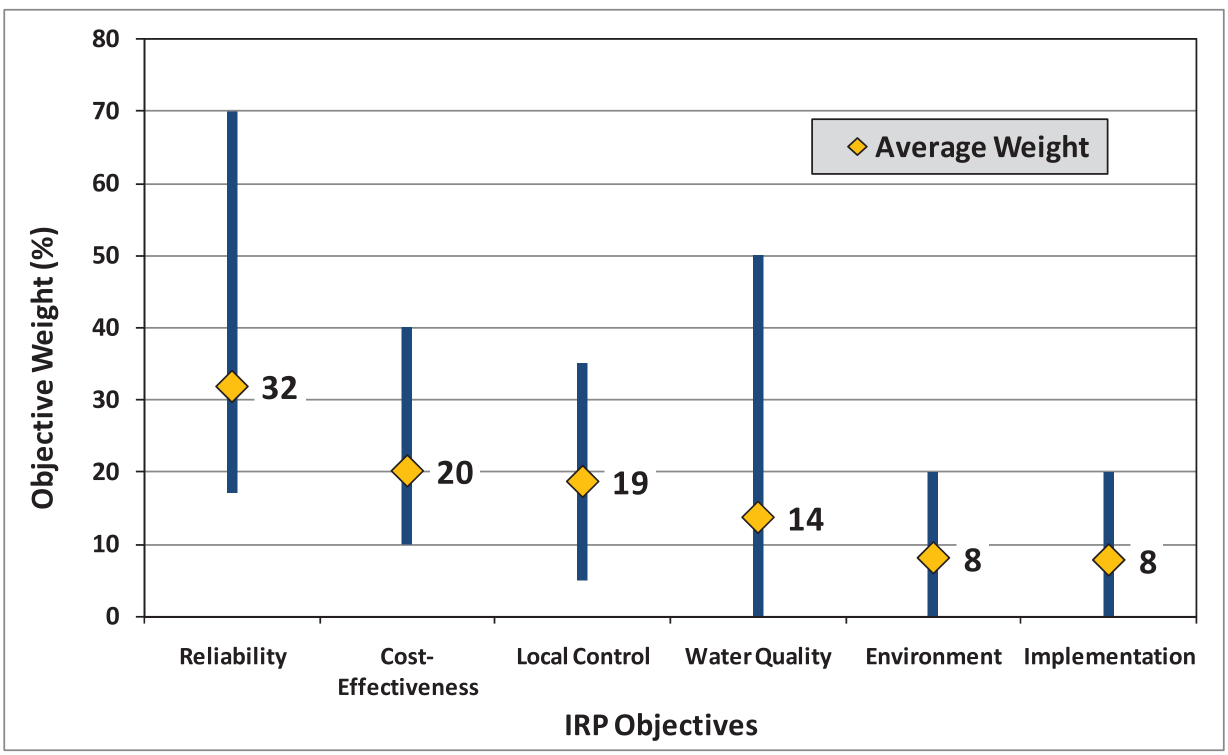


Figure 4-2
Stakeholder Weights for IRP Objectives

The weighting of objectives for Upper District indicates that *Reliability* was the most important objective, followed by *Cost-Effectiveness, Local Control* and *Water Quality*. The weighting also showed that *Reliability* and *Water Quality* had the most variation in weights as indicated by the range in blue lines in Figure 4-2. For example, at least one stakeholder felt *Water Quality* was not important at all, while at least one stakeholder thought *Water Quality's* importance was 50 percent of the total of all weights. *Reliability* had an equally large spread, with one stakeholder's weight at 18 percent, and another's at 70 percent. These spreads in objective weights were helpful in conducting sensitivity in the ranking of alternatives as described in Section 7.

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Section 5

Recycled Water Options

Recycled water supply options evaluated in this IRP include direct non-potable reuse (e.g. delivery of tertiary treated effluent for landscape irrigation) and indirect potable reuse (IPR), which involves treatment and/or blending for recharge of the groundwater basin, and then subsequent extraction with wells for potable use. Specific direct non-potable reuse projects are planned for implementation as part of Upper District's Direct Reuse Program, described in Section 5.1. For IPR, three alternatives are evaluated that treat wastewater from the San Jose Creek Water Reclamation Plant (SJCWRP) for spreading within the Main Basin, as described in Section 5.2.

5.1 Direct Non-Potable Reuse

Upper District has developed a Direct Reuse Program to use direct delivery of recycled water to serve non-potable demands, thereby offsetting reliance on imported water sources. The Direct Reuse Program began in FY 2002/03 and in FY 2011/12, Upper District recycled water deliveries were 2,084 AFY. If all planned and potential projects are implemented, the Direct Reuse Program is forecast to provide approximately 5,400 AFY.

The Direct Reuse Program is in various stages ranging from completed projects to planned and conceptual options. Recycled water supply for the Direct Reuse Program customers is obtained from the two water reclamation plants that serve the entire service area, owned and operated by the Sanitation Districts of Los Angeles County, the Whittier Narrows and San Jose Creek Water Reclamation Plants.

Table 5-1 summarizes existing, planned and potential non-potable reuse projects. At the time of the IRP preparation, several projects that were being planned are now in various stages of construction, as indicated in the table.

Table 5-1: Summary of Existing and Potential Non-Potable Reuse with Upper District's Direct Reuse Program

Status	Component	Yield (AFY)
Existing [1]	Phase I – Rosehills	660
	Phase IIA - Whittier Narrows and Rosemead Extension	1,570
	Phase IIB - Industry Package 1 and Package 2	1,050
	Sub-total	*3,280*
Planned and Potential (for IRP consideration)	Phase I - Rosehills Expansion	600
	Phase IIB - Industry Package 3 and Package 4 [2]	520
	Phase III - Membrane Bioreactor Treatment Plant	500
	Reuse Future Extensions of Recycled Water Program	500
	Sub-total	*2,120*
	Total	**5,400**

[1] Yield shown is based on FY 2008/09 recycled water sales.

[2] At the time of the IRP analysis, these projects were planned but have since moved to construction.

5.2 Indirect Potable Reuse

As part of the IRP, Upper District is evaluating alternatives to use recycled water for groundwater basin replenishment—referred to as indirect potable reuse (or IPR). Building upon the work completed in the Groundwater Reliability Program (GRIP), CDM Smith developed cost estimates for several different treatment options for IPR factoring in the proposed recycled water contributions as presented in the draft California recycled water regulations (CCR Title 22 Division 4, Chapter 3, Article 5.1). The IPR project under evaluation involves delivery of recycled water from the San Jose Creek Water Reclamation Plant (SJCWRP) to the Main Basin for surface recharge to replenish the Main Basin. The options evaluated for providing treatment of the recycled water prior to recharge are:

- Advanced Water Treatment (AWT) – AWT process facilities can include Microfiltration (MF) or Ultrafiltration (UF), Reverse Osmosis (RO), Advanced Oxidation using Ultraviolet (UV) and Hydrogen Peroxide, and chemical addition for product water stabilization. AWT systems also require additional recycled water for regular membrane washing, which in the case of wastewater applications creates a waste stream that must be managed.

- Tertiary Treatment – Use of additional disinfection processes for removing suspended, colloidal, and dissolved constituents remaining after conventional secondary treatment.

- Hybrid Treatment – Some combination of Tertiary and AWT treatment systems.

IPR of up to 24,000 AFY in the Main Basin could potentially be achieved with the implementation of any of the treatment options. Since all available effluent is already treated to tertiary standards, the AWT and Hybrid Treatment options will involve construction of additional treatment facilities. For options that produce 24,000 AFY, improvements in LACSD collection system and San Jose Creek facility would also need to be made to achieve this level of IPR. For Upper District's IRP, two levels of IPR were evaluated: 10,000 AFY and 24,000 AFY.

Key to the analysis of IPR options is the allowable Recycled Water Contribution (RWC) that a potential groundwater recharge project could be permitted for operation. The California Department of Public health (CDPH) limits the amount of recycled water for groundwater recharge based on both the level of treatment and the method of recharge. In its simplest form, the RWC is defined as the volume of recycled water applied to a site divided by the sum of the recycled water volume plus diluent water (water from non-recycled sources) volume applied to the same site. Diluent water sources available to the Upper District IPR at the SFSG include imported water and stormwater runoff. Projects that use higher levels of treatment processes (e.g. AWT relative to tertiary treatment approaches) are permitted for higher RWCs. Additionally, increases to the initially permitted RWC can potentially be achieved for projects that can demonstrate consistent compliance with performance criteria. Table 5-2 shows the RWC values assumed in the Upper District IRP that are the basis for determining diluent water requirements.

Table 5-2. Assumed Recycled Water Contribution for IPR Options

Period	FAT*	Tertiary
2015-2020	75%	20%
2020-2025	75%	33%
2025 +	100%	50%

* FAT = full advanced treatment

The IPR treatment options have different requirements for diluent water (Figure 5-1) to achieve the same annual volume of recycled water recharge in the recharge area. Stormwater or imported water for dilution are accounted in the evaluation of the IPR options, as they may increase cost or influence the other Upper District projects under consideration. Historical stormwater spreading (120-month rolling average) in the Santa Fe Spreading Grounds (SFSG) already provides the majority of the diluent water needed, leaving roughly 750 AFY of supplemental diluent supply needed to meet the 2025 projection for IPR supply (only ~3 percent of IPR potential). This could be met with imported water or it may be possible to develop synergies between projects, such as a stormwater recharge projects that provides the supplemental diluent water needed to allow implementation of IPR.

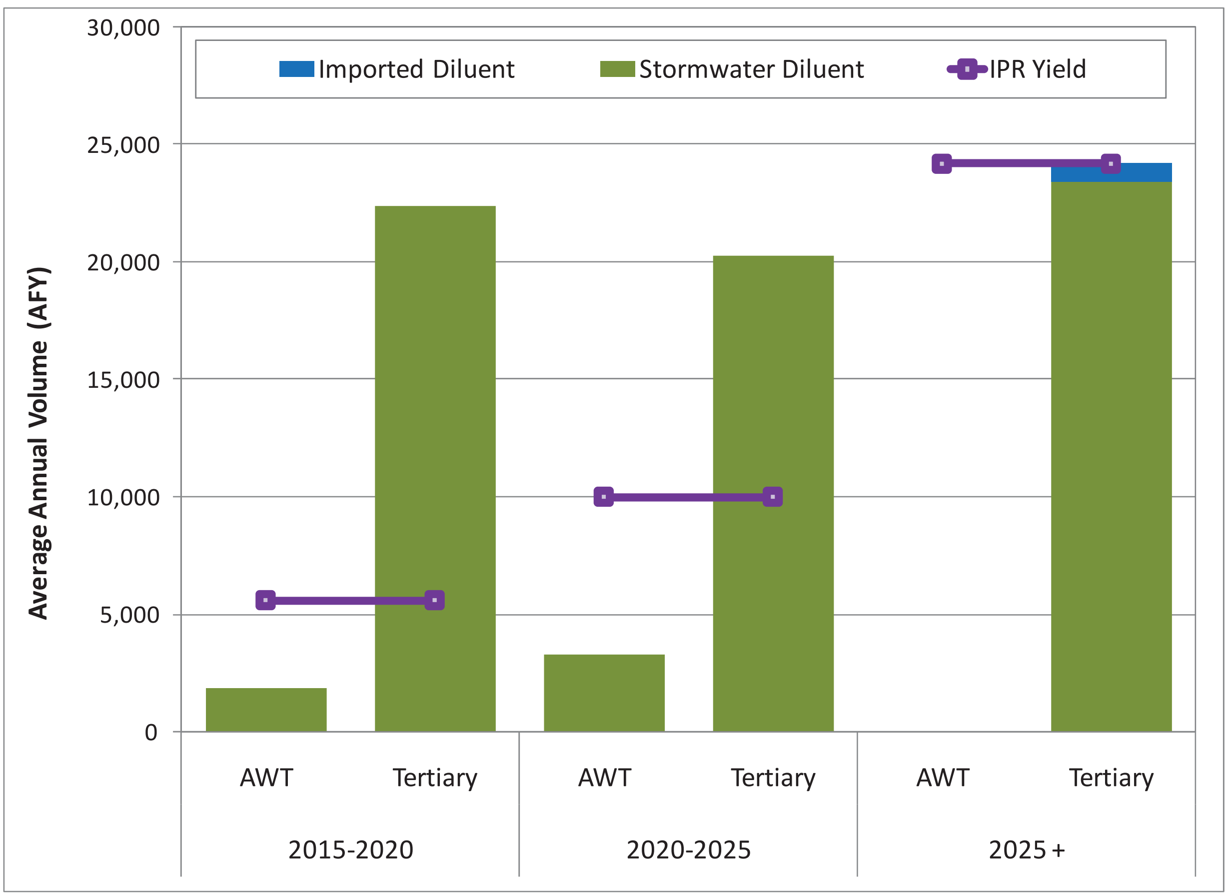

Figure 5-1
IPR Recharge in SFSG and Diluent Water Requirements for each Option

5.3 Recycled Water Option Costs

Capital and O&M cost estimates for most of the non-potable reuse options were provided by Upper District. CDM Smith estimated the capital and O&M costs for the membrane bioreactor treatment plant based on similar operating projects in operation. Costs for non-potable reuse projects are summarized in Table 5-3.

Table 5-3. Estimated Costs for Non-Potable Reuse Recycled Water Options

Cost	Capital Cost ($)	Annual O&M ($/yr)
Phase IIB - Industry Package 3	$2,200,000	$90,000
Phase IIB - Industry Package 4	$3,000,000	$60,000
Phase III - Membrane Bioreactor Treatment Plant	$8,000,000	$230,000
Reuse Future Extensions of Recycled Water Program	$10,000,000	$100,000
Total	**$23,200,000**	**$480,000**

Table 5-4 summarizes estimated capital costs for the two IPR options; tertiary treatment and full advanced treatment (FAT). These estimates are based on scaling down original estimates in the GRIP for the 10,000 AFY yields. The annual O&M cost estimates are summarized by project components and were derived from the cost curves for various project components provided in GRIP. In addition, costs were estimated for a hybrid IPR option involving a smaller AWT plant (14 MGD) for blending with tertiary treated water. This hybrid AWT plant was sized to provide sufficient capacity to reduce the TDS from tertiary effluent (~580 mg/L) to a concentration low enough to meet water quality objectives (450 mg/L)for the Main Basin. Also, a reduced amount of tertiary recycled water utilized in the hybrid option would ensure that the historical surface runoff spreading in SFSG be sufficient to meet the RWC target without any supplemental diluent water requirements.

Table 5-5 presents the O&M costs for the different treatment options, based on scaling the costs from the GRIP study as well as accounting for the draft Recycled Water Contributions.

Table 5-4. Estimated Capital Costs for Indirect Potable Reuse Recycled Water Options for 10,000 AFY of Supply Yield

Cost[1]	Tertiary Treatment	Full Advanced Treatment (FAT)	Hybrid (Tertiary/AWT)
Sewer Diversions [2]			
Route media filter backwash to plant influent	n/a	$100,000	$100,000
Re-route sewers in the vicinity of the Pomona WRP to SJCWRP	n/a	$1,500,000	
EQ Basin [3]	$24,200,000	$32,000,000	$28,900,000
AWT Facilities Excluding Brine Discharge	n/a	$99,000,000	$58,000,000
AWT Brine Discharge	n/a	$47,000,000	$28,000,000
Conveyance to SFSG			
Pipeline from SJCWRP to SFSG	$53,800,000	$53,800,000	$53,800,000
Pump Station from SJCWRP to SFSG	$5,100,000	$5,110,000	$5,110,000
Total	**$83,000,000**	**$239,000,000**	**$174,000,000**

[1] All costs are in 2011 dollars, unless noted otherwise. Costs are based on cost curves included in *Grip Alternatives Analysis Final Report*, RMC, June 2011. Appendix B.

[2] Assumes 14,600 AFY is available at SJCWRP. The remaining recycled water is achieved by recovering washwater and re-routing sewers. The remaining recycled water needed for tertiary treatment can be obtained with minimal costs, but the excess recycled water needed for the FAT option require capital investments.

[3] Assumes EQ basin capacity required is 20% of recycled water supply, plus backwash supply required for FAT options.

Table 5-5. Estimated O&M Costs for Indirect Potable Reuse Recycled Water Options for 10,000 AFY of Supply Yield

Cost[1]	Tertiary Treatment	Full Advanced Treatment (FAT)	Hybrid (Tertiary/AWT)
Tertiary Water Purchase [2]	$3,020,000	$1,850,000	$1,500,000
Imported Water Purchase [3]	$702,000	n/a	n/a
EQ Basin [4]	$111,000	$147,000	$133,000
AWT Facilities Excluding Brine Discharge	n/a	$20,400,000	$12,000,000
AWT Brine Discharge	n/a	$1,770,000	$1,040,000
Conveyance to SFSG			
Pipeline from SJCWRP to SFSG	$237,000	$237,000	$237,000
Pump Station from SJCWRP to SFSG	$3,220,000	$3,220,000	$3,220,000
Groundwater Recovery [5]	$2,420,000	$2,420,000	$2,420,000
Total	$9,700,000	$30,000,000	$20,500,000

[1] All costs are in 2011 dollars, unless noted otherwise. Costs are based on cost curves included in *Grip Alternatives Analysis Final Report*, RMC, June 2011. Appendix B.
[2] Assumes "floor" rate tertiary effluent price of $105/AF for FAT and hybrid options and "ceiling" rate tertiary effluent purchase price of $315/AFY for no advanced treatment option.
[3] Assumes $936/AF of imported water purchase cost.
[4] Assumes O&M cost for EQ basin is approximately 0.5% of construction cost.
[5] Assumes $100/AF for groundwater recovery.

To approximate the annual cost of water from each of these options, the estimated capital costs were amortized over thirty years with an assumed interest rate of five percent. This cost is added to the annual O&M cost for the proposed recycled water facilities to determine the total annualized cost for both non-potable and indirect potable reuse projects. Comparing these annualized costs, including capital and O&M, with the estimated average annual yields, the unit cost of water in unit cost ($/AF) is approximated (see Figure 5-2).

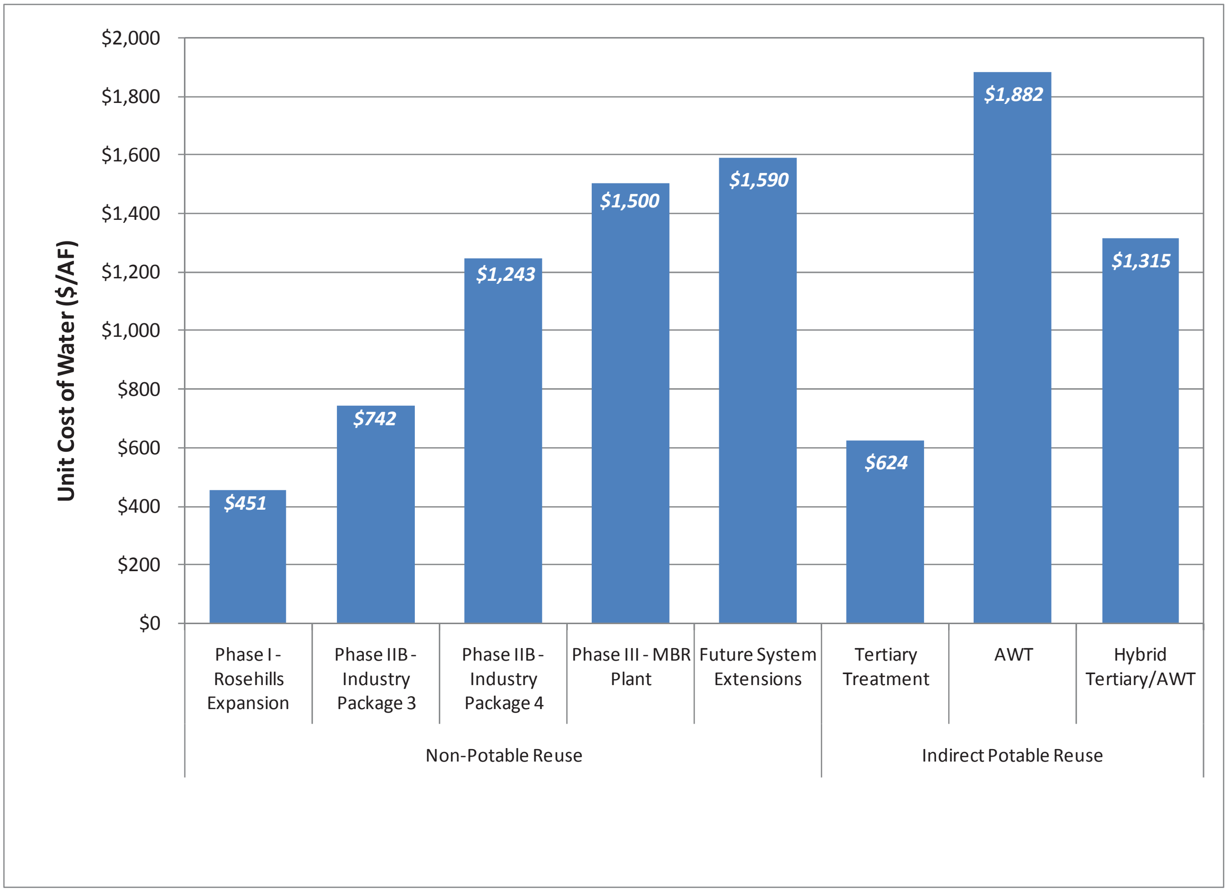

Figure 5-2
Estimated Unit Cost of Water for Recycled Water Options for the IRP

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Section 6

Stormwater and Water Transfers/Storage Options

Stormwater harvesting options evaluated in this IRP include centralized (i.e. regional) and decentralized (i.e. lot level) project types. Specific centralized stormwater projects identified in the Potential Effective Recharge Capabilities (PERC) Study (Stetson Engineers, 2007) were evaluated, as described in Section 6.1. Decentralized options were evaluated for implementation by considering three methods on a typical parcel and then extrapolating over areas not upstream of one of the evaluated centralized options, as described in Section 6.2. Water transfers and storage options are discussed in Section 6.4.

6.1 Centralized Stormwater Options

The Los Angeles County Flood Control District (LACFCD) owns and operates a series of dams and spreading basins to conserve (i.e. reduce outflows to ocean) stormwater runoff in the San Gabriel River and Rio Hondo watersheds by diverting runoff into facilities that provide storage and recharge underlying groundwater basins. In 1985, the responsibilities and authority vested with LACFCD were transferred to the Los Angeles County Department of Public Works (LACDPW), with the Watershed Management Division having the role of planning and policy and the Flood Management and Water Resources Divisions having the role of maintenance and operations. The IRP evaluated options to enhance existing facilities or construct new facilities to increase recharge of stormwater in the Main Basin. In 2011, the Watermaster's Stormwater Capture Ad Hoc Committee completed a Summary of Potential Stormwater Projects for Main Basin recharge, which was based upon findings of the second (1995) and third (2007) updates to the PERC study (Stetson Engineers, 2011). Of the thirteen projects described in this summary report, Ad Hoc committee selected five , which are evaluated in the IRP, including:

- Miller Pit
- Olive Pit
- Walnut Creek Spreading Basin
- Buena Vista Spreading Basin
- Peck Road Spreading Basin

6.1.1 Long Beach Judgment

The Long Beach Judgment, approved in 1964, provides for the accounting of runoff in the San Gabriel River and Rio Hondo, to ensure equitable volumes of water are available to entities downstream (Lower Area, overlying the Central groundwater basin) of Whittier Narrows. Per the Long Beach Judgment, recharge of stormwater runoff is accounted for to help satisfy water entitlements for downstream recharge in the Central groundwater basin. The San Gabriel River Watermaster determines annual volumes and useable water and Lower Area entitlement (function of preceding 10-yr rainfall) to compute annual debits or credits for the Upper Area to the Lower Area as well as long term accrued credits or debits. The San Gabriel River Watermaster also performs a long-term accounting (LTA) after each 15 to 25-year period when average rainfall is between 18-19 inches. The LTA adjusts accrued credits or debits to account for differences between Lower Area entitlement during the LTA period and Usable Water actually received by Lower Area during the LTA period.

Figure 6-1 shows useable water deliveries from Upper Area to Lower Area, annual Lower Area entitlement, and accrued credits over the second and third LTA periods. Over these LTA periods, the Upper Area has accrued a credit of approximately 150,000 AFY. The first LTA period (1963-1979) was excluded from the IRP analysis because, at that time, overall urban development in the watershed was substantially lower than current levels, resulting in lower imperviousness and less surface flow at Whittier Narrows.

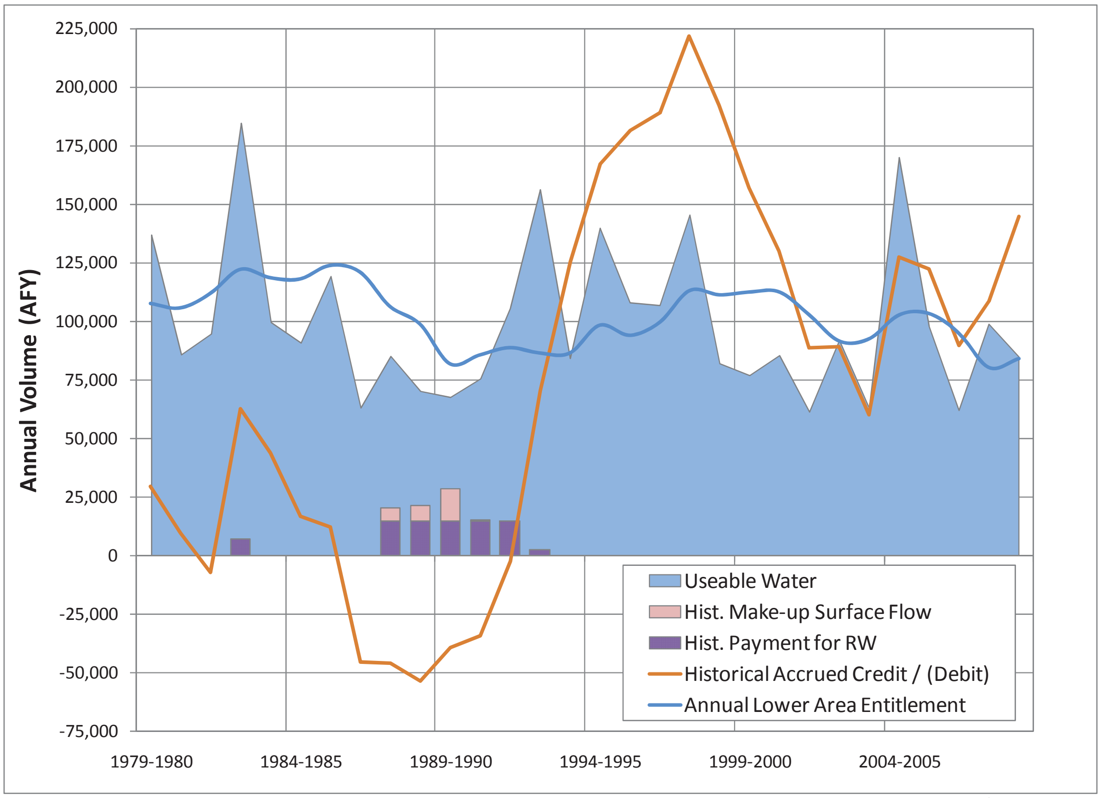


Figure 6-1
Summary of Upper Area Water Deliveries to meet Lower Area Entitlements for Second and Third Long-Term Accounting Periods

Not all surface flow passing though Whittier Narrows is considered usable and therefore effecting the determination of whether the Upper Area delivered sufficient water to meet the Lower Area entitlement in a given water year. The portion of surface flow generated in the Upper Area that flows out of the Montebello forebay (assumed lost to the Pacific Ocean) is referred to as 'unusable surface flow'. Unusable surface flow consists of runoff in the San Gabriel River or Rio Hondo that is too turbid for recharge or exceeds the diversion/storage capacity of the Rio Hondo Spreading Grounds (RHSG) or San Gabriel Spreading Grounds (SGSG). Since unusable surface flow is not accounted for in meeting the Lower Area entitlement, capture and recharge of this volume in the Upper Area would not reduce Usable Water. Unusable surface flow is highly variable due to rainfall patterns, with volumes ranging from < 10,000 AFY to over 400,000 AFY. In a median year, approximately 15,000 AFY of unusable surface flow is lost to the Pacific Ocean. For the Upper District IRP, new Main Basin recharge with stormwater was determined using two different runoff capture approaches; with and without limiting Upper Area stormwater capture to unusable surface flow, as defined in the Long Beach Judgment.

6.1.2 Centralized Stormwater Projects

Figure 6-2 provides a schematic of stormwater drainage showing the location of proposed projects for centralized stormwater capture. Two different types of centralized stormwater capture and recharge were evaluated in the Upper District IRP, including:

- Diversion into new deep replenishment basins, with Miller and Olive Pits as two proposed projects, shown as orange filled squares in Figure 6-2.
- Enhancement of existing spreading basins to provide additional off-site recharge capacity, with Peck Road, Walnut Creek, and Buena Vista Spreading Basins (SBs), shown as red outlined features associated with existing facilities. Off-site recharge involves the temporary detention of additional surface runoff in an existing facility for conveyance to a secondary recharge area. For the Buena Vista SB project, a new deep replenishment basin within United Rock Pit 3 would also be constructed to receive the runoff captured for recharge. For the Peck Road and Walnut SB projects, secondary off-site recharge occurs within the channel bottom following the storm event.

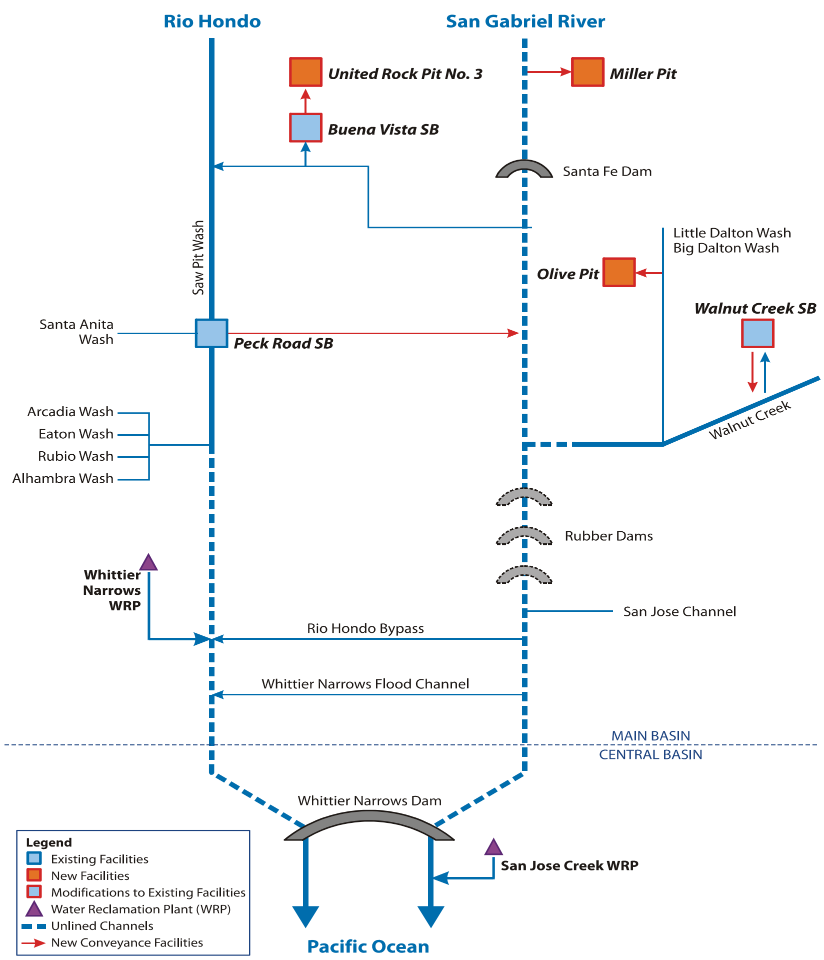


Figure 6-2
Schematic of Drainage and Proposed Centralized Stormwater Harvesting Projects

Miller and Olive Pits are existing deep pits, which could be used for groundwater replenishment. Miller Pit would capture runoff from the San Gabriel River at I-210, upstream of the Santa Fe Dam and Olive Pit would capture runoff from Dalton Wash downstream of Azusa Canyon Road. Key parameters used in the analysis of stormwater capture potential at Miller and Olive Pits include diversion, storage, and recharge capacities (Table 6-1). For Miller Pit, the San Gabriel River downstream of Santa Fe Dam provides recharge capacity within the channel bottom, thus modeled inflows to Miller Pit representing new Main Basin groundwater recharge was limited to days when flow downstream of the Santa Fe Dam (E281) exceeded 50 cfs, a rough estimate of the natural channel bottom recharge capacity for surface runoff downstream of the Santa Fe Dam.

Table 6-1. Summary of Proposed Improvements at Existing Spreading Basins

	Within Basin			Off-site Recharge		
Project	Storage (AF)	Recharge Rate (ft/day) [1]	Diversion (cfs)	Type	Pumping / Recharge (cfs)	Potential Inflow Data Source (LA County Flow Gauge ID)
Miller Pit	850	2.0	50-100 [2]	n/a	n/a	San Gabriel River below Santa Fe Dam (E281)
Olive Pit	1,150	1.0	50-100 [2]	n/a	n/a	Dalton Wash at Merced Ave (F274)
Peck Road Spreading Basin	3,350	0.1 - 2.0	n/a	Channel Bottom	50	Sawpit Wash below Live Oak Ave (F194) plus Santa Anita Wash at Longden Ave (F193)
Walnut Spreading Basin	170	0.3 - 2.2	150	Channel Bottom	20	Walnut Creek below Puddingstone (F40) plus 1.25 times Arcadia Wash below Grande Ave (F317)
Buena Vista Spreading Basin	200	0.1 - 2.0	2,900	United Rock Pit 3	25	Santa Fe Diversion Channel (F280) plus 0.18 times Arcadia Wash below Grande Ave (F317)

[1] Recharge rate varies with hydrologic year type.

[2] Diversion rate estimated to provide effective stormwater capture while avoiding oversizing facilities beyond a point of diminishing returns.

The projects at Peck Road and Walnut Spreading Basins involve construction of a pump station and conveyance to move water detained during a storm event to unlined channel segments after flow in the receiving channel recedes to below the natural recharge capacity of the channel bottom. For Peck Road Spreading Basin, the project includes conveyance pipeline to bring the detained water east from the Rio Hondo drainage-shed to the San Gabriel River. The project proposed for the Buena Vista Spreading Basin involves a new pump station to move stormwater captured from Buena Vista Channel and Santa Fe Diversion Channel to a new groundwater replenishment basin within United Rock Pit 3. Table 6-1 summarizes the key sizing criteria for pumping, conveyance and off-site recharge. Rio Hondo upstream of Whittier Narrows Dam provides recharge capacity within the channel/basin bottom, thus modeled inflows to Peck Road and Buena Vista Spreading Basins representing new Main Basin groundwater recharge was limited to days when flow in the unlined segment of Rio Hondo was greater than 50 cfs.

It should be noted that there are several environmental and water quality issues that will need to be resolved before implementation of any of these centralized stormwater projects. For example, during the development of Upper District's IRP, the U.S. Fish and Wildlife Service established two critical habitat designations for endangered/threatened species, the Santa Ana sucker and southwestern willow flycatcher. Both of these habitat designations are in areas that compete with flood control and stormwater capture operations in the watershed. In addition, water quality regulatory requirements and potential liabilities for additional stormwater capture projects will have to be considered on a case-by-case basis.

6.1.3 Estimate of Centralized Stormwater Yield

A stormwater capture analysis was developed to estimate potential for increased recharge of the Main Basin with addition of new projects. The analysis involved testing the impact of additional storage and recharge capacity on historical daily hydrologic data from drainage areas upstream of the proposed project locations. Daily water balance simulations computed total potential Main Basin recharge and potential recharge of runoff otherwise lost to the Pacific Ocean (i.e. unusable surface flow). Figure 6-3 shows the daily evaluation steps, including specific flow data thresholds, implemented to determine potential recharge of available 'unusable surface flow' in one of the five centralized stormwater projects.

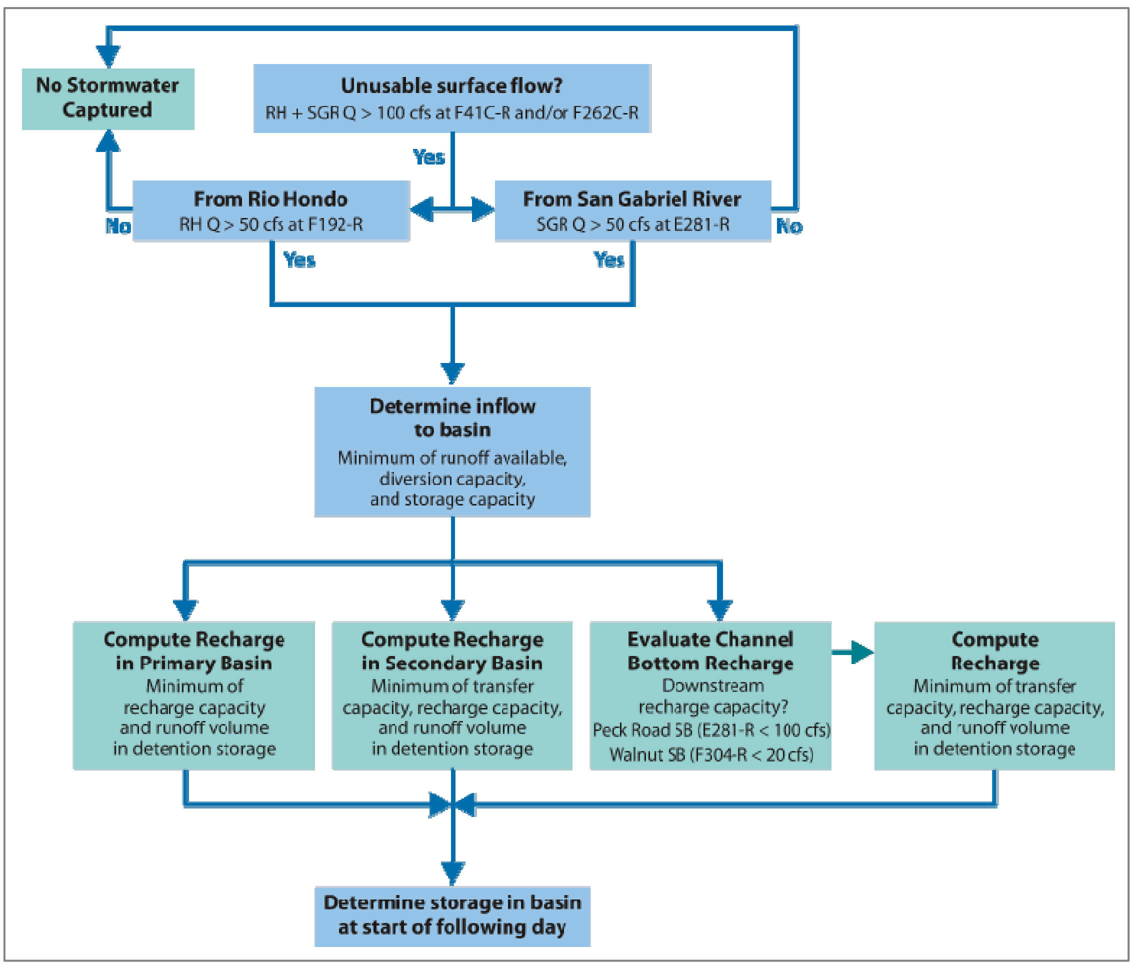


Figure 6-3
Flowchart for Computing the Potential Capture and Recharge of 'Unusable Surface Flow' in each of the Centralized Stormwater Projects

For several implementation scenarios of one or more projects, as shown in Table 6-2, results were aggregated to annual volumes for use in evaluating long-term yield. In some cases recharge limitations caused combinations of projects to have a lower yield than the sum of projects if implemented individually. Centralized stormwater recharge has large year-to-year fluctuations in recharge potential, which could be dampened by long-term storage in the Main Basin. Generally, the analysis showed long-term average annual recharge potential could provide significant new groundwater recharge relative to the gap between current supplies and projected water demand.

Table 6-2. Average Annual Estimates of Main Basin Recharge from both Total Potential and 'Unusable' (Otherwise Lost to Ocean) Volumes for each Centralized Stormwater Capture Scenario

Scenario	Portion of Potential Main Basin Recharge Otherwise Lost to Pacific Ocean (AFY)
All Projects	5,298
Diversion from Walnut, Buena Vista, and Peck Road SBs	2,263
Miller Pit	1,290
Diversion from Walnut SB	484
Olive Pit	2,329
Diversion from Buena Vista SB	696
Diversion from Peck Road SB	1,318
Miller Pit + Olive Pit	3,603
Diversion from Walnut and Peck Road SBs	1,678

6.2 Decentralized Stormwater Options

Decentralized stormwater options in the Upper district were evaluated for residential and commercial parcels. By reducing runoff from parcels, the captured water can be utilized to offset non-potable water demands or increase recharge to the underlying Main Basin. An ancillary benefit of decentralized stormwater options is a reduction in pollutant loading and conveyance of polluted stormwater to receiving water bodies. Select subwatersheds of the San Gabriel River watershed within the Upper District boundaries were evaluated for implementation of decentralized stormwater options including Alhambra, Arcadia, Dalton, Eaton, Rubio, San Jose, and Walnut Creek (Figure 6-4). Other subwatersheds were not evaluated as it was assumed centralized stormwater options would address these areas.

6.2.1 Decentralized Stormwater Projects

Three decentralized stormwater options were evaluated, including

- Single-family residential (SFR) rain barrels - Rain barrels are barrels installed to capture runoff from rooftops by redirecting runoff from downspouts to the barrels. Collected water is later used for non-potable demands, such as irrigation. Typically, rain barrels have hose spigots to allow for irrigation use of the collected water.

- SFR bioretention areas - Bioretention areas, also known as residential rain gardens, receive water from redirected rooftop runoff. Bioretention areas have the benefit of reducing offsite runoff, providing aesthetic benefits to the parcel, and providing groundwater recharge in areas underlain by more permeable soils..
- Commercial cisterns - Commercial cisterns operate in a similar manner to rain barrels, but at a larger scale. Rooftop runoff is redirected to the cisterns and used at a later time for non-potable demands. Cisterns can be located above ground or below ground and may require pumps to adequately deliver the collected water into existing irrigation systems.

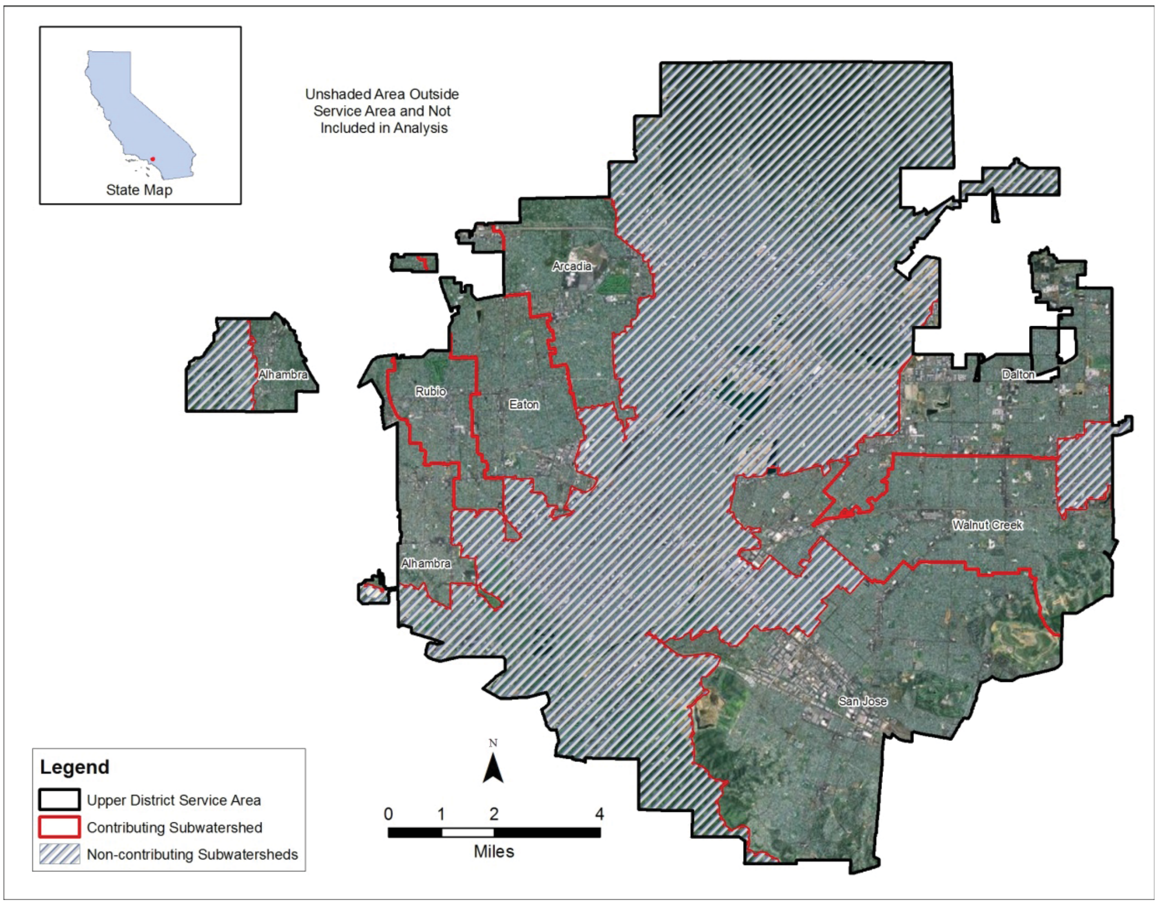


Figure 6-4
San Gabriel River Watershed Areas within Upper District Service used for Decentralized Stormwater Options

Projects that capture and recharge onsite runoff, SFR bioretention areas, differ from those that involve capture and subsequent use for onsite irrigation, SFR rain barrels and commercial cisterns. The former requires recovery of new recharge water from the underlying aquifer with groundwater wells, while the latter provides a direct offset of water demand. Evaluation of these options was completed for a typical installation on a median size SFR or commercial parcel, and then results were extrapolated over portions of the service area. The following sections summarize the analyses used to assess the potential water yield from these decentralized stormwater project types.

6.2.2 Estimate of Stormwater Yield

Estimates of yield for a representative SFR and commercial parcel with typical installation of the proposed projects involved development of a continuous simulation model of daily runoff volume capture and recharge or onsite irrigation. Daily rainfall and evapotranspiration data were obtained from nearby meteorological stations to develop the yield estimates. Table 6-3 provides the design criteria and assumptions used to estimate yield, and the averaged results from the three decentralized stormwater project types.

Table 6-3. Design Criteria, Assumptions, and Yield Estimates for Decentralized Stormwater Project Options

Parameter	SFR Bioretention	SFR Rain Barrel	Commercial Cistern
Total Number of Parcels	168,000	168,000	700 [1]
Total Implementation Rate	30%	30%	100%
Median Parcel Size (sf)	6,500	6,500	70,000
Median Rooftop Area (sf)	1,600	1,600	13,000
Median Parcel Imperviousness	35%	35%	80%
Irrigated Landscape Area (sf)	n/a	4,000	12,600
Storage Capacity (gal)	1,300	200	3,000
SFR Bioretention Bottom Area (sf)	100	n/a	n/a
SFR Bioretention Design Percolation Rate (in/hr)	0.25	n/a	n/a
Annual Yield for Subject Area (AFY)	2,371	425	66
Percent of Irrigation Demand	n/a	3%	11%
Average # of Days with Irrigation	n/a	35	67
Percent of Runoff Capture	51%	14%	18%

[1] Number of existing commercial parcels that are greater than 1 acre and have buildings on site within

For the SFR rain barrels and commercial cistern project types, only the runoff from the roof area is captured; therefore, it was assumed that all rainfall is effectively captured until the storage capacity is filled. The rate of drawdown of the stored runoff is computed as a function of daily onsite irrigation demand, computed as specified in the Statewide Model Water Efficient Landscape Ordinance. Figure 6-5 shows results of the continuous simulation model for a 1-month period including several storms that filled a rain barrel and then the drawdown of stored runoff water during dry periods between storm events. As expected, the yield was constrained by the different seasonality of runoff volume and irrigation demand (Figure 6-6).

For SFR bioretention, runoff form the entire parcel area is estimated using a runoff coefficient to account for abstraction of rainfall and percolation over pervious areas upstream of the project. Sizing of the SFR bioretention area involved application of local stormwater design criteria, including a design storm depth of 0.75 inches, standard specifications for planting media depth and porosity, allowable ponding, and average underlying soil permeability for the region (Table 6-3).

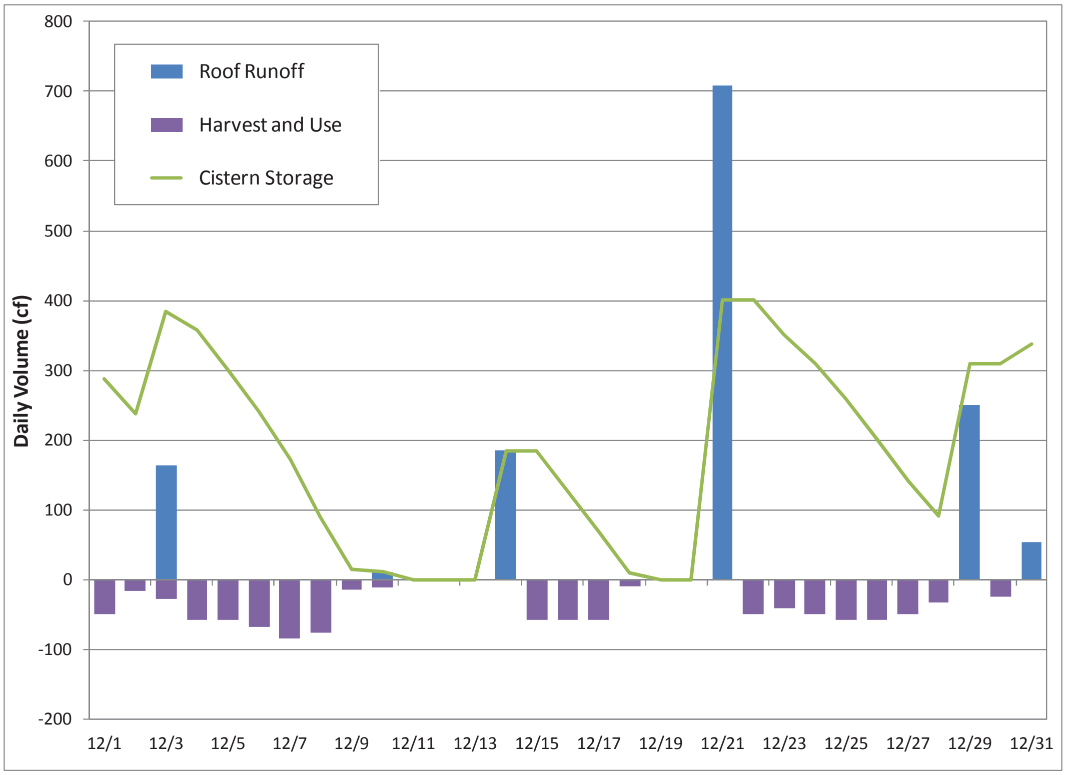


Figure 6-5
Extraction of 1-month of Runoff Volume, Storage, and Onsite Irrigation Use for a Typical Commercial Cistern Stormwater Project

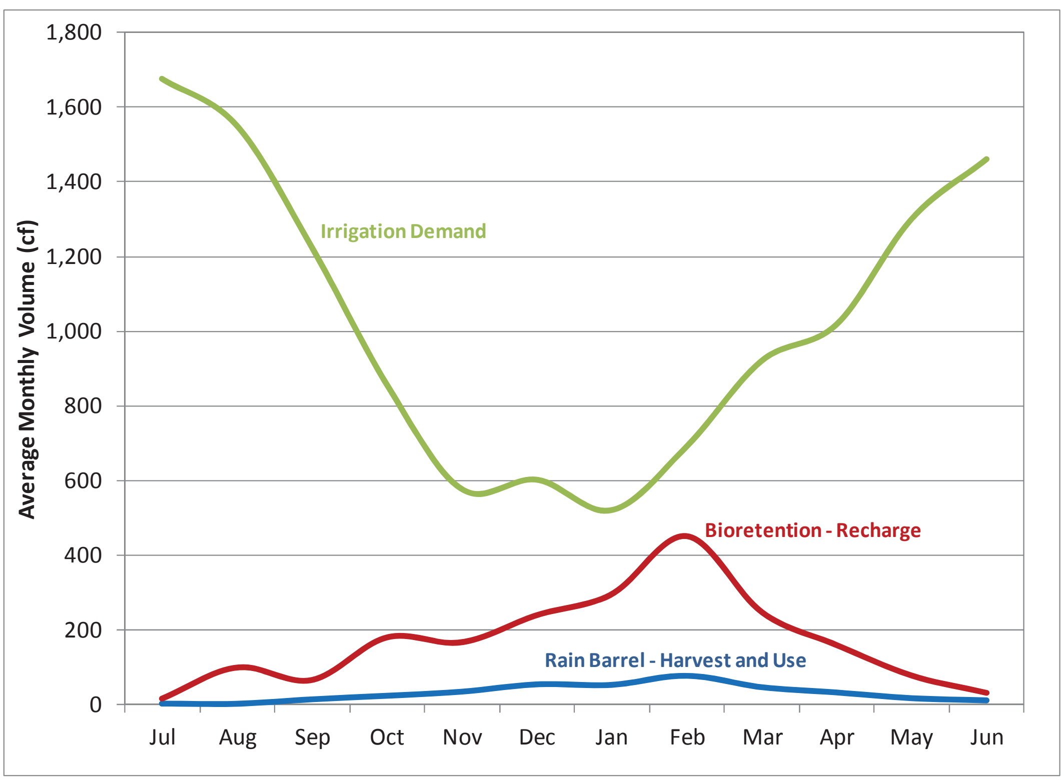


Figure 6-6
Average Monthly Yield from Decentralized SFR Stormwater Project Options

6.3 Stormwater Option Costs

Cost estimates were developed by CDM Smith using data from the PERC Study, supplemented by CDM Smith contractors evaluation, for the five centralized and three decentralized stormwater project options evaluated for the Upper District IRP. For the centralized stormwater options, detailed takeoff estimates were prepared for capital costs, which are summarized in Table 6-4. These capital costs consist of earthwork and construction of new diversion, pumping, or conveyance facilities. These costs can vary significantly depending on the final conceptual design of the proposed project. Table 6-5 summarizes estimated capital costs for the decentralized project types, which involve extrapolation of estimated cost for a typical project on a median SFR or commercial parcel over approximately 50,000 SFR and 670 commercial parcels in the subject area.

Table 6-4. Estimated Costs for Centralized Stormwater Options

Cost	Miller Pit	Olive Pit	Peck Road SB	Walnut SB	Buena Vista SB
Earthwork	$ 610,000	$ 1,300,000	n/a	$ 200,000	$ 210,000
Concrete	$ 60,000	$ 60,000	n/a	n/a	$ 60,000
Pipelines	$ 830,000	$ 260,000	$ 2,900,000	$ 50,000	$ 190,000
Pump Station	n/a	n/a	$ 820,000	$ 490,000	$ 700,000
Rubber Dam	n/a	$ 1,000,000	n/a	n/a	n/a
Admin / Permits / Contingency	$ 1,070,000	$ 1,780,000	$ 2,610,000	$ 520,000	$ 800,000
Total	$ 2,570,000	$ 4,300,000	$ 6,330,000	$ 1,260,000	$ 1,960,000

Table 6-5. Estimated Costs for Decentralized Stormwater Options

<table>
<tr><th>Cost</th><th>SFR Bioretention</th><th>SFR Rain Barrel</th><th>Commercial Cistern</th></tr>
<tr><td>Equipment [1]</td><td rowspan="2">$ 1,200</td><td>$ 400</td><td>$ 1,500</td></tr>
<tr><td>Installation [2]</td><td>$ 100</td><td>$ 1,400</td></tr>
<tr><td>Total (per parcel)</td><td>$ 1,200</td><td>$ 500</td><td>$ 2,900</td></tr>
<tr><td>Total (Extrapolated)</td><td>$ 60.5 million</td><td>$25.2 million</td><td>$ 2.0 million</td></tr>
</table>

[1] Rain barrel cost from http://www.cleanairgardening.com; Bioretention cost from http://www.millcreekwatershed.org/assets/files/howto.pdf; Commercial cistern and pump cost from http://www.thetanksource.com.

[2] Installation costs for rain barrels and cisterns estimated from *Los Angeles Integrated Resources Plan, Facilities Plan, Volume 3: Runoff Management*; CH:CDM, July, 2004.

To approximate the cost of water from each of these options, the estimated capital costs were amortized over thirty years with an assumed interest rate of five percent. Also, annual cost to operate and maintain (O&M) the proposed stormwater facilities was assumed to be three percent of the total capital cost for both centralized and decentralized projects. Comparing these annualized costs, including capital and O&M, with the estimated average annual yields, the unit cost of water in $/AFY is approximated (Figure 6-7).

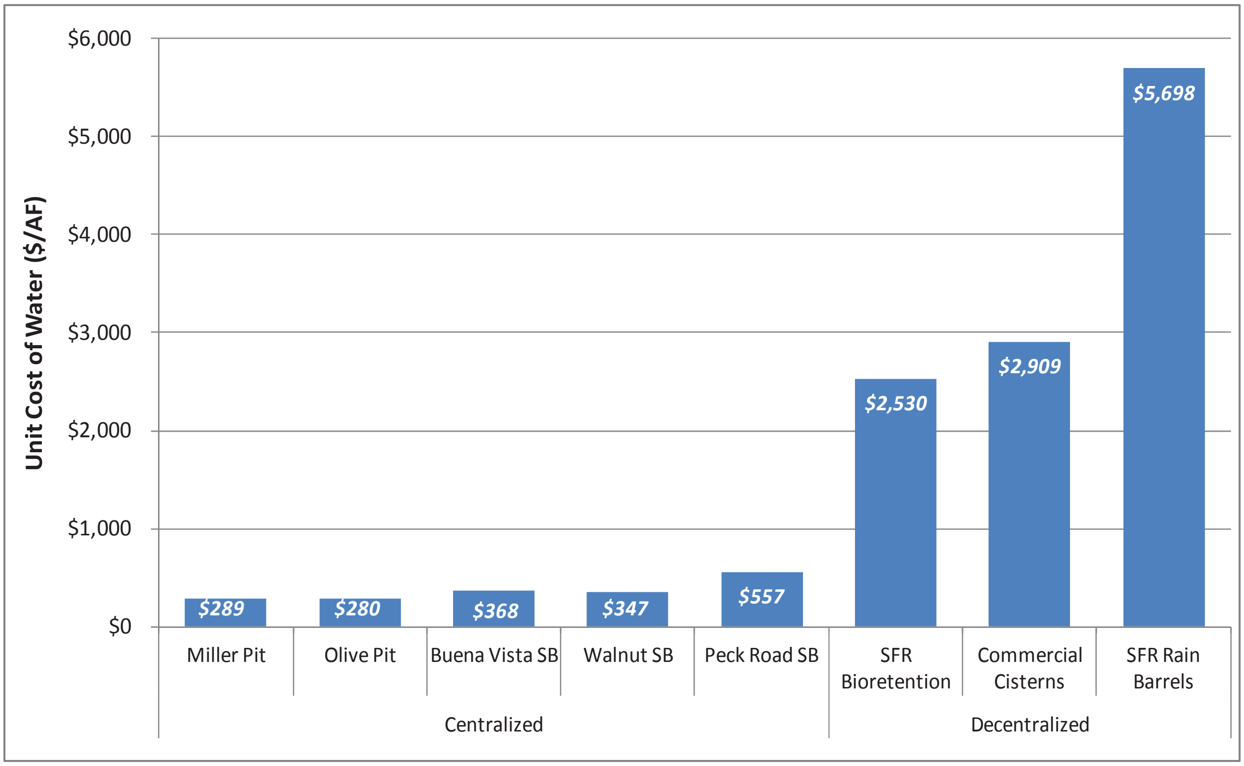


Figure 6-7
Estimated Unit Cost of Water for each Stormwater Project Evaluated in the Upper District IRP

6.4 Water Transfers/Storage

For the purpose of the IRP, a generic water transfer/storage option was developed. This could be a proxy for several different programs such as a wet year storage program in which Upper District buys or contracts long-term for water during wet hydrologic years from the Central Valley, Kern-Friant system, or a number of groundwater banks such as Arvin-Edison. It could also represent purchase of MWD replenishment water if that program is re-instated.

Given the MWD water supply reliability analysis presented in Section 3, Upper District's need for new water supplies is not required every year. In fact, in most years there will likely be enough water to meet water demands in the service area. But approximately 20 percent of the time, there is an expected gap between future demands and existing, firm water supplies. Because of this, and because Upper District and its retail agencies have access to a large groundwater basin for storage, wet-year water transfers can be very cost-effective. Wet-year transfers are generally less costly and more reliable because of reduced stress on the Delta and lower SWP/CVP system demands. The wet-year transfer water would be stored in the Main Basin for later use during dry years and droughts. The key, however, is to keep this water in the Basin for long-term storage.

The cost assumptions for the IRP for this water transfer include the following components: (1) purchase price of water; (2) wheeling charges to be paid to MWD for use of their system to move the water; and (3) extraction, or groundwater pumping costs when the water is used. Table 6-6 presents these water transfer costs.

Table 6-6. Summary of Assumed Water Transfer/Storage Cost

Cost Category	Unit Cost[1] $/AF
Water Transfer Purchase Price	$195
MWD System Access Charge	$217
MWD Water Stewardship Charge	$43
MWD Power Charge	$136
Total	**$591**

[1] All costs in 2012 dollars.

Section 7

Alternatives Evaluation

The conservation and water supply options that were described in Sections 2, 5, and 6 were characterized in terms of potential benefits to provide insights into how they might be combined into alternatives. Besides cost and supply yield, which are presented in Sections 2, 5 and 6, the following benefits were assessed for each of the major option categories:

- **Drought Proof** – indicates how well an option is resilient against droughts. Those options that are dependent on surface water will have greater hydrologic variability and therefore be more prone to droughts.
- **Climate Change** – indicates how well an option is resilient against climate change. While surface water will be more vulnerable to climate change, groundwater that is recharged by mountain snowpack can also be affected by climate change.
- **Basin Water Quality (WQ)** – indicates how well an option improves basin water quality, specifically salinity.
- **20x2020 Goal** – indicates if an option will help meet the state's required reduction of per capita water use of 20 percent by 2020.
- **Flexible** – indicates the option's flexibility in terms of phased implementation or incrementally utilized.
- Total Maximum Daily Load (TMDL) – indicates if the option helps the region meet TMDL requirements for discharges of stormwater into receiving waters.

For each of these benefits, the options were assessed using a simple, relative scoring (see Figure 7-1).

Option Category	Benefits					
	Drought Proof	Climate Change	Basin WQ	20x2020 Goal	Flexible	TMDL Benefits
Indirect Potable Reuse (tertiary/blend)	●	●	◒	●	◒	○
Indirect Potable Reuse (FAT*)	●	●	●	●	○	○
Non-Potable Recycled Water	◒	●	○	●	◒	○
Centralized Stormwater Capture	●	◒	●	○	●	●
Decentralized Stormwater Capture	◒	◒	○	○	◒	●
Water Transfers/GW Storage	◒	◒	◒	○	●	○
MWD Imported Water	○	○	◒	○	●	○
New Water Conservation	●	●	○	●	◒	○

* Full advanced treatment

● – Strong benefit
◒ – Moderate benefit
○ – Little to no benefit

Figure 7-1
Benefits of Different Options

What this characterization indicates is no option provides all of the benefits that are needed in this IRP in terms of reliability, water quality, meeting California's 20x202 conservation goals, being flexible and providing total maximum daily load (TMDL) benefits. Therefore, alternatives (combinations of various options) were defined and analyzed against the planning objectives using the IRP process described in Section 4.

7.1 Definition of Alternatives

To help define the IRP alternatives, themes were used. Some themes were designed to push a particular option in order to see how that strategy would perform. This was useful to see trade-offs between these alternatives. Two alternatives, however, were designed to be hybrid mixes using the insights gained from the options assessment summarized in Figure 7-1. In the end, the following 6 alternatives were defined:

1. **Maximize Reuse** Maximizes recycled water, both non-potable and indirect potable options
2. **Maximize "Green"** Maximizes options that have minimal impacts on environment
3. **Maximize Reliability** Maximizes options that have high reliability elements
4. **Maximize Flexibility** Maximize options that are the most flexible in implementation and operations
5. **Balanced Mix A** A hybrid alternative with balanced options, with a focus on cost-effectiveness
6. **Balanced Mix B** A hybrid alternative with balanced options, with a focus on permitting

Table 7-1 presents these 6 alternatives and the options included in them.

Table 7-1 Options Included in Each IRP Alternative

Options	Alternatives (Yields in Acre-Feet)					
	Alternative 1 Max Reuse	Alternative 2 Max "Green"	Alternative 3 Max Reliability	Alternative 4 Max Flexibility	Alternative 5 Balanced Mix A	Alternative 6 Balanced Mix B
Indirect Potable Reuse (tertiary/blend)	10,000				10,000	
Indirect Potable Reuse (AWT*)	14,000		24,000			10,000
Non Potable Recycled Water	1,520	520	1,520	1,020	1,020	520
Centralized Stormwater Capture		5,300	5,300	5,300	5,300	5,300
Decentralized Stormwater Capture		1,700			200	
Conservation (level 1)	2,500		2,113			
Conservation (level 2)				5,000	5,000	7,500
Conservation (level 3)		10,000				
Water Transfers/Storage		10,000		10,000	11,413	9,613
MWD Drought Penalty Purchase				5,000		
Sub-total New Options	**28,020**	**27,520**	**32,933**	**26,320**	**32,933**	**32,933**

* AWT = Advanced water treatment.

7.2 Evaluation of Alternatives

The alternatives in Table 7-1 were evaluated against performance metrics presented in Table 4-1 (Section 4). To evaluate the reliability and cost of the alternatives, a mass balance simulation was conducted using the time series from 2012 to 2035. Both average year and drought year conditions were simulated. Average year simulations were used for lifecycle cost analysis, while drought year conditions were used for assessing supply reliability (see Appendix G for an example simulation for Alternative 5). In addition to the reliability and cost performance metrics, other metrics where developed. Greenhouse gas emissions (expressed in metric tons/acre-foot) were estimated based on energy requirements for each option in the alternatives. Runoff managed (expressed as acre-foot) was estimated by accounting for the reduction of stormwater discharged to the ocean. The other performance metrics (climate change, local control, water quality, flexibility, permitting, institutional, and customer) were based on a qualitative "score" of 1 to 5, where 5 equals best performance. This qualitative assessment was based on other IRPs in Southern California, as well as input from Upper District staff and best engineering judgment. Table 7-2 summarizes all of the performance metrics for all of the alternatives.

Table 7-2 Performance Metrics for Alternatives

Objective	Performance Metric	Alternative 1 Max Reuse	Alternative 2 Max "Green"	Alternative 3 Max Reliability	Alternative 4 Max Flexibility	Alternative 5 Balanced Mix A	Alternative 6 Balanced Mix B
Reliability	2035 Max Shortage (AFY)	4,913	5,413	0	6,613	0	0
	Cumulative Av Shortage (AF)	5,611	2,601	3,402	3,587	0	0
	Climate Change Score	5.0	3.5	5.0	2.0	4.0	4.0
Cost	PV Total Cost ($ M)	$1,272	$1,152	$1,415	$1,141	$1,128	$1,479
	2012 Total Capital Cost ($ M)	$197	$27	$284	$35	$91	$189
Local Control	Local Control Score	5.0	3.0	5.0	2.0	4.0	4.0
Water Quality	Water Quality Score	4.0	3.0	5.0	2.5	3.5	4.5
Environmental	Greenhouse Gas (MT/Year)	20,406	5,187	25,013	5,659	10,601	16,338
	Runoff Managed (AFY)	0	7,000	5,300	5,300	5,500	5,300
Implementation	Flexibility Score	1.0	4.5	1.0	5.0	3.5	3.5
	Permitting Score	3.0	3.5	4.0	5.0	3.0	4.5
	Institutional Score	3.5	2.0	3.0	3.0	4.0	4.0
	Customer Score	2.5	4.5	4.0	5.0	3.0	5.0

AFY = acre-feet/year; AF = acre-feet; $ M = millions of dollars; MT = metric tons.

For all "Scores" 1 = worst performance, 5 = best performance.

These performance metrics were input into a decision software tool called Criterium Decision Plus (CDP), developed by InfoHarvest, Inc. This industry-standard decision software is used to standardize different metrics (quantitative and qualitative) and incorporate criteria weighting in order to score and rank alternatives. The software uses a technique called multi-attribute rating that is described in Figure 7-2 and below.

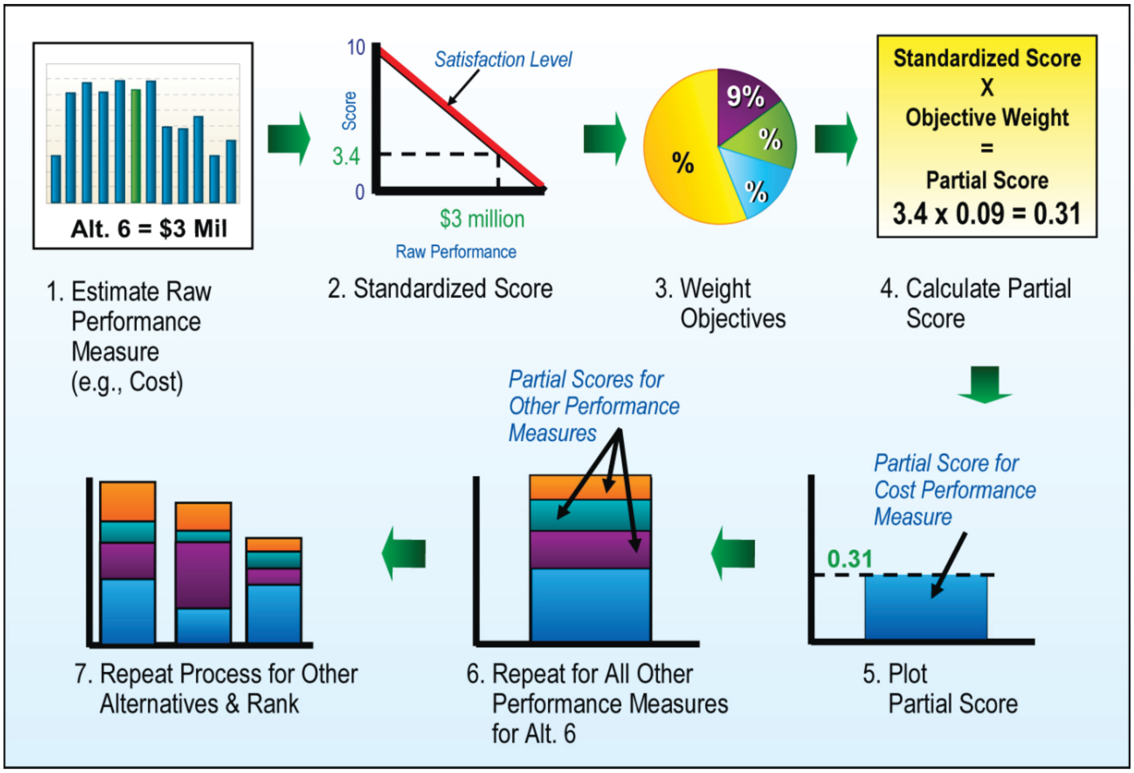


Figure 7-2
Multi-Attribute Rating Technique Used by CDP Software to Rank Alternatives

Multi-attribute rating uses 7 steps to score and rank alternatives. In step 1, raw performance for all of the alternatives is compared for a given criteria (in this case cost). Step 2 standardizes the performance into a score from 0 to 10. In this example, Alt 6's cost performance is fairly expensive so it's standardized score is fairly low (e.g., 3.4 out of 10). This step is important because performance is measured in different units (i.e., cost in dollars, reliability in AFY). Step 3 assigns weights to the objective and Step 4 calculates are partial score for a given alternative based on the multiplication of the standardized score (Step 2) and weight (Step 3). The partial score is plotted (Step 5), and then the whole process is repeated for a given alternative for all of the other performance measures (Step 6). This creates a total score that can then be compared to other alternatives. Steps 1-6 are repeated for all alternatives and compared so they can be ranked (Step 7). This process is powerful because it not only ranks alternatives but clearly shows trade-offs.

Figure 7-3 presents the ranking of Upper District's IRP alternatives using the average stakeholder objective weights presented in Figure 4-2 (Section 4).

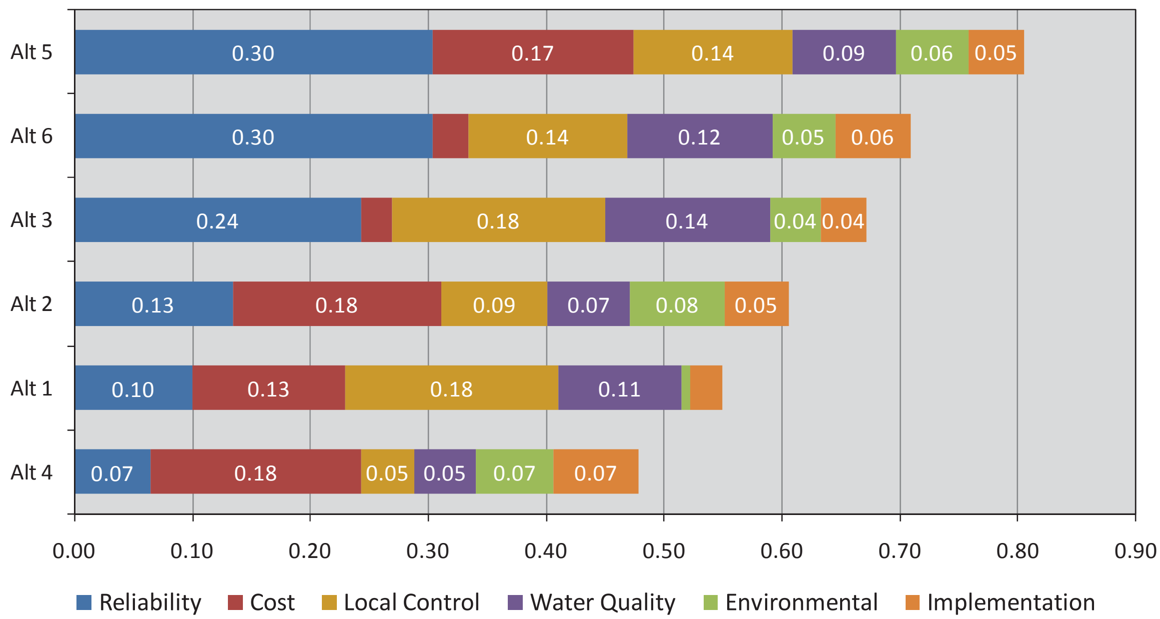


Figure 7-3
Ranking of IRP Alternatives Using Average Stakeholder Objective Weights

Based on average stakeholder weights for the objectives (shown as different color bar segments), Alternative 5 clearly ranks highest overall. It has the best score for reliability (partial scores are shown in white text on the bars), and the second best scores for cost and local control. It also has good scores for water quality and environmental. Its only mediocre score is in implementation—mainly as it relies on tertiary treatment (plus adequate blend water) for groundwater recharge of recycled water. Alternative 6 ranks 2nd, while Alternative 4 ranks last.

In order to test the robustness of this ranking, several sensitivities were conducted by altering the weights between the objectives: (1) all objectives are equally weighted, at ~17 percent each; (2) water quality is given a super weight of 40 percent, while all other objectives are given a weight of 12 percent each; and (3) cost is given a super weight of 40 percent, while all other objectives are given a weight of 12 percent each. Figure 7-4 presents the ranking of alternatives for the base ranking (using stakeholder weights) and for the three sensitivities.

Figure 7-4 indicates that Alternative 5 ranks 1st three out of four scenarios, and only when water quality is given a super weight does it rank 3rd. Alternative 6, which uses full advanced treatment for groundwater recharge of recycled water, ranks 2nd two out of four scenarios and only ranks 1st when water quality is given a super weight. However, when cost is given a super weight Alternative 6 ranks 5th (second-to-last). All other alternatives never rank 1st and rarely are consistent in their ranking of 2nd or 3rd places. This sensitivity analysis indicates that the evaluation and ranking of alternatives is fairly robust.

	Rankings					
Scenario	1	2	3	4	5	6
Stakeholder Weights	Alt 5	Alt 6	Alt 3	Alt 2	Alt 1	Alt 4
Equal Weights	Alt 5	Alt 6	Alt 2	Alt 3	Alt 4	Alt 1
Water Quality Weight	Alt 6	Alt 3	Alt 5	Alt 2	Alt 1	Alt 4
Cost Weight	Alt 5	Alt 2	Alt4	Alt 1	Alt 6	Alt 3

M[illegible]

M[illegible]

Figure 7-4
Sensitivity in Alternative Rankings

Figure 7-5 presents the resource mix for Alternative 5 compared to the status quo in year 2035, assuming no Delta fix and a repeat of a drought. Alternative 5 would cut Upper District's reliance on imported water in half, compared to the status quo approach. Alternative 6 would have similar reduced reliance on imported water. In fact, both Alternative 5 and 6 have significant merit as long-term strategies for Upper District. As such, Section 8 presents specific recommendations using an adaptive management approach based on the options included in both of the high-ranking alternatives.

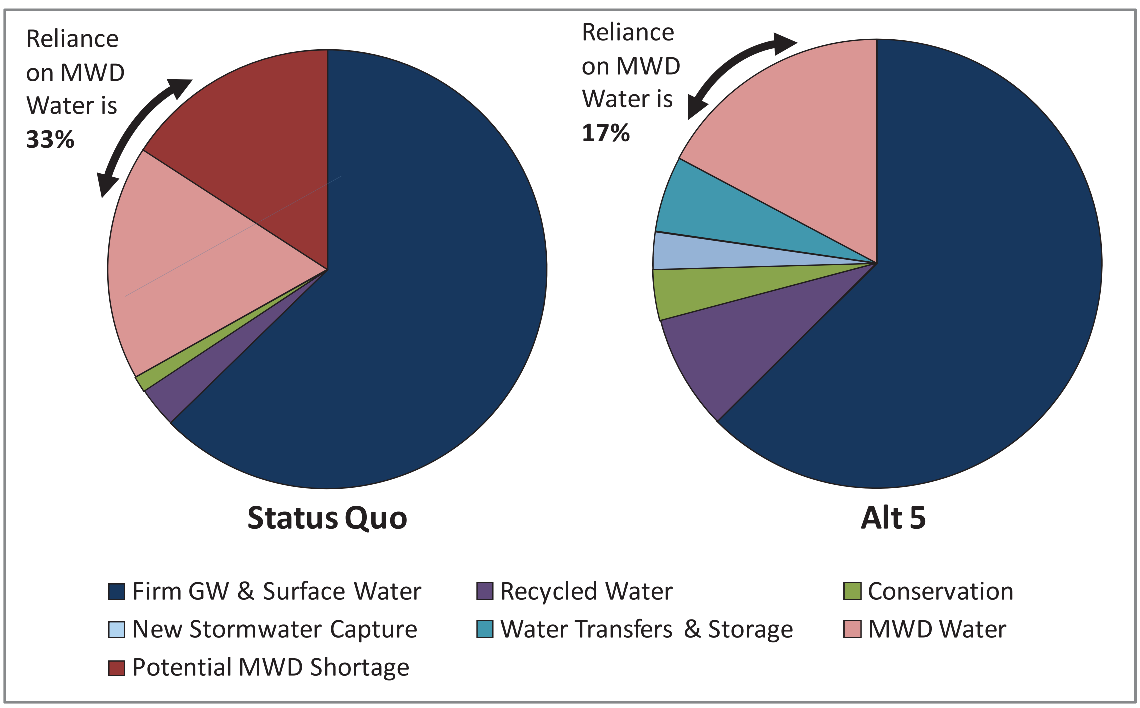


Figure 7-5
Resource Mix for Alternative 5 Compared to Status Quo in Year 2035 during a Drought

Section 8

Adaptive Management and Recommendations

The comprehensive evaluation of alternatives presented in Section 7 concluded that Alternatives 5 and 6 were most frequently the highest ranking alternatives, even under sensitivity analyses. These alternatives compare and contrast in the following ways:

Options Included	Alternative 5	Alternative 6
Conservation	5,000 AFY	7,500 AFY
Centralized Stormwater Capture	5,300 AFY	5,300 AFY
Decentralized Stormwater Capture	200 AFY	--
Water Transfers/Storage	11,400 AFY	9,600 AFY
Non-Potable Recycled Water	1,200 AFY	520 AFY
Indirect Potable Reuse (GW Recharge)	10,000 AFY*	10,000 AFY **

* Tertiary with blend

** Full Advanced Treatment

While both alternatives offer full reliability through 2035, even without a Delta fix, they do so in slightly different ways. The main difference is the treatment for indirect potable reuse. Alternative 5 relies on tertiary treatment with sufficient blend of native stormwater to meet California draft recycled water regulations, while Alternative 6 relies on full advanced treatment (FAT). FAT is substantially more expensive both in initial capital cost and in annual O&M costs. For instance, Alternative 6 has a capital cost that is more than double that of Alternative 5, $189 million vs. $91 million. Upper District is currently working closely with WateReuse and Los Angeles County Sanitation District to conduct research to identify the most appropriate treatment technology. Alternatives 5 and 6 also differ in how California's 20x2020 conservation goal is achieved. Alternative 5 puts more emphasis on meeting the conservation goal through recycled water, while Alternative 6 puts more emphasis on water conservation to meet the goal.

Despite the differences between the alternatives, they are not incompatible. In fact, they can build off of each other depending on the outcome of several factors. For example, a significant cost for the indirect potable reuse is the conveyance pipeline from the SJCWRP to LACPW spreading grounds. This pipeline would be needed regardless of the treatment selected. If Upper District is not successful with securing regulatory and customer approval for tertiary treatment with blend water it can proceed with AWT without losing any investment in the pipeline. Also, there is the possibility of a hybrid between the two treatment alternatives. For example, the first 5,000 to 10,000 AFY could be tertiary treatment with blended stormwater, then if needed advanced water treatment could be used for additional phases. Several other agencies in Southern California are exploring this hybrid treatment for its cost-effectiveness and water quality objectives.

8.1 Adaptive Management

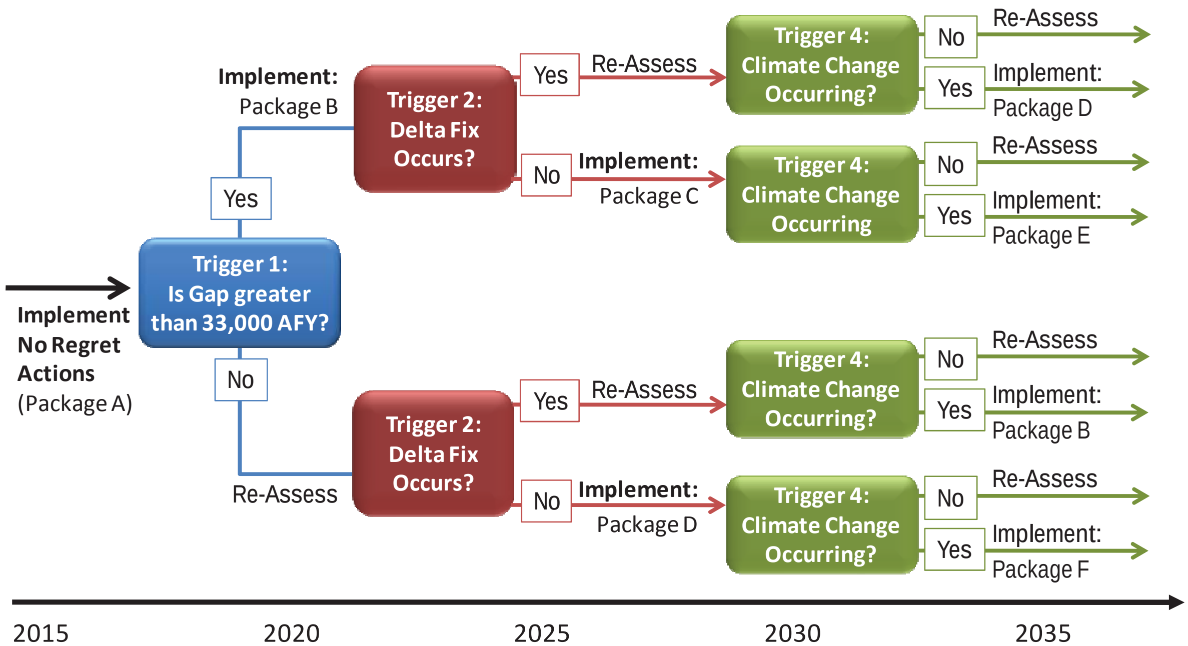
Because of the uncertainty in the size of the potential gap between existing water supplies and projected water demands, an adaptive management strategy was developed for Upper District's IRP. Adaptive management is a process in which different future scenarios are defined. Risk triggers are then identified that serve as branches of a decision tree. For each trigger, outcomes are predicted, and for each outcome, actions are identified. Adaptive management also identifies no or low regret actions that will produce benefits under most or all outcomes of the future. This approach results in a "living" document that can be revisited and updated as the future unfolds.

For the context of Upper District's IRP, no or low regret actions represent the implementation of those projects that are necessary for meeting regulatory and/or other state requirements (such as meeting the 20x2020 conservation goal), those projects that have a unit cost ($/AF) that is projected to be lower than MWD's imported water cost for Upper District, and those actions which provide the necessary foundation to move forward with long-term actions (such as studies and design).

Based on the IRP evaluations, the following options are considered no or low regrets:

- Expanding active water conservation to an annual total of 5,000 AFY
- Implementing up to 1,200 AFY of the most cost-effective non-potable reuse projects
- Implementing up to 5,300 AFY of centralized stormwater capture
- Conducting regulatory investigations and design services for indirect potable reuse

These no or low regret actions should occur within the next 5 years. Beyond these short-term actions, Upper District's adaptive management strategy for the IRP is shown in Figure 8-1.



Package A:	active water conservation (5,000 AFY); non-potable reuse (1,200 AFY); centralized stormwater (5,300 AFY)
Package B:	indirect potable reuse (10,000 AFY)
Package C:	additional phase of indirect potable reuse (14,000 AFY); water transfers (11,400 AFY); additional active water conservation (2,500 AFY)
Package D:	indirect potable reuse (10,000 AFY); water transfers (11,400 AFY); decentralized stormwater (200 AFY)
Package E:	additional stormwater capture (5,000 AFY); additional water transfers (20,000 AFY)
Package F:	additional stormwater capture (5,000 AFY)

Figure 8-1
Adaptive Management Strategy for Upper District's IRP

8.2 Recommendations

Based on the evaluation of alternatives and adaptive management strategy, the following recommendations for Upper District's IRP are:

1. Develop financing plan and CIP for IRP implementation—working closely with retail water agencies, and partner agencies such as Watermaster, Los Angeles County Flood Control District, Los Angeles County Sanitation District, and U.S. Army Corps of Engineers;

2. Conduct regulatory review and preliminary design for indirect potable reuse treatment options;

3. Working closely with partner agencies, implement the following options between now and 2017:

    - Active conservation, as recommended in Water Use Efficiency Master Plan

    - Planned non-potable recycled water projects

    - Centralized stormwater capture projects; and

4. Re-Assess demands and supplies per the adaptive management framework presented in Figure 8-1, and if necessary implement other options of the IRP strategy such as indirect potable reuse, water transfers, and additional stormwater capture.

It is also recommended that Upper District update the IRP and risk triggers every 5 years, in conjunction with its preparation of the Urban Water Management Plan.

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